ANDROID | DISASTER RESILIENCE NETWORK

Proceedings

ANDROID Doctoral School in Disaster Resilience 2014

MediaCityUK, Salford Quays, United Kingdom – 8-11 September 2014

4th International Conference on Building Resilience incorporating the
3rd Annual Meeting of the ANDROID Disaster Resilience Network

Edited by:

Professor Srinath Perera

Mr. Hans Jorgen Henriksen

Dr. Alexandra Revez

Dr. Irina Shklovski

Lifelong Learning Programme

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ANDROID Doctoral School Team

Professor Srinath Perera (Northumbria University, UK)

Dr Irina Shklovski (IT University of Copenhagen, Denmark)

Hans Jorgen Henriksen (Geological Survey of Denmark and Greenland, Denmark)

Dr Alexandra Lima Revez (National University of Ireland, Galway, Ireland)

LIST OF REVIEWERS

The editors wish to acknowledge the contributions made by the RDS review panel listed below.

Dr Alexandra Lima Revez	National University of Ireland, Galway, Ireland
Prof Andrew Collins	Northumbria University, UK
Dr Bridin Carroll	University of Birmingham, UK
Dr Carolyn Hayles	University of Bath, UK
Ms Chamindi Malalgoda	University of Salford
Ms Claudia Bach	United Nations University, Denmark
Dr Gayan Wedawatta	Aston University, UK
Dr Gayani Fernando	University of Moratuwa, Sri Lanka
Dr Gayani Karunasena	University of Moratuwa, Sri Lanka
Mr Hans Jorgen Henriksen	Geological Survey of Denmark and Greenland, Denmark
Dr Irina Shklovski	IT University of Copenhagen, Denmark
Dr James Jeffers	Bath Spa University, UK
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Dr Malcolm Garland	Royal College of Surgeons, Ireland
Prof Marco Lombardi	Università Cattolica (UNICATT), Italy
Dr Marie Mahon	National University of Ireland, Galway

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Prof Srinath Perera	Northumbria University, UK
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Dr Thayaparan Gagendran	University of Newcastle, Australia
Dr Therese Conway	National University of Ireland, Galway
Dr Wesley Flannery	Queens University, Belfast
Dr Yamuna Kaluarachchi	Kingston University, UK

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INTRODUCTION

The ANDROID Doctoral School is a core element of the ANDROID disaster resilience network with a mandate to strengthen the link between research and teaching in the area of disaster resilience. The interdisciplinary mixed teaching space that we have developed as part of this ongoing project encouraged and promoted the work of doctoral students in this field. Furthermore, the doctoral school provided an opportunity for the developmentof a supportive interdisciplinary community of researchers in the area of disaster resilience.

The ANDROID disaster resilience network doctoral school consists of two programmes:

1. Online Doctoral School (ODS) and
2. Residential Doctoral School (RDS)

The interlinked programmes work together to deliver on a number of teaching and research driven objectives. The Online Doctoral School, conducted in Spring 2014, provided an innovative platform for developing an interdisciplinary knowledge base for the doctoral candidates. A total of 44 doctoral candidates representing 27 countries participated in the two day online programme. The school offered a series of live presentations by domain experts in disaster resilience around the world, an opportunity for discussions between experts and students and thematic sessions aimed at engaging the students in knowledge discovery and identification of shared problems and issues through detailed discussions fully exploiting the state of the art facilities in online programme delivery.

The Residential Doctoral School programme (2014) was used as an opportunity to build on the outcomes of the Online Doctoral School by actively engaging doctoral student work through presentations, domain expert feedback and intensive discussion during the annual meeting of the Android Disaster Resilience Network. All participating students developed and submitted an original research piece (based on their doctoral studies) that was peer reviewed by experts within the field. The RDS process includes a limited number of scholarship awards to attend a three day event which entails a panel review of the work of the students and dissemination of this work to a wider audience. A total of 26 papers dpuble peer reviewed and edited through the doctoral school team were presented at the RDS 2014. All presenters were successful participants of the online doctoral school, ODS 2014 held in March 2014.

The residential portion of the school was held from the 8th to the 10th of September, 2014 in the MediaCityUK, Salford Quays in Manchester runs in parallel with the 4th International Conference on Building Resilience which incorporates the 3rd Annual Meeting of the Android Disaster Resilience Network. The conference event itself has been jointly organised by the Centre for Disaster Resilience, University of Salford and the ANDROID Disaster Resilience Network, in association with the United Nations International Strategy for Disaster Risk Reduction (UNISDR) Making Cities Resilient: 'My City is getting ready!' campaign.

This volume presents concise summaries of the contributions of all the doctoral papers presented at the RDS (2014), produced and developed by doctoral students with the guidance, direction and suggestions of a group of experts led by the ANDROID Doctoral School team. Thesepapers demonstrate the richness, diversity and interdisciplinary nature of research topics and problems being tackled by disaster

resilience researchers. Furthermore, we see hereexample of discovery and expansion of research themes that go beyond disciplinary boundaries, reflecting on the greater context of disaster resilience. The work of the doctoral researchers presented here is a valuable contribution to the body of knowledge which, given the growing vulnerability and exposure to disasters of human and natural origin, depends on the development of greater interdisciplinary expertise among the scholars of the future.

Further information on the ANDROID Doctoral School can be found at: http://www.disaster-resilience.net/index.php/doctoral-school-2014.

A summary of the papers presented are given below.

Paper 1

Ravankhah and Schmidtpresent a multidisciplinary methodology/framework to address issues related to disaster risk assessment (DRA) for cultural heritage projects. It is to some extent extrapolation of the cultural heritage development to DRA. It analyses the risk management process within disaster management cycle and applies risk management and attempt to device a process to identify and quantify risks. It uses a multi hazard approach to assess vulnerability, assessment as a crucial part of the framework.

Paper 2

Tau and van Niekerk used international relations theory of neoliberal institutionalism in order to address the lack of a standard collaborative inter-government framework among the countries of the African continent that could be employed in the management of disaster risks and during response and recovery. The paper proposes an institutional collaborative model for disaster risk management in the South African Development Community, which combines the theoretical, political and technical dimensions of collaboration to enhance buy-in and capacity development for the disaster risk reduction function in governments. The model builds upon the empirical finding that collaboration should first be needs driven, fit for purpose and owned by the collaborating states and that the role of international organisations must be supportive in nature.

Paper 3

Adeniyi et al. note that despite significant success in reduction of human casualties in disaster, the economic losses continue to increase and must be addressed. Authors argue that it is crucial to understand the role of the private sector generally and SMEs in particular around investments into resilience of built environments to environmental hazards. The paper presents a literature review of current research on resilience of built environments to environmental hazards and proposes a research design with the aim to develop a built environment disaster resilience investment enhancement framework that integrates disaster resilience maturity and business risks for SMEs.

Paper 4

De Majo addresses the “preventive turn” in disaster risk reduction at national and supra-national level, noting the shift from government to governance as evidence of decentralization of power and diversification of actors in the task of addressing hazards and mitigating their impacts. The paper presents an overview of the Hyogo framework and DDR policies and argues for a need to study the role and practice of global governance in increasing disaster preparedness worldwide.

Paper 5

Wesley explores the need to focus on small scale disasters in a society where large scale single event draws attention but smaller scale disasters can have a greater impact especially on the urban landscape and the society. It analyses the impact on urban dwellers in the city of Manizales, Colombia, who are frequently confronted with highly localized risks. This case study is taken as an attempt to provide greater degree of attention to a less researched domain. The magnitude of these small scale disasters may be smaller but the impact can be severe due to social density and frequency of disaster events. The economic impact could be higher when it is affecting urban areas. The paper presents a document analysis considering the web of informationalization framework. It reviews the institutionalisation of the topic of small-scale disasters in the realms of sustainable urban development and disaster management. The paper argues for a more critical reading would reveal the need for a deeper understanding of a narrative, especially paying attention to the stories of the lived experiences of those individuals that are vulnerable to small-scale disasters.

Paper 6

Genade and van Niekerk employ the Gender-Age Socio-Behavioural Intervention (GASBI) model towards introducing the GIRRL (Girls in Risk Reduction Leadership) Project multi-site case study. The paper leads to the development of new protocol guidelines for integrating gender and age considerations into praxis which aims to address the deficiencies in DRR policy in Southern Africa.

Paper 7

Khangale uses qualitative methodologies to explore key processes and relationships in reference to disaster risk reduction. The critical review of literature leads to the development of a model for integrating disaster risk reduction in national multi-sectoral planning in South Africa.

Paper 8

Nguyen and Horne examine provincial scale climate change action plans in Vietnam. Further research is proposed to investigate the making process to inform the potential effectiveness of plans and the development of principles for policy making that may assist in effective plan making which could ultimately strengthen local climate resilience.

Paper 9

Kuznecova et al. present an application of the methodological framework for resilience assessment of urban energy systems and flows that they had developed in earlier work. Through the use of this framework the paper presents an analysis that quantifies the level of urban resilience from the energy metabolism perspective, taking into account different sustainability dimensions and introducing aspects such as environmental, social, economic, technical and risk factors. The paper presents a case study of the proposed methodology trough quantitative evaluation of the resilience level of three Baltic cities – Riga, Vilnius and Tallinn – as well as it aims to identify the main weak spots and common features affecting the resilience within the studied systems. The case studies produced interesting outcomes; however, empirical results suggested that the weighting of indicators should be a task of utmost importance in subsequent research.

Paper 10

Hosseiniet al. develops a framework for policy makers and stakeholders to investigate the role of climate change mitigation and adaptation in price and rent determination, development returns, and insurance premiums and project financing provisions in the property market. Multi-criteria analysis, option value and willingness to pay methods in mix method are investigated as tools to find optimum mitigation and adaptation strategies applicable in building projects.

Paper 11

Toseroni introduce resilience maps for visualizing the community's adaptive capacity as supplementary to traditional hazard, vulnerability and risk maps. A challenge here is the need to identify new parameters capable to assess the complex relation between socio-economic processes and disasters, and subsequently develop new formulas and indexes merging prevention and emergency management elements. By development of combined resilient emergency plans and resilient regional planning the goal is to reinforce the culture of disaster prevention and preparedness, with the overall goal significantly to reduce disaster risk.

Paper 12

De A. Souza considers issues around long term adaptation post flooding in Brazil and strategies for recovery and mitigating future risk. The paper presents an overview of current research relevant to the context under study and preliminary results of a qualitative study of emergency management and social work professionals involved with long term post-disaster recovery in affected communities. The paper concludes that risk reduction from landslides and flooding is not only associated with geo-physical matters, but mainly related to the complexity of Brazilian´s political, economic and social references. The major goal of this work is to identify strategies for working with residents of at risk areas, especially those in the most vulnerable socio-economic strata.

Paper 13

Santos critically explores key practices and policies underlying flood resilient community agendas. Goals and methodologies expressed in the Floods Directive, and its Portuguese transposition, are analysed in the way they contribute or conflict to the goal of achieving more flood resilient communities. In particular, a reflexion is made about the consideration of resilience in three of the most important issues of the Floods Directive: the risk assessment phase, the management phase and the participation and communication phase.

Paper 14

Sunarharum et al. focus on the dynamics of interactions between community groups and government agencies crucial for improved community resilience as part of flood risk reduction through effective community engagement strategies. The work concerns a case study in Kampung Melayu Village in Jakarta and challenges of relocation of households living in floodplains, and the paper explores barriers in communication, and the need for a simplified approach for effective flood risk management. A collaborative forum with engagement of communities and governments can here potentially improve the information and knowledge transfer regarding flood risk planning.

Paper 15

Mavhura et al. examine flood disaster vulnerability in Tokwe-Mukorsi community in Zimbabwe and identify high risks of exposure due to torrential rains of households with poor socio-economic conditions living upstream and downstream of a dam with reference to a recent flooding in 2014.Relocation to safer places of this community is evaluated as the only viable long term flood response strategy. The paper investigates lack of relocation readiness. Lack of compensation for displacement, absence of basic infrastructural development in relocation sites, availability of livelihood activities and unwillingness to move into a drough-prone region are main barriers.

Paper 16

Ferreira explores issues related to water policy and drought management in Portugal and Brazil. It investigates how development of institutional structures related to water policy can interfere with the establishment of measures that alter the capacity of drought resilience of watershed events. It analyses the existing structures in two case study situations in the two countries and the supporting legal framework supported through expert and stakeholder interviews. The research concludes with identification of the difficulty in applying a truly holistic approach to water issues, resulting in actions that hinder the responsiveness of communities across the drought management.

Paper 17

Yumarni et al analysed the capacity of women in creating community resilience in Indonesia. It presents a case study of Bantul district in Central Java where researches have explored the women capacity and its impact on sustainable post disaster reconstruction. They have utilised cognitive mapping as a methodology for case study detailed evaluation of interviews and data gathered. They conclude that the post disaster reconstruction processes must be inclusive and equitable while that the economic needs and resources allocation to both women and men must be considered accordingly and proactively.

Paper 18

Aijazi focuses attention on the need to go beyond physical and material provisions to communities affected by disasters and draws attention of the reader to more intangible aspects of societies. It makes reference to re-building lost relationships, social connections, sense of self etc within a context of social repair. This is a concept that is relatively under-explored in research. The research takes case studies from the Neelum and Siran valleys in Pakistan within a backdrop of violence and civil unrest. It concludes that social repair orientation to disaster recovery recognizes people as complex and complete political beings and not just as abstract social categories where life aspirations of the survivor is considered in a broader sense.

Paper 19

Tagliacozzo focus on understanding the process of communication between authorities and citizens during the disaster recovery phase, with special attention to the role of new media. Two case studies are considered (i) Emilia Romagna earthquakes in Northern Italy and (ii) Christchurch earthquakes in New Zealand to be investigated with a mixed-mode survey. The goal of the research is to investigate the requirements for a Web 2.0 platform which is able to support communication between the authorities and citizens during the aftermath of natural and anthropogenic disasters.

Paper 20

D'Amico and Currà investigate the relationship between earthquake resilience and urban structure with the aim of increasing urban resilience. The paper proposes a methodology for assessing urban vulnerability of historical towns taking insights from heritage sites in Italy.

Paper 21

Burton presents a performance based approach in assessing post disaster housing capacity requirements during the recovery phase of the disaster management life cycle. The approach utilises a set of building-level limit states that have been defined based on their implication to functionality and recovery following an event. The recovery function for an individual building is probabilistically computed accounting for the likelihood of and intensity of an earth quake vibration. It also incorporates Socio-Economic Factors in developing the approach. The approach has been is implemented for a residential community in Noida, India with positive results.

This paper was adjudged the Best Doctoral Paper of the RDS 2014.

Paper 22

Gandelli summarizes the research program with the aim to develop technologically advanced sliding isolators for the design of strategic buildings with an increased seismic-resilience. The paper describes the motivation for this work and presents interim results from initial experimental assessment of mechanical and frictional properties of current and novel sliding materials as well as the results of the shaking table tests assessing the dynamic response of a base-isolated steel frame. Data and implications from these tests are reported.

Paper 23

Pusceddu et al. investigates emergency architecture and the needs of displaced people assisting the phase of response and re-construction, and suggest an innovative lightweight, modular temporary air shelter house to support disaster resilience. The solution has to be lightweight for guaranteeing safety during disasters and modular, easy to assemble and transport. Here the Thermal Reflective Multi-layer System (TRMS) is identified by analyzing various construction materials and architectural examples. Air Shelter House is a technological skin, to apply externally, to different kind of structure, respecting the local construction tradition.

Paper 24

Flores and Fenn use an explorative approach to examine how community members can help to reconstruct their own housing after disasters. The main idea is to investigate how traditional construction materials can be replaced by 3 Dimensional Lightweight Panels (3D-LPs). A prototype basic housing unit of 50 sqm using 3D-LP simulated was simulated in Building Information Modelling (BIM), showing that 3D-LPs was faster than standard construction and resulted in superior performance. The paper concludes that a basic permanent housing by use of 3D-LP can be built in ninety days by unskilled people trained by skilled people saving up to 45 % of the total costs compared to the use of traditional materials.

Paper 25

Silva proposes a comparative exploration between national and safety organizational cultures of airports. Examining both differences and similarities within several airports it includes an evaluation of procedures including safety management systems and state safety programmes.

Paper 26

Hayat and Amaratunga discuss the institutional factors affecting the capacity of the local government in the maintenance of the road infrastructure assets. Twenty-eight semi-structured interviews were conducted with representatives of road infrastructure stakeholders at the local, provincial and national level. The analysis reveals the main institutional issues perceived as the affecting factors to the local governments' road maintenance capacity.

Session One – Resilience in Arts and Architecture

Paper 1: Developing Methodology of Disaster Risk Assessment for Cultural Heritage Sites

Mohammad Ravankhah[1] and Michael Schmidt[2]

[1]*Brandenburg University of Technology, Cottbus, Germany; email: ravanmoh@tu-cottbus.de*
[2]*Brandenburg University of Technology, Cottbus, Germany; email: michael.schmidt@tu-cottbus.de*

ABSTRACT

Cultural heritage still suffers from the lack of a specific and systematic risk assessment process despite emerging recent investigations on protection of such outstanding properties from natural hazards. Vulnerable attributes of heritage sites are conveying irreplaceable values that make it much more complicated to identify and analyse potential disaster losses to those elements. This paper aims to develop a methodology of disaster risk assessment specified to cultural heritage sites in an interdisciplinary framework. The existing methods and approaches of risk assessment as well as relevant global practices are applied to fulfil the aim.

Keywords: cultural heritage sites, disaster risk assessment, natural hazards

INTRODUCTION

Cultural heritage sites are considerably vulnerable to natural hazards not only because of physical damage of a primary hazard, but also due to disaster risks induced by secondary hazards as well as human-errors that may cause irreversible losses during emergency response and post-disaster recovery. To cope with the problem, an interdisciplinary research is needed to study the nature of hazards on one hand and specific characteristics of cultural heritage in a value-based system on the other hand. Since the last decade, heritage conservation has being applied disaster risk management as a tool to become more systematic and comprehensive, specifically in the area of risk assessment.

Although some investigations have been devoted to risk preparedness and management for cultural heritage properties exposed to natural hazards, such as Stovel (1998), FEMA (2005), and UNESCO (2010), rather less attention has been paid to a systematic disaster risk assessment methodology. Such an interdisciplinary study needs to deal with fragile historic characteristics, irreplaceable values, and limited risk mitigation and preparedness alternatives. In fact, risk assessment seems more complicated when it comes to historic destricts in which correlations among socio-cultural, physical, economic and environmental risks need to be analysed in a value-based system.

This paper attempts to develop a disaster risk assessment methodology specific to cultural heritage based on the existing methods and approaches from heritage conservation and disaster risk management disciplines. Special focus is given to the technique of identifying, analysing and evaluating disaster risks as well as how to integrate value and vulnerability assessment of tangible heritage to the overall process. The proposed disaster risk assessment aims to promote effectiveness of pre-disaster mitigation and preparedness in order to make cultural heritage more disaster-resilience considering its authenticity and integrity.

A NEED FOR AN INTERDISCIPLINARY APPROACH TO RISK ASSESSMENT FOR CULTURAL HERITAGE

Traditionally, a hazard was perceived as a phenomenon which directly affects physical attributes of historic sites. A shifting approach emerged, during last years, to consider potential impacts of disaster resulting from a hazard not only the hazard itself. The term disaster, defined by UNISDR (2009) as "a serious disruption of the functioning of a community", is looking at characteristics of a hazard as well as vulnerability of elements at risk. Disaster resulting from natural hazards is a situation, induced by risk factors within and outside of the historic core zone, which can disrupt a complex environment in which the property is situated. Disaster risks, therefore, need to be considered through analysing direct and consequential losses affecting a wide range of material and immaterial aspects of a heritage site and its setting.

The complexity of natural hazards in the context of cultural heritage seems to be overcome only by an integrated approach to disaster risk in an interdisciplinary manner. Here, we are dealing with the knowledge and methodology applied in three disciplines of architectural and heritage conservation, disaster risk management, and natural science to cover different aspects of the issue. Risk assessment methodology therefore, need to be applied from the field of disaster risk management and then, adapted to the specific attributes of cultural heritage.

When it comes to terminology of DRM for natural hazards, the fundamental concept which needs to be clarified is 'risk'. The term 'risk' refers to the "expected losses from a given hazard to a given element at risk, over a specified future time period" (Coburn et al. 1994). FEMA (2005) defines risk as "the potential loss associated with a hazard, defined in terms of expected probability and frequency, exposure, and consequences". Importantly, significance or value of cultural heritage is an integral part of exposure influencing risk. In addition to the three mentioned risk elements, risk relies on efficiency and effectiveness of existing management system. This component is demonstrated by UNISDR (2012) as "resilience or coping capacities" and by NERAG (2010) as "level of existing prevention/preparedness (PP) control, and level of existing response and recovery (RR) control".

Risk assessment by definition is "a methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability" (UNISDR, 2009). In a simple term, a general procedure of risk assessment can be expressed in "the overall process of risk identification, risk analysis and risk evaluation" (AS/NZS ISO 310009:2009). Risk assessment thus, as a core phase of disaster risk management process (Figure 1), is a tool to which data regarding hazard, exposure, vulnerability, and coping capacity enters and information required for risk treatment and decision-making exits. Admittedly, effectiveness of mitigation and preparedness actions for conservation of historic areas relies heavily on reliability and validity of risk assessment (Figure 1). Taylor (2005) and Waller (2002) believe that risk-based related models seem to be more effective compared with traditional collection condition for historic buildings and their contents. Taylor (2005, p. 128) stresses that "risk assessment is an extremely useful concept for preventive conservation and planning because it does not rely on the existence of damage to establish priorities for its prevention".

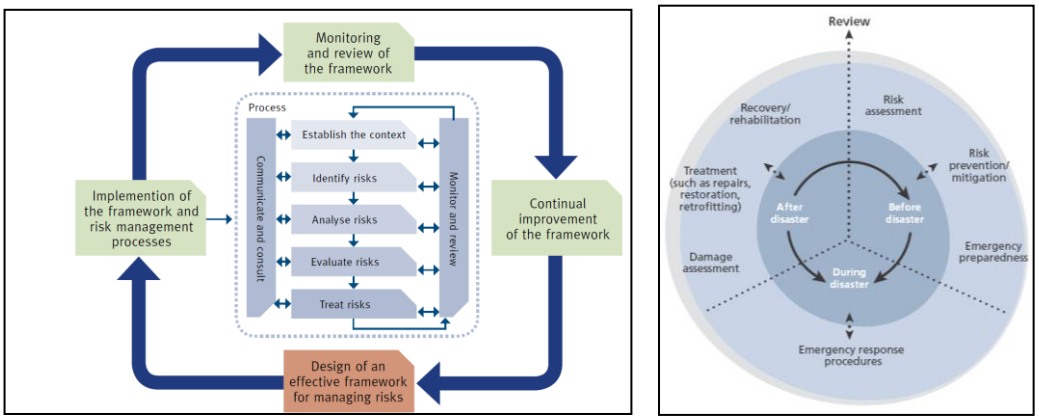

Figure 1 Risk Management process NERAG, 2010 (Left); Disaster Risk Management cycle UNESCO, 2010 (Right)

EXISTING METHODS AND APPROACHES TO DISASTER RISK ASSESSMENT FOR CULTURAL HERITAGE

As mentioned earlier, there are very few investigations dedicated to a disaster risk assessment method for cultural heritage exposed to natural hazards. FEMA (2005) in a hazard mitigation guideline presents a systematic process to profile hazards, assess value and vulnerability of historic properties, and estimate potential economic loss. Jigyasu et al. (2010), in UNESCO manual on managing disaster risks, emphasize that risk should be assessed through a holistic view to analysing risk factors and cause-effect relationship considering heritage value. In a broader sense, risk assessment for NERAG (2010) falls into three major steps: identifying, analysing, and evaluating risks. Although the NERAG method is not specified to cultural heritage, it follows a systematic and coherent process, quite applicable to build environment.

Through investigating the existing methods of disaster risk assessment in general or in particular for cultural heritage, the author aims to develop a specific methodology in an interdisciplinary approach. Furthermore, relevant global practices contribute in the process to fill the gap between theory and practice.

Identifying risks

"Risk identification involves the identification of risk sources, events, their causes and their potential consequences" (AS/NZS ISO 31000:2009). For NERAG (2010), risk needs to be identified through a disaster scenario to explore "interrelations among all causes that may result in an emergency, the impacts that may arise from the exposure, and relevant controls that are in place". Similarly, Jigyasu et al. (2010) stress the importance of cause-effect relationship considering multi-hazard analysis. In simple terms, risk components data provide a ground to predict potential impacts or losses which may occur during and after a disaster.

Regardless of direct damage of a primary hazard to historic fabric, risk can arise from secondary hazards. Earthquake for instance, may lead to a fire caused by explosion, flooding from a damaged dam, or followed by looting of valuable assets. In environmental-related risks, rising ground water as a result of earthquake may cause dampness and growth of vegetation on historic fabric (Jigyasu et al. 2010). Besides, human-errors (e.g. improper intervention) might pose additional threats to post-disaster condition of a property during damage assessment and recovery process. Therefore,

disaster risks should be identified through an integrated approach to pre, during and post disaster circumstances of a heritage site and its setting.

In the World Heritage context, we are dealing with Outstanding Universal Values (OUV) and complicated condition of authenticity and integrity in pre and post-disaster situation. Outstanding Universal Value means "cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity" (WHC. 12/01, 2012, Para. 49). Challenge of test of authenticity and integrity of Bam and its Cultural landscape, following Bam earthquake 2003, in the inscription process on the UNESCO World Heritage List is an example of this issue. Importantly, a serious threat to authenticity and integrity of a heritage site affected by a hazard means it can be no longer nominated on the World heritage List; or the same situation for a World Heritage site can place the site on the UNESCO in Danger List.

Before starting risk identification, a clear understanding of existing management system, current gaps, available resources, stakeholders and scope of the project need to be carried out. The process then, continues with assessing the risk elements.

Hazard assessment: procedure of identifying source of disaster not only focuses on primary natural hazards, but also on associated secondary hazards as well as human-induced hazards likely to threaten a site. A history of past hazards including their probability and severity can further help risk analysis. The assessment will be fulfilled by producing a hazard boundary map, as FEMA (2005) suggests, that through overlaying with map of values and vulnerability of properties results in a risk map.

Exposure assessment: elements at risk in terms of tangible heritage fall into: monuments and their contents, historic sites, historic cities, cultural landscape, and archaeological sites. In the context of World Heritage, Jigyasu et al. (2010, p. 23) indicates to identify and evaluate those elements conveying OUV of a property considering its authenticity and integrity.

Value assessment: Assessing value of cultural heritage is truly a complex and challenging procedure in dealing with a variety of physical, socio-cultural, and economic aspects. Worthing and Bond (2008, p. 54) states that "the importance of the site cannot be inferred or assumed, but needs to be demonstrated through understanding the place and assessing its significance through a rigorous, transparent and objective process".FEMA (2005) determines the level of value for historic properties based on: "historic designation, geographical context of significance, public sentiment, economic importance, and degree of integrity". In Istanbul, for example, "the level of protection depends on the historical and architectural value of the building and of its contents, as well as on its strategic importance and its level of use" (Barucco & Fanciullacci 2008).

Admittedly, historic properties in a planning area need to be prioritized in terms of value for measuring risks, depending on loss in value, and future prioritizing the properties for risk reduction strategies. A hierarchy suggested by Kerr (2004, cited in Worthing & Bond 2008, p. 82) categorizes cultural heritage into "exceptional, considerable, some, limited, unknown, and no value", which is based on international, national, regional, and local importance.

Vulnerability assessment: susceptibility of a property to hazards relies heavily on factors within a property or in the surrounding environment. FEMA (2005, p. 2-5)

considers vulnerability of buildings in a multi-hazard context to analyse correlation of potential effects from different hazards. In this regard, Jigyasu et al. (2010, p. 26) give an example of "conservation guidelines for mortars developed because of a greater incidence of flash-storms which may not be appropriate in terms of earthquake resistance".

Vulnerability of a property to natural hazards greatly linked to its pre-disaster situation in terms of deterioration and inappropriate intervention. In the case of Arg-e Bam, Langenbach (2005, p. 1) argues that it was not only the earthquake caused such a huge damage to the citadel, but "the collapse of the walls was caused largely by a combination of the effects of the additive changes made to the walls during recent restorations (…), damage from termites, and loss of the cohesion of the clay from drying out".

Generally, there are two methods of vulnerability assessment: qualitative and quantitative. According to Barucco and Fanciullacci (2008) a quantitative assessment of building vulnerability can be based on "global vulnerability (weakness in several parts), prevalent (load factor, failure mechanism) and local (weakness in a limited part)". Qualitative assessment, on the other hand, is a rapid assessment process based on "in-situ inspection and on a preliminary knowledge of the building history and its architectural and technical features" (D'Ayala et al. 2008). In a rapid vulnerability assessment method, Schmidt & Rudolff (2014) have developed an "impact matrix of climate change risks on cultural heritage". In such a matrix, which can be applicable to natural hazards as well, based on climate change-related risks and potential receptors of impacts at historic constructions, the level of vulnerability is determined. The vulnerability assessment method however, needs further research to cover various physical, socio-cultural, economic and institutional vulnerability of cultural heritage to natural hazards in an integrated procedure.

To sum up, disaster risk identification process, as showed in Table 1, should be based on a clear perception of risk elements. Importantly, risks need to be identified in an integrated view to disaster resulting from multiple hazards, secondary hazards, and human threats and errors. According to the table, disaster risks are identified considering the existing disaster risk management system at a heritage site, and eventually, sorts of potential losses are determined.

Table 1: Process of identifying disaster risks to cultural heritage sites

Source of Disaster Risk			Exposure (Heritage) Statement		Vulnerability Statement		Existing DRM System		Risk Statement		Types of Potential Losses	
Primary Hazard/ Multiple Hazards	Secondary hazards	Human-errors	Elements of the site	Value of the site	Vulnerability Types	Statement	Mitigation	Preparedness	Risk No.	Risk Statement	Direct/ Consequential	Physical/ Socio-cultural/ economic/ environmental

Risk map: a risk map is a practical method to identify those heritage sites located in hazard-prone areas including necessary information for decision making. It further improves the efficiency of emergency response. FEMA (2005) suggests a composite

map consisting of identified hazards, inventory of historic properties and value of these assets to assess their vulnerability to natural hazards. In the case of cultural heritage, a comprehensive risk map, preferably in GIS format, needs to be generated considering all risk components as Figure 2 illustrates.

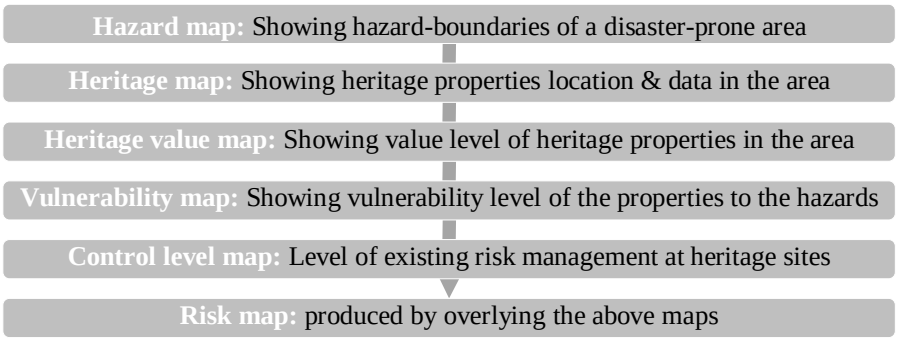

Figure 2 Creating a risk map for cultural heritage sites

Analysing risks

Risk analysis is "the systematic process to understand the nature of and to deduce the level of risk" (AS/NZS ISO 310009:2009). According to NERAG (2010), risk can be measured based on its likelihood and consequence level (Figure 3). Waller (n.d., p. 24), in terms of protection of museums and associated contents, states that severity is an interaction of fraction susceptible and loss in value. Jigyasu et al. (2010, p. 29) stress "the consequence in terms of loss of value" as an additional specific criterion which reflects impact on particular features of a World Heritage site conveying its OUV. Similarly, Paolini et al. (2012, p.30) applied a method of risk rating, adopted from ICCROM–CCI–ICN (2007), at Petra archaeological site in Jordan based on sum of the criteria "probability, loss in value, and fraction susceptible"; each of these criteria is evaluated based on a scoring system from 0.5 to 5. In UNESCO view, in fact, damage to the elements of a heritage site and loss of significance of the site need to be measured separately.

	Consequence Level				
Likelihood Level	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium
Very Rare	Low	Low	Low	Low	Medium
Almost Incredible	Low	Low	Low	Low	Low

Figure 3 Qualitative Risk Matrix © NERAG 2010

Consequently, to avoid confusion in the process of risk analysis, it is suggested that consequence level for cultural properties measured through a consequence matrix based on Loss of Heritage Significance, which involves loss in value and loss in authenticity and integrity, and Level of Vulnerability (Table 2). Afterwards, the level of risk is measured based on hazard probability, consequence level, and quality of existing disaster management at place (Table 3). Risk Matrix (Figure 3) can be applied to rate qualitatively the risk. Undoubtedly, as table 3 demonstrates, uncertainty of data

and work process needs to be considered as a factor which influences the reliability of risk analysis output.

Table 2: Matrix to assess the consequence level of natural hazards on cultural heritage

Potential Loss of Heritage Significance		Level of Vulnerability				
Loss in Value/ OUV	Loss in Authenticity & Integrity	Negligible	Low	Medium	High	Very High
Very High		Moderate	Moderate	Major	Catastrophic	Catastrophic
High		Minor	Moderate	Moderate	Major	Catastrophic
Medium		Minor	Minor	Moderate	Moderate	Major
Low		Minor	Minor	Minor	Moderate	Moderate
Negligible		Minor	Minor	Minor	Minor	Minor

Table 3: Process of analysing disaster risks to cultural heritage sites

Risk No.	Hazard Probability	Consequence Level			Existing DRM Level		Risk level	Uncertainty level		
		Vulnerability level	Loss in Value	Loss of Authenticity & Integrity	Mitigation Level	Preparedness		Interdisciplinary Knowledge	Hazard data	Heritage data

Evaluating risks

"Risk evaluation is the process of comparing the results of risk analysis with risk criteria to determine whether the risk and/or its magnitude is acceptable or tolerable" (AS/NZS ISO 31000:2009). According to the NERAG risk matrix (Figure 3), the already analysed risks are classified into intolerable risks need to be reduced whatever their cost (red zone), tolerable risks need to be reduced (yellow zone), and acceptable risks should be managed through existing systems (green zone).

The output of risk assessment procedure emerges via evaluating the already analysed risks which carrying value and vulnerability of elements of a heritage site and probability of hazards. Therefore, risk evaluation can provide decision making process with reliable information to decide for mitigation and preparedness strategies as well as to help set priority for risk reduction measures.

PROPOSED DISASTER RISK ASSESSMENT PROCESS

Figure 4 demonstrates a summary of disaster risk assessment process described in this paper. In general, the procedure assesses interrelation between hazard and heritage, considering existing disaster management system, to build a disaster scenario and risk map. Such an interdisciplinary framework formulates vulnerability and risk analysis for cultural heritage. The output, as mentioned above, provides risk reduction strategies

with accurate and reliable information regarding the level and nature of risks. As Figure 4 shows, a follow-up multidisciplinary team should review and verify the process to enhance the effectiveness of risk assessment. Furthermore, consultation with stakeholders and public participation in the procedure, regardless of accelerating availability of required data, can build public and political support and strengthen disaster resilience.

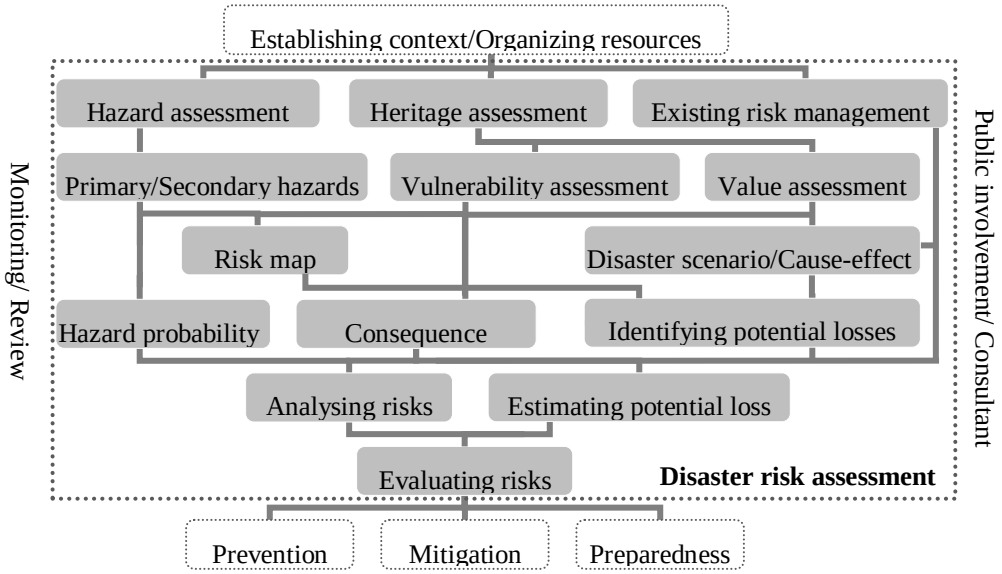

Figure 4 Disaster risk assessment procedure for cultural heritage sites

(Adapted from existing methods of FEMA 2005, UNESCO 2010, and NERAG 2010)

CONCLUSION

This paper has developed a methodology of disaster risk assessment specified to cultural heritage sites, based on the existing methods and approaches to the subject, in an interdisciplinary way. In other words, the paper applied disaster risk assessment to heritage conservation to make the process of heritage protection from hazards more systematic and comprehensive. Undoubtedly, to identify risks and determine their magnitude, the mentioned risk elements need to be analysed in a multi-hazard context considering primary hazards, secondary hazards, and potential human-induced threats and human-errors during and after a disaster. The study further, suggested how to integrate loss of value in the consequence level in the process of risk analysis. Through the literature review it appears that vulnerability assessment, which is so crucial for identifying and analysing risks, has been underestimated and therefore, deserves further interdisciplinary research. To sum up, the proposed systematic disaster risk assessment in the value-based structure of heritage properties needs to be considered in the overall disaster management system to build a resilience-based framework of heritage conservation.

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Session Two – Disaster Management Policy

Paper 2: An institutional model for collaborative disaster risk management in the SADC

Mmaphaka Tau[1], Dewald van Niekerk[2]and Per Becker[3]

[1]*North West University, South Africa; email: Mmaphakat@gmail.com*
[2]*North West University, South Africa; email: Dewald.vanniekerk@nwu.ac.za*
[3]*North West University, South Africa; email:Per.becker@lucram.lu.se*

ABSTRACT

In this study, a collaborative model for disaster risk management in the Southern African Development Community (SADC) was developed. A qualitative study involving disaster risk management centres of all SADC member states was undertaken. The study employed a literature study and empirical research to realise its objectives. The article therefore outlines the institutional collaborative model for disaster risk management in the SADC. The model combined the theoretical, political and technical dimensions of collaboration to enhance buy-in and capacity development for the disaster risk reduction function in governments. The model is also aligned with the national (15 member states) and continental (African Union) disaster risk reduction mechanisms. As a key theory of multi-national collaboration, the international relations theory of neoliberal institutionalism was used to elaborate on the SADC collaborative system. The model therefore demonstrates the need for a multi-disciplinary approach to achieving disaster risk management and reduction in the SADC, and elsewhere, if the developmental objectives of disaster risk reduction are to be realised.

Keywords: Disaster risk management, Disaster risk reduction, Southern African Development Community, international relations, neoliberal institutionalism.

INTRODUCTION

The African continent has a population estimated at 880 million in 2005 and growing at a rate of 2- 4% per annum (ICSU, 2007:4). The continent's reported economic damages resulting from disasters of hydro-meteorological, geological and biological origin for the period 1991– 2005 amounts to US$10,08 billion (CRED International Disaster Database, 2009). The fact that most African countries are poor and lack adequate resources, cause the continent to be least equipped and prepared to cope with the impacts of hazards and disasters (ICSU, 2004; 7; ProVention Consortium, 2008:9). The absence of a comprehensive and uniform SADC collaborative framework which can be employed in the management of disaster risks and during response and recovery from hazards (e.g. fires, epidemics, floods, earth quakes, explosion) and disasters taking into account inadequate research on the subject necessitated the writing of the paper.

Based on the (PHD) study carried out by Tau (Tau, 2014), **the objective of the paper is to present an institutional model for collaborative disaster risk management in the SADC**. Within this context, the paper outlines the institutional structure and working arrangements developed to ensure collaborative disaster risk management in the Southern African Development Community (SADC). The paper is therefore contributes to enhancing disaster risk reduction in the SADC and elsewhere by outlining an institutional model necessary within the international relations context.

INTERNATIONAL RELATIONS THEORY THROUGH THE LENS OF DISASTER RISK MANAGEMENT: A FOCUS ON NEOLIBERAL INSTITUTIONALISM

The article employed international relations theory in developing the institutional collaborative model for disaster risk management in the SADC. The international relations theory refers to theories concerned with the relationships among the world's governments (Goldstein, 2004:3). This theory has relevance to the study due to its focus on *inter alia,* diplomatic strategic relations of states, conflict management, general governance, high level administrative cooperation (Brown & Ainley, 2009:1) as well as cross-border transactions of all kinds, namely political, economic and social (Brown & Ainley, 2009:2; Goldstein, 2004:4; Thornhill, 2002:9). Collaboration on disaster risk management in the SADC is therefore no exception to the focus of international relations theory. Within this context, cooperation between the SADC countries as elaborated in this article was, in part, premised on the key tenets of international relations theory's neoliberal institutionalism theory. These tenets include, *fostering of friendly relations between and among states*, *states assisting and supporting one another*, *states informing and consulting each other on matters of common interest*, *states coordinating (and harmonising) legislation with one another*, *states adhering to agreed procedures and avoiding legal proceedings against each other* (South Africa, 1996; OAU, 1980:72; AU, 2001:10; SADC, 2001:40; SADC, 2003:8; AU, 2004:12; Jackson & Sørensen, 2003:139; ISDR, 2002:113; Tau, 2014).

These foundational tenets and their applicability to the institutional model for collaborative disaster risk management in the SADC are discussed in detail in the PhD thesis by Tau (Tau, 2014). Their relevance for achieving the objective of the paper is depicted in the institutional collaborative model developed by Tau (Tau, 2014) as depicted in Figure 1 below. The tenets of neoliberal institutionalism therefore provide aframework within which to conceptualise an institutional collaborative model for disaster risk management in the SADC within the confines of international relations protocols without undermining individual states' sovereignty. The development of the model was arrived at through the application of a sound research methodology as discussed below.

ACHIEVEMENT OF THE PAPER'S OBJECTIVE: DEVELOPING AN INSTITUTIONAL MODEL FOR COLLABORATIVE DISASTER RISK MANAGEMENT IN THE SADC

The study applied a qualitative research design. Qualitative methods in the form of *literature study, review of documents* (Maree, 2008:82) and *focus group interviews* were utilised (De Vos *et al.*, 1998:313; 2002:305; 2005:299 & 2011:360; Henning, Van Rensburg & Smit; 2004; Creswell, 2003; Maree, 2012; Terre Blanche *et al*., 2006:304). These methodological techniques are based on the PHD study carried out by Tau (Tau, 2014). A discussion on the elements of the research methodology follows in the next section.

Literature study entails the review of various documents such as, but not limited to, reports, international and SADC declarations, protocols, policy frameworks, reports, discussion documents, books, academic thesis, project reports. Focus group interviews on the other hand involved the undertaking of interactive engagements with a group of pre-selected participants. These participants were drawn from disaster management offices of SADC member states, academic institutions involved in disaster risk reduction education, training and research, state and non-state entities within the SADC as well as international organisations involved in disaster risk reduction and

related responsibilities. The resultant institutional model for disaster risk management is therefore presented in the section below.

OVERVIEW OF THE SADC INSTITUTIONAL COLLABORATIVE MODEL

The SADC institutional model for collaborative disaster risk management, as presented hereunder, assumes a three tier structure constituting of the African Union (AU), the SADC and the 15 SADC member states perspectives represented by **A, B and C** as depicted above. This is because the successful operation of the model is dependent on internal (SADC) and external (AU & SADC member states) factors. An additional external factor to the model is the role of international institutions, state and non-state institutions in facilitating and supporting the collaborative system as represented by the bock marked **B9**. The success of the model is therefore dependant on the effectiveness of the member states systems as well-structured and functional SADC disaster risk management and reduction structures and supported by the AU and non-state systems as depicted through the model above.

The key to interpreting the model is therefore constituted of four (4) elements notably:

i. The solid line which depicts structural and reporting relationships;

ii. Broken line which depicts regional relationships within the collaborative system;

iii. Solid lines without arrows which depict functional description, and;

iv. Bubble connectionwhich depicts focal areas associated with a particular function (i. e. functional focal areas)

As with any other programme, the success of the model hinges on the existence of measures necessary to give effect to the collaborative system involving policy frameworks, institutional review and the national and SADC adoption of performance indicators against which to measure the success of the states owned and driven model. To this end, the SADC collaborative model is outline hereunder through a section entitled: the achievement of the research objectives: An institutional model for collaborative disaster risk management in the SADC followed by a summary of its performance indicators.

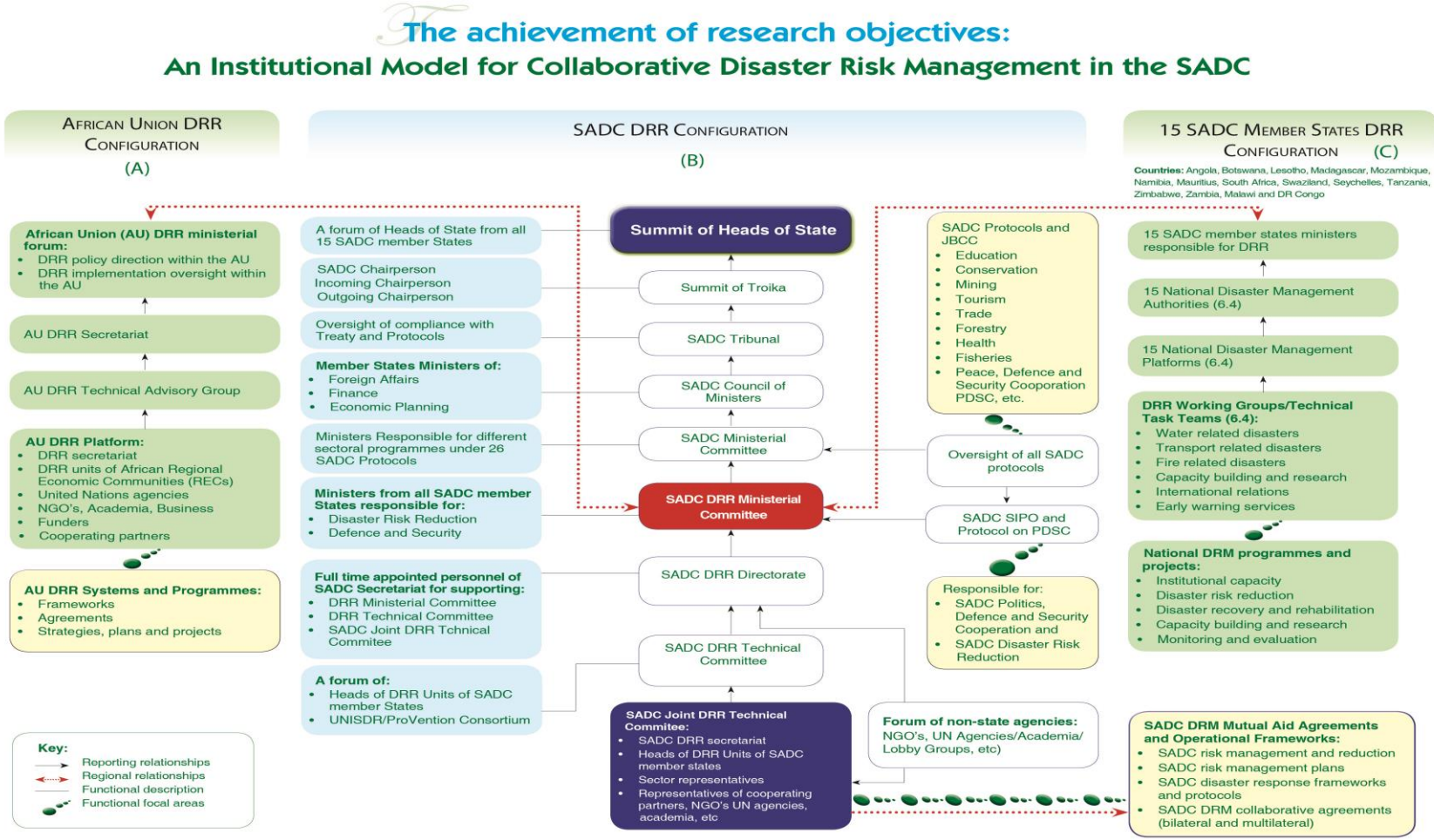

Figure 1 An institutional model for collaborative disaster risk management in the SADC: Source (Tau, 2014:281)

Performance indicators underscoring the institutional collaborative model for disaster risk management in the SADC.

The theoretical and empirical perspectives of the study revealed that the SADC model must be structured in such a way that it enhances disaster risk reduction objectives of the SADC in line with its development objectives. The model must also be aligned to regional (AU), global (UN) and national (SADC member states) systems and priorities. To this end, the theoretical and empirical chapters manifested performance indicators which underscore the successful implementation of the SADC institutional collaborative model. The performance indicators are combined into political, technical and systemic issues as depicted in table 1 below. Responsibilities for actualising each of the measures of the collaborative model are assigned to the relevant agents or entities within the region as listed in the table.

Table 1: Performance Indicators for the institutional collaborative model for disaster risk management in the SADC.

Performance Indicators (PIs)	Measures	Responsible Agent
Indicator 1: Formalisation of the SADC DRM Political Forums (e.g. SADC Ministerial committee on DRR	– Conduct study on political support to the SADC DRR programme; Present report, with recommendations to the SADC Council of Ministers	**SADC secretariat supported by UN agencies and member states**
Indicator 2: Conduct regular technical and intergovernmental meetings on DRM(e.g. SADC DRR Technical committee)	– Develop a schedule of meetings (at least 3 per year); Rotate meetings in SADC member states	**SADC secretariat supported by member states**
Indicator 3: Support the formalisation of UN agencies, state and non-state actors forum on disaster risk reduction (forums may be separated or one forums can be formed)	– Undertake an audit of UN agencies, state and non-state entities and their DRM mandate and capacities; Establish a forum of international organisations and non-state agencies; Establish SADC **joint** DRR Technical Committee	**SADC secretariat, UNISDR with the support of member states**
Indicator 4: Give legal status and ratify SADC policy and other implementation frameworks	– Audit all existing frameworks and identify gaps; Improve and adopt frameworks; Formulate and ratify a stand-alone SADC Protocol on DRM/R and its supporting Declaration; Ratify the SADC Policy and Strategic Frameworks for DRR (prioritise pre-and-post disaster phases); Undertake and audit of MoUs and other frameworks required to support DRR in the SADC; Adopt MoU Protocol for the SADC (with bilateral and multi-national focus)	**SADC secretariat wish support of agencies and member states**

Performance Indicators (PIs)	Measures	Responsible Agent
Indicator 5: Uplift the SADC Disaster Risk Reduction Unit into a Directorate	– Assess and address human resources capacity development for the SADC DRR Directorate; Revise SADC secretariat structure and factor in climate change function and responsibilities; Adopt DRR policy and resources plan	**Member states under the coordination of the Council of Ministers (facilitated by the SADC secretariat)**
Indicator 6: Develop a database on regional and national DRM/R capacity and resources	– Undertake an audit of DRM needs in the region; Compile an audit of national DRM capacities; Compile an audit of national DRM capacities and resources	**Member states under the coordination of the SADC secretariat**
Indicator 7: Formulate and adopt a SADC capacity development, research and communications framework	– Undertake DRM capacity building needs analysis for the SADC; Undertake DRM capacity building resources analysis for the SADC; Undertake DRM research needs and resources analysis for the SADC; Develop and ratify the SADC DRM capacity building framework and communications protocols	**SADC secretariat supported by member states**
Indicator 8: Formulate and adopt the International Disaster Response Laws, Rules and Principles (IDRL) guidelines for the SADC to ensure coordinated institutional coordination	– Based on the an audit of needs and resources in the SADC; Adopt guidelines and implementation plans	**SADC secretariat working with member states, other agencies and under full political support**
Indicator 9: Establish a stand-alone DRR budget for the SADC with clear funding protocols	– Conduct an audit of SADC DRM funding needs and potential sources; Develop and funding framework and guidelines; Establish and operationalise SADC DRM funding	**SADC secretariat working with member states, other agencies and under full political support**

Performance Indicators (PIs)	Measures	Responsible Agent
Indicator 10: Formalise relationships with existing sectoral collaborative forums (e. g. Joint Bilateral Commission on Cooperation , etc)	– Conduct and audit of existing sectoral forums; Identify collaborative areas; Develop collaborative instruments between DRM institutional systems and sector collaborative systems	**SADC secretariat working with member states, other agencies and under full political support**

Source: Tau (2014:287)

The performance indicators for the SADC institutional model for collaborative disaster risk management represent amenu of strategic activities to be undertaken to ensure the effectiveness of collaboration in the region. As demonstrated above, this collaboration will be made possible, vertically and horizontally, through the involvement and structured support of international organisations and other state and non-state actors. The key feature of the model is that state ownership of the collaborative effort is crucial. The model has also proved that neoliberal institutionalism, *albeit* not in its totality (as discussed in Tau, 2014), is a relevant theory to explain and design an institutional model for collaborative DRM in the SADC and elsewhere. The following tenets as summarised by Grieco (1988:494) and Galbreath (s.a:17) were found to be particularly applicable:

i. States are the key actors in world politics but international institutions play a major role in facilitating cooperation among states i. e. states live with institutionalised cooperation (confirmed through the study by Tau, 2014);

ii. States are complex and unitary-rational actors (refuted under the study by Tau, 2014);

iii. Anarchy is a major shaping force for state preferences and actions (apparently) (refuted under the study by Tau, 2014);

iv. International institutions are an independent force facilitating cooperation (confirmed through the study by Tau, 2014), and

v. Neoliberal institutionalists are optimistic about prospects of international cooperation (confirmed through the study by Tau, 2014).

The study therefore concluded that neoliberal institutionalism *mutatis mutandis* (see theoretical section above) is a relevant theory for an institutional collaborative model for disaster risk management in the SADC in as far as the confirmed tenets are concerned. By implication, international institutions and other state and non-state actors have a critical role to play in supporting DRM collaboration in SADC and elsewhere. This must however happen within a fully state owned system implying that member states involved in the collaborative effort must define their needs and priorities for collaboration and seek outsiders to complement their aspirations and efforts towards fulfilling them.

CONCLUSION

The article expanded on the current institutionalisation and operational systems of disaster risk management and reduction in the SADC. This is because the article employed both theory and empirical research to clarify the current configuration within the SADC in order to formulate an Institutional Model for Collaborative Disaster Risk Management in the SADC. The article also revealed that the current institutional arrangements and processes within the SADC need to be enhanced. It also proved that international institutions and other state and non-state actors have a critical role to play in supporting international collaboration. It therefore became evident that international collaboration should take place in two perspectives: bilateral and multi-national collaboration.

The article revealed that collaboration should first be needs driven, fit for purpose and owned by the collaborating states and that the role of international organisations must be supportive in nature. To this end, the application of neoliberal institutionalism to institutional model for collaborative disaster risk management in the SADC has been confirmed *mutatis mutandis*. Notable also is the fact that there have not been any variations in views and opinions as reflecting in the collected data in the study by Tau (Tau, 2014) which formed the backbone for the article. The article therefore contributes to the body of knowledge on disaster risk reduction by exploring and demonstrating the application of international relations theory to the disaster risk reduction discourses through the development of an institutional model for collaborative disaster risk management in the SADC. This model can be applied to structure supra-national collaboration on disaster risk reduction and other disciplines. It can therefore be used to manage disaster risk as well as sudden and slow-onset incidents associated with natural hazards such as, but not limited to fires, earth quakes, drought, floods, epidemics and human-induced risks such as xenophobic attacks, major trans-boundary accidents, and chemical explosion.

The uniformity of literature on the subject and the congruence of empirical data serve as an indication that the SADC institutional model for collaborative disaster risk management is deemed as being critical to enhancing the SADC disaster risk management and reduction system.

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Paper 3: The Case for the Need to Encourage Private Sector Investment in Enhancing Disaster Resilience in the Built Environment

Onaopepo Adeniyi[1], Srinath Perera[2] and Lei Zhou[3]

[1]*Northumbria University, UK, email:o.adeniyi@northumbria.ac.uk*
[2]*Northumbria University, UK, email: srinath.perera@northumbria.ac.uk*
[3]*Northumbria University, UK, email: lei.zhou@northumbria.ac.uk*

ABSTRACT

Increasing investments in disaster risk reduction have led to a noticeable reduction in human casualties from disasters but economic loss is still on the increase. These losses are usually caused by property damage, job loss, service and business disruption among others. The importance of the resilience of the built environment in the overall resilience agenda cannot be overemphasized. While continuity is a key concern after a disaster most governments do not have adequate financial strength to offset the costs of disaster impacts, the role of the private sector becomes crucial in the protection of assets.The aim of this research work is to develop a built environment disaster resilience investment enhancement framework that integrates disaster resilience maturity and business risks for SMEs. Key issues relevant to private sector disaster resilienceinvestment enhancement has been extracted from literature. Further stage of this research work will make use of the highlighted key issues towards achieving the aim of the study. The work done so far is hereby presented in this paper. The main areas reported are: the problem background, the specific objectives of the study, key lessons from literature, and the summary of research design.It is clear that there is insufficient research and development in addressing the issue of encouraging private sector investment in disaster resilience. Building resilience is addressed primarily as a public sector issue where often disasters are dealt with as an afterthought without adequate planning and investment in building resilience capacity.

Keywords: building resilience, built environment, disaster resilience, investment, private sector.

INTRODUCTION

According to UNISDR (2009)natural disaster is a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Inferring from Kahn (2005) and Kellenberg and Mobarak (2008), both works were also cited in Hallegatte (2013), increasing investments in disaster risk reduction have led to a noticeable reduction in human casualties from disasters, but economic loss is still increasing at an alarming pace (Ki-Moon, 2013, IRIN, 2005). The economic loss will continue to increase unless drastic control measures are taken(Bouwer et al., 2007, Ki-Moon, 2013, Pielke et al., 2008).Although, several events contribute to economic loss from disasters, among these are damages to premises, damages to stocks, and business disruption, the worth of damages done to the built environment and the ripple effects of the damages are significant(Haigh, 2010, UNDP, 2013). Lawrence and Low (1990) described the built environment as an abstract concept used to describe the products of human building activity and includes any physical alteration to the natural environment. In this study, the built environment is referring to human made surroundings. The scope of the private sector is small and medium-sized enterprises (SMEs).

Towards achieving the disaster resilience of the built environment some strategies have been developed. These strategies are with respect to choices of construction method, building codes, planning and construction considerations, design options, choices of installations and construction materials (UNDP, 1994, Rossetto, 2007). The level of use of these strategies is still very low as physical damage to premises remains a major impact of disasters. For instance, (UNDP, 2013) stated that it was difficult for the Japanese fishing industry to recover after the Great East Japan Earthquake(GEJE) as a result of huge physical damage to infrastructure, processing and storage facilities, markets, processing factories, power supply among others. Asgary et al. (2012) also identified the significance of damage done to business facilities as a result of the 2010 flood in Pakistan. Pitt (2008) and Wedawatta (2013) also acknowledged the importance of business premises to continuity after disaster and the significance of the damage currently being done. These indicate that only a more resilient built environment can reduce physical damages and in turn reduce the ripple effect of the damages.

Although, all categories of stakeholders feel the impact of disasters in one way or the other, the impact of disasters on SMEs is not only felt by the SMEs but many citizens, employees and connected supply chains. SMEs make up 99.8% of private sector business enterprises, it provides about 67.1% of private sector jobs in Europe (European Commission, 2008). In South East Asia, SMEs make up about 96% of businesses (ASEAN, 2013). The above figures underline the importance of the need to make SMEs disaster resilient.

This paper presents the case, initial discoveries from literature, and research design summary of a doctoral research. The study is being undertaken to investigate and address the desire of enhancing private sector investment in built environment disaster resilience. The first part of the paper is the introduction; it is followed by the problem background. Thereafter, the paper discusses relevant literature and presents key lessons identified. The need for further research was emphasized and the research design for the doctoral study was set forth. The key lessons highlighted in this paper will form the basis for achieving the overall aim of the doctoral research.

PROBLEM BACKGROUND

The built environment should be able to absorb occasional disruptive events and accommodate occasional disturbance. For instance, in the case of flood events, apart from building codes and land use planning considerations, the use of anti-flood air-bricks, toilet bungs, backwater valve, flood defenders, steel security fire and flood door among other installations are suitable options for ensuring continuity and satisfactory built environment performance after flood events. These installations have been done on properties in North Yorkshire, South of Bristol, Worcestershire among others (Dhonau et al., 2013). Also, similar strategies are available for other types of hazards. For instance, Orion, a New Zealand company made an investment of US$ 6 million on seismic protection (UNISDR, 2013). Obviously, achieving resilience attracts additional initial costs, this reason among others explains the low level of adoption of strategies for building disaster resilience (Warhurst, 2006, Neumayer et al., 2014). Governments have been bearing the majority of the cost of disaster impacts. Recently, many governments have repeatedly voiced out their inability to support reconstruction as a result of dwindling resources in the face of increasing needs. However, a number of governments and non-governmental bodies have identified the ability of the private sector in meeting some of these needs through different approaches (Ki-Moon, 2013).

Disaster risk reduction and building disaster resilience is currently believed by many citizens to be the responsibility of the government, especially the local governments. Whereas, the financial resources for building disaster resilience is seriously under threat as supports from superior levels of government to the local governments are limited and even reducing (Local Government Association, 2013b, Local Government Association, 2013a). Many local governments have been undertaking serious cost cutting measures, they are striving to make ends meet(BBC, 2014, Institute for Fiscal Studies, 2012, Local Government Association, 2013b, Local Government Association, 2013a, NAO, 2013). Actually, even without financial challenge or austerity, building resilience should not be perceived as the responsibility of governments alone since the private sector and private asset owners have the potential of playing key roles. It is time for households, large, medium and small-sized enterprises as well as all other stakeholders to understand the need to protect their assets and reduce built environment or property related loss from disasters.

There appears to be much dependence on post-disaster benefit and insurance compensations (ADB, 2013)rather than pre-disaster preventive, mitigation and resilience measures. Whereas, it is already been projected that insurance might not be affordable and/or available to some assets with time (Dhonau et al., 2013). The earlier the private sector adopts the culture of building disaster resilient built environment the better. Currently, there is a perception of low net return on investment in resilience, whereas building resilience should be seen as a way of making all properties and businesses more attractive, safe and preserved in the long term. The initial great value placed on short term returns must be modified to favour sustainability and disaster resilience (United Nations, 2013).

What does not get measured, often gets ignored, as much as the need for resilience has been identified, resilience of built environment has always been a mere theoretical description until recently when UN/ISDR began the development of scorecards for the measurement of local government and city resilience (UNISDR and GFDRR, 2012).In order to continually monitor the status of disaster resilience or disaster resilience maturity, an assessment instrument needs to be established for the built environment. This will assist in confirming the extent of investment in disaster resilience as well as charge stakeholders to improve investment. Others are working on the development of resilience index from varieties of perspective (community, economic, tourism service) but none on the built environment. Achour et al. (2014) assessed hospital resilience to natural hazards and went ahead to develop an estimation model to quantify the impact of utility supplies interruption on the operation of healthcare facilities. Similarly, Holladay (2012) assessed the resilience and sustainability of community-based tourism development in the Commonwealth of Dominica.

The aim of the doctoral research is to develop a built environment disaster resilience investment enhancement framework that integrates disaster resilience maturity and business risks for SMEs. The specific objectives of the study are stated below:

1. To identify and assess the sustainability impacts of disasters on SMEs;
2. To examine the loss mitigation measures that can be adopted by businesses to address the sustainability impacts of disaster;
3. To evaluate the risks of investing in disaster resilience;
4. To assess barriers to private investment and benefits of investing in building disaster resilience;

5. To develop a model for assessing disaster resilience maturity level of the built environment of SMEs;
6. To assess the relationship between disaster resilience maturity level and business risks towards developing a private investment justification matrix and framework for encouraging investment in resilience; and
7. To develop and validate the framework for encouraging private investment in building disaster resilience.

Objectives 1 to 4 are meant to assist in understanding the entire context of the relationship between SMEs, disasters, disaster resilience, and private investment in disaster resilience. The deliverables expected from objectives 5 and 6 are built environment resilience level measurement instrument and an investment justification matrix respectively. Objective 7 is expected to result in a validated disaster resilience framework for enhancing private sector investment in the built environment.

LITERATURE REVIEW

Private investments and disaster resilience in the built environment

ADPC (2013) and United Nations (2013) stated that the private sector, investment banks and insurance companies can play a major part in the quest for mitigating disaster-related losses and building disaster resilience. The participation of these organisations in enhancing disaster resilience of the built environment can be based on the type of services they offer to asset owners. For example, investment banks can establish a scheme through which property owners can obtain loans at a reduced interest rate to enhance the disaster resilience of their properties. Also, insurance companies can charge premium based on the level of a property's disaster resilience. Figure 1 describes the different levels of private sector (SMEs) involvement in building disaster resilience. Organisations engaging in building resilience outside their own premises should perceive such actions as corporate social responsibility and not philanthropy. This study intends to focus on organisation's resilience of its built assets and their investments in enhancing the level of resilience of its surrounding built environment.

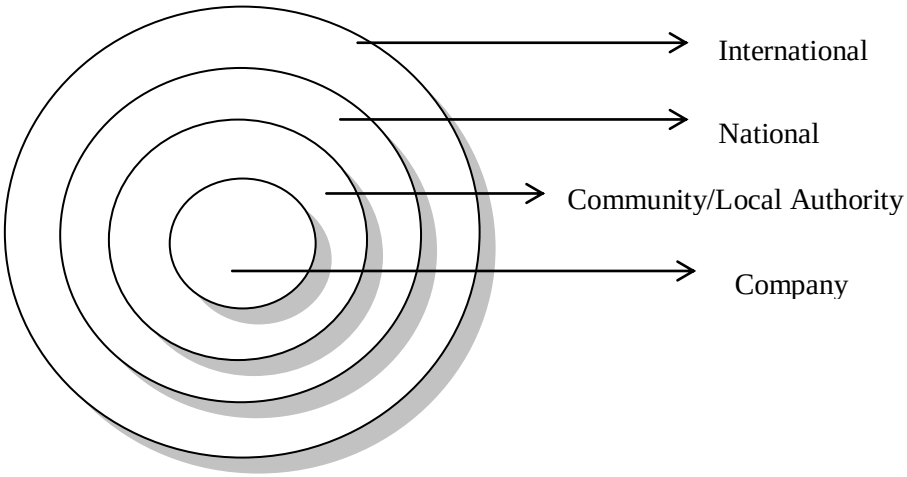

Figure 1 Levels of private sector (SMEs) involvement in building disaster resilience

Property destruction as a result of disaster shock leads to direct financial loss, expenditure on repair and business interruption (See Figure 2). It should be noted that a disaster will strike the built environment first before every other entity within the built

environment gets distorted. Therefore, the importance of the resilience of the built environment in the overall resilience agenda cannot be overemphasized(UNDP, 2013).

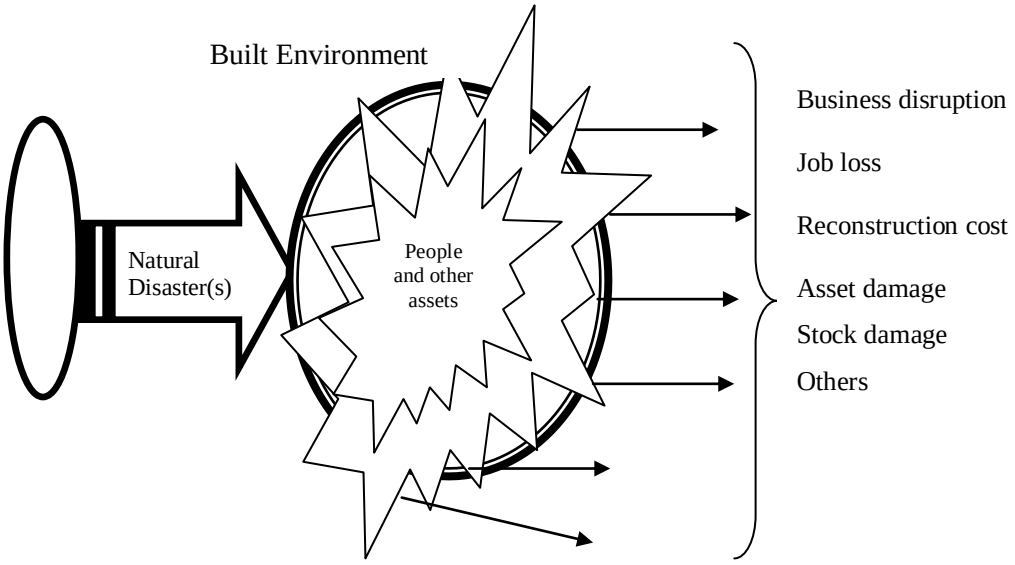

Figure 2 Economic impact of disasters on Small and Medium Enterprises

According to Neumayer et al. (2014), two main strategies can be adopted by private individuals to reduce the expected cost or impact of disasters. They can avoid settling or operating in high risk areas or construct buildings of little or no probability of being damaged when known hazards strike. On most occasions, high risk areas have economic advantages, so, there is opportunity cost for not settling or operating in such areas. Likewise, there are additional costs for putting up disaster-proof structures. While continuity of operations remains a key concern after disasters, governments do not have adequate financial strength to offset the cost of disaster impacts, the need for private sector involvement in protecting assets becomes important. Interestingly, fresh submissions are emerging in respect of the superiority of benefit to the cost of disaster risk reduction and building disaster resilience. Wedawatta (2013) stated that disaster costs are seemingly being underestimated and this is negatively affecting the Cost-Benefit Analysis (CBA) of disaster resilience and Disaster Risk Reduction (DRR) measures. UNISDR (2013) also reported that the New Zealand Company Orion, invested US$ 6 million on seismic protection; consequently, the investment saved the business up to US$ 65million. Business organisations can engage in joint and collective investments such as flood management schemes towards protecting buildings and structures (built environment) that cannot be adequately made disaster-proof individually.

Generally, private sector under-invests in disaster preparedness and mitigation measures, due to information asymmetry, problems due to collective action, myopic behaviour, emphasis on cost cutting, short term targets of organisations among others(Neumayer et al., 2014, Warhurst, 2006). Neumayer et al. (2014) described the aforementioned factors as "market failures" causing sector to under- invest in disaster preparedness and damage mitigation, even if disaster propensity is large. Governments can correct these market failures but they also face incentives to under-invest in expensive disaster preparedness policies and loss mitigation regulations (Neumayer et al., 2014). Since the magnitude of loss depends on the wealth of the affected area (Bouwer et al., 2007, Neumayer and Barthel, 2011, Pielke et al., 2008), Neumayer et

al. (2014) called for investment incentives that depend on the probability and anticipated magnitude of natural hazards i.e. Disaster propensity. Where there is high propensity, individuals should have higher incentives to privately invest in resilience.

Private investment enhancement strategies across themes

While seeking solution to the challenges of maximizing the effectiveness of publicly funded sustainable land management and identifying incentives to attract private capital, United States Agency for International Development (2012) identified the need for a new approach towards forging public private alliance. It recommended the following two steps: develop an analytical framework for assessing market- or performance-based environmental policies from an investor perspective; convene a targeted dialogue to identify and catalyse scalable investment opportunities. The first step is basically to illuminate the inherent challenges, opportunities, risks and mitigation options. The second step is meant to bring all stakeholders (not just the private) together to consider the context which has already been established in stage one towards channelling a way forward.

Sustainable transport infrastructure is another theme that has a relatively less visible attractive risk-return profile compared to fossil fuel based alternatives(Ang and Marchal, 2013). In order to scale-up private investment, Ang and Marchal (2013)recommended the use of regulations, pricing instruments, innovative financial tools and risk-sharing mechanisms. These were discussed under five headings which can be described as actual steps to take. The headings are: Strategic goal setting and policy alignment, enabling policies and incentives, Transitional financial measures and instruments (e.g. grants and loans, loans guarantee and credits, bonds), capacity building in line with the theme, promoting the theme among stakeholders – especially those directly affected. The suggested approach seems similar to the approaches suggested in the themes discussed earlier.

Towards attracting private investment into green growth, World Economic Forum (2013) outlined five actions described as lessons from good practice, the actions were said to have emerged from the review of case study projects, past performance of various mechanisms and instruments, as well as initiatives from Green Growth Action Alliance. The actions are: public sector support and backing i.e. display of readiness; policy support i.e. framework for a supportive environment; tailoring policies to local requirements involving end-users; early-stage funding and grants; de-risking through innovative models i.e. risks of investing should be minimized as much as possible through guarantees and insurance against policy, regulatory and macroeconomic risk.

Contrary to the use of high tax to discourage some practices and using reduced tax to encourage some practices, Rozenberg et al. (2012) discussed the suitability of low carbon projects having access to cheaper loans at the expense of others, in this approach, expenditures on mitigation are compensated via the reduction in probable future investments. The concept was described not to be 'as efficient as a tax system but politically easier to implement' (Rozenberg et al., 2012). With respect to disasters resilience, it's like using future wealth to pay as a hedge against present and future disaster.

In a bid to improve private investment in Agriculture towards fulfilling a vital function of contributing to economic development, poverty reduction and food security at all times,OECD (2013) drafted a ten component framework. The components of the framework are Investment policy review; Investment promotion and facilitation

activities; Related infrastructure development, Trade policy, Financial sector development; Human resources, research and innovation; Tax policy; Risk management; Responsible business conduct; and Environmental laws and policies. It was rightly pointed out that the need for increased investment is not only on the large scale level but also at the domestic level. Also, some of the issues that need to be revised go beyond the Agricultural sector but they have influence on the Agricultural sector. Although, agriculture brings direct profit unlike building resilience; almost all the dimensions in the framework are relevant to the building resilience theme.

The bulk of private involvement has been on relief and immediate response through financial and material good donations as well as through company or individual volunteers (UNISDR, 2009b). More investment is needed across a wider spread. While discussing the need to stimulate investment in resilience through policy change and innovation, ADB (2013) identified the following activities as necessary steps, they are: Set resilience goals, encourage private sector participation, join forces with climate change adaptation proponents, and track progress in strengthening resilience. Describing how to encourage private participation, the study suggested the use of legislative and policy frameworks, research and development grants, the use of public private partnerships, incentives and other financial mechanisms. Among the deductions that can be made from this study are the need to have targets, linkages, and progress monitoring mechanism. It can also be deduced that appropriate legislative and policy frameworks as well as the use of incentives are very germane.

A broader outline and examination of probable incentives for resilience building is perhaps lacking in literature. Other interesting observations from ADB (2013) is that the study acknowledged the 'loose' use of the word investment – It refers to all efforts and not only financial inputs, the study also focused on resilience as a whole, and specifically called for the use of indicators for monitoring and evaluating resilience.

KEY LESSONS IN LITERATURE

While bearing the peculiarity of the resilience theme in mind it is believed that the concepts and approaches that were engaged in other themes can be modified to suit the resilience theme. A literature review on strategies for attracting private investment across themes was presented in an earlier section of this paper. In line with the main intention of the doctoral study which is to develop a framework for enhancing private sector investment in building disaster resilience of the built environment, the following lessons have been derived:

- Government's political-will is needed for the intention of engaging private investment to be successful as an enabling and supporting environment has to be created (World Economic Forum, 2013, OECD, 2013).
- Despite the fact that it is the private sector that is to be convinced,thorough public and private stakeholders' involvement is required (United States Agency for International Development, 2012).
- An alteration in policy will be required (Ang and Marchal, 2013, OECD, 2013)
- Risks associated with private investment needs to be understood and minimized(Ang and Marchal, 2013, OECD, 2013, United States Agency for International Development, 2012, World Economic Forum, 2013).
- An instrument for measuring the progress of investment in resilience at all levels is necessary (ADB, 2013).
- Clear and attractive incentives are needed(Ang and Marchal, 2013, Rozenberg et al., 2012).

- Enlightenment and promotion of the need for private investment and the supports available from the government is needed(OECD, 2013).
- While advocating for resilience, activities under related matters especially climate change adaptation and sustainability must be held in mind(OECD, 2013, ADB, 2013).

The lessons above will form the basis of the investment enhancement framework to be developed. It is believed that if more investment is successfully attracted into enhancing built environment disaster resilience, economic loss caused by property damage, repair cost, and business interruption resulting from physical damage will be significantly reduced.

RESEARCH METHODOLOGY

The earlier sections of this paper, especially the problem background and the section on key lessons in literature underline the need and set the stage for further research. A detailed discussion on the research design proposed for the doctoral study is not intended here, Figure 3 captures the summary.

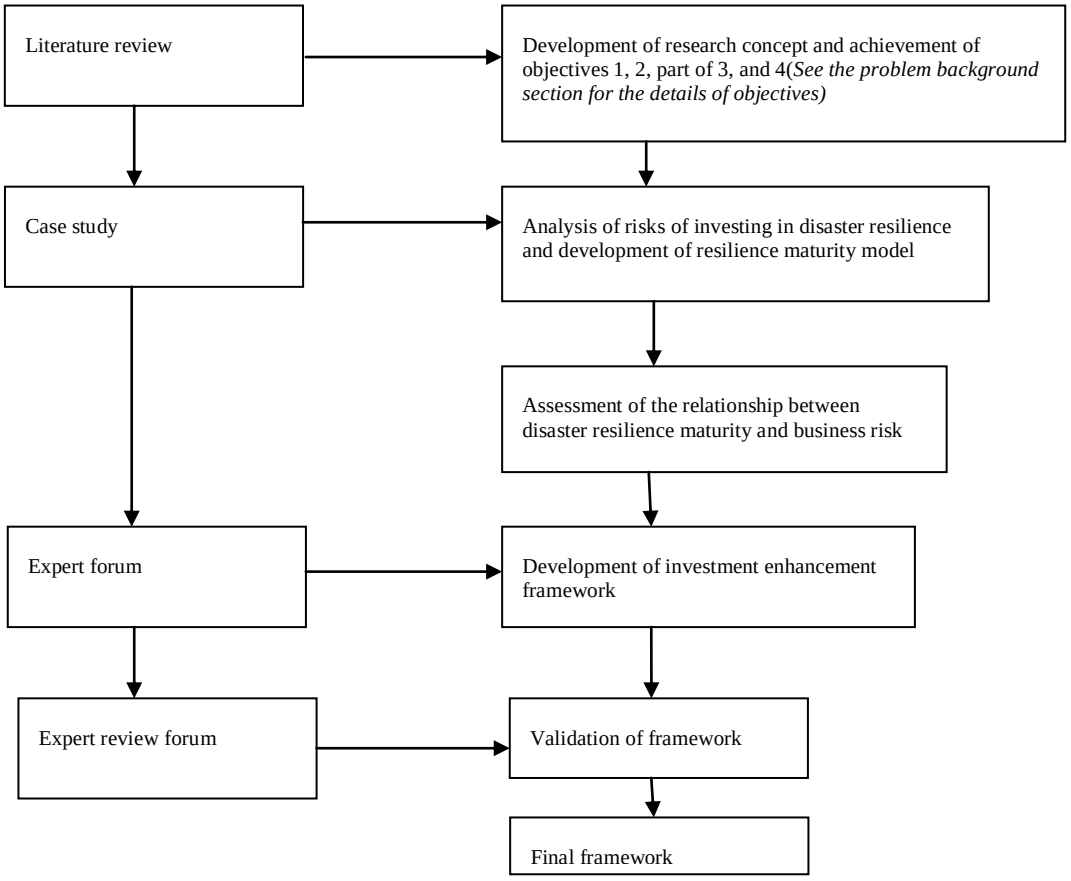

Figure 3 Research design

The process will begin with literature review and synthesis. Objectives 1, 2, 4 and part of objective 3 will be achieved through literature review and synthesis. Thereafter, some companies will be selected as case studies. These case study organizations will be engaged in achieving objective 5 i.e. development of resilience maturity model and part of objective 3 i.e. analysis of risks of investing in disasterresilience.Appropriate qualitative and quantitative analysis will be done to achieve objective 6 i.e. assessment

of the relationship between a SMEs built environment disaster resilience maturity level and business risks. Objective 6 is meant to provide further evidence that justifies the reasonability of investing in disaster resilience. In order to achieve objective 7 i.e. development of a framework for enhancing private sector investment in building built environment disaster resilience, several rounds of interaction will be conducted with an expert forum consisting of private and public sector representatives. All earlier achieved objectives and other issues like creation of political will and enabling atmosphere, incentives, and enlightenment strategies among others will be considered. The outcome of the forum will be used to develop a framework that will thereafter be sent to experts for validation. The final outcome will be a validated organisation based private sector disaster resilience investment encouragement framework that integrates business risk and disaster resilience maturity.

CONCLUSIONS

The key lessons in literature compiled in a section of this paper provide an insight into the issues surrounding the encouragement of private sector investment in disaster resilience. Recently, calls for increased private investment especially in the area of economic loss reduction within the built environment have been on the increase. However, some basic issues are simply not being addressed yet.

This paper describes the case and the basically the work done so far on a doctoral research which aims to develop a disaster resilience framework for encouraging private sector investment in the built environment. The scope of the study has been briefly described in the paper. The problems conceived and the lessons extracted from initial literature review and synthesis sets the scene for further study. It should however be noted that consideration will be given to other necessary issues as the study progresses.

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Paper 4: Global networks: Building resilience worldwide.

Veronica De Majo[1]

[1]*Örebro University/Dalarna University, Sweden, email: vdm@du.se*

ABSTRACT

In the era of globalization, i.e. the growing influence of global processes in local, national and regional arenas, natural disasters are considered a 'global' problem. In this context, global networks have led to significant achievements in disaster risk reduction (DRR) but they have also presented obstacles and challenges, often endogenous to the system's complexity. It is necessary therefore to understand this complexity in order to enhance its benefits and reduce its constraints. The purpose of the paper is to introduce a PhD project that aims to gain a better understanding of the role of global networks in building resilience worldwide, focusing particularly on norms, rules and steering mechanism that shape behaviors, attitudes and beliefs. Resilience is defined as the capacity of a community potentially exposed to hazards to resist, absorb, and adapt in order to cope with natural disasters. The preliminary content analysis on the Hyogo Framework for Action and related documents showed that there are instruments and shared practices, a common language, and institutions engaged in DRR. Consequently, there are patterns of a nascent system of global governance that encompasses cooperative measures to solve problems on global scale, in which diverse actors interact through different channels establishing steering mechanisms.

Keywords: disaster risk reduction, global governance, preparedness, resilience.

INTRODUCTION

Natural hazards are not likely to be eliminated. They are impossible to avoid and in many cases they are difficult to predict or prevent. Moreover, each country has its own hazard profile, vulnerability, cultural, economic and political characteristics, as well as its risk and emergency management system (Coppola 2011). Hence, it has been observed that hazardous events have different effects in different countries. In more developed countries they seem to create more economic losses, while in developing countries there are more victims and fatalities (Stanganelli 2008; Collins 2009).

More developed countries count on technical solutions as supporting tools in the decision making process and they seem to be a step ahead of less developed countries that frequently show inadequate (or absent) disaster preparedness and mitigation programs, low (or inexistent) budget assigned to this field as well as the lack (or limited when existing) of communication and early warning systems. In addition, current developing patterns heighten the vulnerability of human societies through changing demographic, technological and social conditions, unplanned urbanization, development within high-risk zones, under development, and environmental contamination (Stanganelli 2008; Collins 2009).

The number and seriousness of disasters have been increasing in recent years and they will continue affecting communities. As a consequence of globalization, and the increasing connectedness and interdependence that it implies, natural disasters have also become more 'transnational' and therefore communities are deeply affected by hazards that are originated outside their territorial boundaries. Globalization is a complex concept and its meanings have differed widely. According to Keohanne and Nye (2000: 105), globalization can be considered an effect of *globalism* that is defined

as "the state of the world involving networks of interdependence at multicontinental distances".Hence these connections occur through 'flows and influences' of capital and goods, information and ideas, and people and forces, and also of environmentally and biologically relevant substances, e.g. acid rain and pathogens(Keohanne and Nye 2000).

In this paper, globalisation is defined as the growing influence that financial, economic, environmental, political, social, and cultural processes that are global in scope into have at the local, national, and regional levels (Ocampo 2003). In this sense, it is characterized by the erosion of boundaries between local, national and international arenas, which leads to the 'internationalization' of problems (and potential solutions), i.e. matters that in the past belonged to the local, national or regional arena. In consequence, globalizationfacilitates trans-national interactions by shrinking social, political, economic and cultural distance (Knight 2009).

The consequences of recent natural disasters have highlighted that it is crucial to systematically incorporate disaster risk reduction strategies and policies in order to reduce communities' vulnerability and improve their capacity to cope with natural disasters. Therefore, individual responsibility, local coordination, and continuity plans to ensure the ability to respond to and recover from hazardous incident are important components (Sutton and Tierney 2006), which also implies the involvement (and interaction) of a diversity of actors not only at local level, but also in the national, regional and international arena.

The research project and research question

As it was mentioned in the previous section, many actors are involved in disaster risk reduction and their interaction can occur within the local, national, regional and international arena. Thus, in the era of globalisation the role of global partnerships and networks in order to diminish communities' vulnerability become crucial.

The effects and consequences of globalism and globalization are often given for granted and it is important to study the consequences that those processes have in the task of addressing a 'global' and complex problem such as natural disasters. Therefore, the aim of this paper is to present a PhD project –still in an initial stage- that seeks to contribute to gain a deeper understanding of the role that global networks play in building resilient communities worldwide, with especial focus on the creation of norms, rules and steering mechanism that can lead to changing behaviors, attitudes and beliefs.

In this context, the different papers that will be part of the thesis (in compilation format) would contribute to explore different aspects in order to answer the following overarching research question:

- How and to what extend do global networks contribute to governing disasters and disaster risks, and building resilience worldwide?

The project would hopefully also contribute to improving disaster preparedness and building resilience in all communities, which is likely to be accomplished by gaining a better understanding of the benefits that global partnerships provide to disaster risk reduction as well as the obstacles that they introduce.

Prevention, preparedness and resilience

In disaster risk reduction it is common to refer to prevention, preparedness and resilience. However, those concepts are complex and, in consequence, difficult to define. The aim of this section is not to discuss those terms thoroughly since this task would be done in one of the papers that constitutes the dissertation. Instead, this section seeks only to introduce prevention, preparedness, and resilience, pointing out some communalities and difference among them.

Prevention is defined as the total avoidance of adverse impacts of hazards and related disasters (UNISDR 2009) and although it is related to measures and strategies taken in advance –and, thus, it is directly associated to the pre-incident phase-, the notion prevention does not seem to fit completely in this context since it is related to the intention to completely avoid potential adverse impacts of hazardous events, something that is seldom likely.

Preparedness, on the other hand, encompasses the knowledge and capacities developed to effectively anticipate, respond to, and recover from, the impacts of hazard events (UNISDR 2009). It involves measures aiming to respond effectively and recover more quickly in the occasion of a hazardous event, seeking at the same time to ensure that the resources necessary for responding effectively in the occasion of a disaster are in place, and that those who have to respond know how to use those resources (Sutton and Tierney 2006). In other words, it implies providing people who may be impacted by a disaster with the necessary tools to increase their chance of survival and to diminish social and economic losses (Coppola 2011).

Finally, *resilience*has been defined by UNISDR (2009) as the capacity of a system, community or society potentially exposed to hazards to resist, absorb, accommodate to and recover from a disaster in a timely and efficient manner. Scholars have also define resilience as the capacity to cope with unanticipated dangers, the ability to resist damage and change at the event of a natural hazard, and a system's ability to absorb change, to self-organised and to bounce back, learn and adapt (for a review on literature on resilience see e.g. Gaillard 2010, Manyena 2006, and McEntire et al. 2002). Although most definitions consider learning as a important element, Manyena (2006) points out that the terms such as 'cope', 'bounce back', 'absorb change', or 'adapt' in order to return to 'normal' tend to emphasize a reactive approach, instead of a proactive one.

While preparedness has commonalities with resilience, in this paper resilience is considered as a macro-concept that encompasses both prevention and preparedness, with especial focus in the last one. Since hazardous events and their impact are difficult to avoid it is crucial to "be prepared". Preparedness has commonly been viewed as consisting of activities aimed at improving response and coping capabilities. Even though emphasis has been increasingly being placed on recovery preparedness, i.e. planning not only in order to respond effectively during and immediately after disasters but also in order to successfully navigate challenges associated with short- and longer-term recovery (Sutton and Tierney 2006), preparedness, as a process, is considered in this paper as a vital element in the pre-incident phase and a precondition to be resilient. An effective response in the occasion of a disaster highly depends on the level of preparedness, and the level of preparedness is closely related to the extent of the relevant knowledge available at pre-disaster phase (Von Lubitz et al. 2008).

Although different disasters are often unique and communities have particular local features, it has been argued that community response can be similarly modelled (Paton and Johnston 2001). Thus, preparedness should have in principle an "all hazard" focus, allowing communities around the world to respond in similar ways regardless of the type of disaster, making possible to incorporate individual hazards in a later stage (Sutton and Tierney 2006). Furthermore, even when what works in a community does not necessary work in another, the learning process is considered critical since communities can learn from their own disaster experiences but also from others' good practices, and then building resilience to future hazards.

METHOD AND MATERIAL

This section is under construction since the ideas of possible articles are still broad. In any case, the intention is to use mainly qualitative methods, i.e. content analysis (eventually discursive policy analysis) with focus on policy documents published by the United Nations and national governments, and even elite interviews. Content analysis has been utilised to date seeking to gain a better understanding on the underlying themes in policy documents publicised by the United Nations International Strategy for Disaster Risk Reduction (UNISDR), and how the (policy) problem has been frame.

Thus, the focus is put principally on the ***Hyogo Framework for Action. Building the Resilience of Nations and Communities to Disasters***(HFA) and related documents. HFA is a 10-year plan aiming to make the world safer from natural hazards, which was adopted by 168 Member States of the United Nations in March 2005 just a few weeks after the Indian Ocean Tsunami. The HFA is considered to symbolize the first international acknowledgement on the necessity to systematically incorporate risk reduction efforts into policies and programs that lead to sustainable development and poverty reduction (UNISDR 2007; Collins 2009). The document highlighted the need for building the resilience of nations and communities to disasters (UNISDR 2007).

The ***Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action*** (IDNDR 1994) has been taken into consideration as a background document for the analysis. Other relevant documents, reports, and papers are: 1) Hyogo Framework for Action 2005-2015. Mid-term review 2010-2011 (UNISDR 2011), report that analyses the progress on implementation of HFA in the first five years; 2) Towards a Post-2015 Framework for Disaster Risk Reduction (UNISDR 2012) report that provides background information for the process of consultation on HFA2; 3) Synthesis Report: Consultations on a Post-2015 Framework on Disaster Risk Reduction (HFA2) (UNISDR 2013a), document that compiles issues that emerge in the first phase of the consultation process; 4) Post-2015 Framework on Disaster Risk Reduction (HFA2). Report from 2013 Global Platform Consultations (UNISDR 2013b), document that summarizes the issues from consultations at the last Global Platform sessions; and 5) United Nations Assembly's ***Suggested elements for the post-2015 framework for disaster reduction June 2014***(2014), paper that outlines suggested elements for HFA2 as the background document for the first Intergovernmental Preparatory Committee meeting (PrepCom) for the Third UN World Conference on Disaster Risk Reduction (Geneva, 14-15 July 2014). Other reports and papers originated within the process of preparation for the Third UN World Conference on Disaster Risk Reduction, to be held 14-18 March 2015 in Sendai, Japan, could be included.

GLOBAL GOVERNANCE: A THEORETICAL FRAMEWORK

Thakur and Van Lagenhove (2006) defines global governance as the complex of formal and informal institutions, mechanisms, relationships, and processes between and among states, markets, citizens, and organizations—both intergovernmental and nongovernmental—through which collective interests are articulated, rights and obligations are established, and differences are mediated. Rosenau (1995) refers to "rules", "control", and "steering" and Dingwerth and Pattberg (2009) disaggregate global governance into four constitutive elements: systems of rule, levels of human activity, the pursuit of goals, and transnational repercussions. In addition, Finkelstein (1995) defines the phenomenon as any purposeful activity that seeks to 'control' or influence another entity in the arena occupied by nations or at other levels by projecting influence into that arena.

In other words, global governance can be explained as the sum of diverse governance process—formal and informal mechanisms to accomplish some grades of order—within an international system in which there has never been any such thing as order and world government (Weiss and Kamran 2009). It implies cooperative measures designated to solve problems on a global scale, in which diverse actors are involved and, at the same time, it is this variety of new actors and their interaction that makes the international system even more disaggregated and decentralized. Global governance represents a qualitative change as the result of the demand of 'political globalisation' in order to deal with global problems (Kacowicz 2012).

Media influence and modern transportation have helped to erode national boundaries and these factors facilitated transnational interactions by shrinking social, political, economic and cultural distances (Knight 2009). The partners involved in global governance compete with each other, but they also cooperate, which augments their mutual dependence, and the wide spectrum of actors interacts through diverse channels and networks establishing steering mechanisms (Porter 2009).

Rosenau (1995) studies the interaction of actors and the channels they used to established steering mechanisms and rule systems in global governance in depth. He divides them into three groups: those created through the sponsorship of states (e.g. international and regional organizations such as the UN system), those sponsored by non-state actors (e.g. ONGs, social movements, epistemic communities, group of volunteers etc), and those jointly-established by states and non-states actors (e.g. cross-border coalitions and issue regimes, funded in both cases to strive for a common purpose). The interaction and networking between actors can occur in four different arenas—and even across and within their boundaries—namely intergovernmental (states), transgovernmental (states and national agencies), transnational (NGOs and business corporations) and supranational (institutions created with a specific purpose, for example under the umbrella of the UN) (Dingwerth and Pattberg 2009).

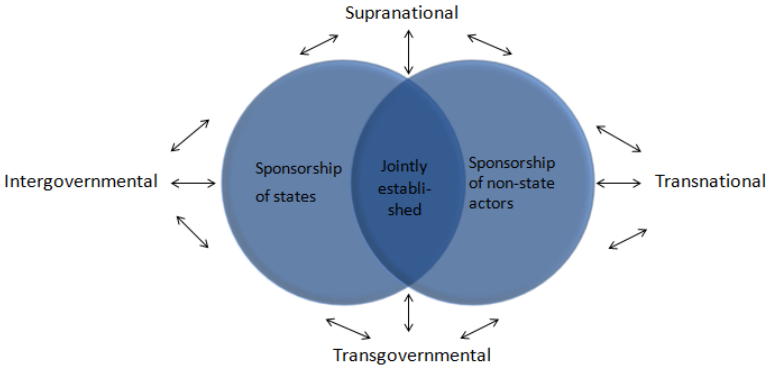

Figure 1 Steering mechanism/actors, and arenas.

In this context, international and regional organizations have become essential partners in the promotion and establishment of rule systems and, at the same time, they seem to play a predominant role and have become integral to global governance (Weiss and Kamran 2009). Because of the characteristics of the international system, the increasing number of issues that encompass world politics, and the diversity of actors that interact in diverse arenas—as well as the inherent complexity of their interaction—the world might encounter different forms of global governance. Based on shared problems or common interests, the actors differ in their purposes and methods (i.e. persuasion, threat or coercion), and some of them might be more effective than others (Rosenau 2009).

DISCUSSION

As has been pointed out in a previous section, natural disasters have become transnational and are considered a 'global' problem since communities are affected by hazards that originated even outside their territories. In the past, states had the monopoly on the formation of rules in the international system, regardless of the type of rules or the mechanisms used to gain consensus. However, this situation radically changed with the diversification of actors, and the decentralization of power occurred as a result of the shift from *government* to *governance*.

Hence, while each state has the primary responsibility for implementing policies and programmes that aim to reduce vulnerability and increase community resilience, the task to addressing hazards and mitigating their impacts no longer seems to depend exclusively on states' own capacities and, in consequence, other actors have influence (to different degrees) on the decision-making process, not least at the global level. Disaster risk reduction is the resultof a wide range of activities and interaction of actors, such as governments and local institutions, international institutions and multilateral and bilateral development institutions, non-governmental organizations (NGOs), scientific communities, the media and the private sector (Christoplos, Mitchell and Liljelund 2001; Sutton and Tierney 2006; UNISDR 2004).

Furthermore, international and regional organizations are important for studying the connection between disaster risk reduction and global governance and, consequently, it is essential to take into consideration the role of the International Strategy for Disaster Risk Reduction (UNISDR, the United Nations Office for Disaster Risk Reduction) in building disaster resilient nations and communities. In this context, the *Hyogo*

Framework for Action: Building the Resilience of Nations and Communities to Disasters (HFA)is considered the first international acknowledgement of the necessity for systematically incorporating risk reduction efforts into policies and programs that lead to sustainable development and poverty reduction, as well as practical measures and actions.

As the outcome of the Second Conference on Disaster Reduction, the expected effect of HFA is to substantially reduce disaster losses by 2015 (in terms of lives and social, economic, and environmental assets), which can be done by building the resilience of nations and communities to disasters with the "full commitment of all involved actors" (UNISDR 2007). The document comprises three strategic goals, and five priorities for action with several key activities related to each of them. As strategic goals, HFA include 1) a more effective integration of disaster risk consideration into sustainable development policies, planning and programming at all levels, focusing on disaster prevention, mitigation, preparedness and vulnerability reductions,; 2) the development and strengthening of institutions, mechanisms and capacities to build resilience to hazards, in particular at community level; and 3) a systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery program in the reconstruction of affected communities (UNISDR 2007).

Thus, the HFA is articulated in the form of five priorities for actions, and each one includes guiding principles in the form of key activities (or suggested measures that later would be translated into progress indicators) in order to achieve disaster resilience, which are addressed and involved a variety of actors in different sectors:

- HFA 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
- HFA 2: Identify, assess and monitor disaster risks and enhance early warning
- HFA 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels
- HFA 4: Reduce the underlying risk factors
- HFA 5: Strengthen disaster preparedness for effective response at all levels

Promoting a proactive approach, three principles are proposed by the framework: a multi-hazard perspective; an integrate vision of the problem; and the involvement of all policies and planning strategies acting on territory (Stanganelli 2008), encouraging commitment to disaster reduction and to the spreading a culture of disaster prevention worldwide. In this context, HFA advocates to the promotion of a "culture of prevention", "culture of safety" and "culture of resilience" instead of a culture of reaction.

Disaster risk is considered a "global concern" that can threaten the world's economy and population, as well as the sustainable development of developing countries (UNISDR 2007). The prevention, management and reduction of disasters represent, therefore, a great challenge for communities worldwide, and the need to formulate a clear regulatory agenda has been recognized in HFA (Olowu 2010). In this context, HFA is a normative and non-binding document that contains the core principles for integrative disaster risk management and promotes the development and strengthening of institutions, mechanisms and capacities in order to build resilience to hazards. Furthermore, it implies a global approach since the efforts should be supported by the cooperation and/or partnership of actors at the bilateral, regional and international levels (UNISDR 2007; Collins 2009).

HFA promotes a multi-stakeholder approach and encourages the existence of a system of networks (on voluntary bases) to contribute to its implementation and, thus, the importance of "networks" and "partnerships" are highlighted in all five priorities for action: HFA1 in relation to community participation; HFA2 regarding research and scientific and technical cooperation; HFA3 promoting dialogue and networks of experts across sectors; HFA4 focusing on private-public partnerships; and HFA5 advocating for the coordination of regional approaches and policies for response and assistance. In this sense, the document highlights that each state is, in principle, responsible for policies and programs for increasing resilience and diminishing the impact of hazards, but it also acknowledges that concerted international cooperation and an "enabling international environment" are a prerequisite for the development of knowledge, capacities and motivations that are needed to build resilience (UNISDR 2007).

As a result, a variety of instruments and institutions have been built up, in many cases under the sponsorship and coordination of UNISDR. The Global Platform for Disaster Risk Reduction takes place every second year since 2007 as a forum for discussion and information exchange for government representatives, NGOs, scientists, and practitioners, among others. Regional platforms are also multi-stakeholder forums for dialogue and exchange in a given region, and besides that, two binding regulatory agreements have been signed in Asia in order to regulate disaster preparedness and response action, i.e. the ASEAN Agreement on Disaster Management and Emergency Response; and the SAARC Agreement on Rapid Response to Natural Disasters. In national contexts, national platforms work as multi-stakeholder forums for improving disaster risk reduction policies.

CONCLUSIONS

Ten years have passed since the implementation of HFA. Nowadays it is possible to observe shared practices and a common language within disaster risk reduction, as well as many instruments, organizations and institutions that have been developed, including two binding agreements that have been implemented to date in Asia. Furthermore, the dissemination of lessons learned has been encouraged and improved as a central element for increasing communities' capacity to cope with natural disasters and building resilience in a globalised world.

In this context, we are in the presence of a nascent system of global governance, quite immature in relation to other policy fields, such as environment and security. This system is characterized by non-hierarchical and networked relations between a variety of actors in different arenas, and across and within their boundaries, making the system complex, especially regarding the definition of roles and responsibilities, and the implementation of policies and programmes, particularly at local level.

Global networks have led to great achievements in the development of resilient communities but they have also introduced obstacles and challenges, in many cases inherent to the system's complexity. Therefore, further studies of this system are necessary in order to understand its complexity, which can lead to enhance the benefits that global governance provides to DRR.

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Paper 5: Exploring the relationship between urban development and disaster vulnerability through the lens of small-scale disasters: The case of Manizales, Colombia

Julia Wesely[1], Cassidy Johnson[1] and Stephen Edwards[1]

[1]*University College London, London; email: julia.wesely.13@ucl.ac.uk*

ABSTRACT

The paper attracts attention to the topic of small-scale disasters in urban development and disaster management discourses and thereby highlights the necessity to address people's underlying vulnerabilities in order to improve the management of highly localized and frequent risks posed by natural hazards. Often resulting small-scale disasters hardly attract media and policy attention, and are assumed to lie within the coping range of households rather than requiring external assistance. However, impacts of single small events often destroy individual livelihoods and their high quantity, frequency and cumulative effects severely hamper development efforts, hence, arguably also matter on the city scale. The city of Manizales in Colombia is internationally recognized for successfully integrating disaster management and development efforts and, thus, several actors already engage in a lively discourse about small-scale disaster risks. Taking an outsider perspective on Manizales´ development, the paper applies the Web of Institutionalisation framework (Levy 1996) to two documents that describe the changes in the urban sustainable development and disaster risk agendas over the past two decades as well as one article highlighting the issue of small-scale disaster risks in Colombia. It thus explores the potential of integrating small-scale risk management into existing institutional structures as narrated from this good practice case to an international audience.

Keywords: hidden vulnerabilities, risk management, small-scale disasters, urban development.

INTRODUCTION AND BACKGROUND

"Cities at risk" and "cities as risk" are two expressions commonly used by scientists and practitioners to frame challenges for urban risk management and development planning. The number, frequency, geographical scale and social and economic impact of risks related to natural hazards is expected to increase due to e.g. climate change, expansion of urban settlements and increases in asset accumulation (Bull-Kamanga 2003; Suárez 2011) Thus, many scholars advocate a strong integration of risk management into the urban development agenda - especially in the Global South where most severe challenges are anticipated (Alexander & Davis 2012; Birkmann et al. 2013; Sanderson 2012). Along with an increasing recognition of the social construction of disaster risks, i.e. the vulnerability of urban dwellers to natural hazards, came the notion of manageability, reflected in the multitude of policies addressing risks and their impacts at different (geographical) scales (Davis 2011; Lavell 2012). The practical and conceptual importance of the scale dimension is clearly reflected in the two fields that address these risks. The disaster discourse builds upon the notion of large-scale exceptional events such as tsunamis with severe impacts on human lives and assets (i.e. affecting more than 100 households or resulting in more than 10 mortalities). On the other hand, poverty and development discourses strongly reflect upon problems associated with everyday risks to livelihoods, such as illnesses related to insufficient sanitation.

However, the last decade saw calls that these two scales and fields do not fully blend into each other, but that there are unaddressed risks in-between those scales, such as persistent hazards like seasonal floods or frequent landslides, which are argued to have highly underestimated, and often still unknown immediate and chronic impacts on the vulnerability of urban dwellers and on a cities´ overall (economic) development (Cardona et al. 2008; Suárez 2011; Wisner & Gaillard 2009). Considering that low-income dwellers are often forced to reside in more hazardous parts of the cities and in poorly constructed houses, impacts often also reveal and might even intensify vulnerabilities resulting from social and spatial inequalities. These small-scale (also termed extensive, hidden, small, neglected) risks are currently defined in a way that suggests that they receive neither policy attention in the field of disaster management nor that of everyday environmental hazards, and are – at least conceptually - dependent on spontaneous, local coping responses rather than long-term strategies (Bull-Kamanga 2003; UNISDR 2009)

In Colombia, first attempts to capture the impacts in a comparable way to large-scale disasters have been made. Between 1971 and 2002, the EM-DAT database recorded 97 events that qualified as disasters, while the Desinventar Database, which does not set use these qualification criteria, registered more than 19.000, in which almost 9500 people died, almost two million people were affected, 93.000 houses destroyed and 2017 houses were affected (Marulanda et al. 2008). While these numbers only capture a limited range of impacts, they still hint towards the severity of the problem and have been picked up by numerous academic and policy reports, also beyond the Colombian context.

Yet, discussions do not seem to go beyond a vague notion of what small-scale risks entail and a systematic analysis and common understanding building on in-depth empirical and conceptual debates appears to be lacking. Questions arise such as: Does the concept relate to small-scale hazards, such as landslides or small-scale impacts in terms of immediate economic losses? What are the dynamics of natural hazards, vulnerabilities and risks, which result in small-scale disasters? On what knowledge and data does the concept build?

Exploring those questions through building on the already existing discursive knowledge from Colombia - with a focus on the city of Manizales - could lead to a more nuanced understanding of small-scale disaster risks, which could inform discussions about their definition in the international arena. Discursive knowledge matters in this case, because it is understood in the Foucauldian way as going beyond the text, i.e. being enacted and practiced in such forms as policies or projects (Brinkman 2012). Informing the definition of small-scale disasters is relevant as this forms one aspect of the risk discourse, which today might produce blind-spots and hide vulnerabilities and risks. For example, insurance mechanisms might not cover losses for households, if landslides are not reported and their consequences officially declared as a disaster.

As small-scale disasters are highly localised and often invisible to outside perspectives, more frequent but less spectacular than large disasters, they are generally less present in media and policy debates. Thus, it can be argued that despite increasing problem awareness, most cities do not see any substantial and sustaining change in the way this topic is addressed and incorporated into every-day urban governance and disaster management.

The term institutionalisation reflects one way to conceptualize the aim of a sustained change how small-scale risks can be incorporated into urban development. Abercrombie et al. 1988 (in Levy 1996) described it "as the process whereby social practices become sufficiently regular and continuous to be described as institutions, that is social practices that are regularly and continuously repeated, are sanctioned and maintained by social norms, and have a major significance in social structure."

To address challenges related to the institutionalisation of small-scale risks, the paper thus contributes to the facilitation of learning from experiences of the few cities of the Global South, which already engage in discussions to integrate them in urban development and disaster risk management. Manizales in Colombia is a widely known good practice example for sustainable integration of disaster management and urban development over the past 20 years, which has been recognized and acknowledged in numerous international academic and policy reports. The city with roughly 370000 inhabitants is situated in the hilly Colombian coffee axis located in the municipality of Caldas. It provides a unique case to critically examine positive and critical aspects of a highly advanced risk discourse in the context of urban development (Hardoy & Velasquez Barrero 2014).

The objective of this paper is to explore three documents that refer to Manizales as good practice case and to analyse them according to a Web of Institutionalisation framework (Levy 1996) that allows for critically engaging with this discourse and eliciting the structures and relations behind dominant narratives of success. It addresses the questions, a) what can be learnt from the discourse in Manizales in terms of institutionalizing the topic of small-scale disasters in the realms of sustainable urban development and disaster management, and b) what can be learnt from the way the narrative is presented to and promoted by the international arena?

Answering these questions might provide an entry point for broadening up the analysis, by challenging the dominant international narratives with local knowledge and empirical realities.

METHODS

The case study focuses on the time since the urban environmental policy and the environmental action plan (Biomanizales and Bioplan) were formulated in the 1990ies and considers developments within the city boundaries, and here especially low and medium income households.

Easy-to-find and easy-to-access academic publications and reports in English have been selected based on the assumption that these resemble the perception of an outsider interested in learning from a good practice case in sustainable urban development and disaster management. While these documents not necessarily reflect the information that is used in Manizales to shape the institutionalization process, they might indicate what its authors consider interesting for international audiences, and hence, relevant to contribute to ongoing debates. Rather than focusing on single projects, programmes or policies, papers giving a broader impression either of Manizales or small-scale disasters were selected. As no document was found that explicitly reviewed how small-scale disasters have entered the discourse on disaster risk management and urban development in Manizales, more general documents on the city (one from the perspective of sustainable urban development and one from the urban disaster management angle) as well as a specific paper on small-scale disasters in the Colombian context are taken into account. The amount of analysed documents is

limited as a methodological exploration of the framework for the purpose of learning from the case study rather than giving a comprehensive account of the issue is intended. However, analysing further documents to enable a deepening and broadening of the scope of analysis is planned in the future.

Documents chosen for closer analysis are "What Role for Low-Income Communities in Urban Areas in Disaster Risk Reduction?" (Satterthwaite 2011), which was published in the Global Assessment Report on Disaster Risk Reduction; the recent publication "Re-thinking "Biomanizales": Addressing Climate Change Adaptation in Manizales, Colombia" (Hardoy & Velasquez Barrero 2014) in the academic journal Environment and Urbanization; and "Revealing the Impact of Small Disasters to the Economic and Social Development. The need of a proposal to cover the losses of low-income people and a framework to measure and reduce the vulnerability" (Marulanda et al. 2008).

As a framework of analysis, the Web of Institutionalisation (Levy 1996) is used. This framework allows for dissecting the narratives and discourses of the documents and to give the institutionalisation process a changing and evolving rather than static account. While there are multiple frameworks to analyse institutional change, this was chosen, because of its acclaimed suitability for exploring challenges of governing sustained change in context of the urban Global South (see e.g. Soltesova 2011). The web-like character highlights the fluidity of the institutionalization process and also reveals a number of potential entry points to act and enable sustained changes. The concurrent consideration of citizen, political, organizational, and delivery spheres makes it an inclusive framework for discussing the cities´ existing institutional landscapes (such as related to urban sustainable development and disaster management), as well as the actions of different groups of actors that can potentially change these landscapes (such as citizens perception of small-scale disasters or pressure from the international community to act).

RESULTS

In the following section, the elements of the framework and their web-like relations (Levy 1996) are interpreted with a focus on their meaning for the institutionalising small-scale disasters in urban development and disaster management. The paper then turns to the three examples that show how this framework might be used to describe how the institutionalization of small-scale disasters is narrated to the international audience.

Application of the framework to small-scale disasters

Starting from the citizen sphere, the lived experience of people affected by small-scale disasters and their resulting needs forms a good basis to explore how sustained change of integrating small-scale risk management can be achieved. Representative political structures link to citizens' needs, as they describe the elected bodies; they should ensure a level of democracy, and thus also accountability in the process. It is essential to critically ask, how accessible these bodies are and to whom and whose interest they are representing. This is a relevant question especially in places with high inequalities such as Colombian cities, where the rich minority has more political weight and influence than low-income inhabitants (Hudson 2010). Pressure to act is often exerted from political constituencies, such as civil society organisations, but also academic institutions or international agencies. The Network for Social Studies for the Prevention of Disasters in Latin America shows that these constituencies do not have

to act individually, but might be more visible and powerful if they act in a coordinated way. (www.desenredando.org).

Looking towards the policy sphere, political commitment might be created if e.g. high level organisations or people make statements in public during election campaigns or in policy drafts. The political structures and commitment manifest themselves in policy planning, i.e. in the actual formulation of policies and the resulting allocation of responsibilities for operationalising it. Literature on small-scale disaster often takes this element as a starting point. Crucial for integrating small-scale disasters into urban development and disaster management are issues of coordination, e.g. between and within sectors (e.g. spatial planning, water management, emergency management) and policy levels (e.g. municipal and regional government). Central in pragmatic considerations is the question of (constantly) available resources, which include not only financial ones, but also human resources. Especially in the field of development and disasters, resources have to be scrutinized whether they are earmarked or unconditional, formal or informal, and to whom they are accessible.

The organisational sphere sees the link from policies to actual procedures, translating them into day to day practices and thus, effectively showing which policies happen, what the underlying rules to their implementation are, whom they include and exclude and which plans remain not implemented. This step of policy translation can be argued to be particularly crucial for small-scale disasters. Considering the already mentioned limits to their declaration as disasters, procedures to address large-scale disasters or everyday environmental hazards might leave a policy-action gap for the in-between issue of small-scale hazards. It is in this regard crucial to figure out who is feeling responsible and able to take responsibility to mainstream the issue and act as a catalyst to govern the sustainable integration of small-scale risks into urban development planning. Along with that, an actor-centred perspective on the competencies and capabilities of operational staff provides insights which people with what skills and background are required, as well as what networks and organisational and professional positions might be necessary for implementations. For example, do local administrators have sufficient knowledge and capacities to act on small and more frequent events?

Finally, the delivery sphere turns to the even more pragmatic and applied concerns such as the actual delivery of programmes and processes. Methodologies should be inclusive, well-reflected, and conclusive. In terms of the learning objective of this paper it is essential to look if calls for more research and theory building regarding the dynamics of small-scale disasters have been responded so far.

This interpretation of the web of institutionalization for small-scale disasters exemplified the characteristics of the elements and the dependencies and feedbacks between them and thus, showed the web-like features of the framework. However, one has to bear in mind that potentially more and tighter linkages can exist, which shape how a sustained change towards institutionalizing the topic can be achieved.

A disaster risk management narrative of Manizales

The presentation of the case study of Manizales as a good practice example in the GAR chapter (Satterthwaite 2011) focuses strongly on the policy and organisational level, and thus, does not reveal any stories of household experiences and interpretations of their reality as well as issues of staff development. As actors, which seem to exert

pressure to develop and implement policies, universities, community organisations, the Red Cross, the insurance industry, and different sections of the local municipality are mentioned in this paper. The local government is also presented as the main representative structure, and its commitment to integrate disaster risk reduction into urban environmental management and coordinate with other governmental and non-governmental bodies is frequently highlighted. In terms of its political commitment, its long-term character and that it even managed to sustain the agenda despite changes in the city government is another positive asset. From the top down, the National System for Prevention and Response to Disasters also requests the commitment of cities to comply and develop and implement policies. Resources to fulfil these commitments are not comprehensively discussed in the chapter, but exemplified with the insurance system, where financial resources accrue from taxes and investments by a private insurance company. The multiplicity and diversity of actors in the citizen and policy sphere already hints towards a shared understanding of responsibilities. The author explicitly highlights the level of coordination as one of the success factors and emphasizes that Manizales manages to bring together key local stakeholders and national actors, private actors, communities as well as local and regional governments. This related to long-term commitment becomes apparent in the element of policy planning, where some of the currently applied frameworks and laws were already negotiated and came into place as early as in the 1980´s, such as the municipal disaster prevention system. Other presented policies include the environmental tax on properties which has to be used for protecting infrastructure, implementing disaster prevention and mitigation measures and the urban planning law, which requires all urban plans to be discussed by a local planning committee.

There are many procedures associated with disaster policies mentioned in the text, such as stabilising slopes, involving communities into risk mapping, converting land at risk and relocations to safer sites. In the delivery sphere, this results in many projects, of which environmental protection infrastructure, construction codes, micro-zoning, environmental traffic lights, a collective voluntary insurance programme for low-income households, tax reductions for efforts leading to reduced household vulnerability and the community programme Guardianas de la Ladera are mentioned. What stands out in the case of Manizales is also the application of participatory methodology, and the city's efforts to engage the public (e.g. through the environmental observatory). Although research institutions are critical actors in the efforts to integrate disaster management and sustainable urban development, they are not prominently portrayed and theory building and specific research results are not made explicit. However, their central position in Manizales is implicitly apparent through the multitude of local authors cited in the document.

A sustainable urban development narrative of Manizales

In a recent paper (Hardoy & Velasquez Barrero 2014), the evolution of the sustainable urban development agenda of Manizales over the past decades is analysed. The scope of this paper is broader than the one before, hence, provides the readers with a richer and more comprehensive narrative of the institutionalization.

In the citizen sphere, inhabitants of Manizales are portrayed as permanently exposed to disaster risks. However, lack of sewage treatment rather than disaster risks are seen as main issues. The lived experience is also shaped by the inhabitant's socio-economic situation, which is above the Colombian average, with about 10% (28% on national average) of the inhabitants not being able to satisfy their basic needs. The report suggests that pressure on political structures might be exerted from being

internationally recognized as flagship city. Specifically mentioned was the environmental assessment done by universities, municipal and other stakeholders, who based on its results pushed the development of Biomanizales. Complex representative political structures are in place to ensure the accountability of the local government. This includes independent control entities to oversee municipal work and the territorial planning council that is assigned by the mayor based on a list of potential members presented by the civil society.

Further, the co-existence of municipal and state level authorities leads to a physically dense presence of these representative structures. Along with being the location of the municipal seat and capital of the Department of Caldas come increased political commitments. Another highlighted factor that is essential for the commitment is the Voto Programatico, which forces elected officials to turn promises from their election campaigns into concrete plans and by-laws. Policy planning is extensively addressed in this paper. On the national level, the Constitution, the Colombian National Plan for Adaptation to Climate Change, and the National Development Plan as well as general environmental legislations for disaster risk reduction are mentioned. Biomanizales is the central local environmental policy for this paper, which is accompanied by the local disaster risk plan, and the government decree on funding, which secures 1,2% tax on rural and urban properties to be invested in local environmental programmes. Financial and human resources are also presented. Budget and personnel is e.g. allocated to the Environmental Secretariat in Manizales, the Colombian Adaptation Fund, which can be used for recovery and reconstruction projects, and 12% of the city budget has been used over the past 10 years for structural work, risk mitigation and corrective measures.

Additionally, the environment and especially the diverse eco-regions are presented as fragile resources that require special care. Similarly to the previous document (Satterthwaite 2011), this paper reveals high organisational complexity and shared understanding of responsibilities. It is slightly more specific for local responsibilities and names the Environmental Secretariat Manizales, CORPOCALDAS (the responsible body for natural resource management), local councillors as government entities, and especially the academic institutes for hydrology, meteorology and environmental studies as non-state ones. Implementing multiple policies requires not only finding successful procedures one-by-one, but in a coordinated way, as has been pointed out with the climate change national system that overseas several initiatives.

The paper gives the impression of a tight linkage between policies, procedures and the actual delivery of programmes and plans. Environmental education programmes, zoning plans, preservation areas, local disaster plans, a network of eco-parks, environmental observatories etc. are showing the multitude of engagement with sustainable urban development and disaster management in the city. Behind this stands a methodological approach that aims to ensure strong participatory mechanisms, and close collaborations between research, government bodies, the private sector and CSOs. Research - conducted both by international and local scientists - seems foremost concerned with providing background knowledge to these programmes and projects as well as with their evaluation.

A small-scale disaster narrative of Colombia

Framing the document (Marulanda et al. 2008) into the Web of Institutionalisation reveals that only few of the elements are currently either addressed in Manizales and/or communicated to international readers. Included are the impacts of small-scale

disasters, which could be interpreted as experiences and interpretation of reality, some methodology and research addressing the issue as well as a programmes in which they are embedded. Directly lived experiences are not addressed in this paper, however, the character of small-scale hazards as persistent but largely invisible hazards, and their constant burden on low-income households, which are particularly vulnerable are emphasized. The paper further distinguishes between the interpretations of realities by different sectors, such as agriculture and housing and critiques that impact assessments are so far limited to economic aspects. In the delivery sphere, the Local Disaster Index was developed by the Institute of Environmental Studies at the National University of Colombia in Manizales and attempts to map the spatial distribution and variability of risks related to small-scale hazards, based on entries from the DesInventar database. Proceeding in the framework to programmes and projects, the paper then points out that Manizales is the only Latin American city to have a voluntary insurance scheme in place, which has been refined since the 90ies and via cross-subsidies transfers the disaster risks of low-income dwellers.

DISCUSSION

Findings will now be discussed in two ways. First, the content of the discourse as presented through the framework can be analysed. The narrative of Manizales as a good practice case study can only be affirmed through evaluating it with the Web of Institutionalization framework. Based on the first two documents, it can be said that most of the elements seem to be covered and, thus, point towards a sustained change in the way urban development and disaster risk management are integrated in the cities day to day practices and related structures. Especially the Policy Sphere and Organisational Sphere provide positive examples, how different elements to produce, implement and mainstream policies are in place and well-linked and coordinated. The paper on small-scale disasters shows that there has not been as much explicit recognition of the topic. However, there seem to be multiple structures and instruments already in place, which can – and presumably to a certain extent already do – accommodate small-scale disasters into the portfolio of risks and development initiatives they are addressing.

Many of the programmes mentioned in Satterthwaite (2011) already seem to target small-scale hazards as well, such as attempts to stabilize slopes or convert land uses. Exemplified by the DesInventar database and the Local Disaster Index developed in Manizales, extraordinary resources of conceptual knowledge and empirical data exist, whose value to the international community has already been recognized, as can be seen by the expansion of the database into more countries. The holistic understanding and conceptualisation of risk in Manizales, which involves everyday environmental hazards (as targeted e.g. in the Bioplan), small-scale disasters and large disasters (included in international databases), seems to encourage a flawless integration of different disaster scales into urban development. However, caveats arise from this overarching conceptualization, as different scales might not only entail different impacts, but also different dynamics, which are yet not well understood. Other frameworks might need to be explored or developed to capture these differences, make them explicit and, thus, also useful for the discussions around defining small-scale disasters.

Second, the way the discourse is presented to the readers can be explored and reflected upon. Framed as narrative of a successful case study, the text often names elements of the framework, such as programmes, policies or political structures rather than telling something about their quality and scrutinizing them. A critical reading might reveal

that certain elements are actually not as beneficial as they appear within the broader institutionalization framework. For example, relocations to safer sites (Satterthwaite 2011) might positively influence the peoples overall exposure to disaster risk if viewed from a city scale. However, it is crucial to reveal deeper layers of this discourse and ask who is affected and how, and how does the process take place. An open question remains, why knowledge about the actual operationalization and the more small-scale implications of small-scale disaster management, as resulting e.g. from ethnographic research and working with local communities does not seem to have a space or interest to be presented to the audience of this discourse. In the end, small-scale disasters produce victims and vulnerabilities, and the voices of these victims cannot be clearly heard from the analysed documents. It is an inconvenient question, whether this lack of attention to individual, ethnographically based narratives in the discourse presents a blind-spot that might produce or increase vulnerabilities. Certainly, however, this is yet a widely uninformed and speculative question, which will be explored in the further stages of this PhD research. Future analysis of this discourse will also benefit from further in-depth studies of secondary data - especially publications from local authors for local audiences - as well as empirical data in order to compare and contrast narratives and their discursive powers from a more insider perspective.

CONCLUSIONS

The call to pay more attention to the topic of small-scale disaster risks and to increase the understanding of their dynamics and characteristics especially in the context of the urban Global South has been highlighted in international debates. Impacts of single small-scale events often destroy individual livelihoods and matter on the small scale. Furthermore, their high quantity, frequency and cumulative effects severely hamper and undermine development efforts and, thus, arguably also matter on larger scales.

The paper explored the question what international disaster risk and urban management communities that express this call can learn from the discourse in Manizales, specifically in terms of institutionalizing the topic of small-scale disasters in the realms of sustainable urban development and disaster management. It found that both agendas seem to be largely mainstreamed into the cities day-to-day practices and operational structures. From this perspective, it can be concluded that a sound basis is provided for integrating yet another aspect of risk, i.e. those risks posed by small-scale hazards into the urban agenda. However, while the three analysed papers allowed for roughly framing the discourse, they did not give much indication on its quality. Thus, regarding the second question - what can be learnt from the way the discourse is presented to and lead by the international arena – the paper argues that a more critical reading reveals the need for a deeper understanding of a narrative, especially paying attention to the stories of the lived experiences of those individuals that are vulnerable to small-scale disasters.

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Paper 6: A New Protocol in Disaster Risk Reduction Policy and Praxis for the Southern Africa Region: Gender-Age Socio-Behavioural Intervention and the GIRRL Programme Model

Kylah Genade[1] and Dewald van Niekerk[1]

[1]*North-West University, South Africa; email: biggsk77@gmail.com*

ABSTRACT

Gender and age considerations are not prioritised within the context of disaster risk reduction (DRR) policy and praxis in Southern Africa. Research suggests that the impact of gender and age considerations within DRR is under-estimated or undervalued. The primary reasoning for this undervaluation is based on socially exclusive practices, which derive from unequal power allocations within the social context. This inequality is evident in stereotypes and biases, which limit various aspects of life for the affected. 'Age' and 'gender' are delineations by which power is allocated. As a result those individuals, who fall into these negative aspects of the categories, depending on the scenario, are often pushed to the periphery of society. This peripheral positioning also creates greater vulnerability and hence greater exposure to disaster related risk for the demographic. The Gender-Age Socio-Behavioural Intervention (GASBI) model, employing the GIRRL (Girls in Risk Reduction Leadership) Project multi-site case study will be introduced as a means of addressing the deficiencies in DRR policy and praxis in Southern Africa and will serve as a new protocol for guiding the integration of gender and age considerations into praxis.

Keywords: Adolescents, Disasters, Girls, Risk Reduction, Southern Africa.

INTRODUCTION

The global trends suggest that adolescent girls "have been ignored; their views unheard and their needs unmet" pertaining to disasters, humanitarian response and development initiatives (Plan International 2013 p. 9). There has been a "one-size fits all" approach rather than collecting specific data requisite for creating effective and efficient programmes designed uniquely for adolescent girls (Plan International 2013 p. 9). Research suggests that the impact of both gender and age considerations (reflected in the demographic of 'female adolescents') within disaster risk reduction (DRR) is under-estimated or undervalued (Plan International 2013). The primary justification for this undervaluation is socially exclusive practices derived from unequal power allocations within society (Plan International 2013; Rashid & Shafie 2013). The term social exclusion refers to "the process by which certain groups are systematically disadvantaged because they are discriminated against on the basis of ethnicity, race, religion, sexual orientation, caste, descent, gender, age, disability, HIV status, migrant status or where they live (Rashid & Shafie 2009 p. 17)."

Gender and age based disadvantage and exclusion is prevalent in many traditional cultures within the Southern Africa region and is evident of practices such as those that limit the access of women and adolescent girls to land ownership, finance and education, as well as dissuading them from participation in decision making and public forums (UNICEF 2006). This disadvantage and discrimination has also been documented where adolescent girls as a group have been exposed to alienation within the context of disaster reduction or emergency response programmes (Rashid 2009 p. 17). Limited studies in Africa (Ethiopia, South Sudan and Zimbabwe) have revealed

that girls were the most negatively affected in disasters based on factors linked to discriminatory practices such as greater workload, limited opportunities, early marriage, negative general attitudes towards girls as well as failure to consider special needs of girls (i.e. limited strength and vulnerability to disease) (Rashid 2009). The United Nations (UNISDR 2009b p.30) refers to vulnerability as being the characteristics and circumstances of a community that make it susceptible to the damaging effects of a hazard. It is evident that social exclusion in Southern Africa contributes to disadvantage which reinforces the vulnerability of adolescent girls to disasters (Hoogeveen et al. 2005).

DRR policy and praxis reveals that gender and age based considerations are not being prioritised and actualised in Southern Africa. This failure is even more significant in light of the realisation that more women and girls die as a result of disasters than men making not just gender but age a significant factor in disaster risk (Plan International 2010; Enarson & Morrow 1998; Plan UK 2010). The concept risk is described in this context as the potential disaster losses, (lives, livelihoods, assets) which could occur to a particular community (UNISDR 2009 p. 30).

The growing adolescent demographic which makes this group the majority population in the region, and the fact that climate change is increasing the frequency and intensity of natural hazards along with increasing the risk of disasters further reiterates the need for gender-age considerations in DRR efforts (UNDP 2004). However this failure presents an opportunity to address the current inadequacies involved in reducing the risk faced by those influenced by gender and age related exclusion. The opportunity is capitalised by the creation of a new framework targeting specific criteria including: gender, age, socialization/social conditions and behaviour modification. The proposed model has been termed the 'Gender-Age Socio-Behavioural Intervention (GASBI)'.

The research will introduce GASBI as well as highlight a case study of the Girls in Risk Reduction Leadership (GIRRL) Programme' which seeks to serve as an application of the GASBI. The GIRRL Programme was implemented at five sites within the Southern African region including South Africa, Zimbabwe, Zambia, Lesotho and Malawi through a Provention Consortium grant and subsequently replicated with support from the Government of South Africa and the 'CARE' organisation.

GENDER-AGE SOCIO-BEHAVIOURAL INTERVENTION- THE CONCEPT

In response to the acknowledged need for gender and age considerations in disaster risk reduction policy and praxis in the Southern Africa region following neglect, the GASBI is offered as a model for addressing the neglected issue. GASBI is being proposed as a practical and localised approach to specifically identifying and addressing the unique social drivers of vulnerability for a target group (defined by both age and gender). The intervention model is derived from a strategic combination of leading theories linked to disaster risk, vulnerability and social practice to address deficiencies and weaknesses in current policy/practices for addressing risk in highly vulnerable groups such as adolescent girls (Cutter et al. 2003; Wisner & Luce 1993).

To be effective GASBI needs to be operationalized at the community level with the collaboration of multiple, local stakeholders and the input of the participants. The practical application should take into consideration the social context and would involve an assessment of the community and the needs of the target group in order to

contextualise their specific vulnerabilities and how they fit within the broader community. The approach then applies strategic activities oriented toward developing positive behaviours through the appreciation of social processes and practices, in order to facilitate the reduction of vulnerability and to create community resilience.

GASBI first recognises disaster theory, particularly supporting the works of Perry (2007), Renn (1992) and Mileti (1999) which supports that disasters are social functions influenced by social conditions and practices. GASBI acknowledges the need to integrate considerations regarding social context in order to effectively seek to reduce risk. Braveman provides a definition of social conditions as being "the array of social, economic and political circumstances including the built environments that strongly shape and are shaped by those circumstances, in which people live and work (2010 p. 32)". This acknowledges that disasters are influenced by social conditions and as such effective DRR must take social factors into consideration.

The second framing theory used to justify the validity of GASBI recognises the disparities of disaster impact across social groups. Vulnerability theory suggests that certain individuals or social groups possess characteristics that impair their ability to withstand adversity according to Adger (2006), Cannon (2000), and Fussel (2007). Inequalities derived from characteristics associated with age, gender, religion and disability can limit or exclude access and power in society, which restrains their ability to rebound following hardship (Wisner & Luce 1993). The combination of multiple characteristics such as age and gender increases the vulnerability of the group. DRR should recognise the need to prioritise persons/groups, which are least able to resist disaster related harm.

The GASBI model borrows from Social Practice theory based on its ability to acknowledge additional variables such as moral norms, beliefs, cultural context, past behaviours and self-identity as influences on behaviour (Berger & Luckmann 1991; Hargreaves 2011). This model recognises that individuals do not live in a social vacuum but in reality their circumstances and local context can override all cognitive factors (Hargreaves 2011). Hence the efforts to promote positive risk reduction activities and actions cannot be solely influenced by direct efforts to change individual attitudes, values and beliefs but are often constrained by contextual factors embedded within social practices (Hargreaves 2011; Warde, 2005). It is critical understand not only how social factors of a particular context contribute to individual behaviour but also to appreciate that efforts at remediation must take place not just with the individual but also at the community level. The GASBI model supports efforts to positively modify behaviour while taking into consideration the practices and interconnected elements that contribute to risk within the community.

DISASTER RISK REDUCTION POLICY AND PRAXIS - A REGIONAL PERSPECTIVE

There is a lack of binding legislation governing the Southern Africa region as a whole, and as a result the analysis of policy will rather focus on the courses of action, regulatory measures and priorities for funding identified by regional representative bodies. The United National International Strategy for Disaster Reduction (UNISDR) Africa Region seeks to support the region's attempt to implement the Hyogo Framework for Action (HFA) in DRR (Vordzorgbe, 2006). The HFA derived from the World Conference on Disaster Reduction (2005) represents the course of action for achieving DRR from a global perspective and has been adopted by many countries in Southern Africa including Zambia, Zimbabwe, Lesotho, Malawi and South Africa

(UNISDR 2013). The HFA promotes the prioritisation of five key actions including the need for national and local prioritisation of DRR, the identification and monitoring of risks and the use of early monitoring systems; the creation of a culture of safety through information and innovation; the reduction of risk factors; improved effectiveness of disaster preparedness at multiple levels (UNISDR 2005 p 6).

The UNISDR in their follow up summary report for the period 2011-2013 confirmed the limitations that exist in the actualisation of the HFA. This admission reflects the difficulties in achieving praxis in the region. Although referring broadly to the African context, the report emphasises the following deficiencies including: the need for building community resilience, ensuring access to women and children are involved in DRR; promoting the engagement of youth in environmental protection, climate change adaptation, economic empowerment and information sharing, as well as the importance of involving the contributions of youth in DRR activities (UNISDR, 2013).

There is an emerging sentiment reflected in the most recent statement regarding Africa's contribution to the post 2015 HFA made by the 5th Africa Regional Platform and 3rd Ministerial Meeting for Disaster Risk Reduction. The statement made distinct recommendations including the need for public participation by youth, children and women to help ensure that their leadership and capacities are enlisted in risk reduction efforts which reflected the previously mentioned deficiencies (UNISDR 2014 p 2). Further references are made to the recommendations for institutionally linking stakeholder forums including women's and youth groups (UNISDR 2014 p.3). The Statement however in acknowledging the need for including specific groups such as youth, children and women, however this call for action has not yet been reflected practice. The document reiterates the realisation of Africa's large and growing youth population as a significant consideration in efforts to reduction risk in the region (UNISDR 2014 p.3).

The African Union (AU) as another regional body has further validated the need to prioritise the development of institutional frameworks, good governance practices, emergency response, risk identification and knowledge management as key aspects of the risk reduction strategies (AR-DRMU 2010). The Southern African Development Community (SADC) Disaster Risk Reduction Unit (DRRU) further supports the inherent and imperative need to prioritise risk reduction. However despite its intent, the position of DRRU policy is generally criticised for it's overly idealistic nature and failings to prioritise local level actualisation (AR-DRMU 2010; International Resources Group Ltd 2001). The implications are most widely seen at community level wherein the need to focus on specific groups and encourage gender and age considerations are insufficient (AR-DRMU 2010). Its' directives are devoid both of the explicit recognition of vulnerable groups and the acknowledged need to specifically target these groups through local level initiatives (International Resources Group Ltd 2001).

Hence to date the gap in DRR policy and praxis in from a regional perspective pertaining to the gender-age considerations still exists to a great extent and creates a void that needs to be addressed and acknowledged. The recent call for the inclusion of women, children and youth is a moderate effort but this has yet to bring about the marked change necessary to take Southern Africa's DRR to a state of gender–age maturity.

SOUTHERN AFRICA DISASTER POLICY

The majority of countries within Southern Africa have some form of disaster-focused legislation, which aims at providing policy guidance. It is apparent that much of the

independent country legislation is weighted down with descriptions regarding the structural hierarchies of national and sub-national disaster management entities and less on how DRR should be actualised. Most legislation is dominated by details regarding structural organisation, power allocations (within each country) and the mandates of each entity in terms of responsibilities, protocols and reporting, such is found in five of eight sections within the Lesotho Disaster Act (GOKL 1997).

It should be noted that significance is linked not just to what the legal directives state but also what information is implicit. Some of the Southern African countries fail to make reference to central ideas associated with disasters such as 'risk', 'vulnerability', 'capacity', 'exposure' and 'hazards'. The national disaster legislation from Lesotho for example fails to make reference or acknowledge the term 'vulnerability' which could be argued as being one of the core elements necessary for addressing risk (GOKL 1997). On the other hand the South African and Zimbabwean legislation both fail to specifically recognise terms such as 'gender', 'youth' or 'women' (GoSA 2002; GoZ 1989) which could construe the lack of prioritisation in national disaster legal framework and have negative repercussions for directing praxis. Alternatively, Zambia's Policy document provides definitions of the term 'gender' in its glossary stating its reference to:

…Social and economic differences between men and women that are learned, changeable over time and have wide variation within and between cultures. This is opposed to sex that refers to the biological differences between men and women. Gender is used to analyse roles, responsibilities, constraints and opportunities of men and women in development (DMMU 2005 p.vii).

Zambia further provides the recognition that disasters do favour certain groups by indicating that "disaster effects are gender selective, affecting mostly women, children and elderly, hence gender consideration in disaster management shall be prominent at all levels (DMMU 2005 p 14). This document fails to neither expand on this notion nor give clear guidance as to how this should be done in practice. Although there is reference to 'children and the elderly' also, there is no acknowledgement that specific age considerations should be made. According to the introductory section, despite references to the participation of civil society, multi-levels of government, management/technical/review committees as well as the mining industry, the Truckers Association of Zambia, utility companies and Lusaka Water and Sewerage, there was no reference to involvement of either women's or youth groups (DMMU 2005 p. iii). The policy does direct the inclusion of women for the Satellite Disaster Management Committee by stating "two men and two women (to be) selected to represent the community (DMMU 2005 p.29)." In Part IV Section 2 subsection (a-o), of the Lesotho legislation, there is a detailed list of District Disaster Management Team members however despite references to church members and representatives from the schools, there are no provisions made for persons representing women's or youth groups (GOKL 1997).

The overview of Southern Africa's disaster policy finds it broad and incomplete. The need to provide more specific references to cover gaps in areas such as acknowledging the value of gender and age considerations as well as guiding the implementation of these considerations in praxis would make a significant contribution to the value of the policy.

SOUTHERN AFRICA DISASTER RISK REDUCTION PRAXIS

In a report summarising DRR praxis in the Southern Africa region, it was acknowledged that ex-ante activities were focused on four main areas including

technical assistance, sector activities, advisory services and leveraging investment (AR-DRMU 2010 p14). Specific activities were identified as general awareness, policy support, institutional strengthening, risk mitigation and investment, supporting risk finance systems, as well as improving emergency response and preparedness (AR-DRMU 2010 p. 14).

The focus for DRR praxis has been rooted in community based projects, many focusing on water and sanitation, food security and sustainable livelihoods; risk and vulnerability assessments; climate change adaptation and early warning systems development; education, awareness and capacity building for communities and government (USAID 2011; UNICEF 2009; Plan International 2013; Oxfam Zambia 2014). The majority of these projects were led and funded by donor agencies such as the Department of Foreign International Development, United Nations Children's Fund, Catholic Relief Services, The Red Cross, Oxfam, CARE, United States Agency for International Development, the World Bank and the United Nations Development Programme. Many of these projects work in partnership with local governments in order to build institutional capacity of government workers as well as for local community members with governmental stakeholders or partners. However the lack of government led practical action is suggestive of their limitations in instigating praxis.

Leading agencies present DRR projects with statements such as 'targeting vulnerable Zimbabwean farmers' or 'benefiting 45000 individuals and schools' (USAID 2011 pp. 6-7). These references overlook specific details such as the involvement or focus on women, adolescents or children who do make contributions to projects or who attend awareness programmes at local schools. This lack of specificity leaves vulnerable groups non-prioritised and fails to benefit those most distinctly at risk. The combination of both age and gender considerations fail to be acknowledged together in the context of many examples of DRR praxis.

THE GIRRL PROGRAMME

The GIRRL Programme serves as the application of GASBI in praxis, highlighting the need to remediate or reduce the negative effects of socially exclusive practices, which are prevalent features in many Southern Africa traditional cultures (UNICEF 2006). The imbalance caused by the exclusion, results in adolescent girls often having a lack of social voice. The socially exclusive practices reinforce the idea that girls are victims and are powerless particularly in the context of hazards and disasters. The concept of dependency and weakness is further reinforced through the prevalence of physical and sexual violence, poverty, dependence on alcohol and drugs, forced prostitution, teenage pregnancy and exposure to disease (HIV/AIDS, sexually transmitted infections) such is the scenario in many informal settlements of South Africa and Zambia (Forbes-Biggs & Maartens 2012).

The GIRRL Programme seeks to overcome the effects of social exclusion through the application of the Participatory Action Research (PAR) approach as the foundation for the initiative. The PAR process supports cooperative enquiry to examine existing practice, reflect on and improve strategies, skills or techniques necessary to help improve life conditions of the girls involved (Krimerman 2001). In this instance adolescent girls engaged in GIRRL, will seek to understand how they can use information to make better decisions and how new skills can help reduce their vulnerability and build resilience.

The GIRRL Programme sought to address the issue of risk reduction by minimising the social vulnerability of adolescent girls through its focus on gender and age specific capacity building activities for empowerment and enabling agency (Forbes-Biggs &

Maartens 2012). Originally implemented in Ikageng Township (South Africa) in 2007-8 through funding from Provention Consortium (Forbes-Biggs 2008), the programme received support from the Dr. Kenneth Kaunda Municipal Disaster Centre and was replicated in three additional sites in the district (Tshwelelang, Tching, Kanana).

The GIRRL Programme methodology was instigated as a multi-session (15-25 based on the needs of the group, held twice weekly for 3-5 months) training and participatory information-sharing programme, engaging twenty adolescent girls (aged 13-19 years) per site who would be developed as leaders for building resilience within their communities. Girls were identified by project leaders and school officials based on specific criteria including: experienced poverty, aged 13-19 years old, being female and willingness to help others. The capacity building was conducted through the provision of interactive, participant driven training and information sharing in areas such as personal (mental, physical and sexual) health, self-defence, peer education, decision-making, first-aid, fire safety, environmental awareness, community-based disaster risk assessment and effective communication. Each session was carefully adapted to the specific community context through the initial insight of project leaders, stakeholders and key persons from within the locality but then shaped by the extensive contributions of the girl participants (Forbes-Biggs & Maartens 2012). Following the sessions the participants hosted a community awareness based on their perceptions of hazards and threats in the area. Song, poetry, drama and dance were used to convey their targeted messages to help build community resilience.

The programme's objectives included: to train twenty adolescent girls as leaders to improve individual and community capacity; to develop human capacity to improve survival skills of vulnerable communities, to engage girls in risk reduction activities; to promote girl participants as role models for their communities particularly related to DRR; to establish a culture of 'community of safety' and awareness through the active involvement of and information dissemination of adolescent girls; to encourage great participation of girls and vulnerable communities in DRR; and to develop positive relations between key players in DRR including coordinating entities, stakeholders, and empowered youth to help establish participatory-based community based disaster planning (Forbes-Biggs 2008 p. 4).

In 2012, CARE and the African Centre for Disaster Studies (ACDS) partnered for the implementation of a regional learning and pilot activity in Southern Africa based on the GIRRL Programme, in Zambia, Zimbabwe, Malawi and Lesotho. Each country implemented an initial pilot of the GIRRL approach adapted to their local context. A detailed analysis of the GIRRL Programme is necessary to confirm its strengths, weaknesses and relevance as a practical application of GASBI through activities such as an analysis of risk perception, perceptions of self, participation in DRR activities, as well as a comparison of output measured against the tenets of the HFA to gauge its contributions to disaster risk reduction.

CONCLUSIONS

It has been presented that DRR policy and praxis in the southern Africa region has not reached a stage where it is ready to recognise and prioritise the needs and contributions of distinctly vulnerable sub-groups such as adolescent girls. The study sought to present a radical new protocol, the GASBI, for dealing with issues surrounding vulnerability, which are not adequately addressed but necessary for the effective disaster risk reduction policy and praxis in Southern African context. The GASBI, endeavours to link theories regarding disaster risk, vulnerability, and social practice in young people, to the practical application of unique participatory gender-age intervention targeting the specific needs and opinions of vulnerable adolescents girls

through socially targeted behaviour change. The study builds on the international recognition of the participatory action research focused GIRRL Project as a case study while seeking to document its contributions to youth and gender considerations in disaster risk reduction.

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Paper 7: A Model for Integrating Disaster Risk Reduction in National Multi-Sectoral Planning In South Africa

Musiwalo Moses Khangale[1]

[1]*North West University, South Africa; email:mosesk@ndmc.gov.za*

ABSTRACT

Changing climatic conditions, urbanisation and poorly planned developments are some of the factors that have resulted in the increase of disasters (both anthropogenic and natural) in recent years. The advent of HIV-AIDS pandemic compounded by high poverty levels also exacerbates the vulnerability to natural hazards of many across the globe with Africa being hardest hit. Now, there is international acknowledgement that efforts to reduce disaster risks must be systematically integrated into government policies, plans and programmes for poverty reduction, service delivery and sustainable development for them to be sustainable. This integration requires the participation of all relevant sectors in a society including environment, finance, industry, transport, construction, agriculture, education, health etc for these initiatives to be sustainable. Relatively little research has focussed on this topic and this study seeks to address this gap in literature and presents a model that will be useful in integrating disaster risk reduction in national multi-sectoral planning in South Africa. As a starting point and a basis to the rest of the study, organisation and strategic planning theories will be critically analysed to determine how they inform national multi-sectoral planning. A literature review of both national and international sources will be conducted regarding current developments, related challenges and good practices in the integration of disaster risk reduction with national multi-sectoral planning. The legal and institutional frameworks for both Disaster Risk Reduction (DRR) and national multi-sectoral planning in South Africa will also enjoy attention. The study will assume the format of an exploratory study using qualitative methods to discover or understand important issues, processes and relationships with a view to proposing a model for integrating disaster risk reduction in national multi-sectoral planning in South Africa.

Keywords: Disaster risk reduction, disaster(s), disaster risk management, multi-sectoral planning, South Africa.

INTRODUCTION

Lafferty and Meadowcroft (2003:1) observed that over the past decade the idiom of sustainable development has increasingly come to frame international debates about environment and development policy-making. Catapulted to prominence by the report of the Brundtland Commission in 1987, sustainable development was formally endorsed as a policy objective by world leaders at the Rio Earth Summit five years later (Lafferty & Meadowcroft, 2003:1). Around the globe political leaders and public administrators now routinely justify policies, projects and initiatives in terms of the contribution they make to realising sustainable development.However, as noted in the United Nations International Strategy for Disaster Reduction (UNISDR) (2009:v), development efforts are increasingly at risk as a faltering global economy, food and energy insecurity, conflict, global climate change, declining ecosystems, extreme poverty and the threat of pandemics are amongst the factors challenging progress towards improving social welfare and economic stability in many developing countries. According to Coppola (2007:17), the cost of disasters worldwide is increasing at an alarming rate.

There is convincing evidence that the number and seriousness of disasters are increasing, and that poor countries and poor communities are disproportionately affected (DFID, 2004:7). In line with this observation, Twigg (2004:9) notes that developing countries are hit hardest by natural disasters. Olowu (2010:304) contends that for developing countries such as make up the African continent, the weakness of state infrastructures, absence of appropriate legal and policy frameworks and sometimes inadequate resources particularly render them more vulnerable to the gory consequences of large-scale disasters. It is in this context that the African Union (2004:1) notes that Africa is the only continent where the regional share of reported disasters in the world total has increased over the past decade. There were 96 disasters recorded in 2008 and they included 44 floods, and 9 droughts that affected 16.3 million people and incurred economic losses estimated at over a billion dollars (UNISDR, 2009:8). The Southern Africa region is also affected by disasters and the ensuing section examines factors that exacerbate the vulnerability of this region and its people to hazards.

Factors impacting on disaster risks within the Southern African Development Community (SADC) region

According to the World Wide Fund for Nature (WWF) (SADC, 2008:49), there are indications of climate change in Southern Africa. Records from SADC countries reveal that temperatures have risen by more than 0.5 degree Celsius over the past 100 years, and the 1990s were the warmest and driest ever (SADC, 2008:49). There are also fears that the region could be affected by a rise in the sea level with the warming very likely to be greater than the global annual mean warming (SADC, 2008:49). A study by SADC (2010:5) noted that the dependence of the region on climate-sensitive sectors like health, agriculture, water, infrastructure and transport, coastal zones, energy, tourism, biodiversity and ecosystems, forestry and fisheries, environment and land increases the vulnerability of the region to climate change. In addition to HIV/ AIDS (discussed in detail in ensuing sections), water and food insecurity and major challenges in the area of democracy, peace and security which often result in crisis-induced mass migration are some of the challenges that this region has to contend with (SADC, 2010:10).

Southern Africa also faces numerous developmental challenges ranging from rural-urban migration, poverty eradication, conflict and instability and climate change to mention but a few (Karimanzira, 199:20-21). All these challenges exacerbate the vulnerability of the region and its people to disaster risks. Furthermore, the SADC region is amongst the poorest regions in the world with nearly 45% of its total population living on one US Dollar a day (SADC: 2010:10). While poverty levels vary from one country to another, there is consensus that the manifestation of poverty is acute among vulnerable groups like households headed by old people and those headed by children that have been trending upward as a result of HIV/AIDS (SADC, 2010:13). Flowing from the above discussion, it is thus clear that efforts to reduce disaster risks in South Africa cannot be viewed in isolation but should rather be located within the broader context of sustainable development within the region. This view is underscored by the White Paper on Disaster Management, 1999 which observed that:

"Natural and other threats are not constrained by national boundaries. Measures taken in South Africa can increase or reduce risks in neighbouring countries, just as potential dangers across our borders can directly affect South Africa" (South Africa, 1999:19).

Against this background, the next expands further on this by examining the institutional mechanisms for cooperation amongst countries within the SADC region with specific reference to disaster management.

Existing transnational agreements within the SADC region

Various instruments for cooperation such as protocols and declarations are used within the SADC region as a basis for cooperation on matters of mutual interest including but not limited to disaster management. Notable amongst these instruments is the Protocol on Forestry which makes provision for cross-border wild land fire management, Protocol on Politics, Defence and Security Cooperation which provides for the enhancement of regional capacity for within the region such as developed several trans-national agreements and other relevant instruments to facilitate cross-border collaboration between countries. These includes the Protocol on Forestry which also deals with management of wildland fires across borders, Protocol on state security, defence which provides for disaster management and co-ordination of international humanitarian assistance as well as the Protocol on Health which deals with mechanisms for cooperation during emergencies and disasters. The Dar-es-salaam Declaration on Agriculture and Food Security in the SADC region is another instrument that calls for cooperation amongst countries of the region on the management of trans-boundary animal and plants diseases, disaster preparedness through strengthening national early warning systems, enhancing vulnerability monitoring capabilities, to mention but a few (SADC, 2004). Having contextualised the disaster risk profile of the SADC region as well as some of the institutional measures put in place to manage these risks, the ensuing section expands further on this by briefly examining the disaster risk context of South Africa.

BACKGROUND

Study area

While South Africa is not prone to spectacular disasters such as volcanic eruptions and massive earthquakes, localised incidents of wildfires, informal settlement fires, seasonal flooding in vulnerable communities, droughts, and anthropogenic disasters such as oil spills and mining accidents continues to undermine the resilience of communities (Vermaak & van Niekerk, 2004:555; UNISDR, 2002:1). A recent study by the IFRC (2011:18) resonates with this observation when it noted that South Africa faces a wide-range of natural and human-induced hazards which include droughts, floods, dam failures, urban and rural fires, mining-induced earthquakes and sinkholes, epidemics, large scale transportation accidents, and spillages of hazardous waste that could potentially lead to disaster events. In essence, as the IFRC (2011:18), asserts, most frequently occurring disasters are as a result of impacts of these hazards: floods and storm events, droughts and veldfires the (in order of frequency). Like most countries in the SADC, South Africa's vulnerability to disasters is also amplified by diseases such as HIV/AIDS as outlined in the ensuing section.

Effect of HIV/AIDS on South Africa's disaster risk profile

The advent of HIV-AIDS also exacerbates the vulnerability of Africans to natural hazards (UNISDR, 2004:29; Van Niekerk *et al*., 2002:31). According to De Waal (cited by Wisner *et al*., 2004:69), "in southern Africa, the impact of HIV-AIDS has meant that some rural areas have lost many of their younger adults. The productivity of agriculture has suffered, as has the ability of households to engage in a variety of activities traditionally associated with coping with hazards such as drought". Apart

from reduced agricultural productivity, resilience will also be affected by direct health impacts from water-borne diseases and malnutrition and indirect impacts for parents who must tend to sick children and the elderly (UNISDR, 2009:110). Similarly, Barnett and Whiteside (2006:10) observed that southern Africa remains the worst affected sub-region with South Africa having the highest number of people living with HIV in the world. In addition to the challenges posed by HIV/AIDS, the threat of climate change is also ever present.

Effects of climate change on the disaster risk profile of South Africa

As indicated in preceding sections, disasters have been on the increase in Africa and climatological disasters were an important contributor to this increase, as the continent was hit by severe droughts, leading to over 14 million victims (CRED International Disaster Database, 2009:16). Global climate change will significantly affect the frequency and intensity of hazard occurrence in Sub-Saharan Africa as it will also create new vulnerabilities and exacerbate existing ones as further decreases in the availability of water and agricultural yields as well as a lack of suitable land for pasture threaten the viability of livelihoods (ISDR, 2009:8; IPCC, 2007:50). South Africa will have to adapt to the impacts of climate change by managing its climate and weather-related risks, reducing its vulnerability and increasing the resilience of society and the economy to the adverse effects of climate change and variability (South Africa, 2012:10). Having briefly outlined the disaster risk profile of South Africa and how vulnerability to disasters is amplified by HIV/AIDS and climate change, the ensuing section examines the multi-sectoral nature of DRR in the country.

The multi-sectoral nature of disaster risk reduction in South Africa

The primary responsibility for disaster management in South Africa rests with the government. (South Africa, 1999:12). In South Africa, government is constituted as national, provincial and local spheres of government which are distinctive, interdependent and interrelated (South Africa, 1996:37). The centrepiece of the South Africa government's legislative response to disaster management is the Disaster Management Act, 2002 (Act no 57 of 2002) (DMA), which repealed the former Civil Protection Act 67 of 1977 (IFRC, 2012:27). The DMA, 2002 defines disaster management as a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at (a) preventing or reducing the risk of disasters (b) mitigating the severity or consequences of disasters (c) emergency preparedness (d) a rapid and effective response to disasters and (e) post-disaster recovery and rehabilitation (South Africa, 2002:5. According to van Niekerk (2006:97), the DMA heralds a new era in the way in which South Africa approaches disasters risk management and also calls for the establishment of structures, frameworks, plans, procedures, and strategies that cut across all government sectors. In essence, the DMA provides the ideal legislative framework that entrenches the commitment of the South African government to disaster risk reduction through sustainable development, within the realm of cooperative governance (van Niekerk, 2006:97; 1996 Constitution). The DMA has a distinct disaster risk reduction focus, and places considerable emphasis on the development of adequate structures, planning and integrated and coordinated disaster management activities on all tiers of government (van Niekerk, 2006:101).

Section 25 of this legislation further states that national organs of state must prepare disaster management plans setting out notably, the way in which the concept and principles of disaster management are to be applied in its functional area, and

particulars of its disaster management strategies (South Africa, 2003:30). This disaster management plan of a national organ of state must form an integral part of its planning (South Africa, 2003:30). Van Niekerk (2006:97) adds that the multi-sectoral nature of disaster management in South Africa requires integration and coordination of activities of all role players into a holistic and comprehensive system aimed at disaster risk reduction. This view is supported by the United Nations Development Programme (UNDP) (2007:15) which argues that disaster management is not a separate discipline but a cross-cutting issue thatneeds to be considered in many areas and sectors and at all levels of polity, society and economy.

Flowing from the above discourses, the UNISDR (2004:20) adds that indeed, DRR, as a multi-disciplinary and multi-sectoral endeavour, falls under the programme of diverse institutions. Hence, disaster risk reduction policies need to be comprehensive, integrated and balanced across sectors. Effective design and implementation of disaster risk reduction involve institutional collaboration between various stakeholder interests and require clear assignment of roles, assumption of responsibilities, and coordination of activities (UNISDR, 2004:20). Currently no model exists to monitor and guide the integration of disaster risk reduction in national multi-sectoral planning internationally and in South Africa (AU, 2004; UNDP, 2004:15; Van Niekerk, 2005). A model for integrating disaster risk reduction in national multi-sectoral planning will enhance South Africa‘s ability to reduce disaster risk (South Africa, 2003; South Africa, 2005). Against this background, the following case study provides an example of the effect of managing a disastrous wildland fire outside a multi-sectoral and multi-disciplinary framework as required by the DMA:

Case study

As outlined in preceding sections, wildland fires is one of the three major hazard facing South Africa. Tlokwe Local Municipality (TLM) in North-West province is one of the municipalities located within an extreme wildland fire risk category. On 23 August 2011, the TLM experienced ravaging wildland fires which killed two people and injured six others as well as damaged farming infrastructure, grazing and livestock (Wiggill, 2013:2). South Africa has an established wildland fire early warning system known as the Fire Danger Index (FDI) and on this day, the FDI indicated that the conditions for extreme and disastrous wildland fires were a strong possibility (Van Niekerk & Coetzee, 2011 cited by Wiggill, 2013:2). On this day, there were a total of 13 wildland fires raging within the TLM area and the capacity and resources to manage these fires was exhausted. A study of this fire indicates that one farmer lost more than 600 cattle with an estimated monetary loss of more than R6 million (Davies, 2011 cited by Wiggill, 2013:2).

Various role players such the TLM fire brigade and disaster management service as well as the Fire Protection Associations (FPAs) established in terms of the National Veld and Forest Fire Act, 1998 are involved in integrated wildland fire management within the TLM. Wildland fires are a known hazard within the TLM and adequate measures must be put in place by responsible agencies to ensure effective response to these fires when required. Analysis of this fires revealed that the absence of a Joint Operations Centre (JOC) staffed by relevant officials with decision making powers contributed to the increased losses suffered by landowners in this incident. The JOC is a critical element in responding to incidents of this nature as it is responsible for providing strategic direction and leadership as well as coordination of resources to manage an incident. The fact that this structure was not established by the relevant agencies indicates that the level of preparedness to deal with disastrous situations was

inadequate.

There is also acknowledgement by most role players that the absence of a communication plan for managing the incident resulted in a chaotic and fragmented response to the fire. The fact that wildland fires are a recurring seasonal hazard in the TLM area necessitates the development of contingency plans which clearly outlines how disastrous situations will be managed. The use of early warning information to inform planning by relevant agencies is also a critical element in managing disastrous wildland fires. It is also critical that planning by sectoral departments within the TLM area should consider the risks posed by wildland fires to infrastructures, livelihoods and the environment. Where applicable, measures to reduce these risks must be integrated in strategic plans of relevant agencies.

While the study has not analysed specific models used by other countries to integrate disaster risk reduction in national multi-sectoral planning as yet, it is anticipated that as the study progresses, the mechanisms or models used by countries within the Brazil, Russia, India, China (BRIC) will be analysed with a view to informing the development of a model for South Africa.

The ensuing section briefly sheds light on the theoretical framework that will underpin this study.

LITERATURE REVIEW

As its theoretical frame of reference, this study will be grounded on two theories, namely Organization theory (Gortner *et al*., 1987:5-7; Daft & Wilmott., 2010:14; Roux *et al*., 1997:15; Henry, 2004:58-76; Rosenbloom & Kracvhuk, 2002:147-176); and Strategic Planning theories (Tewdwr-Jones cited by Paterson, 2009:12; Young, 2003:4; Lewis *et al*., 2004:115-176; Daft, 2006:236-263; Robbins & DeCenzo., 2008:70-96). The choice of the two theories is motivated by the fact that while planning and organising are public management functions, it is critical that theoretical considerations that underlie the development of multi-sectoral planning in South Africa through departmentalisation be clarified to understand the principles that underpinned this process. Organisation theory which, as Gortner *et al*. (1987:6) argue, makes an important and useful contribution to the study of government and public management will be useful in outlining these theoretical considerations and principles with a view to determining how they can be applied in South Africa to inform a model for integrating disaster risk reduction in multi-sectoral planning in line with the objectives of the study.

Although most organisation theory scholarship e.g. Hodge and Anthony (1991:19), Lundstedt, 1972:328), Robbins (1987:474) and Starbuck (2003:143), agree that many premises of organisation theory were understood by the ancients, the beginnings of the factory system in Great Britain in the eighteenth century is viewed as the birthplace of complex economic organisations and, consequently, of the field of organisation theory (Hodge & Anthony, 1991:19; Marcus & Van Dam, 2007:13; Ott *et al*., 2011:31; Shafritz *et al*.,2011:223). According to Kassem (1977:12) and Scott (1961:7), the evolution of organisation theory can be categorised into three major schools of thoughts which are the classical, neo-classical and the modern school of thought. Kassem (1977:12) is of the opinion that the dominant currents in organisational thinking since the beginning of this century have taken the form of thesis (classical organisation theory), antithesis (neo classical/ human relations theory), and synthesis (modern organisation theory/ open-system theory).

Classical Organisation Theory (COT) as its name implies, was the first theory of its kind, is considered traditional, and continues to be the base upon which other schools of organisation theory have built (Ott *et al*.,2011:31; Shafritz *et al*.,2011:224). An understanding of COT is essential not only because of its historical interest but also, more importantly, because subsequent analyses and theories presume knowledge of it (Ott *et al*., 2011:31). According to Merkle (cited by Ott *et al*.,2011:32), the classical school dominated organisation theory into the 1930s and remains highly influential today. The term Neoclassical in the context of organisation theory is generally used to describe theoretical perspectives that revise and/ or is critical of COT- particularly for minimising issues related to the humanness of organisational members, the coordination needs among administrative units, the operation of internal-external organisational relations, and the processes used in decision making (Ott *et al*.,2011:92; Scott, 1961:10; Shafritz *et al*., 2011:238).Writers and scholars of this doctrine gained reputation as organisation theorists by attacking the classical writers from the end of World War Two (WWII) through the 1950s(Ott *et al*., 2011:92). In spite of their frequent and vigorous attacks upon the classicalists, the neo classicalists did not develop a body of theory that could adequately replace the COT (Ott *et al*., 2011:92).

By contrast to the COT (thesis) and the human relations theory (antithesis) Modern Organisation Theory adopted systems thinking/ analysis to examine their assertions about human behaviour in organisations (Kassem, 1977:12; Shafritz *et al*. 2011:241). The label "modern" is used to distinguish the more recent writers of structural organisation theory from the pre-World War II classical theorists such as Taylor and Weber (Ott *et al*., 2011:197; Shafritz *et al*., 2011:240). The tenets of Modern Organisation Theory (MOT) are similar to those of COT pioneered by Taylor, Fayol, Weber, Gulick and others, and rest on the premise that organisational efficiency is the essence of organisational rationality, and the goal of rationality is to increase the production of wealth in terms of real goods and services (Ott *et al*., 2011:197).

To complement this theory, strategic planning theory will be applied in the study to provide a theoretical framework that underpins multi-sectoral planning in the South African context. Patterson (2009:8) argued that planning is not a unitary discipline in the sciences or the social/human sciences as contributions towards understanding of planning, and to building the theory of planning, are made from a range of major disciplines such as economics, sociology, political science, urban and rural studies, public administration, operations research, statistics, organisational development and business science. Bryson (2004:6) defines "strategic planning as a deliberate, disciplined effort to produce fundamental decisions and actions that shape and guide what an organisation or other entity is (its identity), what it does (its strategies and actions), and why it does it (mandates, mission, goals, and the creation of public value)".

According to Nieboer (2011:373) and Paterson (2009:5), numerous strategic planning models are available, mostly following a common approach which includes the development of a mission statement, followed by analysis, constructing and implementing goals, objectives and strategies. Amongst these models is the Bryson model known as the strategy change cycle which is derived from the private sector, but with some variations to allow for the public sector context (Hughes, 1998:155; Nieboer, 2011:373). This model as Johnston (1998:356) argues, marries the Harvard Policy Model (environmental fit) with a stakeholder model (reconciling the views of disparate constituents). This is essentially intended to address the issue of pluralist interests – or stakeholder management in the public sector – through consensus

building (Johnston, 1998:356).This view is echoed by Bryson and Alston (2004:15) who posit that the strategy change cycle is designed to help organisations meet their mandates, fulfil their mission, and create public value. Young (2003:15) adds that Bryson's model is methodical, participative, conventional, and particularly adaptive to public organisations. As indicated below, one of the aims and objectives of this research is to define, assess, examine and critically analyse the theories of Organisation and Strategic Planning and how they inform national multi-sectoral planning. The utility of the Bryson Model (figure 1) in the public sector is therefore the main reason why the model was chosen in this study. While the sequencing of these steps may vary from one organisation to the other, the model does provide a suitable list of points to enable a strategic plan to be formulated (Hughes, 1998:155).

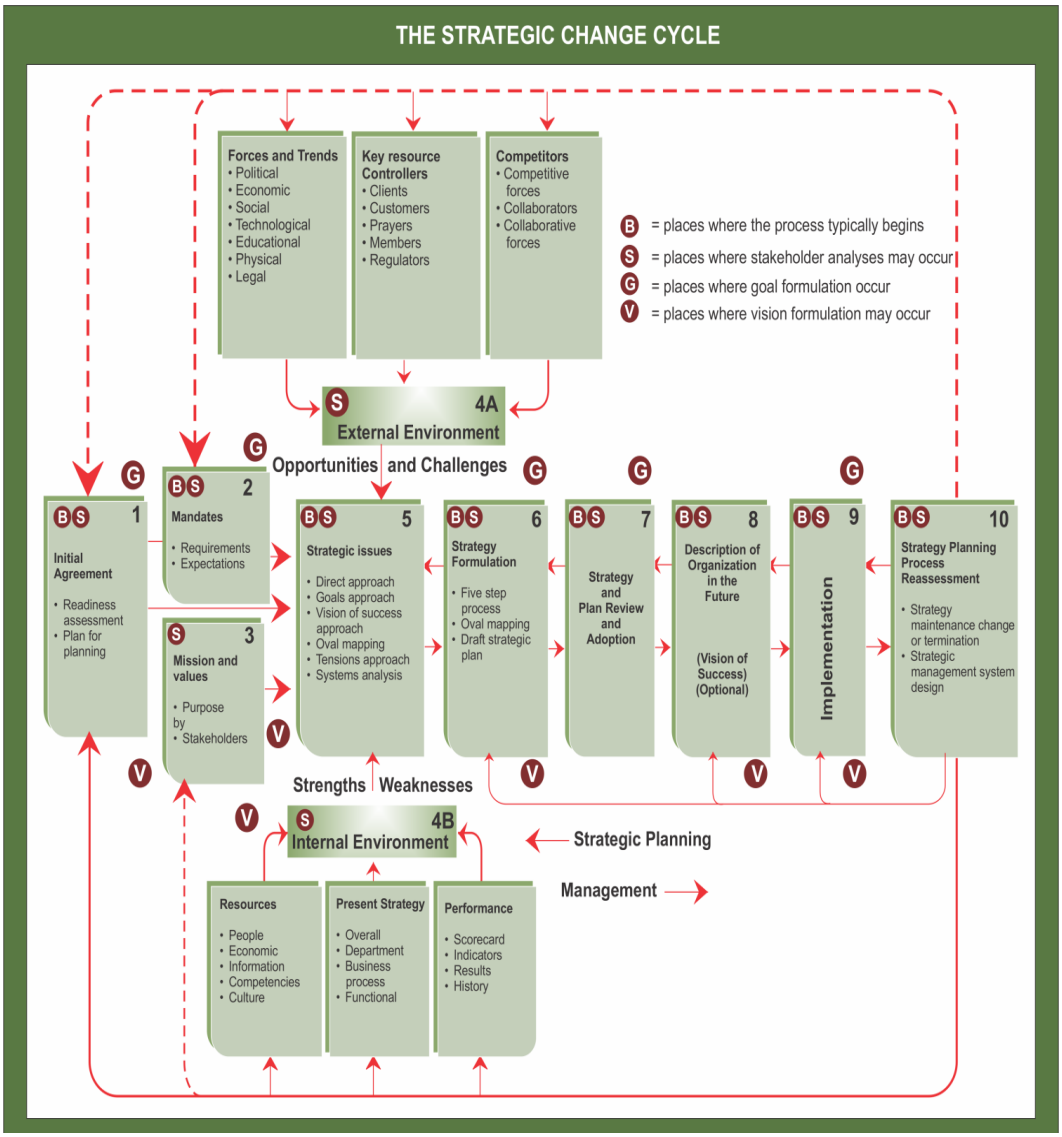

Figure 1 The strategy change cycle

Source: Bryson, (2004:33)

Although the Bryson model is widely used, it is not without limitations. While this model recognises some of the problems of strategic management in a public sector environment, the model does not fully address the complexities of competing internal

managerial processes, such as with the budget and corporate-planning approaches including rational and power behavioural factors (Johnston, 1998:356). The above said, it is clear that in a rapidly changing environment, in which most organisations operate, strategies must be continuously reassessed and adapted to ensure they remain relevant. It is against this backdrop that the need for a model to integrate disaster risk reduction in multi-sectoral planning for South Africa became apparent and critical. It is anticipated that such a model will assist national departments in integrating disaster risk reduction in their sectoral planning initiatives, thereby reducing disaster risks in the country. Through this model, understanding of disaster risk in South Africa and the alignment of disaster risk reduction strategies will also be enhanced. This section has highlighted the theoretical framework that will underpin this study; the ensuing section sheds light on the research methodology that will be adopted in this research.

RESEARCH METHODOLOGY

The research will assume the format of an exploratory study using qualitative methods with a view to discovering or understanding important issues, processes and relationships (Cooper & Schindler, 2001:140; Leedy & Ormrod, 2005:102).

Research aims and objectives

The research aims to develop a comprehensive model that would guide the integration of DRR in national multi-sectoral planning in South Africa. In order to reach the above aims, the objectives of the research are to:

a. To define, assess, examine and critically analyse the theories of Organisation and Strategic Planning and how they inform national multi-sectoral planning;

b. Investigate and analyse existing legal instruments and frameworks governing disaster risk reduction in South Africa;

c. Investigate and analyse how national multi-sectoral planning developed in South Africa;

d. Explore and examine international models for integrating DRR with national multi-sectoral planning;

e. Explore and describe the indicators/performance criteria/parameters to be incorporated into a model for integrating DRR in national multi-sectoral planning in South Africa.

This section has presented the research aims and objectives, the ensuing section expands further on this by describing the data collection tools that will be used in the research**.**

Data collection

The purpose of this research is the development of a model for integrating DRR in national multi-sectoral planning in South Africa. In pursuing this goal, and in view of the qualitative nature of this research, which requires the researcher to explore, define and obtain the data relevant to the research, focus group interviews will be utilised. Focus groups consist of a small number of individuals or interviewees that are drawn together for the purpose of expressing their opinions on a specific set of open questions (Welman *et al*., 2005:201). As noted in de Vos *et al.* (2005:300), focus groups are useful when multiple viewpoints or responses are needed on a specific topic. A

multifaceted approach and well-thought-out questions which are essentially open-ended to allow participants freedom to respond from a variety of perspectives will be utilised (De Vos *et al*., 2005:303). Existing seven government clusters which were established in 2009 to foster an integrated approach to governance that is aimed at improving government planning, decision making and service delivery will be utilised in the grouping of departments for purposes of the focus group interviews (Presidency, 2010:3). These clusters function at different levels, namely Ministerial, Director-General and communication clusters and are as follows: Infrastructure Development; Economic sectors and Employment; Governance and Administration; Human Development; Social Protection and Community Development; International Cooperation, Trade and Security; Justice, crime prevention and security (Presidency, 2010:3-4).

The use of these clusters in the focus group interviews will enable sectoral focus to be maintained during the interviews. Since there are several departments that form part of more than one cluster, departments from each cluster will be grouped into groups of two to three departments for purposes of the focus group interviews sessions and 16 focus groups interview sessions will be held. Identified organisations outside the public service will also be grouped together into two groups for purposes of the focus group interviews and this will bring the total number of focus groups to 18. This will result in smaller groups (four to six people) per focus group which as noted by De Vos *et al*. (2005:305) are preferable when the participants have a great deal to share about a topic or have intense or lengthy experience related to the topic under discussion. The advantages of focus groups include the fact that they provide sources of information that can be obtained rapidly and at a low cost as well as enabling the participants in the group to discuss their opinions and experiences in such a way that a consensus of opinion regarding research problems can be reached (Welman *et al*., 2005:201).

Data analysis

The process of data analysis involves making sense out of textual and image data (Creswell, 2009:25). According to De Vos *et al*. (2005:311), the aim of analysis in the context of focus groups is to look for trends and patterns that reappear within a single focus group or among various focus groups. Data will be analysed according to the 10 steps of data analysis as outlined by Spencer *et al.* (2003:212-217). These include:

a. Sorting and reducing data to make them more manageable;

b. Identifying initial themes or concepts;

c. Labelling or tagging data by concept or theme;

d. Sorting data by theme or concept;

e. Summarising or synthesising data;

f. Identifying elements and dimensions, refining categories, classifying data;

g. Establishing typologies;

h. Detecting patterns (associative analysis and identification of clustering);

i. Developing explanations (answering how and why questions), and

j. Seeking applications to wider theory/ policy strategies.

All findings will be presented scientifically with the aid of tables, graphs, matrix displays and context charts. Triangulation will be utilised to verify information regarding reliability and validity. As Creswell (cited by De Vos *et al*., 2005:361) proclaims, the concept of triangulation is based on the assumption that any bias inherent in a particular data source, investigator and method would be neutralised when used in conjunction with other data sources, investigators and methods. A combination of procedures such as document study, secondary analysis and interviewing will be used to validate and cross-check findings (De Vos *et al*., 2005:314). In addition to this different participants will participate in the study as outlined in the preceding section.

CONTRIBUTION OF THE STUDY

The orientation and problem statement above alluded to the non-existence and importance of a model for integrating disaster risk reduction in national multi-sectoral planning in South Africa. The importance of integrating disaster risk reduction in national multi-sectoral planning in South Africa has been identified by disaster management scholars in recent years. For example Van Niekerk (2005:238-254) and Dlamini (2011:112-118) make the point that disaster risk reduction must be integrated into sectoral plans, incorporated into existing government planning cycles and integrated into sectors such as agriculture, health, housing, etc to be effective. The development of a model for integrating disaster risk reduction in multi-sectoral planning will contribute significantly in guiding such integration across sectors. This study will therefore contribute significantly to the body of knowledge currently in existence in South Africa and internationally on the subject matter. The study will also provide the impetus towards further research, investigation and thinking in the integration of disaster risk reduction in multi-sectoral planning in South Africa and elsewhere in the world.

CONCLUSIONS

This paper has introduced key considerations for the integration of DRR in national multi-sectoral planning. Within the context of South Africa (as a developing country) it emerged that various factors such as the advent of HIV/AIDS pandemic compounded by high poverty levels, urbanisation, and climate change all contributes in increasing the vulnerability of the country to natural and anthropogenic hazards. This paper also demonstrated that the multi-sectoral nature of DRR in the country necessitates the adoption of an integrated and coordinated approach to maximise the impact of initiatives aimed at building resilience of communities to hazards. It also emerged that the fundamental paradigms, concepts and doctrines of organisation and strategic planning theories respectively can be applied in South Africa to inform a model for integrating DRR in multi-sectoral planning in line with the objectives of the study.

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Session Three – Disaster Risk Reduction and Climate Change Adaptation

Paper 8: Responding to Climate Change in Vietnam: A study of local action plans

Linh Nguyen Sy[1] and Ralph Horne[2]

[1]*RMIT University, Australia, email: linh.nguyensy@rmit.edu.au*
[2]*RMIT University, Australia, email: ralph.horne@rmit.edu.au*

ABSTRACT

Vietnam is particularly vulnerable to climate change, as indicated in the latest IPCC report.It is therefore particularly important to both understand and ensure the effectiveness of mechanisms for responding to climate change in Vietnam. This paper reports on an ongoing study examining provincial scale action plans in Vietnam. Content analysis of the climate action plans of 38 provinces and cities formulated in 2011, 2012 and in 2013 revealed that 30 over 38 provinces purposely set out the objectives of "improve and strengthen capacity" and "increase the awareness and responsibility", although the budget allocated for "soft components" such as capacity building and process change was typically less than 5% of the total requested. Vulnerability assessment also featured, as did disaster responsiveness. 2011 plans requested a much lower annual budget than those formulated in 2012 (403bn VND) and 2013 (5,729bn VND). Further research is proposed to investigate the making process to inform the potential effectiveness of plans andthe development of principles for policy making that may assist in effective plan making which could ultimately strengthen local climate resilience.

Keywords: climate change impact, climate change resilience, local climate action plans, policy making, vulnerability assessment.

INTRODUCTION

Anthropogenic climate change is widely regardedas one of the most critical challenges to human kind in the 21st century and there is a real possibility of it seriously stalling human development (UNDP, 2007). It is already affecting millions of people and thwarting their efforts to escape poverty, particularly in developing countries (Munang et al., 2013). As such, every responsible government across the world has developed specific and significant commitments and policy initiatives to mitigate and adapt. Developed and developing countries are trying to combat climate change in different ways. Developed countries are generally putting effortsinto greenhouse gas reduction or mitigation measures and developing countries are prioritising adaptation to the impact of climate change (IPCC, 2007, 2012).

Despite efforts to date in dealing with climate change, inequalities in capacity to adapt are still commonplace. Furthermore, planning for climate change adaptation confronts governments in developing countries with challenges at many levels. These challenges pose systemic threats that are becoming increasingly apparent around the globe (UNDP, 2007, IPCC, 2007, 2013). Local climate action planning has also received increasing attention from scholars around the world. Boswell et al. (2012) highlights the climate change adaptation strategy development process which proposes including climate impacts, local vulnerability and local resources as the foundation to choose and prioritise actions. Analyses of climate change policies have been undertaken in many places and at different levels, for example, evaluation of climate change action plans has been conducted at regional, national and local levels in some developed countries such as Australia, United States of America, Denmark, Norway, Sweden and the

European Union (Baker et al., 2012, Ellen Bassett and Shandas, 2010, Biesbroek et al., 2010, Lund et al., 2012, Dannevig et al., 2012, Tang et al., 2010, Bedsworth and Hanak, 2013).

Bedsworth and Hanak (2013) examined factors related to adoption of local climate policies in California, the United States of America, and Baker et al. (2012) attempted to evaluate local climate change adaptation planning in Southeast Queensland, Australia. While these studies sled important light on the content of climate change actions and adoption of these actions at the local level so far, no analysis of climate change action plans in developing countries has been reported with a focus on how these action plans formulated. Moreover, previous studies that focus on local climate change action plans such as Wheeler (2008), Tang et al. (2010) and Baker et al. (2012)tend to focus on the evaluation or analysis of qualities of the plans, rather than the process of formulation and/or implementation effectiveness.Arguably, while content is a logical and important starting point, it is useful to analyse not only the content of action plans but also the plan making process in the institutional, political and social context within which each plan is intended to be implemented.

Vietnam has a national approach to policy development and implementation, characterised within a state system of government which consists of the central government at the national level and 63 provincial governments. In most cases, policy is developed by national ministries, adopted by the national government and then passed to provincial authorities for implementation by the provincial departments.This policy process typically involves national policies being expressed as a policy framework or general guideline. Provincial departments are then required to reframe the policy to suit local conditions and then develop appropriate provincial policies and action plans. This PhD research project will test how these and other factors may ultimately influence the content of the action plan, and the subsequent fate of the community.

The guidelines for formulation of provincial climate change action plans in Vietnam are the same and in many cases the budget allocated for plan making, and the duration allowed for this task are the same. This may be expected to lead to the same level of effectiveness of each climate change action plan in different provinces. Upon further investigation this research suggests that there are a number of discrepancies in the way policy is implemented within each province. These derive from the fact that the situation varies from one province to another due to a wide variety of reasons such as differences in local climate impact factors,different political conditions, different approaches to and experiences of community engagement, and the qualifications, interests and institutional contexts of local policy makers and organisations. The PhD study is designed into different phases in four-year timeline, this paper only reports initial results of content analysis (objectives, timeline and requested budget) of 38 action plans formulated and approved (11 plans in 2011, 19 plans in 2012 and 8 plans in 2013) by the authority of 38 provinces and cities in Vietnam. The analysis was intended to focus on three main components of objectives, timeline and requested budget to identify similarity and differences among 38 provinces. Result of this analysis will allow researchers to direct questions to understand the process of the action plan formulation in designate provinces and identify factors that contribute to effective action plans to respond to climate change at local level in a development country. The paper is structured into five sections starting with this introduction section, context of climate change in Vietnam, research design and method, results and discussions, and conclusions.

CONTEXT OF CLIMATE CHANGE IN VIETNAM

The national context of climate change and policy frameworks is an important element in determining effectiveness of local climate change adaption plans(Baker et al., 2012). Therefore this section introduces the context of climate change in Vietnam. Located on the tropical monsoon and typhoon centre of the East Sea, Vietnam is among the five countries that are globally most affected by the impacts of climate change, including hazardous events such as flood, storms and droughts which count for nearly 80 percent of the natural disasters in Vietnam (GEF and UNDP, 2008). This section will describe climate change and disaster associated issues in Vietnam and briefly highlights policy measures that the government of Vietnam has placed in to address the situation.

Climate change and disaster related issues in Vietnam

Among the most important effects of climate change in Vietnam are rising temperature and sea levels, and more (in both number and intensity) extreme weather phenomena such as tropical storms, floods, and droughts.Vietnam climate change scenarios (MONRE, 2011) show that by the end of the 21st century, annual average temperature will rise by 2-3^{o}C; total rainfall will increase, while the dry-season will decrease; and sea level will rise as much as one meter relative to the 1980-1999 level.

These changes will have significant impacts on habitats and human lives. With sea level rise of one meter, about 40 percent of the Mekong River Delta, 11 percent of the Red River Delta, and three percent of other regions will be submerged, with 20 percent of Ho Chi Minh City under water. Associated losses in property and damage to the national economy are significant: 10-12 percent of the population will be directly affected, costing about 10 percent of GDP according to the National Strategy on Climate Change (GoV, 2011). Such severe consequences in Vietnam are an explicit threat to poverty alleviation and hunger eradication, as well as to the achievements of the United Nations' Millennium Development Goals and the sustainable development of the country (UNDP, 2009).

According to UNDP (2007), every year Vietnam suffers from 6 to 8 tropical storms and other extreme weather characteristics such as extreme cold or drought. In recent years, natural disasters stemming from climate change have already become larger and more frequent, bringing damage and destruction to local economies, cultures, and natural environments. Between 2001 and 2010, floods, storms, landslides, droughts, saltwater intrusion and other climate-related disasters have left 9,500 people dead and missing, with economic losses reaching about 1.5 percent of GDP each year (GoV, 2011).

Climate change policy framework in Vietnam

In recent years, the government of Vietnam (GoV) has developed a policy framework and other mechanisms to respond to climate change in Vietnam. The framework is structured and directed by four key policies, the National Targeted Program to Respond to Climate Change (GoV, 2008), the National Strategy for Climate Change(GoV, 2011), the National Strategy for Green Growth(GoV, 2012), the Communist Party's Resolution on Actively Responding to Climate Change and Strengthening the Management of Natural Resources and Environmental Protection (CPV, 2013).

The NTP-RCC was approved by the Prime Minister under Decision No. 158/2008/QD-TTg (December 2, 2008)assigninga total budget of VND1,965 billion (US$115M[1]).The NTP-RCC has the strategic objective:

> "to assess climate change impacts on sectors and regions in specific periods and to develop feasible action plans to effectively respond to climate change in the short-term and long-term to ensure sustainable development of Vietnam, to take opportunities to develop towards a low-carbon economy, and to join the international community's efforts in mitigating climate change and protecting the climatic system". (GoV, 2008 p.2)

The National Strategy for Climate Change (NSCC) was approved in 2011 by the Prime Minister's Decision No. 2139/QD-TTg (GoV, 2011) with the objective to:

> "Optimise the capacity of the country in dealing with climate change; adopt climate change adaptation and greenhouse gas emission reduction measures; safeguard human life and property; promote sustainable development goals; strengthen human and natural system resilience to climate change; develop a low-carbon economy to protect and enhance quality of life; ensure national security and sustainable development in the light of climate change impacts; and share efforts with the international community to protect the global climate system". (GoV, 2011 p.5)

In recognition of the importance to sustainable economic development and the impact of climate change, the government assigned the Ministry of Planning and Investment (MPI) a coordination role to develop the National Strategy for Green Growth (NSGG). Supported by the United Nation Development Program (UNDP), Korea International Cooperation Agency (KOICA) and others, the strategy was approved by the Prime Minister in September, 2012. In this:

> "Green growth is a means to achieve a low carbon economy and to enrich natural capital. It is expected that this will become the dominant trend in sustainable economic development which requires that mitigation of greenhouse gas emissions and increased capacity to capture greenhouse gases are gradually becoming essential indicators in social economic development". (GoV, 2012 p.2)

The National Strategy for Green Growth is designed to provide the road map for Vietnam to 2050 in transforming its economic development modes which can contribute to the reduction of greenhouse gas emissions or intensity of greenhouse gas emissions per GDP unit. This strategy is therefore mostly related to mitigation measures rather than adaptation options.

In June 2013, the Communist Party of Vietnam (CPV) officially approved Resolution No.24-NQ/TW to actively respond to climate change and to strengthen natural resource management and environmental protection. This is the current guiding document for climate change response, natural resources management and environmental protection to 2050:

> "The overall objective of this resolution is to manage responses to climate change and disasters, and address greenhouse gas emissionsby 2020, and, by 2050, to

[1] As of the average exchange rate in December 2008

> actively respond to climate change to ensure sustainable management of natural resources and the quality of the environment". (CPV, 2013 p.3)

Interestingly, compared to other sectors, the climate change policy framework has been prepared in a reverse manner. The CPV typically provides policy directions, and then the strategy is formulated by the government of Vietnam (GoV) before the creation of action plans. In the case of climate change policy formulation in Vietnam, the National Targeted Program to Respond to Climate Change (NTP-RCC) was first formulated and approved in 2008, and in December 2011 the National Strategy for Climate Change (NSCC) was approved. Then in 2012 the action plan to implement the NSCC was formulated (Decision No. 1474/QĐ-TTg dated October 5th 2012) by the GoV. However, it was not until June 2013 that the resolution of the CPV (policy direction) was developed and approved. This indicates that climate change policy making in Vietnam has taken an unusual policy pathway and a more 'bottom up' approach (at the macro level) has influenced the policy making process.

Delivery of the climate change policy framework in Vietnam requires engagement at the provincial and city levels. This is primarily where the resources need to be allocated to designated stakeholders for projects that will encourage resilient infrastructure and capacity development. The primary mechanism is the provincial action plans. In order to understand the challenges in mobilising and allocating resources for implementation of the policies at the local level, it is necessary to analyse the content of these plans before conducting research on how these action plans were formulated.

RESEARCH DESIGN AND METHODS

In this research climate change policy formulation and implementation at provincial level is used as a case study to examine the policy making process in Vietnam and to understand the devolution of the national climate change policy, as it is reframed and implemented in the provincial and city levels of the administration system.

The findings presented in this paper are part of an ongoing PhD project which is composed of three key stages. Firstly, content analysis of the provincial action plans to respond to climate change in Vietnam has been conducted. Secondly, in-depth interviews with relevant stakeholders and group discussions with key actors in policy making process will be conducted to explore the formulation and implementation of a number of selected action plans. Finally, results and findings from the first and second phases will be synthesised, and implications for policy formulation and implementation in Vietnam will be drawn. In this phase critical analysis techniques will include use of focus groups with key stakeholders. Thus, findings will be synthesised in the broader institutional, political and social context.

In this paper, the focus is on stage one, where the content of climate change action plans of 38 provinces is assessed. Content analysis was used to map the content of the 38 provincial action plans. Weber (1985) defines content analysis as research methodology that utilises a set of procedures to make valid inferences from texts. This method was applied to analyse the content of the provincial climate change action plans adopted in 2011-2013. The analysis in the first was focused on three key elements of the provincial action plans namely objective, timeline and requested budget in order to identify similarities and differences among provinces receiving the same support from the national government and to provide background information for second phase of the PhD study.

Climate action plans of 38 provinces and cities were randomly selected from the archive of the Standing Office for National Targeted Program to Respond to Climate Change (NTP-RCC). This sample size was deemed sufficient to represent the total of 63 provinces/cities in Vietnam. Analysis was focused on the objective, timeline and requested budget of the action plans with the assumption that with the same support from national (both finance and guideline) and with the same institutional arranging in a central-oriented policy making system the content and structure of all action plans is similar. A framework for analysis was developed and an excel sheet was created to input key content of the action plans. Coding was applied from 1 to 38 representing for 38 provinces and cities. Objectives, timelines and requested budgets were compared among the provinces/cities against year of formulation of these action plans.

RESULTS AND DISCUSSIONS

Content analysis of local climate action plans and/or local climate change adaptation plans have been conducted in many places in the world, particularly in developed countries such as the United States of America (Tang et al., 2013, Tang et al., 2010, Coffee et al., 2010, Bedsworth and Hanak, 2013), Australia (Baker et al., 2012), Europe (Biesbroek et al., 2010). These studies concentrate on evaluation of either mitigation measures in United States of America or adaptation measures as in Australia and Europe, and the focus on evaluation of activities rather than looking at the action plan objective, timeline and requested resources. In this paper, results of content analysis of provincial (local) climate change action plans is the focus.

Content analysis of 38 climate change action plans revealed a wide diversity of timelines and budget requested by provincial authorities, even where objectives of the action plans are quite similar. Likewise, in cases where the same support (budget) from national government and similar timeframe is allocated, the content (for example, areas of interventions, total budget requested, comprehensiveness of the action plans, and timeline for implementation) varies greatly according to the year of formulation. Plans produced in 2011 have an average of 6 years of implementation, whereas those formulated in 2012 and 2013 have an average 8 and 11 years of implementation respectively. These differences cannot be explained by geographic spread or size of a province (population and financial contribution to the state budget), rather, it seems that the early action plans (formulated in 2010 and 2011) adhere generally to a 2015 timeline, whereas those formulated and approved in 2012 and 2013 may link to the duration designed for the implementation of the national strategy for climate change (2011-2020 and with a vision to 2050).

Early plans formulated in 2010 and 2011 requested a much lower budget than those formulated in 2012 (410bn VND in average) and 2013 (5,729bn VND in average). General objectives are quite similar across the plans, such as:

> "Improve the ability to respond to climate change in a short term and in a long term in order to ensure sustainable development of sectors and districts in the province. Protect lives of communities, prevent, avoid and mitigate the impact of natural disasters".

It is clear that the general objective of many provinces and cities inherit from the statement of the national policies, particularly the National Targeted Program to Respond to Climate Change (NTP-RCC) and the National Strategy for Climate Change (NSCC). To some extent, the National Strategy for Green Growth also influences the statements of those local action plans which were formulated in 2013.

When comparing the specific objectives of 38 action plans across the country, more than a half of provinces and cities established the same specific objective.

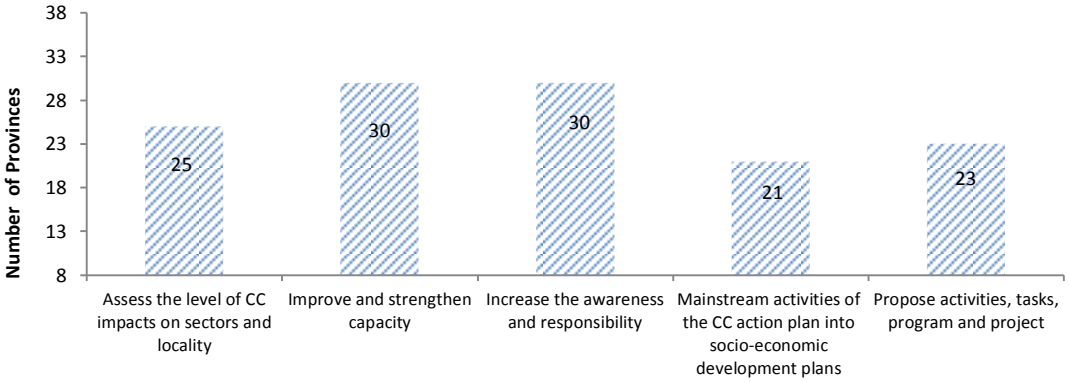

Figure 1 Selected examples of CC action plan objectives and frequency of their use.

Figure 1 shows that "improve and strengthen capacity" and "increase the awareness and responsibility" of authorities and communities were the most commonly included objectives in the climate change action plans of 38 provinces. It is assumed at this point in the research that formulation of each action plan involved consultation with background documents such as climate change assessments, vulnerability assessments and scenarios of climate change impacts, including sea level rise. Notably, 25 out of 38provinces/cities established a key objective of their climate change action plans as "assess the level of climate change impacts on sectors and locality". This implies that in 25 cases action plans were formulated without taking account of existing assessments, or at least with a limited knowledge of climate change impacts. Furthermore, 23 out of 38 provinces/cities stated "propose activities, tasks, programs and projects" as one of the objectives of the action plan. This implies that the plan intends to provide directions for the formulation of other plans.

Links were often envisaged with other existing plans. For example, 21/38 provinces/cities (55%) propose as an objective that activities proposed in the climate change action plans will be also incorporated into existing socio-economic development plans. This would automatically draw the attention of local authorities, as it indicates a need to integrate climate actions into the five year socio-economic development plans (2016-2020) which will be developed in 2015.

Among the 38 action plans analysed, resource requirements were typically presented via a bottom up, project-by-project cash budget. The exception, Quang Nam province in the Central Coast of Vietnam, proposed a long-term climate change action plan, with implementation to 2030 divided into two phases (2013-2015 and 2016-2030). The plan includes 65 programs and projects, but there is no allocated budget.

Of those who did present budgets, the lowest outlier, Khanh Hoa, indicated implementation would cost only 11bn VND ($US523.000). The highest outlier, Ho Chi Minh City, requested a total budget of 70,000bn VND (US$3.34bn). Thus, the variation in proposed budget for implementation of the action plan among provinces is considerable. While the provinces are of different sizes, with different populations and levels of built assets and economic infrastructure, the variation is most clearly explained by examination of the list of prioritised projects and areas of intervention.

The biggest proportion of the budgets is allocated to infrastructure works including sea dykes, drainage systems and riverbank works. Not all these expenditures appear to match the plan period. For example, the Ho Chi Minh City budget of 70,000bn VND for implementation of its climate change action plan for period 2012-2015 appears to include some projects which were already started as early as 2003. In contrast, the action plan for Khanh Hoa province contains only 5 projects. These include assessment of climate change impacts, and awareness raising. No infrastructure projects are proposed.

Across the remaining plans, areas for intervention varied but most proposed priorities for agriculture, forestry, transportation and infrastructure, water resources, and health care. In each area of intervention, a number of activities are proposed, although some provinces grouped these into broad categories such as capacity building, rather thanorganising them by economic sector. Plans formulated in 2013 reference "low carbon economy" indicating national policy influence (the National Strategy for Green Growth was approved in September 2012 citing this phrase as a core objective).

Influence is also apparent from the international community at national level where both the national targeted program to respond to climate change (NTP-RCC) and the national strategy for climate change (NSCC) received technical and financial supports from international development agencies in formulation process. At the local level however, anecdotally, the authors note that support from international agencies are limited. This cannot be seen from the analysis of policy documents but it will be investigated further in future phases of the research. Given the vulnerability of Vietnam to climate change impacts, many donor agencies are engaged with climate change responses across the country, with their own agendas and priorities influencing action plan processes and content. The involvement of national government agencies and international development or donor agencies as dynamic actors is apparent, as is the variability of the plans according in particular to the year in which they were formulated. The transformation of national climate change policies regarding the scope of objectives and timelines is clearly revealed in this study. The requested budget for implementation of the climate change action plans varies greatly from province to province. Indeed, 50% of total budget is requested from the state budget this will lead to over-dependence on the availability of the funding and the procedure to locate budget to provinces. This may delay implementation of measures/activities proposed in the action plan; ultimately objectives of these action plans may not be delivered as expected. This paper raises a question of how local actions to respond to climate change can be delivered with limited resources in the hands of local authorities. A study in Queensland, Australia by Baker et al. (2012) also highlight the same finding.

CONCLUSIONS

It is clear that the climate change policy framework in Vietnam has evolved dramatically at the national level since 2008. At the local level, however, across the plans, there is a variable and often weak structuring of objectives. This suggests that implementation of these plans may be ineffective, since the rather broad objectives and generalized plans will lead to difficulties in proposing activities and mobilising resources. According to Boswell et al. (2012) climate impact and local vulnerability assessment should be conducted before proposing the responsive activities in a climate change adaptation strategy/plan. However, 25 of 38 provinces propose such an assessment as a key objective of their climate action plan. Also there is a huge variation in total budget requested among provinces and particularly there is a difference in budget requested between action plans which were formulated in 2011

and in 2013. Action plans formulated in 2013 also propose a longer timeline for implementation (11 years on average) compared to the plans formulated in 2011 (6 years) and in 2012 (8 years). The influence of national policies on requested budget and timeline of local action plans is apparent, and this has led to an inconsistent set of plans and the provincial/city scale.

The plan content analysis reported here indicates structural factors prevail over plan making. The role of stakeholders (such as NGOs) and new models of engagement will be analysed in the next stage of the research where the focus will be on plan making process. Climate change planning is evolving at international, regional, national and local levels and we are witnessing the interactions among policy makers, researchers and other relevant stakeholders in their efforts to design effective local climate actions (Bulkeley and Betsill, 2013). Further research will include identification of and consultation with the major stakeholders in plan formulation, the activities they undertook, and mapping of the institutional structure, conduct and performance associated with plan implementation in order to understand how local climate change actions developed and executed in a developing country such as Vietnam and what can be done to improve the effectiveness of local actions responding to climate change.

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Paper 9: Methodological approach for urban resilience assessment within the energy metabolism perspective: practical application

Tatjana Kuznecova[1], Francesco Romagnoli[1] and Claudio Rochas[1]

[1]*Riga Technical University, Institute of Energy Systems and Environment, Latvia; email:tatjana.kuznecova@rtu.lv*

ABSTRACT

This paper presents the results from method approbation, which aims to quantify the level of urban resilience from the energy metabolism perspective, taking into account different sustainability dimensions and introducing aspects such as environmental, social, economic, technical and risk factors. The core of the proposed approach is a set of indicators to be used within the multi-criteria analysis integrating the scope of thermal energy metabolism. The aim of the research is to identify the weak points of each studied energy systems in order to help stakeholders develop a future strategy for resilience enhancement.

Keywords: energy metabolism, indicators, resilience, sustainability

INTRODUCTION

Energy systems have to become more resilient and prepared for possible threats in the face of climate change, otherwise urban communities will experience regular discomfort and a decrease in social well-being. However, the world is still lacking practically-applicable methods and tools for resilience assessment, especially within infrastructure and the energy systems dimension. As district heating systems are one of the important infrastructures in urban environments, it is necessary to improve the methodological framework for resilience assessment, creating one that could be easily utilised by the stakeholders in the preparation for, and adaption to climate change, as well as the restoration of the system after a hazardous event.

According to Kennedy et al. (2011), the use of urban metabolism principles in urban design is a relatively new development. Urban metabolism is a multi-disciplinary concept that examines material and energy flows in the cities shaped by various social, economic and environmental forces (Holmes &Pincet 2012). In general, urban metabolism can be defined as "the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste" (Kennedy et al. 2007). Studying urban metabolism within the resilience issues is still a novel yet essential approach, since there is a mutual interaction between these two concepts. Properly organized flows of materials and energy, and elimination of wastes and sub-products, is crucial for the healthy, well-functioning and safe urban systems; on the other hand, the processes and systems ensuring urban metabolism should be secure, appropriately managed and continuously improved as in the adaptive cycle.

A large number of different formulations and explanations of the term "resilience" exists and different concepts have been developed for application to different types of systems. According to Westrum (2006), system's resilience usually is supposed to consist of the following components: i) expectation and preparation before an extreme event; ii) survival during the event; and iii) recovery of a state of equilibrium after the

event. Risk, vulnerability, resilience and adaptive capacity are closely linked terms with complex and often ambiguous definitions and conceptual interactions. According to Faber and Stewart (2003), risk is often defined as the product of the probability of an extreme event occurring (P) and its consequences (C). Vulnerability is a function of the exposure (who or what is at risk) and sensitivity of a system (the degree to which people and places can be harmed) (Cutter & Bames 2008). Adaptive capacity is a significant factor in characterizing vulnerability and it may be characterized as the extent to which a system can modify itself to move to a less vulnerable condition (Luers et al. 20013). Adaptive capacity reflects the ability of the system to respond to changes in its external environment, and to recover from damage to internal structures within the system that affect its ability to achieve its purpose (Dalziell & McManus 2004). System attributes such as diversity, flexibility, and interoperability; rich information; knowledge; innovations may foster adaptive capacity (Roege et al. 2014). Since this study represents a continuation of the work described in the article by Kuznecova & Romagnoli (2014, in press), authors suggest that readers pay attention to the introduction part provided in that work.

This research briefly presents a method for urban resilience quantification from the energy metabolism perspective, taking into account different sustainability dimensions and introducing aspects such as environmental, social, economic, technical and risk factors. As a continuation of the work presented by Kuznecova & Romagnoli (2014, in press), the main aim of this paper is to illustrate a practical application of the proposed methodological framework for resilience assessment of urban energy systems and flows. The methodological approach, given in a form of asimpleschematic algorithm, guides the user through the main steps of assessment and gives explanations on how the indicators are selected and data are processed. The core of the methodology is represented by a set of universal indicators for resilience assessment within the urban energy system. The current paper presents the a case study of the proposed methodology trough quantitative evaluation of the resilience level of three Baltic cities – Riga, Vilnius and Tallinn – as well as it aims to identify the main weak spots and common features affecting the resilience within the studied systems.

METHODOLOGY

The methodological approach for the comparison of resilience within different urban systems is described in the work of Kuznecova & Romagnoli (2014, in press). The core of the framework for resilience assessment is the set of indicators used in a multi-criteria analysis (TOPSIS) (Hwang et al. 1981, Pubule et al. 2014). This article is mainly focused on the creation of a multi-criteria matrix and data analysis.

According to the article's review on resilience concepts proposed in the introduction , indicators related to urban metabolism and energy system resilience were developed (see the article by Kuznecova & Romagnoli 2014, in press) in order to be used within the analysed case. The indicators characterize three main steps of energy metabolism within the city boundaries: energy production, supply and end-use, with a major focus on household consumption. Use of energy in the transportation sector is omitted from the current study. The indicators are spread over the various sustainability dimensions, which in this case are represented by technical, socio-economic, environmental, risk and governance/management dimensions. Details regarding the proposed indicators can be seen in the paper by Kuznecova & Romagnoli (2014, in press). Both qualitative and quantitative indicators are used.

Technical, socio-economic and environmental dimensions symbolize the main pillars of sustainable development. In turn, the risk dimension characterizes the probability of a hazard. Most of the qualitative indicators refer to the governmental dimension, which is considered to be of vast importance. According to the UNDP (2011), it is necessary to build community resilience and reduce vulnerability to natural hazards by enhancing the capacities of local government units. It has three main complementary components – policy development, capacity enhancement and improved coordination**.** Thus, the governmental and managerial dimension represents one of the main pillars of current assessment. It is mainly characterized by the availability of action plans and development programs aimed at protecting cities from natural disasters (floods, in the current case), as well as the availability of resources and level of awareness in terms of risk assessment. In fact, protective measures should include restoration or reinforcement of natural protective capabilities, which indirectly contribute to the protection of critical infrastructure and facilities. According to the European Commission (2014), examples of such measures are: restoration of natural flows, restoration of wetlands that can store flood water, urban Green Infrastructure such as green spaces, sustainable urban drainage, etc.

Data processing

The data relating to the current energy system's performance required preliminary processing. For the calculation of the diversity indices, the Shannon-Weiner formula was used (Lo 2011). This formula originates from information theory and has become popular in ecological research, while also being adapted for other scientific fields.

$$H = -\sum_{i}^{s} p_i \cdot \ln p_i \ . \qquad (1)$$

Wherep_i is the share of fuel i in the energy mix or the market share of supplier i (Lo 2011).

For the baseline scenarios, weights of importance are evenly distributed between the main dimensions: technical, socio-economic, environmental, risk and governmental. Some of the indicators are ranked in a qualitative way by converting them in the non-dimensional attributes. These are mainly relevant to the indicators within the governance/management dimension. Existing action plans/development programs, as well as the availability of resources and funds in all three cities, are assessed and ranked according to the five point scale considering availability and relevance to the energy sector security and disaster risk management.

CASE STUDY

For the practical implementation of the proposed methodology and set of indicators, three cities located in the Baltic States were selected – Riga, Vilnius and Tallinn. The cities were selected according to the following assumptions: they are located in the same climatic zone; each is their nation's capital and refers to the similar geographic scale and economic development.

This study focuses mainly on flood risks due to the existence of a large number of water bodies in some of the studied areas. According to Flood Risk Management Plan for Riga City (2012), water covers around 15.7% of the territory of Riga. Storms, snow melt and coastal erosion intensified by climate change create significant risks to the urban area, particularly the energy infrastructure; and at least one boiler house ('Rigas Siltums', Daugavgriva) is at risk of flooding with a 50% of probability of occurrence.

According to the European Centre for River Restoration (2013), future climate change will potentially affect all aspects of the rainfall regime. Increases in rainfall at all scales will increase the risk of flooding to a greater or lesser extent. Consequently, the disaster risk indicator for this particular case was split into several themes characterizing flood risk: water covers (% of territory), mean soil sealing (%), extreme precipitation (days), as well as the availability of flood risk maps and forecasts. Some of the proposed indicators were excluded from the practical application due to the absence of data.

Table 1. Diversity of heat production plants in Riga.

Heat station	Installed capacity, [MW]	Ratio [%]	Diversity coefficient $\ln p_i$
TEC-1	493	24.26	-1.42
TEC-2	544	26.77	-1.32
DHP*Imanta	404	19.88	-1.62
DHP*Zasulauks	271.9	13.38	-2.01
DHP*Ziepniekkalns	105.8	5.21	-2.96
DHP*Daugavgrīva	30.79	1.52	-4.19
DHP*Vecmilgrāvis	63.2	3.11	-3.47
Automated gas fired boiler houses	71	3.49	-3.35
Juglasjauda	48.49	2.39	-3.74
Diversity index (H)			1.82

*DHP = District heating plant

An example of thediversity index determination for heat production plants in Riga is shown in Table 1. Preliminary data processing showed that for Riga, Vilnius and Tallinn the diversity indices of heat production plants are 1.82, 1.39 and 1.49 respectively, which represents a more preferable result for Riga. All of the selected indicators with processed values used in multi-criteria analysis are shown in Table 2. The data are collected from a number of reports, statistical bureaus, energy companies and scientific literature.

Table 2.Indicators and values

Dimensions	No.	Indicators	Max/ min	Riga Value	Vilnius Value	Tallinn Value
Technical	1.	Average heat losses in energy supply, [%]	Min	13.41 (13)	13.3 (14.9)	16.6
	2.	Specific heat consumption, [kWh/m^2]	Min	210	180	185
	3.	Average heat production efficiency, [%]	Max	92.00	90.90	92.42
	4.	Diversity of heat production plants	Max[2]	1.82	1.39	1.49
	5.	Diversity of primary energy resources installed capacity for heat production	Max	0.087	0.115	0.16
	6.	Average pipeline age, [years]	Min	70%> 20 years	25.2	24.1
Socio-economic	7.	Population density in area, [person/km^2]	Min	2117	1396	2672
	8.	Average income per family, [€/month]	Max	1247	1185	1785
	9.	Price per MWh heat energy, [€]	Min	58.24	79.15	72.24
	10	GDP per capita in country, [€]	Max[3]	18538	16148	26580
	11.	Dependence on fuel imports for heat production, [%]	Min[2]	98.28	97.55	96.23
Governance	12.	Policy documents/action plans	Max	5	3	2
	13	Importance of the elements at risk (critical infrastructure)	Max	4	2	2
	14.	Intensity of renovation, [%/year]	Max	2.27	3	0.85

[2]Higher value for a Shannon-Weiner index indicates the better diversity

[3]The data obtained from Gicevskis, 2014

Risk	15.	Availability of risk (flood) maps	Max	5	3	1
	16.1	Water bodies, [% of territory]	Min	15.70	2.10	5.93
	16.2	Mean soil sealing, [%]	Min	37	62	62
	16.3	Extreme precipitation, [days]	Min	3.05	0.05	0.05
	17.	Number of failures per 1 km of network per year	Min	n/a	0.27	0.21
Environment	18.	CO^2 emissions, [tCO_2/MWh]	Min^2	104.45	236.15	183.11

Multi-criteria analysis

The TOPSIS method was selected to perform a comparison among different cities. It is based on the concept that the chosen alternative should have the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution. The principle aim of this approach is to support multiple-attribute decision-making through a grading of selected alternatives, or scenarios, in the way in which they match up with the ideal solution (Hwang et al 1981). The basic element of the TOPSIS analysis is a data matrix. The normalisation approach utilised by the TOPSIS method allows performing analysis for both quantitative and qualitative indicators. The ideal and negative ideal solutions are determined according to a type of particular indicator considering whether it is necessary to minimize or maximize a particular parameter (Hwang et al. 1981, Pubule et al. 2014). For the current study, maximised and minimised indicators are shown in Table 2.

RESULTS AND DISCUSSION

The results of multi-criteria analysis showed the following values of resilience index: Riga – 0.758; Vilnius – 0.366; Tallinn – 0.339 (see Figure 1). The resilience index is much higher for Riga due to a larger number of positive (ideal solution) and neutral indicators and fewer negative (negative ideal solution) indicators. TOPSIS analysis showed that governance is the weakest dimension for Tallinn, while Vilnius is weaker within the socio-economic dimension. For Riga, the socio-economic and governance dimensions show the best values overall.

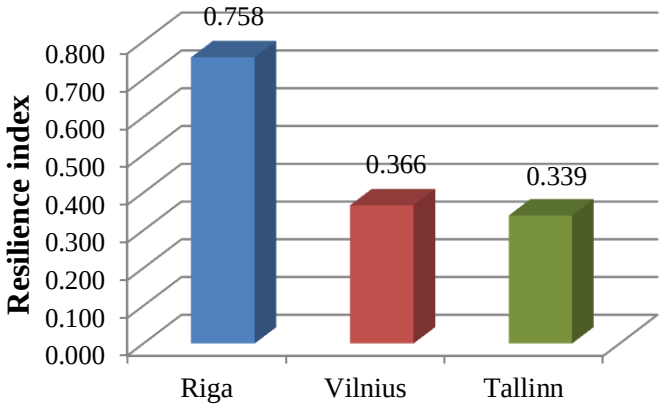

Figure 1 Resilience indices for the three analysed cities

Sensitivity analysis

Resilience index calculation is notably dependent on weights of importance assigned to each of the indicators. In the baseline scenario, weights are divided equally (20%) for each of the five defined dimensions. It means that each aspect is similarly important when assessing resilience of the centralized heating system. The aim of sensitivity analysis is to test changes in the final results according to weights assigned, and to find out which aspects have the greatest impact on the results. In order to study the sensitivity of resilience indicators, four additional scenarios with different weight distributions were implemented (see Table 3).

Table 3. Scenarios for sensitivity analysis

	Technical	**Socio-economic**	**Risk**	**Environment**	**Governance**
Baseline scenario	20%	20%	20%	20%	20%
Scenario 1	30%	30%	13.33%	13.33%	13.33%
Scenario 2	30%	13.33%	13.33%	13.33%	30%
Scenario 3	30%	13.33%	30%	13.33%	13.33%
Scenario 4	13.33%	13.33%	30%	30%	13.33%

In each of the proposed scenarios, Riga showed the highest resilience in terms of sensitivity analysis. The best overall result is achieved in scenario 2, which could be due to the very good characteristic of the governance dimension there. It also produced rather good values for the technical dimension. Meanwhile, scenario 2 is the worst for Vilnius due to extremely weak characteristics of the governance dimension. The results of sensitivity analysis are shown in Table 4. The resilience index for Riga within the proposed sensitivity scenarios varies between 0.706 and 0.851 (maximum deviation from the baseline value: 20.5%); for Vilnius, the range is 0.225 to 0.483 (maximum deviation from the baseline value: 38.5%); in Tallinn the range is 0.242 to 0.370 (maximum deviation from the baseline value: 28.6%). Highlights show the values with the maximal deviation from the baseline values.

Table 4. Results of sensitivity analysis

	Baseline sc.	Sc.1	Sc.2	Sc.3	Sc.4
Riga	0.758	0.706	0.851	0.772	0.709
Vilnius	0.366	0.383	0.225	0.448	0.483
Tallinn	0.339	0.370	0.378	0.242	0.295

As an experimental approach, the proposed method can be considered an important tool to provide a "road-map" or guidelines to a systemic assessment processes and the development of indicators for the overall resilience evaluation. The method can also be used for assessment of the progress after the implementation of resilience enhancing measures for a particular city. However, the framework does not provide *a-priori* specific assessment method or a selected list of indicators for any type of comparison. The proposed approach should be more intended as an important method to provide an overall picture of the key factors and principle dimensions of the built environment resilience evaluation, of which the thermal energy system is considered a part of. Within this aspect, the approach can serve as a basis for a systematic analysis of the resilience. The proposed approach also highlights the fact that several interactions that are affecting the dimensions of vulnerability are dynamic in terms of time and space. This highlights a non-nonlinearity among several factors. For this reason, at this stage of development, the proposed method can be considered as place-dependent framework on which the social, technical, environmental and governance dimensions are interconnected. The introduction of the risk perspective within this method may characterize the exposure to specific hazard or even multi-hazards (both natural and man-made). The real implementation of the proposed framework should be further evaluated in terms of the difficulties associated with identifying the specific indicators of the analysis and their quantification. More effort should be done in terms of determination of weights of importance for the indicators that may vastly affect the final results.

CONCLUSIONS

An ultimate goal of this study was to contribute to the improvement of methodological basis for resilience assessment within urban environment with major focus on energy systems and infrastructure. The initial steps of research are described in the paper of Kuznecova & Romagnoli (2014, in press), where the vast theoretical basis and description of the methodological approach is provided.

The current work aims to present an easily understandable approach for resilience assessment of urban energy sector incorporating different levels of energy metabolism and spreading these perspectives over the sustainability dimensions. The advantage of this method is represented by its simplicity supported by guidelines on specific steps of assessment – starting from definition of goal and scope of the study, selection of indicators and data processing methods (e.g. diversity index calculation), and ending with resilience index calculation through multi-criteria analysis. Currently, many existing frameworks propose guidelines for development of indicators, but do not provide the specific assessment methods (for example, MOVE framework (Birkmann et al. 2013), or EMBRACE project (2013)).

Importance of the practical application of this research is lying down on offered opportunity to propose a useful and effective framework to quantify, screen, and select the potential best strategies aiming to increase the urban resilience, thus providing to the stakeholders an applicable tool suitable for specific situations. The developed methodology provides the opportunity for key stakeholder groups, for example, policymakers, energy service providers, city administrators, urban sustainability and resilience experts and citizens to compare their city's heating system resilience with that of others. The resilience index takes into account the main levels of energy metabolism and allows comparison of urban infrastructures through five aspects - technical, socio-economic, governance, risk and environmental.

Application of the proposed methodology to three Baltic cities showed the best results for Riga. Vilnius, in most of the scenarios, takes the second position. Therefore, the weighting of indicators should be a task of utmost importance in subsequent research. Equal weighting of all of the indicators may not provide an accurate picture of the level of resilience. As a result, a panel of experts and representatives of various social groups should provide weights of importance. On the further steps of research more effort should be devoted to development of dynamic models and tools taking into account both spatial and temporal changes of urban processes and sub-systems.

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Paper 10: Microeconomic Implications of Climate Change Mitigation and Adaptation in the Built Environment in UK

Seyedmohsen Hosseini[1], Roshani Palliyaguru[2] and Christian Leishman[3]

[1]*Heriot-watt University, UK, email:sh370@hw.ac.uk*
[2]*Heriot-watt University, UK, email:R.Palliyaguru@hw.ac.uk*
[3]*Heriot-watt University, UK, email:C.Leishman@hw.ac.uk*

ABSTRACT

It is becoming increasingly clear that mitigation and adaptation to climate change is necessary and inevitable within several sectors. Policy strategies worldwide focus on the role of the built environment in terms of climate change adaptation which emphasise a growing trend towards adapting current settlementsnevertheless, the long-term economic implications of climate mitigation and adaptation in the built environment and the effect of enhancing these two strategies on property value and other related economic variables are overlooked. As a result, uncertainty about future property value has become a critical issue for integrating mitigation and adaptation in the construction sector. Generally, people are reluctant to buy properties and investing in areas at risk from climate change (e.g. buying properties in areas known to be vulnerable to weather events such as coastal areas, rivers estuaries) while this problem is aggravated by the lack of investment from financial lenders and diminished private insurance coverage. It means reluctance is only reduced if land and property prices in vulnerable areas fell, allowing climate adaptation to become commercially moreviable and lead much more favourite for investors in future (increasing demand in future). However, the long-term benefits of climate adaptation and mitigation should be reflected in the property value. In this context, theaim of this study is to establish a decision support system/framework for optimization of climate change mitigation and adaptation in the built environment which provides a holistic approach for: i) enhancing property value/ achieving best value for money and stakeholder satisfaction, ii) creating equal burden/ cost sharing among project stakeholders. This study will provide a framework for policy makers and stakeholders to investigate the role of climate change mitigation and adaptation in price and rent determination, development returns, and insurance premiums and project financing provisions in the property market. Multi-criteria analysis, option value and willingness to pay methods in mix method will be investigated as tools to find optimum mitigation and adaptation strategies applicable in building projects. In consequence, the purpose of this paper is to explore key challenges faced by stakeholders (such as developers, insurance companies, financial lenders, buyers) during decision making for mitigation and adaptation options in resilient building projects and then suggest a framework to solve these challenges.

Keywords: mitigation and adaptation, optimization, decision making, building stakeholders, property value.

INTRODUCTION

Climate change is becoming a central theme of discussion within the construction sector. This is true particularly in terms of future financial commitments and the risks associated with the advent of more extreme weather conditions. For instance, more frequent flooding in a prone area may represent a financial risk for household insurance, a personal risk for home owners and occupiers, but it can also be a business opportunity for regional construction companies while having little direct effect on the original developers and builders (Hertin *et al.*, 2003). At present, there is a need to

extend the burden of risk across government, insurance industry and vulnerable society (Green and penning Roswell, 2004; Treby *et al.*, 2006). But the issue is how mitigation and adaptation cost must be distributed between stakeholders in construction building projects. According to Treby *et al.* (2006) there is a critical problem that in many agencies in insurance and construction industries (such as developers, estate agents, construction, solicitors, valuers, etc.) vested to continue occupation of the flood areas. While these professions often do not directly suffer from impact of flooding, their actions can effect both positively and negatively on flood risk and value of property, hence they need practical leadership guidance. In circumstance where a mortgage is required for house purchase to advance, insurers have become an agency facilitating or constraining development. This two different approaches or behaviours are barrier in front of increasing demand and developing vulnerable properties especially in prone area.

This paper is very initial and part of my PhD study which explores a number of economic and social consequences in the context of climate change mitigation and adaptation strategies in the building sector in the UK. Based on criteria such as stakeholder willingness to invest, the study investigates different potential options to enhance adaptation and mitigation strategies in commercial building projects. It builds on research into the effect of mitigation and adaptation options on microeconomic variables in building sector such as capital cost, maintenance and running cost, insurance cost, return value, rental and price of properties in future. Rather than adding to this technical literature, we seek how mitigation and adaptation options could be embedded in the building project whereas all stakeholders and customers suffer fair proportion of optimum cost and gain higher benefit. The main conceptual aim of this study is to establishing a decision support system/framework for optimization of climate change mitigation and adaptation in the built environment at a holistic level in terms of enhancing property value/ achieving best value for money and equal burden/ cost sharing among project stakeholders. For achieving this aim, the following objectives have been defined:

1. Review various mitigation and adaptation strategies currently used in the national commercial buildings in the area with high climate change effects;
2. To determine the potential benefits associated with mitigation and adaptation strategies and their effects on the economic variables and social attitude;
3. To identify the economic parameters and potential factors or variables those influence the informed selection of optimal mitigation and adaptation options in commercial building projects;
4. To evaluate and establish the weighted importance of the key factors or variables that will help to determine the relative (externality) impacts of the different choices of climate strategies on environment and society;
5. To develop a decision support system to integrate the basic information useful for selecting optimum mitigation and adaptation strategies; and

6. To assess the effectiveness of the proposed approach by applying it to climate change options selection problems using a series of case study commercial building projects in the UK.

Key literature pertaining to climate change impacts, adaptation and mitigation strategies' linkages and challengesare reviewed below. The final section of the paper draws some conclusions reflecting on the need for a decision support system/framework based on accounting cost-benefit criteria in terms of mitigation and adaptation strategies in building project.

LITERATURE REVIEW

The impact of climate change in built environment

Earth's climate is changing rapidly due to rise in the greenhouse gases (GHG) which is caused by human behaviors and activities (Pryce and Chen, 2011). The risk of heat wave, intense precipitation, destructive tropical cyclone, and flooding is expected to increase due to historical GHG emissions (*Groisman et al., 1999; Milly et al., 2002; Stott et al., 2004; Emanuel, 2005; Wilby, 2007*).Other anticipated consequences of climate change for cities include fewer periods of extreme winter cold, increased frequency of air and water pollution episodes, rising sea level and increased risk of storm surge, and changes in timing, frequency and severity of urban flooding associated with more intense precipitation events which have a both direct and indirect impact upon the built environment. Historical data illustrate that more frequent flooding, storm and subsidence events have resulted in accelerated property damage. The Association of British Insurers (ABI) reported that during 1998-2003 flood and storm losses totaled £6.2 billion, double of the previous period *(ABI, 2005)*. The heat wave in the summer of 2003 has been assessed to have damaged 22,000 extra cases of subsidence on business as usual and in that year alone costs for subsidence claims to insurers have been estimated to be around £400 million. In consequent of the more recent flooding in 2007, the insurance industry has paid out around £3 billion for four years claims *(Defra, 2010)*.

Due to the climate change, most of the major cities which are placed in low level areas and close to the shore and coastal line are treated by risk of long term rising sea level (*Nicholas, 2004*). Thus, climate change may have large consequence for initial construction and operation of properties and the financial sector in the risky and low level areas, whereas demand for construction activities could be increased due to the subsequent damage caused by extreme events that directly caused by climate change.Terby *et al.* (2006) also state it is very important to clarify the link between flood risk and property value which is one of the prime indicators of risk effects. One briefing report in UK carried out by *Acclimatise* (2009) illustrates the relationship of climate change risk with value of money of mitigation and adaptation, and properties value in future (see Figure 1). This report also indicates that climate change impacts can include a wide range of positive and negative effects on society, economy and environment but yet have not found the impact of mitigation and adaptation strategies on properties value and other related variables. However, inn our research it will be investigated the role of optimum level of mitigation and adaptation options in building project (based on stakeholder preferences and willingness to accept) upon value of property and other related variables and weather this value could be increase using most suitable options?!

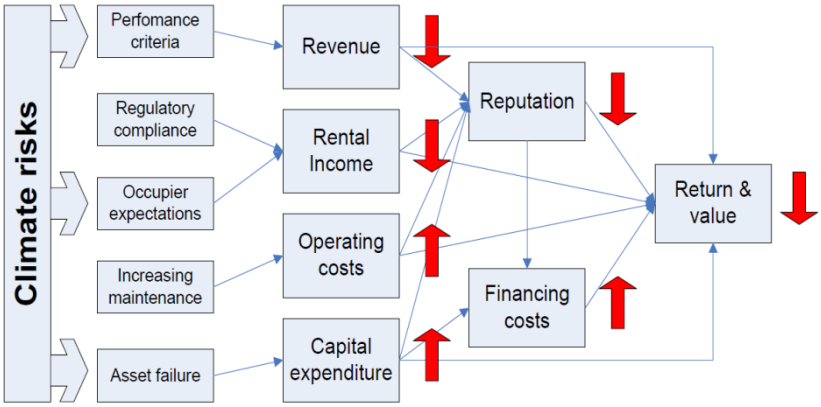

Figure 1 Climate change impacts in the property sector (Acclimatise, 2009)

But on the other hand, there is undoubted agreement that the risk of climate change impacts on the populations, infrastructures and city environment is growing (Wilby, 2007). So far it is shown in literatures (Wilby, 2007; Sanders and Phillipson, 2003) that the large numbers of controls over the climate, environment and population have beenestablished in response to a range of climate change risk such as heat waves, air pollution events and flooding. Although ongoing climate change is predicted to make complicated these problems, spatial planners and building designer are reacting through layout of the cities and building designsfor extreme weather due to the climate change (Wilby, 2007).

Currently two different solutions proposed to respond to climate change threat in many sectors: 1) adaptation strategies and 2) mitigation strategies. Adaptation involves protective measures to avoid, prepare for, or respond to potential impacts from climate change. Adaptation aims to reduce the associated risk to population assets (capital) through a wide range of interventions including behaviours like decision making, procedures, insuring procedures and technical/structural measures. Adaptation aims to act in the short-term and is intuitive, tangible, and direct and also can involve long-term planning of a public health response to climate change and can thus be more abstract, impersonal and undirected (Semenza JC.*et al*., 2008). Adaptation to climate change can be evaluated through generic principles of policy appraisal seeking to promote equitable, effective, efficient and legitimate action harmonious with wider sustainability (Frankhauser*et al*., 1999; de Loe *et al*., 2001; 1999; Burton*et al*., 2002; Adger*et al*., 2005). Adaptation can consist of the selection of construction materials and design that reduce damage from flooding and storms. The selection of building sites on land that is not prone to these natural disasters is another adaptation strategy. In opposite, mitigation involves directly reducing buildings' energy use, selecting land for building which minimize the demand for carbon based transportation and the energy used to construct other urban infrastructure. Mitigation strategies provide a degree of protection against much of the potential extreme climate change events such as flood hazards and allow the potential loss to be lowered (Black and Evans, 1999; Terby *et al*., 2006). For instance, by choosing some strategies like energy efficiency and recycle materials and energy in buildings, accretion of world temperature could be reduced due to the changing behaviours, reducing resource consumption and producing lessCO2 emission which will lead to reduce climate change risks in future. Nonetheless, there is no evidence to clearly show the effect of these two strategies in

different building projects upon the economic losses due to the climate change, housing price and human welfare in future in construction industry.

Potential impact of mitigation and adaptation strategies on the value of buildings

Although balancing between mitigation and adaptation strategies is still considered at international and national levels in different sectors, it displays some important linkages at project level in the construction sector. IPCC TAR concluded appropriate optimization between mitigation and adaptation will be long and boring process and optimum mix of response options will vary by time and country (place) as local condition and cost modify (Klein *et al.*, 2003). Some central shortcoming of optimizing mitigation and adaptation strategies at project level are, namely, **uncertainty**, irrespective of the diversity of economic values and preference within and between society, **equity** or **fairness** for distributional cost of impacts (burden sharing),**local conditions**. Klein *et al.* (2003) state in absent of perfect information, a number of alternative mixes of mitigation adaptation and mitigation strategies may be proposed which different in their economic, social and environmental impacts. For instance, while one option may be equitable and environmentally suitable, it might be cost-effective than other options, although be less environmentally and socially acceptable. These authors didn't propose any proper solution butsuggested to identify which mix or mixes of options are justifiable, some multi-criteria framework needs to be designed with which one can capture, quantify and compare the direct and dependent effects of application of each these or other possible criteria.

Other scholars like Arrow *et al.* (1996) and Tóth *et al.* (2001) argue that balancing between mitigation and adaptation will be challenging because of some unique characteristic issues such as long time horizons; non-linear and irreversible effects; social economic; geographic differences amongst affected parties and global nature of problem. Because of misguide assumption that there is one single optimal mix of adaptation and mitigation options for all possible climate change scenarios, increasingly calls are being made for research to determine the optimum mix of mitigation and adaptation (Klein *et al.*, 2003). They also mention that latter problem results from difficultyinvolved in estimating the cost and especially the benefits of adaptation and mitigation. In the absence of an agreed evaluation framework, the validity of estimated benefits and their use in combination with cost estimates in optimization analysis should be debated (Klein *et al.*, 2003). In fact research is needed to provide guideline to develop justifiable mix of adaptation, mitigation and development policy based on social and economic aspects as well as related element. Klein *et al.* (2003) claim thatoptimal mix mitigation and adaptation will broadly depends on the decision criteria and framework that are applied to identify it. Tóth *et al.* (2001) show a number of examples of such frameworks that involve cost-benefit analysis, cost effective analysis, tolerable windows approach, game theory and multi-criteria analysis. In the way of assumption, criteria and value judgements are dealt with and the choice for a particular decision framework is essentially a policy decision. Nevertheless, other scholars consent that under deep uncertainty and robustness condition as against optimization is a better decision making criterion (Lempert and Schlesinger, 2000).

As IPPC (Intergovernmental Panel on Climate Change) indicate the sign, magnitude and frequency, and their time horizon and existence of climate change impacts are all uncertain at the local level. Uncertainty about climate risk and impact of climate change is increasing the cost of resilience (ex-ante and ex-post) while lead to

uncertainty about profit. For instance, uncertainty about location of damages reduces the proactive adaptation benefits with regards to the mitigation and reactive adaptation. The benefit of adaptation activities are often highly uncertain and even larger than uncertainty on the benefits of mitigation, thus estimating reliable ex-ante is very difficult (Lecocq and Shalizi, 2007). These authors argue that evaluating performance of adaptation measures through their net benefits for avoided damage in principal is possible but is not yet practically. Uncertainty about value for money of mitigation and adaptation is affected by finance, performance, and demand and customers satisfaction. Ingham (2005) present divergence of interest (Hertin *et al*., 2003; Lowe, 2003), value and performance (Lecocq and Shalizi, 2007) influence the value for money of mitigation and adaptation strategies. In terms of performance, they indicate it is possible to identify performance indicators such as maximum speed of wind that a construction can resist but there is no common metric to compare performance across classes of adaptation activities (Lecocq and Shalizi, 2007). Value for money means, achieving to desired outcome at the best possible price.The critical factors maypurchasersinvestigate when assessing value for money include: role of risk, environment consideration, disposal value, energy consideration, capacity of supplier, quality assuring, wider benefits, maintenance and running cost and warranty(Government of Tasmania, 2001).

Bosher *et al.* (2009) state that the problematic context in term of resilience to the flooding is due to the structure of construction industry and nature of interaction among those who plan, design, construct, operate and maintain which resiliency consideration can be integrated. These authors also mention that lack of clarity in the responsibilities of non-government stakeholders and government agencies (Cabinet Office, 2007), and lack of suitable and coherent guidance on integrating hazard mitigation consideration into the design, construction and operation process (Bosher, 2007; Bosher, 2009). Wang *et al*. (2011) indicate lack of both conceptual and empirical data and information that clearly considers mitigation and adaptation strategies together. Current levels of projected investment in adaptation in most of the world are not adequately considered which is Burton, 2004 call it 'adaptation deficit' and these issues lead to high vulnerability to the current and future climate, including the effects of, variability, extremes and systematic changes (Wang *et al*. 2011).Other scholars have specially analysed the uncertainty about future events, capacity constraint, priority of decision makers and the risk of maladaptation. They mention lack of economic data, high levels of economic informality and inequality make it difficult to bridge adaptation efforts to the positive (Gross Domestic product) GDP impact (Cartwright *et al*., 2013).

PROPOSED METHOD FOR THE RESEARCH

Decision-support system/tool is one of the approach that could be used during preconstruction, construction and reconstruction and enable construction stakeholders to make decision based on proactive integration of mitigation for climate change hazards [and adaptation of other hazards] during the design, planning, construction, operation and maintenance of existing and future construction projects (Bosher, 2009). For developing this system, this study will employ a mixed method research approachsuch as option value theoryand willingness to pay which associate with combination of both qualitative and quantitative research design in a multiple case study. Both questionnaires and interviews will be equally conducted with stakeholders on different building projects which will be used as case studies. Data collected from the quantitative research approach such as questionnaire survey would be analysed using both descriptive statistics and inferential statistics such as mean score and

include parametric and nonparametric test and factor analysis respectively to find most critical variables which are important for drawing mitigation and adaptation options. These methods also could be used to weight and rank the stakeholders' trend and willingnessto invest for more resilience buildings to reduce climate change impacts through spending more money and investment.

CONCLUSION

According to the climate change, many stakeholders and parties in construction sector are highly vulnerable to the impacts of climate change. Increasing maintenance cost, capital cost, material price, mortgage, rent, and other economic and social effects are potential impact that could be happened due to rising climate change risks and vulnerability. The challenges for stakeholders and other parties in the building sectors areto integrate and embed optimum level of mitigation and adaptation options in the construction market and improve value of investment in the future. Therefore, the purpose is achieving best value based on resilience with climate change. If both challenging and resource for this task is intensive, requires new approaches. These challenges are compounded by issues as a follow:

1- Complexity of valuation (including properties value, best value for money, stakeholder satisfaction, equal burden and cost sharing)

2- Deep uncertainties about cost and benefit of adaptation and mitigation options

3- Discount value to convert future cost-benefit of mitigation and adaptation into present day value. According to Garnaut (2011), normative approach of discount rate aims to consider values and ethics for wellbeing in future).

4- The difficulty of incorporation of stakeholders in decision making.

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Paper 11: Community resilience planning for emergency preparedness

Fulvio Toseroni[1] and Fausto Marincioni[2]

[1] *Polytechnic University of Marche, Italy, email: f.toseroni@univpm.it*
[2] *Polytechnic University of Marche, Italy, email: f.marincioni@univpm.it*

ABSTRACT

The 2005 UN Hyogo Declaration introduced the concept of resilience in the field of DRR, proposing the union of environmental sustainability with civil protection. The merge of the technical and engineering sciences with the social-ecological ones should enhance the link between emergency planning and management. The Hyogo Framework for Action (HFA) revealed that vulnerability reduction is not enough to achieve effective DRR; greater adaptive capacity is also needed to adjust communities to local environmental processes. Efforts should shift from emergency response toward new adaptive social-economic-cultural strategies; namely go beyond risk analysis and think in terms of symbiotic and resilient relationship between humankind and its surrounding. To visualize the community's adaptive capacity to dimension, beside the traditional cartographic tools, such as hazard, vulnerability and risk maps, we should introduce resilience maps. To achieve this it is necessary to identify new parameters capable to assess the complex relation between socio-economic processes and disasters, and subsequently develop new formulas and indexes merging prevention and emergency management elements. This process will help developing maps of resilience, which could support planners and policy makers to implement effective safety policies. Maps of resilience could also become a pivotal decision support system to: (1) reappraise safe and resilient areas, (2) recover vulnerable and fragile areas, and (3) oppose to development of infrastructures and economic activities in hazardous areas. In the end, the development of resilient emergency plans combined with a resilient regional planning aimed at reinforcing a culture of disaster prevention and preparedness, would lead to a significant disaster risk reduction.

Key words: Disaster Risk Reduction, Emergency preparedness, Resilience Index,

Emergency Threshold Index,, Maps of resilience,.

INTRODUCTION

As a consequence of the increasing occurrence of extreme events, the UN has started some actions and programs in order to prevent them from becoming disasters. Extreme events became disasters only in the presence of vulnerable anthropic system lacking an adequate mitigation system. The UN Disaster Risk Reduction strategy (UN, Resolution 56/195) aims to build a mitigation system to reduce the magnitude of extreme events and the effects of such events, by increasing the resources available to contrast and adapt to extreme events. This article discusses ways to transform a passive approach to disasters management based on emergency response, to a pro-active approach based on preparedness and planning i.e. changing from vulnerability reduction to resilient response.

Since 2005, with the Hyogo Declaration, the International Community is aware that if we want to track progress on Disaster Risk Reduction activities, we need to develop indicators to measure the results of this main goal. This article is a first part of a doctoral research project, began in November 2013, which want provide a possible solution, with the objective to better understand how to:

- ✓ transform resilience from a qualitative concept, to a quantitative property, guiding disasters mitigation actions;
- ✓ develop a new strategy for vulnerability reduction, through compensation between resilience and resistance factors;
- ✓ identify a new analytical method to move from the concept of risk to the concept of "resilience territorial threshold" (Territorial Resilience Rank ?) (endurance limit before the collapse of system);
- ✓ develop maps of resilience for a more effective spatial planning (e.g. nonstructural insurance actions).

LITERATURE REVIEW

From the concept of sustainable to the strategies of Disaster Risk Reduction (DRR)

Since the 1970s research groups such as the Münchener Rück Group begun studying how natural phenomena impact human organizational structures (ed. Münchener Rück Group 2009). This produced important data for the Intergovernmental Panel on Climate Change (IPCC). In 1972, the first UN conference about the environment introduced the concept of sustainability that will be a central element with the document 'Our common future' by the World Commission on Environment and Development (WCED) in the 1987. In the text, the concepts of environment, need, development and generation are linked together in the new paradigm of sustainable development: "The development is sustainable if satisfies the needs of the present generation without compromising the possibility for the future generations to supply their needs". In 1992, the UN conference 'Environment and Development' will lead the paradigm of sustainable development to be the new paradigm of development itself.

From an environmental point of view, the sustainability will be connected to the regulatory concepts of ecological systems: load capacity, self-regulation, resilience and resistance. If an ecosystem is in equilibrium and sustainable by definition, its stability will be linked to the capacity of regulator elements to perform a function of self-regulation in relation to the internal factors and, in particular, to the external factors, such as the extreme events that tend to change the equilibrium of a system. Thanks to the contribution of social science, the concept of environmental sustainability has gained a global significance, including also the economic and social dimension. These three aspects, ecological, social and economic, will become a reference point to measure a system's development and vulnerability. In addition, the concept of disasters resilience will be acknowledged as part of the process of sustainable community building, able to provide a high quality of life for current and future generations (Stanganelli, 2007). The IPCC data indicate significant changes in the climatic equilibrium, facing the possibility of the collapse of the self-regulation capability of Gaia system. The frequent disasters resulted in a progressive increase of loss of lives and materials, partly due to the strong relation between event, community and social vulnerability, which became exponentially stronger in the last part of the XX century.

The research shows a high vulnerability of the poorest societies in terms of culture, technical, economic and social resources. The disasters contribute in fact to the social, economic, cultural and political disaggregation, also within the same national community. In a global view, the analysis of specific patterns of consumption, production, economic and industrial development has demonstrated all their potential to increase the vulnerability to natural events (World Conference on Natural Disaster

Reduction,1994). If socio economic development clashes with climate variations (natural or human induced) increasing disaster risk (Intergovernmental Panel on Climate Change 2012), it is evident the necessity in the long term of new sustainable development models, yet it also shows the necessity of immediate "glocal" (global + local) DRR strategies. On the basis of expected environment change, enhancing DRR strategy should be a fundamental focus for the international community to avoid (prevention) or limit (mitigation and preparedness) the adverse impact of natural, environmental and technological hazards (UN-ISDR, 2002).

The UN International Decade for Natural Disaster Reduction

In 1989, the UN resolution 44/236 started a global enterprise aimed to save human life and to reduce the impact of disasters. The resolution established the International Decade for Natural Disaster Reduction (IDNDR). The aim was to reduce by means of a coordinated international action, especially in developing countries, the loss of lives, property damage, social and economic disruption caused by natural disasters such as earthquakes, windstorms, tsunamis, floods, landslides, volcanic eruptions, wildfires, grasshopper and locust infestations, drought and desertification and other calamities of natural origin (UN 1989).

In 1991, the next resolution no. 46/182 adopted a new integrated approach for the management of all the aspects related to catastrophes, emphasizing the importance of the prevention and preparedness, starting an important process of development of a global culture of prevention. This two UN resolutions were fundamental for the IDNDR activities, focused on all the vulnerable countries, in particular the developing countries, with the opportunity to achieve a safer world by the end of this century and beyond. (Yokohama Strategy 1994). In 1994 in Yokohama (Japan) was held the first World Conference on Natural Disaster Reduction that produced the document: '*Yokohama Strategy and Plan of Action for a Safer World - Guidelines for Natural Disaster Prevention, Preparedness and Mitigation.*' In the text it was possible to insert all the fundamental points of the DRR strategy. The environmental protection became a component of sustainable development consistent with poverty alleviation, which is imperative in the prevention and mitigation of natural disasters. (Yokohama Strategy, 1994).The introduction of the prevention, mitigation, preparedness and recovery actions, went to replace the previous approach based only on the disaster response. This old method was characterized by modest, short term and very expensive results. The way of the prevention and preparedness activities would have contributed greatly to the implementation of sustainable development policies, drawing themselves an advantage. (Yokohama Strategy 1994).The World Conference introduced many innovations, such as the opening of work and studies also in the field of anthropic disasters and the use of the technical term Resilience in the field of DRR. The Yokohama declaration will be the trailblazer for the International Strategy for Disaster Reduction (ISDR), that will close the experience of IDNDR with the UN resolution 65/195 in 2001. (Yokohama Strategy 1994).

The UN International Strategy for Disaster Reduction (ISDR)

In the year 2000, the UN document Millennium Declaration made explicit that the starting point of every DRR action is the respect of Nature, calling for a change of the existing unsustainable models of production and consumption. Only in this way will be possible to transmit the immeasurable riches provided to us by nature to our descendants (UN Millennium Declaration, 2000). The UN reaffirmed its commitment tointensify cooperation to reduce the number and effects of natural and

manmadedisasters (UN Millennium Declaration, 2000). The key concepts of the Millennium Declaration became the basis of the work of the International Strategy for Disaster Reduction (ISDR). In 2005 the 2nd World disaster conference, held in Hyogo (Japan), promulgated the Hyogo Framework for Action (HFA 2005-2015). The main goal of the HFA was to shift from hazard planning and DRR to building more resilient communities (Mayunga, 2007). In other words, a culture of disaster prevention and resilience, and associated pre-disaster strategies, must be fostered at all levels, ranging from the individual to the international organization (Hyogo Declaration, 2005). After the adoption of the HFA document, the concept of disaster resilience has gained a wider interest and has become more popular (Manyena, 2006) in the field of Civil Protection. Nevertheless, in the HFA document resilience was not clearly defined, for example, it is not clear how resilience should be assessed, measured, and mapped" (Mayunga, 2007). What is certain is the need to develop an adaptive social protection strategy, especially in the context of natural hazards (Davies; Oswald & Mitchell, 2009). However, in DRR the concept of resilience is not easy to use, without the development of indicators that could adequately quantify and map it (Mayunga, 2007).

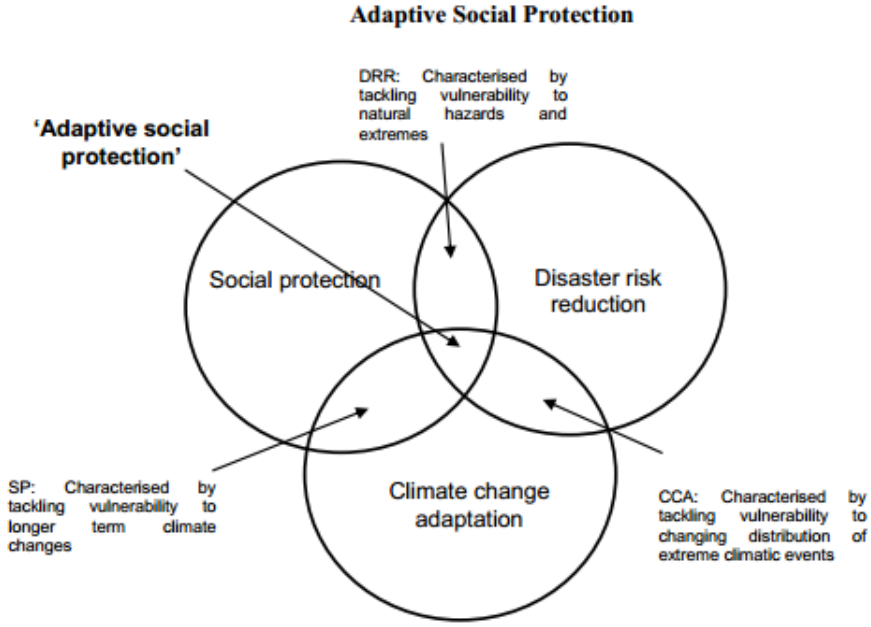

Figure 1 'Climate Change Adaptation, Disaster Risk Reduction and Social Protection', OECD

Source: Davies, Oswald and Mitchell (2009)

Resilience in the DRR field

The term resilience in the field of DRR caused some problems of interpretation and correct application. A reason can be detected in the delay between its appearance in the Yokohama Strategy document (1994), its application in the field of DRR (Hyogo, 2005) and the official definition elaborated by the ISDR (2009). In addition, the chosen word itself was quite difficult, having a complex etymological history, based on three distinctive elements: 1) being a word used with continuity from the Roman age; 2) having maintained a strong adherence to the original meaning through the centuries and different languages; 3) being used as technical word in many different field with a common basic meaning. In a sector as DRR, the concept of resilience managed to

contain, only in a word, all the shades of the complex world of DRR. After 1839, it started meaning the ability of recovery from adversities, in the sense of fortitude (Bell, 1839). It appeared in the field of disasters after the Shimoda heartquake (Japan, 1854), when some American researchers described the recovery actions of Shimoda's citizens using of concept of resilience.

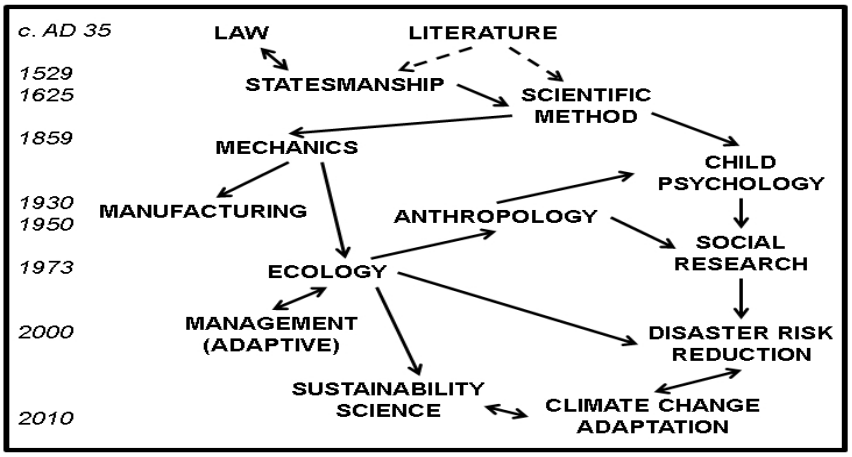

Figure 2 Alexander, 2013, 'Resilience and disaster risk reduction: an etymological journey', *Nat. Hazards Earth Syst. Sci*, 2013, p. 8, pic. 6.

The use of resilience concept in the context of DRR must be connected to two different semantic-scientific fields: the ecological sciences and the psychological sciences. There is no doubt that the adoption of the scientific concept of resilience outside mechanics owes much to the theoretical work of Holling (1973) and Alexander (2013), with the article '*Resilience and Stability of the EcologicalSystems'* (Mayunga 2007), where the researcher stated "The whole sequence of environmental changes can be viewed as changes in parameters or driving variables and the long persistence in the face of these major changes suggests that natural systems have a high capacity to absorb change without dramatically altering. But this resilient character has its limits, and when the limits are passed...the system rapidly changes to another condition" (Holling 1973), and in another passage: "But there is another property, termed resilience, that is a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables." (Holling 1973). After the publication of Holling's work, the concept of resilience collected an increasing success and was frequently used in more sectors, including that of hazards and disasters.

According to Berkes and Ross (2013) "Resilience is a systems concept, and the social-ecological system, as an integrated and interdependent unit, may itself be considered a complex adaptive system" (Berkes & Ross 2013, cited in Alexander 2013). In 1995, Holling modified his definition of resilience: "A buffer capacity or the ability of a system to absorb perturbation, or the magnitude of the disturbance that can be absorbed before a system changes its structure by changing the variables" (Holling et al., 1995, cited in Mayunga, 2007). The introduction of magnitude concept bound to any external disturbance will ultimately connect the concept of resilience to the field of DRR. On the other hand, in the field of social science, the word resilience appeared in anthropology studies after the 1950s and later in psychology. The use of the term "resilience" in the developmental psychopathology of children owes much to the work of the American psychiatrist Norman Garmezy (1918–2009) (Alexander, 2013). He published his findings on resilience in the 1980s (Garmezy et al., 1984, cited in

Alexander, 2013). The passage from physiology, where the system was the mind, to the sociology and human geography, with the use of concept of community resilience, where the system was the social community (Tobin, 1999; Adger, 2000), involved a problem of reconciling the use of the term with the ways in which it has been employed in psychology (Kolar, 2011, cited in Alexander, 2013). In these stages, Timmerman (1981) will probably be the first one to use the term resilience in relation to the concepts of hazards and disasters (Klein et al. 2003, cited in Mayunga, 2007). The researcher defined the term resilience as the measure of system's or part of the system's capacity to absorb and recover from hazardous event (Klein, 2003, cited in Mayunga, 2007).

On the basis of Timmerman's work (1981), many definitions will be published about the concept of resilience in the field of hazards and disasters. From the analysis of different definitions, we can conclude that the conceptualization of resilience depends on the context it is related to, for example, such concept:

- describes the ability/skill of a nation, a group of people, a community or a society to face the disasters, quickly recovering an equilibrium after the effect of the disaster. This ability of action/reaction is called Community Disaster Resilience;
- is linked to an ecological vision, with a central systemic perspective, based on internal and external factors. These factors can develop a self-regulatory and re-organizative process of the system itself in case of a stress event. In this perspective a particular emphasis is put on the internal factors (Pendall et al, 2007). The resilience of system facilitates and contributes to the community's recovery process (Klein et al, 2003);
- refers to two different time frames. The first is the quick capacity to react to an external stress. The second is the long term capacity to build a new equilibrium of the system, without significant changes of a community's progress in a determinate social-environmental context. In this case, the value of Community Disaster Resilience is linked both to the timing and to the capacity to reinforce a community after an event;
- is an oriented process of adaptation of a system, which has important political implications (Manyena, 2006). These implications are based on the principles of experiential learning, in regard to the preservation of its basic structure. From this point of view, the relationship between the disasters resilience and the notion of sustainability in respect of natural resources play a major role. (Smith et al, 2001).

Resilience and vulnerability

If the new approach shifts the attention to the development of the skills and the capacities of a community, resilience necessarily converges with the concept of a system's vulnerability. When we have a high level of vulnerability, the level of resilience will be low and vice versa (Mayunga 2007). The problem of defining resilience in this fashion is that it triggers the circular reasoning that a community is vulnerable because it is not resilient and it is not resilient because it is vulnerable (Klein et al, 2003, cited in Mayunga, 2007). The resilience becomes the last step of the DRR's path. This path started with the concept of hazard, then met the concept of vulnerability and finally the concept of risk. Resilience intensity the relationship between environment conditions, territory and community, and certainly resilience can be seen as a refinement of the concept of vulnerability, thus measurable through the same indices used to measure vulnerability. The most important factors to consider are

those defining the dynamic relation between people, communities, societies and the environment (Mayunga 2007). Moreover, social capital has been recognized as an important and useful concept in disaster resilience (Dynes, 2002, cited in Mayunga, 2007). However, such 'community capital' tends to only focus on some dimensions of disaster resilience, and do not adequately addresses other important components from the economic, physical, human, and natural capital (Tierney 2006).

Resilience indices

The definition and quantification of the link between the physical event and the impacted social system require a necessary simplification among all involved parameters. Of course we have already a lot of different parameters to describe a resilient or a vulnerable system, but usually they are only qualitative data. We need of quantitative data if we want have a practical tool to develop and measure the resilience in a community. The end result of this simplification is the reckoning of indices encompassing relations between environmental and societal processes. Such indices will sum (condense) different indicators, through mathematics formulas, into a number. Indices are powerful tools because of their ability to summarize complicated technical details into simple information that even non-experts can easily understand (Birkmann, 2006, cited in Mayunga, 2007). Indices are often applied in studies of poverty and deprivation, social capital, quality of live, human development, social vulnerability and disaster preparedness (Simpson, 2006, cited in Mayunga, 2007). There are many methods that can be used to standardize or normalize the different indicators into numerical values (Briguglio, 2003, cited in Mayunga, 2007).

HYPOTHESIS AND METHODOLOGY

The main hypothesis of this research is: quantifying the resilience of a territorial system, through the indexing of its key factors, will make possible the identification of its "emergency threshold", namely a limit of such system after which the system loses the capacity to substain the impacts of an event. Four correlate sub-hypothesis have been developed:

- the emergency threshold of a territorial system is given by the ratio between the parameters defining the physical event and those defining the socio-economic context;
- The emergency threshold value indicates the limit beyond which the territorial system loses stability.
- A territorial system can be made less vulnerable balancing the actions to increase its resistance and resilience;
- The actions to increase resistance reduce the primary (structural) vulnerability, whereas the actions to increase resilience reduce the secondary (functional) and deferred (socio-economic) vulnerability.

To compute the Emergency Threshold Index (ETi) of a territorial system, it is necessary to consider the Hazard Index (Hi), connected to the uncontrolled release of energy by the impacting event (magnitude), and the Community Disaster Risk Index (CDRi) connected to the characteristics of the impacted socio-economic system. The value of the Hi will be obtained by ranking and weighting all types of extreme events possible within the studied territorial system. The CDRi will be the sum of the characteristics selected to describe the recovery/response system. The ratio between the total value of Hi (numerator) and the total value of CRDi (denominator), is the Emergency Threshold Index (ETi) of the studied territory or community. The ETi can be a way to measure and describe the concept expressed by Holling's definition of a resilient system in 1973.

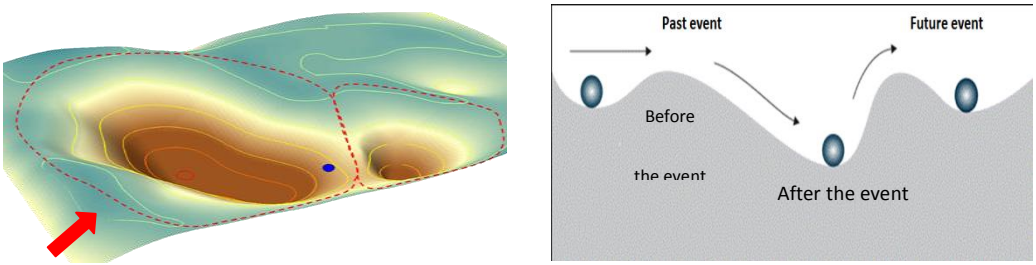

Figure 3 - Leuteritz, T. E. J., and H. R. Ekbia. 2008

The work plan to develop such study is the following:

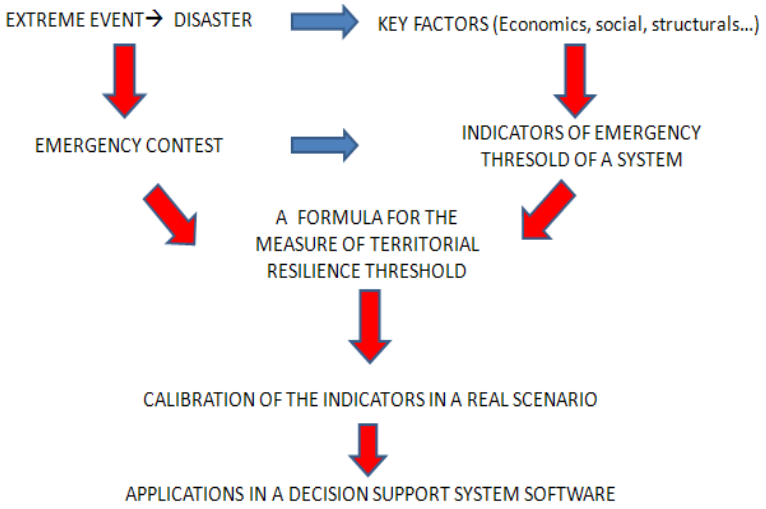

Figure 4 – flowchart of research project

The above discussed hypothesis and methodology will be implemented and tested in two different cases study: (i) a small urban landslide scenario in the municipality of Ancona, and subsequently (ii) a larger volcanic emergency management scenario in the city of Naples. The Ancona urban landslide case study was selected because the local municipal council has already adopted an interesting resilient approach (using real time monitoring and early warning system) to guarantee the safety of citizens still residing over the landslide area. With this case study it should be possible to test the local community resilience index and the local emergency threshold, as well as validate the emergency planning actions.

CONCLUSIONS

The overall objective of this doctoral project is to move DRR beyond the concept of risk and have a quantitative assessment of the responding capacity of a territorial system. The definition of an emergency threshold index (ETi), if on the one hand will help define the limit of a territorial system to sustain the impact of an extreme event, on the other hand will indicate strategies to enhance/elevate such limits (reinforce the territorial system). Such an ETi will:

- indicate the limit beyond which a territorial system will pass from a state of emergency to a state of disaster,

- enable the mapping of disparity in terms of responding capacity within a large territorial system,
- support local policies for sustainable development,
- better use the available resources to manage the emergency.

A possible comprehensive final product of this doctorate will be the implementation of these concepts into a new Decision Support System software. In point of fact, this is the main objective of "Regola Inc.", the software development company co-financing this research.

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Session Four – Flood risk and drought

Paper 12: Methodological Strategies to the Work in Environmental Risk Areas in Brazil

Patricia Carla de A. Souza[1] and Carlos Frederico Loureiro[2]

[1]*Universidade Federal do Rio de Janeiro, Brazil, email: patcarla@gmail.com*
[2]*Universidade Federal do Rio de Janeiro, Brazil, email: floureiro@openlink.com.br*

ABSTRACT

This work focuses on the discussions of a PhD research from *Rio de Janeiro´s Federal University*, Brazil, showing the results reported up to the moment. The referenced research aims to investigate some challenges and methodological strategies concerning environmental risk areas in Brazil, which can serve as bases for community works in at-risk and environmental disaster areas. In spite of the lack of methodological, theoretical studies or public policies related to the theme in Brazil, we are currently facing increasing numbers of events of landslides and floods, especially during summer season. After the last severe rains in some cities of Rio de Janeiro state, important discussions of our urban structure were brought up, most of them related to geo-physical aspects of a disaster more than to methodological strategies for the community subjects involved. Besides the daily vulnerability those residents are exposed to, they also live in social exclusion conditions, displaced, homeless or having lost their families. The research includes a theoretical overview in national and international environmental risk literatures, where concepts of vulnerability, resilience, environmental justice and recognition are overviewed, together with a range of methodological strategies, performed in emergency and post disaster periods by some of the interviewed research participants.

Keywords: Brazil, community, environmental risk, methodological strategies, resilience.

INTRODUCTION

A great number of environmental risk areas have increased in different countries and regions of the world. A number of major disasters are included on that scenario with drastic consequences for the local residents, several of them facing a new condition of displaced or homeless community subjects – i.e. losing their homes and all of their possessions or even experiencing members of the family passing away. According to *United Nations Development Programme* (UNDP/PNUD, 2004) in the document *La Reducción de Riesgos de Desastres – Un Desafio para el Desarrollo*, about 75% of the world population live in areas which at least once have been affected by a natural disaster, such as earthquakes, tropical cyclones, floods and drought. Turning our attention to Brazil - South America´s largest country - flood, landslide and drought are the most frequent natural disasters in the country. With an area of 8,514,876.599 km² (IBGE, 2013) and a population of approximately 190,732,694 inhabitants (Censo, 2010), Brazil is the fifth largest country in the world, including a total of 5,435 (IBGE, 2013) municipal districts. According to *Brazilian Civil Defence* (1998), drought, landslide and flood are disasters of chronic and gradual evolution with different characteristics and periodicity in each region of the country. Floods left about 1.4 million displaced from 2008 to 2012 about 1,543 districts and 27 cities in the whole country were affected. Thus, we are currently facing increasingly events of landslides and floods, especially during summer season in South and Southeast regions of Brazil.

The present work aims to outline some of the challenges related to heavy rain, floods and landslides, especially those which occurred from 2010 to 2013 in Rio de Janeiro state, Brazil. Preliminary findings are provided from the discussions of a PhD research from *Rio de Janeiro´s Federal University* (Psychology Institute, Psychology/Sociology/Social Ecology Programme, UFRJ, Brazil) - entitled *Methodological Strategies to the Work in Environmental Risk Areas in Brazil.* The referenced challenges include lack of disaster theoretical studies or public policies related to the theme in Brazil, together with disregard for social and economic implications of vulnerability (Wisner et al., 2005). The displaced and homeless subjects are usually neglected after the emergency stage of environmental disasters. Also, there are very few critical environmental educational field projects and academic research, concerning social questions and basic therapeutic support. Displaced and homeless subjects are not provided with regular social assistance or psychological support services or even the most basic management strategies for shelter support.

According to the *Brazilian Institute of Geography and Statistics* survey (IBGE, 2014), almost half of Brazilian municipal districts have no risk or disaster management. Also, those data showed that in 2013, 48% of Brazilian municipal districts have no actions related to risk and disaster management. On the basis of those mentioned challenges, the following questions were considered during the research: are there any silent field work experiences being held with residents of at risk areas, preventively, during emergency or in post disaster period? How could preventive environmental education projects be proposed, if disasters have already happened and most of the residents are displaced from their houses - several of them homeless and disoriented in spatial and emotional terms? Do programmes focused only on structural control and geophysical questions imply awareness of the residents about risk? In what ways, are subject or group resilience taken into consideration in those contexts?

It is our belief that the arguments and questions previously introduced justify the relevance of the mentioned discussions and we also expect that those considerations may be useful for future social research about the proposed theme.

Context and Background

Rio de Janeiro is one of the states with the highest number of disasters in Brazil, mainly floods (Figure 1) and landslides (Figure 2). It is located on the southeastern coast of Brazil and covers an area of 43.780,172 and has an estimated population of 16.369.179 in 2013 (IBGE, 2014). In January 2013 recordings, Civil Defence (Defesa Civil, 2013) estimated that 200 thousand people, in the whole Rio de Janeiro state were affected by extremely severe rains in 8 municipalities, including Niterói, Nova Friburgo, Petrópolis, Teresópolis, Angra dos Reis and Duque de Caxias (Xerém).

Figure 1 Flood in Nova Friburgo, 2011

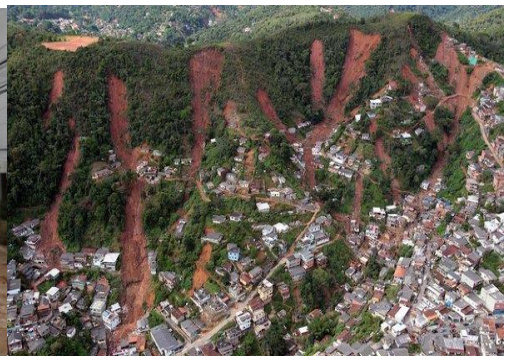

Figure 2 Landslides in Teresópolis, 2011

Earlier during the rainy season of April 2010, Niterói was badly affected by landslides, bringing serious consequences to urban undependable settlements. Those dramatic events brought up serious problems in our urban structure (Souza, P., Loureiro, 2009), such as disorderly occupation and the lack of interest from public administration. In relation to the public administration of Niterói - municipal district of Rio de Janeiro state - the local government gave permission for the construction of residences in unhealthy and at risk areas – it was the case of Morro do Bumba (Bumba´s Hill), Niterói, Rio de Janeiro, where at least 50 homes were affected, in what was considered the worst rain-induced tragedy in the Rio de Janeiro´s history, as its landslides buried about 200 local residents. The constructions have had an official authorization from the government, even though they were on the top of an old garbage field. Even though rain challenges are not a new reality for the residents of Petrópolis, Teresópolis, Nova Friburgo and Angra dos Reis, there is still a lack of preventive strategies in those at risk areas, an increasing number of displaced and homeless not provided with regular social assistance or psychological support services or even the most basic management strategies for shelter support. Moreover, it is important to highlight that multiple types of environmental degradation still happen together with social/economic exclusion practices, mainly in disadvantaged and minority group communities not only in Brazil, but also in other Latin American countries.

RESEARCH METHODOLOGY

Having a qualitative approach as a fundamental strategy (Minayo, 1992), the research involved a theoretical overview in national and international environmental risk and disaster literatures. Even though the research is not classified as a participatory research, we assume that it contains premises of the participatory methodology (Thiollent, 2007). In that sense, recordings from the contribution of the professionals, who lived their experience on the field, represented a rich material and reference for the thesis writings. The field work involved observation and 8 individual semi-structured, extended and in-depth interviews (S1-S8), together with the analysis of data content. The participants were voluntary professionals, who have already worked with socio-educational or therapeutic projects in environmental risk areas - such as therapists, educators, social workers, psychologists, etc - for displaced and homeless subjects, individually or in groups.

Field work has combined direct observation documented through photographs, digital recording and introspective accounts - related to the working experiences of the interviewed professionals. It demonstrated that the quality of the facts and social

relations are inherent properties of the social environmental context. The interaction of researcher, respondent and literature data enabled the possibility of a greater identity of feelings, experiences, values and strategies collected, together with the researcher´s narrative of them (Cho & Trent, 2006). Concerning treatment of data, content analysis methodology provided objectivity, systematisation and inference, relating semantic structures with sociological structures (Bardin, 1979). In addition, thematic analysis was the chosen technique for a better organization of data meaning units, dividing data treatment into three phases: pre-analysis (different readings, listening to recordings), material exploration (transcription of the interviews, organization of theory and empiric data) and results treatment (integration of previous treated data with the dynamics of social and cultural relations in Brazil).

It is important to note that the present work aims to pave the way to understanding the outcomes of the referred research in a broader context. Thus, the findings do not branch into the results of in-depth analysis, which is the next path of the current study.The inventory of the methodological strategies (Souza, P. & Loureiro, C., 2013) presented by the interviewed professionals, during their field practice, is still under treatment and not included on the present discussions. Nevertheless, field work interviews revealed some of the challenges the participant professionals faced during their experiences with homeless or displaced population, after floods and landslides in Rio de Janeiro state.

A BRIEF VIEW OF CONCEPTS

Deterritorialization and Rootlessness

As presented on previous introductory item, after the last severe rains in regions such as *Niterói, Nova Friburgo, Petrópolis, Teresópolis, Angra dos Reis* and *Xerem* – cities of Rio de Janeiro state - important discussions of our urban structure were brought up, most of them related to geo-physical aspects of a disaster more than to methodological strategies for the community subjects involved. It is considered in the referred research that working with the "environment" of those subjects, so fragmented by every aspect involving a disaster – i.e. the relocation of their residences, the feeling of *deterritorialization* and *rootlessness* (Haesbaert, 2001) – requires a reformulation of our previous references of environmental community work. A community work or field project that goes beyond immediate basic needs of water, food, matches, basic food basket should be considered. Also, after the high emergency phase the involved subjects face symbolic and affective loss of reference with the place, where they lived and attended before. In addition, most of the shelters they are moved to are largely established or managed by civil society in Brazil, with very little involvement of public administration and without any formal, psychological or social proposed work for the displaced and homeless from environmental disasters.

Vulnerability

According to Brazilian Civil Defence (1998), *vulnerability i*s the probability of a determined community or geographic area to be affected by threat or potential risk of a disaster established by technical studies. It corresponds to an intrinsic insecurity level of a disaster scenario at an adverse event. Vulnerability would then be the opposite of security. The term *vulnerable* in the referred research is used to mean those subjects that are more subjected to risks. Moreover, they face great difficulties in rebuilding their lives and means of subsistence after a disaster, what makes them *vulnerable* again to subsequent risk effects. Thus, they are considered *vulnerable* to a series of

associated risks, including revival of a shock trauma, helpless and on a powerless position, without finding answers to their questions. Besides that, individual challenges and life history of a subject or community groups can influence their capacity of anticipation, coping, resisting and recovering from an impact of an environmental risk or extreme event. That highly reinforces the connection of at-risk residents and *vulnerability*.

Environmental Justice

According to the *Brazilian Network for Environmental Justice* (RBJA, 2001), the concept of *environmental injustice* is used to refer to a phenomenon of disproportionate imposition of environmental risks for the economically and politically disadvantaged population. On the other hand, the concept of *environmental justice* refers to an environmental dimension, where social injustice will be overcome. That would be a new perspective to integrate environmental and social struggles, an alternative for excluding development (Herculano, 2002). In Brazil, environmental injustice is currently related to an accelerated spread of buildings and housing crunch, resulting in a great pressure upon the former residents to leave their lands. Thus, those low income residents move to at risk areas and that increases the level of marginalization they are exposed to.

Recognition

Recognition (Fraser et al. 2003) passes through the necessity of a local identity reference. The political force of a group will affirm that they exist, but only at the moment that the group subjects also recognize themselves individually and culturally. The act of recognizing oneself as "I am this subject" refers to the concept of *recognition* that also means "I am also one of these subjects". Equal treatment and singularity go together and individual freedom passes through collective freedom. This is the complexity of identity processes. *We are individual and collective agents of history* (Loureiro et. al., 2005, p.120).

Resilience

Possible strategies for the work in at risk areas are an important step to be considered in a relational approach of shock trauma (Levine, 2012) and *resilience*. According to this conception (Assis et al, 2006, p.20), *resilience* would be an interactive process between subjects and their environment, which enables and strengthens them to deal positively with adversity. Nevertheless, it is important to highlight that the concept of *resilience* was very carefully considered in the PhD research. It was noticed that currently the term seems to be constantly being referred to different meanings, according to different technical approaches, some of them not so critically reviewed. Thus, it is important to point out that we do not mean by *resilience* the"teaching" of any special skill, so that subjects would have ecologically or psychologically "correct" attitudes. Rather, the theoretical perspective for resilience used throughout this research refers more to the inner capacity of our body system to manage the charge generated by high stress periods - including shock trauma related to disasters - possibly returning to its self-regulation, independently of the magnitude of the experience (Levine, 2012).

Resilience permits that our nervous system can slowly absorb or release intense energetic charge moved in our physiology at the moment of emergency - where it was necessary to preserve life as a whole. But it should also be considered that communities rarely have basic social, political and economic support, necessary to protect the group from shocks. Initiatives from local government and outside agencies,

together with the creation of public policies in support of community led initiatives and activities may well be of critical importance to the ability of a community to withstand and recover from social, psychological and economic downturn (Matthews, 2007). That was also registered on most of the research interviews. In addition, several interviewed participants discussed the "invisible subjects of at risk areas in Brazil" and the absence of social and housing public policies for the displaced and homeless subjects involved on an environmental disaster. The following item shows preliminary results of the field work, including important comments of the interviewed participants of the research.

PRELIMINARY RESULTS

During the field research, the interviewed professionals emphasised the lack of public policies in Brazil, related to social-environmental and psychosocial issues for the population exposed to environmental disasters. Also, lack of urban planning for population in a vulnerable situation enhances material and immaterial damages for the involved subjects. Thus, the consequences after floods and landslides are greater for economically and socially vulnerable subjects, especially in post-disaster situations. Environmental injustices (Acselrad, 2004) include exclusionary development policies, which reinforce the levels of inequality and marginalisation. Even in urban-industrial development areas, living and working poor conditions are still in evidence. In this item of discussion, questions related to environmental conflicts have become one of the most critical issues for environmental risk area residents. In that perspective, risk areas occupation in Brazil is strongly related to real estate expansion, not only in Rio de Janeiro state, but also in other Brazilian states.

According to Kowarick (1993), self-construction housing becomes the main alternative for some groups not only in less valuable land, but also in areas of greater environmental vulnerability. After the emergency critical stage of the disaster, those community groups face marginalization and an "*invisible condition of living"* (Interviewed participant S1, therapist). They are often stigmatised by the fact of living in environmental risk areas, without considering all the complexity involved in those social-economic contradictions, which involve "*choosing to live in this kind of habitation*"(S1). Homeless and displaced subjects should be considered with their feelings of rootlessness and deterritorialization (Haesbaert, 2001), which the losing or relocating of their residences brings to their new reality. It includes not only material, but also all the symbolic loss they have to face, making them vulnerable to a series of other associated risks.

It is also important to consider different types of vulnerabilities to different groups and communities, as vulnerability should also be related to social, political and economic systems and not only determined by environmental natural factors. McEntire (2001) considered variables, which interact to produce vulnerabilities, such as improper construction of buildings (physical vulnerability), marginalisation of specific groups (social vulnerability), dependency (cultural vulnerability), lacking support for disaster programmes (political vulnerability), sparse resources for disaster prevention, planning and management (economic vulnerability) and lack of structural mitigation devices (technological vulnerability). That turns the post disaster management even more complex, as the impact of a disaster is not the only highly stressful event in their lives - several of them already live experiences of hunger, domestic violence, drugs in the family, unhealthy housing, etc – which make them face simultaneous highly stressful situations, not only because of the referenced disasters, but also for a series of other traumatic experiences. Thus, it is advisable that strategies to cope with disaster may consider emergency therapeutic strategies (Souza et al., 2013) for a minimum spatial

orientation and emotional stability of the subjects involved. Only after that first therapeutic aide, local community subjects, who were exposed to high level stress, can possibly create a minimum internal space to take part in any proposed community environmental project. That approach involves recognition (Fraser, 2003) of their emotional needs together with the response for their immediate demands. They are out of their territory - not only the geographical one, but also their inner symbolic and affective territory is fragmented. Individual resilience is very connected to the perception of the inner resources they have developed throughout life and it includes all the voluntary work they developed with their neighbourhood during hard times.

One of the major challenges faced by some of the interviewed research participants was the arrival and the permanence of local residents in post disaster projects. While there is a fundamental and unarguable need for environmental engineering and geotechnical studies concerning structural questions of a disaster, it is also crucial to consider social, political and psychological references related to the residents reality. It is of extreme importance that disaster related discussions are considered together with concrete and symbolic reality of the community subjects involved. It is also relevant that methodological strategies include more active interaction with Civil Defence professionals, engineers, technicians, therapists, healthcare staff and social community leaders. More than only transmitting concepts or technical orientation for the subjects of at risk areas, we should include socio-educational interactions, which provide dialogue between the different actors involved (Mendonça, 2013). Besides, post disaster projects should not consider strategies dissociated from the reality of the referred subjects, listing only *"linear eco-friendly attitudes, without considering the real need of the involved subjects"* (Interviewed participant S4, Engineer and coordinator of social and educational projects).

Given that high stress levels can impose great limitations not only on the community, but also for the professional staff involved - covering not only physical, but emotional and relational aspects - recognition of their *resilience* may enlarge the presence of the subjects on their first territory: the body. In his studies about *resilience*, Cyrulnik (2006) interrelated concepts of biology, psychology and ethics and defined it as "the art of sailing through a storm". In case of loss, adversity and suffering, inevitable in certain moments of life, solidarity and affection of the community group can act as fundamental points for *resilience*. In that sense, it can bring a new point of reference for environmental risk area residents. A change of reference is needed from passive and excluded subjects, underestimating their capacity to respond to a highly stressful situation, to subjects capable of accessing their resources and coping strategies (Wisner et al., 2005) from their previous experiences and community history, as well. Thus, according to Berkes et al. (2006), a resilient group is capable of absorbing the disturbance and reorganizing itself by a learning inner process to adapt to change.

What was experienced by the group, at the moment of the crisis and its challenges, could similarly enhance the resilience of social ecological systems, making possible a better administration of the transformations provoked by the related environment. In addition, individual resilience is very connected to the perception of inner resources they have developed throughout life. That includes all the voluntary work they developed with their neighbourhood during hard times. Thus, psychologists, social workers, researchers and all the staff involved with at-risk communities may also learn through listening to their local experiences.

As mentioned before, emergency response teams should be involved in useful post-traumatic stress strategies (firemen, nurses, doctors, civil servants, social workers, voluntary groups, etc.). They also need help to come back to their jobs, after high stressful emergency work. Only after taking care of themselves, they are able to come back and work again with the victims, learning from their perceptions of the resources developed in past experiences. The quoted text below is an excerpt of one of the research´s interviews (S8) with a therapist, who is a specialist in highly stressful community works. He refers to the words of a community leader upon the arrival of his group of volunteers:

> "*Those communities don´t have only dramatic histories! They developed creative solutions with their own group experiences, individual and collective resilience. Their group references of local culture, rituals, symbols, values, music, arts (...). Social memories built by their own wisdom (...). The caregiver job is just to value and recognize all those backgrounds they already have, as a resource for stressful experiences. It is common that we listen to displaced and homeless groups: - If you are here to say that we are traumatized, go away! Also, if you are here to teach us to be dependent on a specialist, go away, because you usually come and leave us quickly. You are only welcome if you help us to take care of ourselves!*" (S8).

The words above reinforce the importance of participative projects and methodologies, which are not disconnected from the reality of the participants. Immediate response to those demands includes mainly the construction of new knowledge about their current critical situation and possible actions and strategic ways, involving social, environmental, economic, political, psychological e educational references.

CONCLUSION

Challenges related to at-risk residents or subjects exposed to environmental disasters – more specifically, those involving landslides and floods in Rio de Janeiro state, Brazil during the reference period – were not only material or economic issues to be considered, but also immaterial and subjective. In Brazil, public policies might be supportive not only to the emergency phase of a disaster, but also to post disaster issues and risk management questions. That would possibly reduce the challenges and the related repetition cycle faced in those vulnerable areas.

Sharing with the present work part of the PhD research discussions, performed at the Psychology Institute (Psychology/Sociology/Social Ecology Program) in *Universidade Federal do Rio de Janeiro, Brazil*, UFRJ, we aimed to broaden the discussions on the reference field. Interactions of social, environmental and psychological issues were focused, which involved not only the subjects, but also local communities and professionals related to risk and disasters areas.

Given the present situation of subject invisibility and the lack of knowledge and recognition of actions related to the theme in Brazil, during post disaster phases, complex discussions were taken into consideration, including factors that lead subjects to live in risk areas and related vulnerability issues. Concepts from different scientific areas were presented, aiming a more integrated understanding about the theme. In addition, the work indicated several possible ways of leading with one of the most challenging issues faced nowadays: environmental disasters.

It is our hope that those brief interdisciplinary discussions may motivate new academic researches and possible new social action projects with at risk residents in Brazil.

Finally, that research possibly provides relevant reference material for the creation and improvement of public policies related to disasters matters in Brazil.

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Paper 13: Flood risk governance towards resilient communities: opportunities within the implementation of the Floods Directive in Portugal

Pedro Pinto dos Santos[1], Eusébio Reis[2]and Alexandre Oliveira Tavares[3]

[1]*University of Lisbon and University of Coimbra, Portugal, email: pmpsantos@campus.ul.pt*
[2]*University of Lisbon, Portugal, email: eusebioreis@campus.ul.pt*
[3]*University of Coimbra, Portugal, email: atavares@ci.uc.pt*

ABSTRACT

Flood risk governance is undergoing a step forward with the implementation of the Floods Directive, which extends to all EU member States a standardized approach to assess and manage flood risks, with a strong focus on public participation. This normative document constitutes a considerable development in terms of flood risk policy in Portugal, which should be fully taken as a tool of resilience building.Resilience, however, is a very complex concept which involves the capacity of communities to prepare, adapt and respond to disasters. Whatever the nature of these changes, resilience is present in any risk governance process. After a brief discussion on what practices and policies make a flood resilient community, the goals and methodologies expressed in the Floods Directive, and its Portuguese transposition, are analyzed in the way they contribute or conflict to the goal of achieving more flood resilient communities. A reflexion is made about the consideration of resilience in three important issues of the directive: the risk assessment phase, which culminates in flood risk maps, the management phase to be conducted upon flood risk management plans, and the participation and communication which should be present in all of them.

Keywords: Floods Directive, resilience, risk assessment, risk management, community participation.

INTRODUCTION

Based on the EM-DAT database from 1980 to 2007, estimations are that climate-related disasters will affect[4] about 375 million people in 2015 (Ganeshan & Diamond 2009). In 2012, floods alone were responsible worldwide for 53% of the 139 million people affected by natural disasters, and for an estimated damage of US$ 25.6 billion from a total of US$ 157.5 billions (CRED 2014). Floods, like other natural hazards, are unavoidable but their impacts can be considerably lessened which motivates stakeholders and communities to be more preventive than reactive (Alexander 2012). In general terms, independently of the nature and type of risk - whether natural, social or technological – a preventive *ex-ante* approach is favoured by several factors such as a heightened awareness and acceptance of risk. This is applicable to FRG in Europe where climate change models predict an aggravation of meteorological risks such as floods and storms (Birkmann & von Teichman 2010). The estimated number of affected people shows an increasing trend and decision-makers are realizing that reducing vulnerability is preferable to emergency response (Alexander 2012). A reduction of vulnerability constitutes in fact a condition for increasing resilience. In a broader sense, if a risk governance process doesn't address the social and environmental problems that characterize a given community, then it might fail in developing greater flood resilience. Resilience levels do become evident after a shock

[4]To be affected means to require immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance (CRED 2014).

(Figure 1) but this capacity of dealing and recovering from impacts requires a well-developed and executed risk policy that privileges an *ex ante* disaster approach. In fact, the initial condition of a community is something that is built before the hazard event.

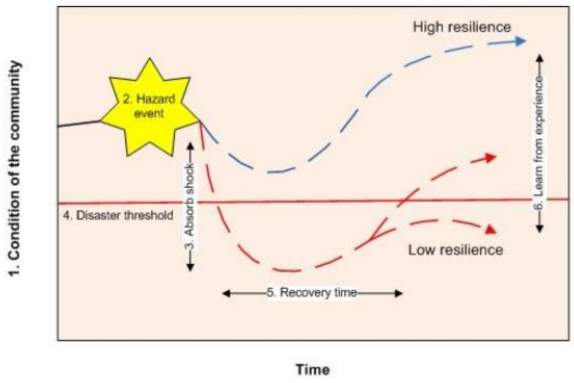

Figure 1 The importance of community resilience in determining the recovery time to a hazard event (Haigh 2010)

The Floods Directive (EU 2007) provides a framework for addressing flooding across Europe. Assuming knowledge, organisation and communication as key resources in risk management (Fothergill, cited in Alexander 2012), this essay attempts to contribute to debates on the role of the Floods Directive and its transposition into the Portuguese legislation, in terms of building more resilient communities. The analysis will be divided in the assessment, management, communication and participation spheres, as they are approached in these two documents.

FLOOD RESILIENT COMMUNITIES

The definition of resilience adopted by the United Nations International Strategy for Disaster Reduction (UNISDR) states that resilience is "the capacity of a system, community orsociety potentially exposed to hazards toadapt, by resisting or changing in order toreach and maintain an acceptable level of functioning and structure" (UN 2005, p. 4).The UNISDR stresses that this capacity is a function of the"degree to which thesocial system is capable of organizing itselfto increase its capacity for learning frompast disasters for better future protectionand to improve risk reduction measures" (UN 2005, p. 4). This concept is wide spread but is not the unique and some authors discuss the readiness for operational use of the different concepts (Gallopin 2006; Klein, Nicholls & Thomalla 2003).

Regarding urban resilience in particular, The World Bank (WB 2013, p. 7) presents a definition similar to the UNISDR, stressing the capability "to prepare for and respond to the risks and impacts". This WB report on the investments of the institution in partner countries regarding disaster risk management and climate change adaptation points out the measures that are part of resilience building: (1) soft measures such as land use and urban planning, community awareness and preparedness, monitoring of hazards and risks, early warning systems, emergency and evacuation plans; (2) hard measures such as retrofitting of critical infrastructure, adapting buildings and urban spaces, managing retreats and relocation and maximization of eco-systems services.

The campaign "Making Cities Resilient" (UN 2014) identifies the characteristics of resilient communities: ability to avoid disasters by improvement of infrastructures, services and building codes; ability to anticipate disaster and protect assets; local government engagement in sustainable urbanization and community participation;

adequate understanding of risks both by local authorities and communities; public participation in the decision-making process, and the local knowledge is valued. As stated by Manyena (2006), it seems consensual that in order to adapt to adverse circumstances, a disaster resilience programme will have to aim at enhancing not only the assets and resources, as well as the understanding about the communities' culture, particularly its "non-essential attributes" (Manyena 2006, p. 439), i.e., those that the community is willing to change in order to adapt and survive.Similarly to other natural hazards – earthquakes, for example – floods can generate disastrous direct and indirect effects whose severity can be even more serious than the direct flooding itself (Messner & Meyer 2006). This fact implies largely that a resilient community to flooding must ideally be a resilient community to hazards in general. Nevertheless, specific characteristics of flood resilience can be found and pursued. In the flood management cycle Schelfaut et al. (2011) highlight that the association of knowledge and awareness is the basis of a flood resilient community.

Community-level flood protection schemes like storage basins, raised river embankments, coastal defences, maintained river channels, floodwalls and barriers can be a first line of hard defence against flooding (Ingirige & Amaratunga 2013), although they intervene more on the flood hazard than on the flood vulnerability dimension. Ingirige and Amaratunga (2013) describe findings from research projects in UK and Bangladesh where non-structural measures for improving flood resilience are pointed out, namely insurance and early warning. Parker, Tunstall & McCarthy (2007) alert for technical, social and institutional aspects that must be accounted for in order to make early warning effective and inclusive of lower social grades. Both studies point out the need for multi-sector and multi-level approaches, for example, in allowing the contingency of socioeconomic routines and by involving non-civil protection actors to assure the effectiveness of evacuation and emergency response operations. Capacity building is also assumed as a critical factor in flood resilience (Ingirige & Amaratunga 2013) – the success of non-structural measures in addressing flood resilience depend on high levels of capacity building because they require multi-stakeholder communication at different geographical scales and decision levels (Schelfaut et al. 2011) along with enhancing perception and risk communication, early warning systems and management plans.

In this brief contribution, it seems clear that flood resilient communities are those supported by FRG policies which assume multi-scale, multi-stakeholder and transdisciplinary approaches as premises for assessing both "constructivist" and "realist" visions of risk (Klinke & Renn 2002). Only upon this wide basis of knowledge, perceptions and inclusion can risk management be effectively conducted.

BUILDING RESILIENCE WITHIN THE FLOODS DIRECTIVE FRAMEWORK

The European Union Directive 2007/60/EC on the assessment and management of flood risks (the Floods Directive) is establishing a new framework for the reduction of their adverse consequences in human health, environment, cultural heritage and economic activity. The framework is organized sequentially in three phases: preliminary flood risk assessment, flood hazard and flood risk mapping and flood risk management. Each phase is subject to a review and update process every six years. The Portuguese transposition of the directive was performed by the Decree-Law 115/2010 of 22 October 2010 (DL 115/2010). FRG was never before performed with such specificity in the Portuguese context making relevant to analyse how the proposed framework deals with the complexity, uncertainty and ambiguity inherent to flood risk,

and how risk-based, precaution-based and discourse-basedmanagement models are considered (Klinke & Renn, 2002). Portuguese literature on this subject is very scarce. The Floods Directive itself is only on its first stages of implementation, this means, flood risk mapping is not yet concluded. Figueiredo et al. (2009) studied flood risk social perception and its degree of incorporation into management mechanisms and found that the "overriding tendency is to underestimate the contribution of social actors in light of technical and scientific views" (p. 597).

The assessment sphere of flood risk governance

Within this sphere the potential to build resilience in a given territory and community lies highly is the last part of the resilience definition provided by the UNISDR, highlighting the importance of "learning from past disasters for better future protection". The absorption capacity mentioned in Figure 1relies also in better knowledge of the flooding historical records and processes, better awareness of potential flood losses and vulnerability and its integration into decision-making.

The preliminary flood risk assessment foreseen in the Floods Directive, and already concluded by the Portuguese government, assumes a precautious attitude by considering "potential risks", i.e., not only areas where flood damages have occurred in the past may be considered, but also areas where flood damages are currently unknown but may potentially occur. Methodologies which categorize the susceptibility of a basin's stream network to flooding (e.g. Reis 2011) as well as geomorphologic analysis play an important role in the identification of such areas. Upon identifying these areas, flood hazard maps are produced for three probability scenarios: low, medium (likely return period $\geq$ 100 years) and high probability. Flood hazard can be assessed through a diversified set of methodologies from which the most used are those based on historical, geomorphologic, hydrological and hydraulic techniques (Díez-Herrero, Laín-Huerta & Llorente-Isidro 2008). What seems to be clear is that a reduction in uncertainty about flood extents and probabilities is achievable when the different approaches are used complementarily to each other (cf. good examples in Benito & Hudson 2010). A positive aspect is the fact that no methodology for hazard mapping is disregarded or made preferable. Santos, Tavares & Andrade (2011) exemplify benefits of using different flood hazard mapping methodologies complementarily, such as a better understanding of the flood processes, with hydrologic and hydraulic methodologies presenting advantages in modelling recent or future changes in the basin and floodplain, while geomorphologic methodologies are advantageous in reliability about longer term planning because they are based in past flooding evidences.

Regarding the vulnerability assessment, the DL 115/2010 details a bit further what is mentioned in the Floods Directive. Both say that risk maps must list the potential adverse consequences associated with the three probability scenarios and identify (i) the indicative number of potentially affected people, (ii) the critical buildings and (iii) the economic activities potentially affected, particularly the critical infrastructures. These items refer exclusively to the identification, by overlay, of exposed elements. The Portuguese transposition only discriminates with more detail these elements, such as contaminant sources, hazardous substances, protected natural areas, lifelines, cultural heritage and areas where a significant solid and debris flow can be expected. A more detailed assessment of social, physical and economic vulnerability would be advisable. Regarding this insufficiency, methodological and conceptual constraints can be found that maintain a technocratic approach in flood risk policy (Jeffers, 2013). The first ones include an excess of confidence in the ability to quantify physical exposure

and the unfamiliarity with vulnerability assessment methods – and its applicability to public policy (Mustafa et al., 2010). Conceptual constraints derive from a biased understanding of flood risk and its causes, which assumes that losses can be eliminated by preventing the flood itself (Jeffers, 2013).

In the Portuguese context, vulnerability assessments are not abundant and the public tendering procedure for the elaboration of flood risk maps prioritizes a quantitative analysis of exposed elements, not vulnerability, of four types: human damages, expressed in terms of affected people; cultural heritage damages; economic damages, calculated in function of land use classes; and environmental damages, based on the presence of the critical and sensitive elements mentioned above. A thorough "understanding of exposure to the hazard, characteristics andpatterns of vulnerability, and the relationshipbetween different stakeholders in the perception offlood risk" (Brown & Damery 2002:424) was presented as valid for the UK, and could be valid for Portugal in the basis for a broader and long-term perspective of FRG.

The management sphere of flood risk governance

Flood risk is under the competency of the Environment Portuguese Agency (APA) as the national water authority. The DL 115/2010 creates a National Commission for Flood Risk Management (CNGRI) in which the APA, the civil protection authority, the cartographic institute and municipalities are represented. In terms of implementation, in February this year, the APA has launched the public tendering procedure for the elaboration of risk flood maps, to be concluded in 5 months but no decision about the winner/s was yet taken. This can constitute a delay in the design and implementation of flood risk management plans (FRMP). According to the directive, FRMP's will be designed for management units where potential risks were previously identified and mapped. Scale of FRMP is an important issue because it implies decisions regarding resource allocation, type and number of involved public and private stakeholders, and strategies of community participation. In Portugal, risk management is essentially based in municipal plans although top-down logic prevails in the policy making and distribution of resources (Tavares & Mendes 2010). Such approach results in lack of attention to local specificities, exemplified by municipalities where flood risk management privileges the main water courses against the flash and urban floods that occur in smaller streams, but whose impact is also relevant due to its frequency, unpredictability, human and material losses. As it was demonstrated in Sultana, Thompson & Green (2008) research, an institutional building following a bottom-up approach, i.e., from the settlement to the catchment scale, might allow a better achievement of the Floods Directive objectives.

From a sector and actors' perspective, the Floods Directive states that FRMP's must consider aspects such as"(...) costs and benefits, flood extent and floodconveyance routes and areas which have the potential toretain flood water, such as natural floodplains, the environmental objectives of Article 4 of Directive 2000/60/EC, soiland water management, spatial planning, land use, natureconservation, navigation and port infrastructure" (cf. Article 7(3)). Such articulation is resumed for the Portuguese context in Figure 2. Inside the Portuguese legal framework for spatial planning, FRMP's are classified as sector plans (cf. Article 12 of DL 115/2010). With this status, they must be in accordance with the top management instrument, the National Program for the Spatial Planning Policies (PNPOT), from which FRMP's receive primary guidance and with regional plans for spatial planning (PROT).

Hydrographical Basin Plans (PBH), some of them under revision, must be in "close articulation" with FRMP, and their chapters on flood risk assessment must "respect the criteria and goals" of the DL115/2010. Regarding local and special spatial planning instruments (PMOT and PEOT), they must adapt to the content and guidelines in vigor under FRMP's. This is also applicable to the Ecological National Reserve (REN), a special legal figure to protect ecological values at the national scale, which must be altered in function of what is established in FRMP's. The preamble of the DL 115/2010 says that FRMP's must "take into account the characteristics of the zones to which they refer and predict specific solutions for each case" as well as consider what is disposed in the emergency planning instruments (PEPC). The Article 12(3) clarifies that PEPC shall "warranty the due compatibility with FRMP's" so the relation is two-sided. Finally, the dispositions of the DL 115/2010 don't prejudice the dispositions of the DL 364/98 – this decree-law obliges municipalities with historical records of flooding in urban areas to elaborate flood hazard maps with the objective of defining restrictive land uses. The revocation of the DL 364/98 is not foreseen, although it could be – particularly after the completion of the FRMP's – for the following reasons: the flooded areas delineated upon the DL 364/98 will naturally be included in the Floods Directive preliminary assessment, and consequentially, in FRMP's; not revoking will create duplication and/or contradictions between risk management measures defined in both documents; risk classifications and assessment methodologies may not concord in several situations raising ambiguous interpretations of the same realities.

The introduction of the concept of "deliberate over-flooding" is foreseen in the Floods Directive which is an innovative measure in the Portuguese context, although experiences already exist in some European countries (Erdlenbruch et al. 2009). Deliberate over-flooding consists in deliberately causing flooding in upstream areas – for example, deriving flow to natural storage areas – in order to reduce and delay the peak flow in downstream areas. This practice allows transfer risk from areas downstream (e.g. urban settlements) to less vulnerable areas upstream. Financial compensatory measures can be defined to make this practice appealing to over-flooded areas. If well designed and implemented – technically, socially and financially – this practice can become an important measure in increasing flood resilience.

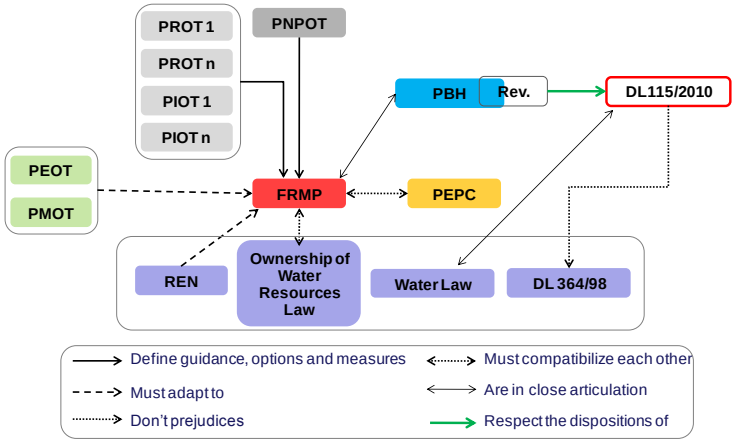

Figure 2 Articulation of the FRMP according to the Portuguese transposition of the Floods Directive.

More clearly than the Floods Directive (cf. Article 7(3)), the Portuguese transposition privileges the option for non-structural measures of risk reduction in FRMP's. Integration of flood risk management with other sector planning instruments is one of the possible ways to pursue this preference, taking advantage of the potential synergies.

It is therefore positive that the Floods Directive refers the need of integrating strategies with the Directive 2000/60/EC (Water Framework Directive) and with spatial planning instruments. The methodological findings of research projects such as the STAR-FLOOD (Hegger et al. 2013) and the CRUE-ERAnet (e.g. Jobstl et al. 2011) in what concerns the selection, monitoring and evaluation of flood risk structural and non-structural measures can provide useful insights for FRMP's.

The Portuguese context of flood risk management may present differences from that of other European regions. The separation between water and people that is observed in some European countries caused by heavy structural measures (e.g. Kelman & Rauken, 2012 and Jeffers, 2011) has not occurred in Portugal. The countries studied in the STAR-FLOOD project present, until recently, a technologically oriented approach to flood management (Hegger et al. 2013) while this may not be the case in Portugal, or at least with the same magnitude. In fact, dams and stream channelization do exist in a few basins but a comparison of their role and the role of non-structural measures in reducing flood damages – particularly spatial planning – are still to be thoroughly assessed. The two opinions on FRMP's that municipal authorities present in Germany (Heintz, Hagemeier-Klose & Wagner 2012) – one holistic, which combines structural and non-structural measures upon a risk governance approach, and another which maintains a focus on local, short-term solutions marked by a security approach – are also present in Portugal, perhaps more evident about coastal than fluvial floods. Regarding this later type of floods, although the lack of research in this area, it seems plausible to think that the role of local administrators in the fields of spatial planning and civil protection, along with the scarcity of financial resources for structural defenses, can justify the minor relevance of structural solutions in Portugal.

Participation and communication in the Floods Directive

If the process of gathering knowledge about flood risk was conducted with participation of stakeholders and communities, its management should also be carried out in a participatory way. This aspect is given top relevance in the Portuguese transposition of the Floods Directive, where Article 14(2) elaborates that FRMP's elaboration, re-assessment and updating must be conducted with the "active participation of all interested parts". It is, therefore, pertinent to envisage how this participation can be planned and put to practice with the public and private sector.

The model of cooperative discourse (Aven & Renn 2010) has the advantage of incorporating several mechanisms of participation and encouraging mutual learning. It is marked by great versatility in coping with the plurality of knowledge and values at stake in FRG, namely, the proposal of different participation tools according to the type of risk. When risks are marked with high complexity, epistemic tools are more adequate in order to deal with scientific and technical expertise. Examples of tools consist in expert auditions or Delphi and Group Delphi dynamics. When risks are marked with high uncertainty – equity and sharing of costs and benefits are in discussion – reflective discourse instruments such as stakeholders' auditions, round tables, and mediation and arbitration dialogues are suggested. When ambiguity is prevalent in decision-making – values, social or moral justification are in discussion - a participatory discourse is present, and the adequate instruments of participation include citizen panels or juries, public consensus conferences or citizen actions groups. If one looks, for example, at the "deliberate over-flooding" practice, it's easily recognizable the relevance in applying all of the three types of discourses given the technical-scientific complexity, potential conflicts of interest and values at stake (cultural, ecological, etc.).

Risk communication is an important part of community involvement. Effective risk communication promotes a risk culture and leads to greater opening and easiness in reaching agreements on management strategies. Risk communication should be tailored to the specific needs of the population, giving each individual the opportunity to judge for them the level of risk which he/she is facing and to make his/her own decisions on the measures of protection and preparedness (Kellens et al. 2009). Maps, as communication tools, play a crucial role in flood risk communication. The three flood probability scenarios foreseen in Article 7 of DL 115/2010 shall be clearly explained, particularly, given the difficulty in conceptualizing the low probability and highly burdensome flood events (Keller , Siegrist & Gutscher 2006), for which the conceptual model of risk map developed under the RISKCATCH project (Spachinger et al. 2008) could be useful. FRMP's shall ponder other communication tools such as WebGIS and their ability to include real time data and population warnings. The creation of a national flood early warning system (cf. Article 11 of DL 115/2010) is a positive aspect of the transposition. The system already existed and provides real time data on rain, flow and dam level in the main Portuguese basins.

CONCLUSIONS

The presented essay argues that the process of building flood resilience begins with the capacity of generating better knowledge about the hazard itself and its consequences upon vulnerable communities. The increase in the capacity of systems to prepare, adapt and respond to hazards starts with a thorough assessment of flood risk and knowledge transfer, as basis for an efficient management. Building resilience specifically to flood risk contributes to a general improvement of resilience to other risks. The transposition of the Floods Directive into Portugal resulted in a robust document in its goals and potential lines of action, and consequently, with a range to decisively contribute to reduce flood losses. Nevertheless, some issues still need to be further studied: participative models in the several phases of the FRMP; financing mechanisms; articulation with other sector planning instruments; and goals and methodologies for performing cost-benefit analysis and monitoring.

An important aspect of community's participation in the process of risk management consists in finding a balance between an essentially sociological view and a vision focused in the physical processes of the hazard – summarized by Klinke & Renn (2002) as "realism" versus "constructivism". As to FRG, it is assumed that the dynamic nature of the risk requires an equally dynamic strategy of management. The elaboration of FRMP should incorporate this principle, focusing on both bio geophysical and socioeconomic specificities of the different hydrographic management units. Methodologies for assessing risk tolerability and regulatory strategies as ALARA ("as low as reasonably achievable") or BACT ("best available control technology") may be beneficial. Methodologies for evaluating resilience (Cutter, Burton & Emrich 2010) could also be included. Dealing with the biophysical and engineering aspects of flooding and the institutional and social landscape of risk management is perhaps one of the greatest challenges to the best application of the Directive. The Floods Directive assumes a simple but relevant step forward in FRG – the assumption that floods are "natural phenomena which cannot be prevented" (EU 2007: preamble (2)), but their impacts can be reduced and mitigated, and their aftermath better overcome. Considering its goals and provisions, the Floods Directive is capable of contributing to build more resilient communities.

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Paper 14: Community Engagement for Disaster Resilience: Flood Risk Management in Jakarta, Indonesia

Tri MulyaniSunarharum[1], Mellini Sloan[2], and Connie Susilawati[3]

[1]*Queensland University of Technology, Australia; email: trimulyani.sunarharum@student.qut.edu.au*
[2]*Queensland University of Technology, Australia; email: mellini.sloan@qut.edu.au*
[3]*Queensland University of Technology, Australia; email: c.susilawati@qut.edu.au*

ABSTRACT

Understanding dynamics of interactions between community groups and government agencies is crucial to improve community resilience for flood risk reduction through effective community engagement strategies.Overall, a variety of approaches are available, however they are limited in their application. Based on research of a case study in Kampung Melayu Village in Jakarta, further complexity in engaging community emerges in planning policy which requires the relocation of households living in floodplains. This complexity arises in decision-making processes due to barriers to communication. This obstacle highlights the need for a simplified approach for an effective flood risk management which will be further explored in this paper. Qualitative analyses will be undertaken following semi-structured interviewsconducted with key actors within government agencies, non-governmental organisations (NGOs), and representatives of communities. The analyses involve investigation of barriers and constraints on community engagement in flood risk management, particularly relevant to collaboration mechanism, perception of risk, and technical literacy to flood risk. These analyses result in potential redirection of community consultation strategies to lead to a more effective collaboration among stakeholders in the decision-making processes. As a result, greater effectiveness in plan implementation of flood risk management potentially improves disaster resilience in the future.

Keywords: community resilience, decision-making processes, flood risk management, relocation, community engagement.

INTRODUCTION

There is an increasing intensity of disasters globally, particularly in East Asia-Pacific region (Jha and Stanton-Geddes, 2013). Cities in the region, whichare growing rapidly, are becoming increasingly vulnerable to disasters, one example is Jakarta. Urbanisation in Jakarta increases the demand for land use while the land availability is limited. This obstacle led to the emergence of informal development in flood-prone areas with high exposure offlood risk, for instance, residential area in the Ciliwung River banks, inhabited by low-income or poor people.

Consequently, adaptation strategies to cope with flooding plays a crucial role in managing flood risk, such as relocation. Relocation is perceived and considered to be the best option to reduce vulnerability to the risk of disaster, especially relevant to the vulnerability of informal settlements in areas with high exposure to flood risk(World Bank, 2004; World Bank, 2010). However, this strategy poses enormous challenge in decision-making of the design process and implementation. Community engagement in decision-making of this strategy is complicated by barriers to communication, including: characteristics inherent to top down governance; technical literacy of affected populations relative to flood risk (Faulkner, et al., 2007; World Bank, 2011c; Dickson et al., 2012); and potential disconnects between perceptions and desires within government institutions and the communities (World Bank, 2011b; EMQ, 2012).

Consultations with communities living in flood-plains occurs primarily top-down, from government to the communities. In the absence of effective consultation, communities may not cooperate in the relocation, or may end up with reduced resilience as a consequence of severing of social networks necessary especially during disasters.

Communication and coordination between government institutions and communities is crucial to ensure the effectiveness of flood risk management policies and programs and increase community resilience (Faulkner, et al., 2007; Katsuhama and Grigg, 2010; Jha and Stanton-Geddes, 2013). Unidirectional consultation strategies, with information flowing only from government and NGOs to the community, exclude local knowledge of conditions and community needs, and inadvertently decrease the effectiveness of design and implementation of flood risk management. This research empirically investigates barriers and constraints to increasing the effectiveness and efficiency of flood risk management by engaging in dialogues with government and NGOs as well as community groups. This research has practical relevance to improve the community resilience relevant to Jakarta flood risk management. It will also contribute to collaborative planning theory, expanding on understandings of power sharing in plan development and implementation.

The Case Study

Administratively, Jakarta exists not as a city but as a province with special status as the capital of Indonesia, named as Daerah Khusus Ibukota (DKI) which means a Special Capital Region. Jakarta is located in a deltaic plain of thirteen natural rivers and more than 1,400 km of man-made waterways (BPBD DKI Jakarta, 2013). As mentioned before, Jakarta is challenged by urbanisation and is increasingly vulnerable to disaster, especially flooding. This dilemma is exemplified by flooding in 2013 and flooding in 2014 which lasts longer than the previous year (BPBD DKI Jakarta, 2014).

Jakarta's chronic housing shortage poses multiple challenges for contemporary policy-makers (Sunarharum et al., 2013) and leads to the occurrence of informalsettlements along Ciliwung River bank. Kampung Melayu Village, as a case study, is one of the villages located in flood-prone area in Ciliwung River bank. In 2014 flooding, Kampung Melayu Village is one of the most affected areas in which the water level reached two to five meters high and there are 10,000 affected, which is 15% of the total affected people in Jakartapeople (BPBD DKI Jakarta, 2014). This significant flooding event is frequently forcing evacuation of portions of the community. Bambang Surya Putra, Informatics Section Head of Jakarta Province Disaster Management Agency (personal communication, 13 January 2014) confirmed that Jakarta flooding is as a result of accumulation of water run-off from upstream region. The accumulated water run-off has complicated the capacity of the drainage channels and the rivers, including Ciliwung River as the main river.

In response to flooding events, Ciliwung–CisadaneRiver Basin Agency (BBWS-CC), under Ministry of Public Works Indonesia, proposed and designed the normalisation of Ciliwung River to optimalize the Ciliwung River's function in managing flooding based on the river capacity for is an extreme flow event with a hundred year return period, called Q_{100} (BBWS-CC, 2013). This normalisation plan requires river widening, including 50 meters of river's wide and 7.5 meters of inspection pathways' wide in both sides of the river (BBWS-CC, 2013). Also, Government of DKI Jakarta would strictly implement regulation of Indonesian Government Number 38 year 2011, stating that 15 meters delineation from both sides of the river is served as buffer areas between the river ecosystems with mainland, which does not allow any development on it. Increasingly, the implementation of Ciliwung River normalisation plan and clearance

of 15 meters radius from both sides of the river is followed by relocation of communities living in the Ciliwung river banks, including communities living in the Kampung Melayu Village.

The normalisation plan affects 4,000 families (Suryanis, 2014) living in Kampung Melayu Village. The affected populations will be relocated into low strata title housing called *Rusun* Komarudin, in Penggilingan Village, East Jakarta- 15 kilometres far from Kampung Melayu Village as their origin. The condition and environment of *Rusun* Komarudin are very different from Kampung Melayu Village. *Rusun* Komarudin is a complex of six towers simple apartment - each of towers consists of 100 units, whereas Kampung Melayu Village is a 0.48 km^2 residential area with 30,181 populations (BPS-Jakarta, 2012). Comparing to *Rusun* Komarudin, Kampung Melayu Village is much closer to the centre of Jakarta as well as to public services, including Kampung Melayu Market and Kampung Melayu Terminal, which give job opportunities for many of Kampung Melayu residents. Bambang Surya Putra, Informatics Section Head of Jakarta Province Disaster Management Agency (personal communication, 13 January 2014) confirmed thatthe value of this area has made Kampung Melayu residents difficult to move, considering the proximity to their job.

In brief, rehabilitating infrastructure amongst informal settlements with histories of controversial evictions and resettlement practices highlight the challenges to engage the powerless communities, poor people who are impacted by the Ciliwung River normalisation plan, in the decision-making processes.

Conceptual Framework of Collaborative Planning and Community Engagement for Disaster Resilience

A collaborative approach to planning was earlier introduced by Godschalk and Mills then was evolved by some other authors. Godschalk and Mills (1966) are suggesting planning process to involve collaborative process, to focus on land use and human activities, and to stress on two way communications between community and planners. To further clarity, collaborative planning is an interactive process of consensus building, plan development, and implementation (Margerum, 2002) as a way to build networks and to improve the knowledge transfer among stakeholders (Innes and Booher, 2000). Wherein, Healey (2006) expands the involvement of not only process of consensus building, but also the inclusion of mechanisms of governance in collaborative planning.

Community engagement is the critical element of a collaborative approach to decision-making process (Innes and Booher, 1999), to know the extent to the power sharing will happen (Arnstein, 1969), to accommodate the desires of the stakeholders and the decision-makers. In the collaborative planning, community engagement might be viewed as an authentic dialogue between stakeholders which leads to reciprocity, relationship building, mutual learning (Innes and Booher, 1999), and consensus building (Healey, 2006; Margerum, 2002). In the context of Indonesia, collaborative planning conceptualizes participation from local government's perspectives as well as local communities' perspectives (Beard, 2002). The urban political-administrative structure determines the collaborative interaction involving local people and establishing governing mechanism in planning at the community level.

Decision-making in many infrastructure settings relevant to flooding is often a long and complicated process. This process will likely include political trade-offs and stakeholder consultations (Herder, et al., 2011). Conflicts may arise as flood risk

management involves multiple stakeholders and multiple objectives (World Bank, 2006; Faulkner, et al., 2007; Kubal, et al., 2009). In this case, integrating information about risk into decision-making processesmight increase the visibility of options for flood risk management.Integrating risk and uncertainty into planning decisions is an approach to reduce this obstacle, by believing two factors need to be taken into account, including: (1) describing the decision-making environment where uncertainties are involved; and (2) examining constraints in the implementation of planning decisions (Herder, et al., 2011).

On one hand, stakeholder engagement is fundamental throughout the disaster management planning process. Perceptions of stakeholders about risk may vary because of differences in values, needs, assumptions, concepts and concerns (EMQ, 2012). These perceptions might influence the decision so that it is important to involve all stakeholders to establish the same understanding about the problem. While governments need to identify whether their investments are suitable to achieve their goals, at-risk populations need to understand whether living in flood plain is unfavourable for them (World Bank, 2004; World Bank, 2010; Dickson, et al., 2012).Flood risk management requires a consideration of the community context to achieve a clear understanding of the relevant specific area. This requirement highlights that engaging the community in flood planning is crucial, enabling communities to directly contribute to the production and dissemination of risk information (Heywood, 2011; EMQ, 2012).

In summary, effective community engagement is complex and requires a long-term commitment to build and maintain relationships with the community and stakeholders at different levels. At a practical level, community engagement means maintaining dialogue while collaboration means working in partnership with the community. Collaborative planning identifies and supports the development of local community and empowering them to exercise choice and take responsibility. This concept requires decision makers to recognize the fundamental philosophy of power sharing in building community resilience in planning.

METHODS

Case study method enables this research to explore and explain the relationship between government institution's and communities' understanding of flood risk management. The detailed case study involves semi-structured interviews as a primary data collection to address research questions and lead to develop the analysis.Thissemi-structured interviews help to shape a better understanding of barriers and constraints to effective flood risk management decision-making, and to potentially offer advice to improve the processes.Interviews were conducted with representatives from governmental agencies, based on their key roles in developing planning flood risk reduction and disaster mitigation and response programs in the province of Jakarta, Indonesia. There are three governmental agencies involved, they are National Development Agency (BAPPENAS), Jakarta Province Disaster Management Agency (BPBD DKI Jakarta), and Ciliwung – CisadaneRiver Basin Agency (BBWS-CC).

Interviews were limited to individuals working at national and provincial levels of governance and aid. Interviews were conducted with a single individual or with a group of individuals from the same agency depending on scheduling availability. Also, interviews were conducted with representatives of NGOs working more directly with communities (generally below the province level) as well as local leaders of Kampung Melayu Village and subsequent sub-villages. The researcher has identified initial

contacts to begin the snowballing technique by drawing on an extensive network of industry and NGO contacts.

RESULTS AND DISCUSSIONS

Collaboration Mechanism for Disaster Risk Management in Jakarta

Achieving urban resilience requires engaging the capacities of social agents to understand and act upon the urban systems through interactive cycles of understanding vulnerability and building resilience (Katsuhama and Grigg, 2010; Jha and Stanton-Geddes, 2013). Engaging with community groups and NGOs to provide necessary inputs to disaster risk management efforts has importance in identifying and acting on risk and vulnerability (Jha, et al., 2012). The law Number 24 Year 2007 of Indonesia, on Disaster Management, provides an opportunity for various stakeholders to actively participate in disaster management including the international organizations and foreign NGOs (Center for Excellence, 2011).

With regard to disaster risk management, DKI Jakarta involves collaboration between communities, governments and governmental agencies. A direct mandatory occurs from the highest level governance to the lower level. Coordination occurs within each level of governance's departments/agencies, led at the national level by the National Disaster Management Agency, and by disaster management boards provincial and district levels. Jha and Stanton-Geddes (2013) emphasize that it is crucial to strengthen coordination across different level of authority and the communities to use and develop risk information. The collaboration mechanism of Jakartadisaster risk reduction, shown by Figure 1, involves combination of top-down and bottom-up coordination which allows government agencies and the disaster management board on each level to coordinate with the lower level of authorities, while feed-back and information from community level goes up into the higher level of governance. Communication exists between the communities of DKI Jakarta and various levels of governance, but power is not shared in a bottom-up manner.

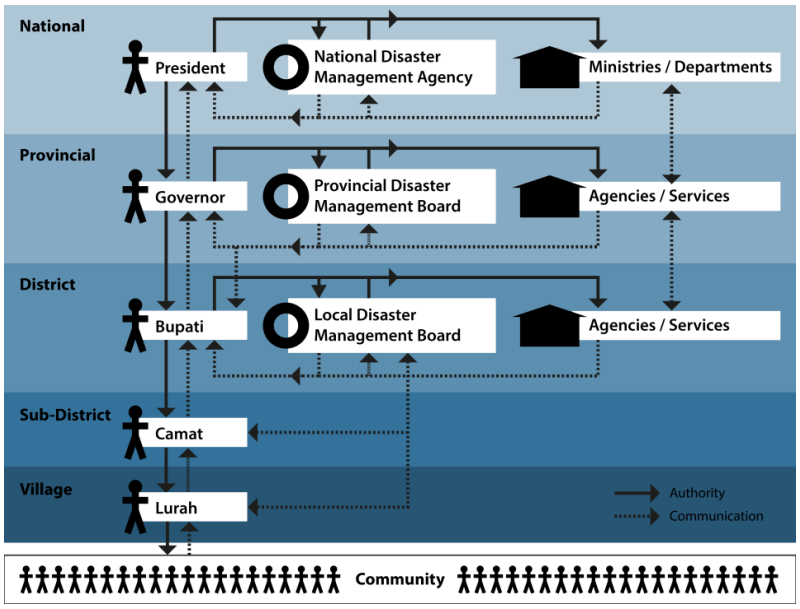

Figure 1 Collaboration Mechanism of Jakarta Disaster Risk Reduction

(Sunarharum, et al., in Press)

In brief, strengthening institutional coordination and capacity building on disaster risk management across sectors and decision-makers in all levels of government is a priority for the region. Jha and colleagues (2012) emphasized that building on existing community-based interventions and social protection systems provides an opportunity for countries to achieve significant outreach of disaster risk management programs at the community and household levels and to reduce the socioeconomic impacts of disasters that disproportionately affect the most vulnerable segments of society.

Different Perception of Flood Risk Challenges the Collaborative Approach

There are reasons why people with marginal incomes lives in disaster-prone sites, including: because they cannot afford to live elsewhere, because they prefer affordable housing in close proximity to livelihood opportunities (World Bank, 2004; World Bank, 2010; Dickson, et al., 2012). Bambang Surya Putra, Informatics Section Head of Jakarta Province Disaster Management Agency (personal communication, 13 January 2014) confirmed that communities living in Kampung Melayu Village are classified as poor that they can only afford to live very close to the river and also close to the traditional market as their workplace.

In the case of Jakarta Flooding, communities perceive flooding as a normal reality and a part of their daily life while the governments perceive it as a crucial disaster that has to be resolved as soon as possible. Flooding is such a common phenomenon for communities living in flood-prone areas. They have been living in at-risk areas, very close to the river, for decades. They already build their own resilience, by implementing adaptation strategies that has made them resistance to(or able to better live with) flooding, for example by raising their house into two storage house and put the electricity power in the second level of their house. From the previous flooding events, they learnt that flooding only occurs for about five days out of 365 days in a year. They prefer to live with flooding.

On the other hand, government of DKI Jakarta perceive relocation of vulnerable populations is a best way to reduce the risk. However, relocation is complicated by several factors, such as: distance from livelihoods and social networks, socio-culturally very different settlement layouts, lack of community participation, and under-budgeting of relocation costs (World Bank, 2004; World Bank, 2010). As a result, even if strategies exist, government of DKI Jakarta faces challenges in developing, implementing, and maintaining risk management. The difference in perceiving risk between government and community is a critical barrier in flood risk management of Jakarta. Oswar Mungkasa, Director of Land Use and Spatial Planning, National Development Agency/BAPPENAS (personal communication, 27 January 2014) was able to confirm that this barrier is as a result of limited knowledge and understanding of risk of flooding, limited institutional capacity and limited standard procedures for incorporating disaster risk management in city planning.

Technical Literacy Related to Flood Risk

Sharing information of disaster hazard and risk amongst decision-makers, includes government institutions and communities, is crucial in risk management efforts (Jha, et al., 2013). Jha and Stanton-Geddes (2013) further clarify that communicating risk and uncertainty in flood risk management, including mitigation and adaptation efforts, is also important to achieve an informed decision. Increasing technical literacy, in tandem with efforts to translate technically complex information into clear and accessible language can aid and enhance a community's capability to undertake activities for

minimizing risk and recover from the impacts of flooding (Faulkner, et al., 2007; World Bank, 2011c; Dickson et al., 2012). However, sharing information relevant to flood risk has been complicated by barriers to communication, especially given possible limited technical literacy of affected populations.

In the case of Jakarta, Jakarta government has been using open street map (Gunawan, et al., 2012), and participatory early warning system(BPBD DKI Jakarta, 2013) to enable communities to access and sharing information. Also, Bambang Surya Putra, Informatics Section Head of Jakarta Province Disaster Management Agency (personal communication, 13 January 2014) confirmed that *Twitter* has been used to share information relevant to flood locations and water level. This social media not only allows communities to participate, but also other governmental agencies, for instance Transport Management Centre agency. By using *Twitter* as one of informational tools, Jakarta Province Disaster management Agency gets more knowledge about the flooding conditions so that some actions could be undertaken. However, the use of *Twitter* does not fully address the information clarity to transfer knowledge and to facilitate coordination amongst decision makers because not many people living at flood-prone areas know or are able to access information on *Twitter*.

On one hand, Jakarta Province Disaster management Agency has been using open street map to engage the local communities in flood risk management. Open street map produces flood maps encourages a community-driven approach, allowing participation of the local leader at the community level, students from Jakarta universities, government officials, the Humanitarian OpenStreetMap Team, donors and partner organisations (BPBD DKI Jakarta, 2013; Gunawan, et al., 2012). However, limited knowledge of populations at risk about how to access the maps becomes another barrier to achieve the goal of information sharing about flooding. Another strategy that Jakarta governments use to inform communities about flooding is by participatory early warning systems. Bambang Surya Putra, Informatics Section Head of Jakarta Province Disaster Management Agency (personal communication, 13 January 2014) confirmed that Jakarta Province Disaster Management Agency gives waring and information about water level and status of each flood gates from upper areas through direct calls to the community leaders as well as through text messages to the communities. Then, community leaders are able to take action to deliver this information and announce it to the local communities through loud speaker of the mosque. When the water level is increasing, Jakarta Province Disaster Management Agency advices people to evacuate themselves to the closest shelter and local emergency centre. However, people living in the flooded areas, in Kampung Melayu Village for instance, do not take this advice seriously and prefer to stay until the water level is reaching the second level of their house. This dilemma becomes a great challenge for the evacuation team due to the difficulties to access flooded areas to evacuate people when the water level is high. Although Jakarta governments have implemented some strategies to reduce the risk of flooding by engaging local communities in sharing information, limited knowledge and low level of awareness of at risk populations have become crucial constraints.

Community Engagement for Jakarta Flood Risk Management

The major challenges for flood management are socio-technical, such as strengthening coordination and cooperation among all stakeholders to support preparedness of institutions and communities (Wilby and Keenan, 2012). Community participation is an essential element to address local needs, engage public in flood disaster

preparedness and build a capacity to cope with flooding (World Bank, 2011). Without support from communities, flood risk management is far from success.

Ciliwung-Cisadane River basin Agency has conducted socialisation to at risk populations relevant to conditions of the existing Ciliwung River and the normalisation plan. Head of villages, local leaders, as well as the key persons were involved in the socialisation program so that they are able to transfer the knowledge about the normalisation plan to the communities. Based on interviews with some of community leader in Kampung Melayu Village, people are able to understand that normalisation plan will be undertaken as one of the solutions for Jakarta's flood. However, they confirmed that there is no consultation and active involvement regarding relocation plan.

Halirik, Head of Community Empowerment in Kampung Melayu Village (personal communication, 20 February 2014), confirmed that relocation plan is very sensitive for at-risk populations in that area and it requires a huge consideration because it will be a big decision for them. So far, information about relocation of people living in Kampung Melayu Village comes one way from top to down, from Jakarta provincial government to the local authorities. Based on the interviews with representatives of community in Kampung Melayu Village, moving into *Rusun* Komarudin is a tough decision since there is uncertainty about compensation of their recent house, the ownership status of the new house, and the livelihood opportunities. Government of DKI Jakarta provides *Rusun* Komarudin as a new place to live in but there is no guarantee about job opportunities to survive from poor economic condition.

In brief, there is a significant communication gap between policy makers and community in Kampung Melayu Village because there is no community consultation to build a consensus regarding Ciliwung River relocation plan. This gap is a significant barrier to the success of the relocation plan. Without having meaningful dialogue, at-risk populations are not motivated to be engaged and face confusedness so that these obstacles will hinder the goal of enhanced community resilience in flood risk management.

CONCLUSIONS

In summary, Jakarta government initiated some large scale infrastructural plans with regard to reduce the risk of flooding. Also, plans are underway to relocate residents away from flood risk areas.However, in the crisis situation, consultation with the communities occurs primarily in one direction–from the government to the community– and excludes local knowledge of conditions and community needs. Additionally, community participation in management planning and flood risk reduction is hampered by several factors, such as: lack of co-ordination and lack of two-way communication between the government and society; limited knowledge in flood affected communities about the risks of flooding; and the differences between the perceptions and desires of the community and the government. These things are obstacles in realizing community resilience and in improving the effectiveness of disaster planning. These challenges can be anticipated by strengthening coordination among all stakeholders at all levels of government (Wilby and Keenan, 2012).

Therefore, it is crucial to conduct a dialogue or communityengagement process involving communities and governments. Application of this collaborative forum potentiallyimprovesthe information and knowledge transfer regarding flood riskin the planning processes. On one hand, the presence of collaborationbetween government entities and communitiescould improve community resilience to face and reduce the

risk of future disasters. In addition, the significant contribution of this approach allows the emergence of decision-support tools or a model of collaborative planning and participatory mechanism.

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Paper 15: Vulnerability to River Flooding and Relocation Readiness: the Case of Floodplain Residents in Zimbabwe

Emmanuel Mavhura[1*], Andrew Collins[2] and Paradzayi Bongo[3]

[1]*Bindura University of Science Education, Zimbabwe, email: edmavhura@gmail.com*
[2]*Northumbria University, UK, email: andrew.collins@northumbria.ac.uk*
[3]*Bindura University of Science Education, Zimbabwe, email: paradzayib@gmail.com*

ABSTRACT

Whilst there is considerable understanding of the complex nature of vulnerability to natural hazards, there remain persistent losses in human lives and property damage through the resultant disasters experienced. Flooding in particular, remains a considerable challenge to achieving greater community resilience in many countries. The objectives of thispaperare to examine flood disaster vulnerability in Tokwe-Mukorsicommunity, Zimbabwe and to identify barriers to relocation considered to be one potential solution. Using a questionnaire survey, field observations and interviews the biophysical and social vulnerability of the Tokwe-Mukorsi community is examined. The data was analysed using MS Excel and thematic descriptions. Results point to issues related to high exposure risks for the households living upstream and downstream of the dam, poor socio-economic conditions of most households and the torrential rains experienced over short periods of time as having increased vulnerability to flooding in 2014. The vulnerability of this communitymandatedthat they should relocateto safe places as the only viable long term flood response strategy. However, lack of compensation for being displaced, absence of basic infrastructural development in relocation sites, availability of livelihood activities in the dam basin and the unwillingness to move into a drought-prone region were major barriers restraining residents from relocating into new areas.

Keywords: flooding, relocation readiness, Tokwe-Mukorsi community, vulnerability, Zimbabwe.

INTRODUCTION

River flooding can arise from both natural processes and human actions (Zou & Wei 2010). The natural processes are through hydro-meteorological hazards such as tropical cyclones, storms and intense rainfall. Dam failure is an example of how human actions through lack of dam construction safety can result in flooding. In Zimbabwe flooding has brought serious impacts. For example, statistics from EM-DAT CRED indicates that floods killed 70 people, affected a total of 266 000 people and caused economic damage of US$ 72 900 000 in 2000 alone in Zimbabwe.

Vulnerability to hazards is usually determinedthrough the combination of physical forces andsocio-economic processes of the human environment (Wisner et al. 2004; 2011; Kusenbach et al. 2010). Conditionsthat result in high vulnerability, should generally lead to evacuation and relocation asviable strategies in response to an imminent hazard (Kusenbach et al. 2010). However, notall threatened groups relocate in times of disasters.Therefore, two questionsarise with respect to the Tokwe-Mukorsi community:How vulnerable is the community to river flooding?Whatparticular conditions influence its relocation readiness? The paper identifies barriers to relocation by assessing the impacts ofvulnerability conditions on relocation readiness.

VULNERABILITY

The term vulnerability has been widely defined in physical andsocial science literature dealing with hazards, climate change, health, ecology, and engineering among others (Hinkel 2011; Kusenbach et al. 2010; Chakraborty et al. 2005; Plummer et al. 2013; Berkes 2007; Kaźmierczak & Cavan 2011; Lin 2012; Füssel & Klein 2006). One of the widely used definitions of vulnerability is that it is the characteristics and circumstances of a community, system or asset that makes it susceptible to the damaging effects of a hazard (UNISDR 2009).There are many aspects of vulnerability arising from various physical, social, economic,and environmental factors. Vulnerabilities therefore vary significantly within a community and over time.

Basic Dimensions of Vulnerability

Some scholars distinguish between social and biophysical vulnerability (Birkmann 2006; Cutter et al. 2003). Biophysical vulnerability deals with the likelihood of exposure to hazards, focusing on the distribution of some hazardous conditions, human occupancy of the hazardous zones and the degree of loss associated with occurrence of a particular event (Cutter 1996; Birkmann 2006; Kusenbach et al. 2010). The magnitude, duration, impact, frequency and rapidity of onset of events as well as structural losses in the built environment (structural vulnerability) all characterise the biophysical vulnerability. For example, the construction of buildings, construction materials used and methods of fabrication have a great influence on disaster impacts.This has led to frequent notice that, regardless of the materials or methods used, building codes must be bothsufficiently stringent and enforced(Cutter 1996). If the regulations pertaining to construction areweak or if there is no oversight during construction, vulnerability is increasedinstead of decreased. Meanwhile, the use of dams toretain water can create a false sense of security and increase the vulnerability of people to flooding (ibid).

Social vulnerability focuses on the social construction of vulnerability. In the immediate and practice way, these are the demographic andsocio-economic factors that increase or attenuate the impact of hazard events on local populations(Cutter et al. 2009). Such factors are rooted in historical, cultural and economic processes and conditions that impinge on the community's ability to cope with disasters and adequately respond to them (ibid). To date a lot of research has been done on biophysical vulnerability (Cutter et al. 2003). However, little is known about the social aspects ofvulnerability in these Zimbabwean rural communities. Generally social vulnerabilities are largely ignored, mainly dueto the difficulty in quantifying them, thus explaining why socially based lossesare normally absent in after-disaster cost/loss estimation reports(Cutter et al. 2003).

The literature on social vulnerability focuses upon the systemand its ability to cope with and respond to ahazard or the ability to recover from catastrophic failures. Itacknowledges that the degree to which communities are vulnerable to hazards is not solely dependent upon the exposure to a hazard (biophysical vulnerability), but also the resilience of the community systems experiencing the hazard (Berkes 2007). Different communities live under different social, economic, political, cultural, and institutional settings. As such they have different levels of vulnerability. For example, Bangladesh and Florida are both vulnerable in a biophysical sense to sea level rise and tropical storms. However, the impact of these events differs significantly, and one cannot explain the differences in terms of the nature of the hazard alone. At the same time, unsafe places do not always intersect with vulnerable populations. For example, in an

area of high biophysical risk, economic losses might be large but equally the population may have significant safety nets to absorb the hazard and recover quickly. Therefore, there is need to focus on the characteristics of the system influencing the ability of people to respond to, cope with and adapt to the hazard. Hence, this study has considered both social and biophysical vulnerability (Cutter 1996) to flooding in the Tokwe-Mukorsi community.

Determinants and theoretical bases of vulnerability

Vulnerability is a function of the character, magnitude and rate of hazard variation to which a system is exposed, its sensitivity, and its adaptive capacity (Berkes 2007; Brooks et al. 2005). As such, the social science community has come to a general consensus aboutsome of the factors that influence social vulnerability to a wide variety of hazards in differentgeographical and socio-political contexts(Adger 2006; Cutter et al. 2003; Kusenbach et al. 2010; McEntire 2012). These include socio-economic status, gender, age, unemployment; occupation and education.On the other hand, there are specificdeterminants relevant to a particular context and hazardtype. Disagreements may arise in theselection of specific variables to represent these broader concepts.

The concept of hazards as context-specific, as opposed to generic alongside determinants of vulnerability is an appropriate way of assessing vulnerability at community level. This is because generic indicators do not capture a complete description of vulnerability at local level where geographical and social differentiations are exhibited (Brooks et al. 2005). Therefore, both generic and hazard-context-specific indicators are used in this study to examine vulnerability to floods at community level. The use of both groups of indicators reinforces each other instead of undermining the strength of the other. However, the precise calculation of social vulnerability indices is beyond the scope of this study due to non-availability of data at community level and a level of subjectivity on what it constitutes.

The diversity of definitions of vulnerability is accompanied by a similar diversity of frameworks, conceptual models, and assessment techniques developed to advance both thetheoretical underpinnings and practical applications of vulnerability(Adger 2006; Cutter et al. 2008; Füssel & Klein 2006; Gallopín 2006; Hinkel 2011; McLaughlin & Dietz 2008; Polsky et al. 2007). A general discussion of methodologies and conceptual frameworks of vulnerability is beyond the scope of this paper. However, this article employs the hazards-of-placemodel (Cutter et al. 2003). This model is preferred because it integrates both biophysical and social perspectives of vulnerability. In this respect, risk interacts with mitigation to produce the hazard potential. The hazard potential is either moderated or enhanced by a geographic filter as well as the social fabric of the place. The social fabric includes community's ability to respond to, cope with, recover from, and adapt to hazards, which in turn are influenced by economic, demographic, and housing characteristics. The social and biophysical vulnerabilities interact to produce the overall place vulnerability of the community (ibid). This approach offers a means to synthesize both the biophysical and social dimensions of vulnerability although it may offer little insight into the processes generating vulnerability.

METHODS AND DATA

Study site

This research was conducted in the Tokwe-Mukorsi Community which was affected by floods in February 2014. The community is located in the Tokwe-Mukorsi dam basin, about 72 km south of Masvingo Town, Zimbabwe in an area shared by three districts: Chivi, Chiredzi and Masvingo Rural (Figure 1). The dam itself is a concrete-face rock-filled dam on the Tokwe River, just downstream of its confluence with the Mukorsi River. Construction on the dam began in June 1998 but stalled in

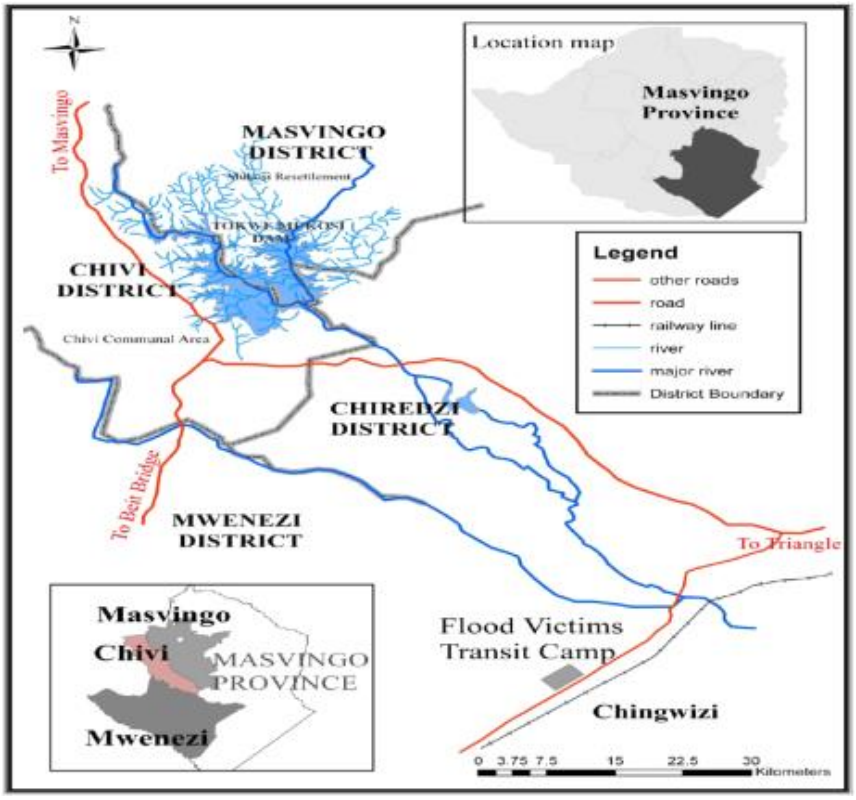

Figure 1 Study site - Tokwe-Mukorsi, Zimbabwe (Source: Authors)

2008. It was then resumed in 2011 and was expected to end by October 2015. When complete, the dam will be 90.3m tall and withhold a 1,750,000,000m^3 reservoir covering more than 9,600 hectares.

The construction of the Tokwe-Mukorsi Dam was planned to displace 6,393 households (about 32,000 people) and their 18,764 cattle from the flood basin. The communities were to be relocated in three phases. Unfortunately, the whole relocation plans were overtaken by events because flooding occurred before the dam was completed and only 600 households had been relocated by the time of the emergency in February 2014. The remaining 5,793 households were caught by surprise in the unsafe basin when flooding occurred. Phase 1 intended to relocate about 1,247 households at risk of water inundation in low lying areas of about 660m above sea level. These households were living in the highly flood-prone areas of the basin. The households were supposed to be relocated by October 2013. Phase 2 intended to

relocate a further 1,878 households by October 2014 when the dam was expected to fill up. Then the last phase would involve 3,268 families in buffer zones who were expected to be relocated by October 2015. When flooding occurred, the government responded by evacuating about 2,230 households (approximately 16,800 people) from the flood basin because the incomplete dam was rapidly rising due to torrential rains. The torrential rains resulted in bursting of the dam wall leading to flooding that affected about 40,000 people downstream.

Data sources

A questionnaire survey, field observationsand semi-structured interviewswere employed for examining vulnerability to flooding in Tokwe-Mukorsi community.Permission for the study was obtained from the Government and the local authority prior to contactingany participants. Final questionnaires were administered in the transit camps and relocation sites. Originally, a random sample was planned, but due to low occupancy rates, this strategy didnot work and a convenience sampling was implemented, consisting of all willing participants.A day-longtraining session was held in March 2014 where each of the datacollection techniques was discussed and practiced.The questionnaire was circulated to the entire research team forcomments and then pre-tested. The pre-test involved administering the instrument to fewresidents in the communityand debriefing about the respondents' experience. Adjustmentswere made to the instrument for content, context and clarity. Thefinal instrument consisted of five sections and 40 questions.The questions were almost all fixed choice, but morethan half also provided opportunities for elaboration. A total of 1,230 questionnaires were successfully administered to the residents of the community.

Face to face interviews were conducted with key informants of the Tokwe-Mukorsi communityin five transit camps and those residing in Chingwizi, the relocation site where most families were being taken to. We included all communities to which we gainedaccess within the available time frame. Asemi-structured guide was developed andpre-tested with three individuals from the community who answered the questions as well as reflectedupon the substance and organisation of the instrument. Afterrefinement, the instrument consisted of 13 open-ended questionsand was oriented to understanding the social vulnerability and barriers to relocation in the community. Ofthe 27peopleidentifiedas key informants and asked to be interviewed, only20agreed to be interviewed.The interviews ranged in length from 30 to 60 minutes; were recorded, transcribed, and memberchecked. The resulting qualitative data were subjected to thematic analysis.

Field observations were conducted in the company of civil engineers from Government and the contractors of the dam. The researchers walked around the affected villages observing the structural measures (indigenous or modern) used against floods. This included the condition of the houses, materials used for their construction, the type of settlement and any other flood protection measures (Mavhura et al. 2013).

RESULTS

Biophysical vulnerability

The Tokwe-Mukorsicommunity is located in a high-risk flood basin of the Tokwe-Mukorsi Dam. Although the area has not experienced flooding in the past, there is a high probability of further flooding as the dam construction nears completion. The dam area encroached into the farming and settlement area of the community. Households

below 660m above sea level were highly exposed to floods and needed immediate evacuation. They were inundated following heavy rains. Other households in the buffer zones became exposed when the dam was rapidly rising. Flooding then affected more than 22,000 people in the dam's basin and caused a burst of the dam wall, resulting in destruction of property, settlements and loss of livestock of about 40,000 people downstream. Therefore the biophysical vulnerability of the Tokwe-Mukorsi community in this respect is caused by three broad factors: human occupancy of the unsafe dam basin, intense rainfall of long duration that resulted in increased river discharge, and the bursting of the dam wall.

Another element of vulnerability in the context of Tokwe-Mukorsi flooding has to do with its built environment (structural vulnerability). The community occupies a rural settlement whose majority of houses are traditional huts with thatched roofs. All houses had floors at or below ground level. This exposed them to flooding even of low magnitude. Beyond the mere fact of living in traditional huts, the actual condition of dwellingsis an additional source of structural vulnerability (Table 1). The majority of the houses were built of easily washed-away materials. All homes (100%) were built without following building and safety codes.

Table 1: Structural vulnerability of Tokwe-Mukorsi homes (n=1,230)

Variable	Indicator	Frequency	%
Building codes	Approved housing plan	0	0
	Building stages checked	0	0
Age of homes	Built before 2004	980	80
	Built after 2004	250	20
Construction materials	Used common bricks for the main structure	780	63
	Used wooden poles for the main structure	450	37
	Thatching grass	730	59
	Used asbestos/iron sheets	500	41
Insurance	No home insurance	1230	100
	No flood insurance	1230	100

Field observations revealed that flood protection measures at community level were totally absent. About 70% of the homes were in disrepair. Furthermore, the safety of the homes also depends on thephysical condition of the surrounding built environment. Given that all homes were located in nucleated villageswith many homes that are ten or more years old, even new homes cannot be considered safe due to thelikelihood of flood debris from disintegrating surrounding structures. Another concern is that 100% of respondents did not have any sort of home insurance despite the fact that all their homes were located in a flood zone. The high rate of non-insured homes may be partly explained by several factors: poverty, unemployment, little savings, high premium rates and little availability of insurance cover or related schemes.

Social vulnerability

A variety of variableswas used to examine social vulnerability of the Tokwe-Mukorsi residents (Table 2). Fifteen percent (15%) of respondents were above65 years of age, andapproximately 19%werebelow 15 at the time of the interview.The sample included a higher percentage of women than men (54% vs. 46%), whichlikely reflects the higher

number of women among affected flood victims. Although this research did notfocus on differential vulnerability by gender, this point is important because women havebeen found to be more vulnerable to hazards (Kusenbach et al. 2010).

Table 2: Social vulnerability considerations of Tokwe-Mukorsi community (n=1,230)

Variable	Indicator	Frequency	%
Age	Over 65 years	180	15
	Below 15 years	230	19
Gender	Female	660	54
	Male	570	46
Household wealth or income	Below $500 a month (av. poverty datum line)	1,230	100
	Above $500 a month	0	0
	Household property worth $1,000 and above	730	59
	Households with more than 5 heads of cattle	870	71
Education	Attained primary education as highest	910	74
	Attained secondary education as highest	310	25.2
	Attained tertiary education as highest	10	0.8
	Literacy rate	1,230	100
Occupation	Households employed in subsistence farming	1,230	100
Economic dependence on farming	Households entirely dependent on farming	1,130	92
	Households with sources of income other than farming	100	8
Water and sanitation	Population with access to proper sanitation	88	7.2
	Population with access to safe water	95	7.7

With respect to economic conditions, results show that all respondents (100%) were earning less than US$500 a month (the official poverty threshold for a household of five people). The respondents were employed in subsistence farming. This situation made them more vulnerable because their farming system is rainfall-dependent. In times of erratic rainfall, their means of living is adversely affected. However, 59% of the respondents reported having household property worth more than US$ 1,000 and livestock over which they could fall back in time of disasters. Another positive characteristic of the Tokwe-Mukorsi community is its high literacy rate (100%). This should moderate its vulnerability to floods. However, the formal education achievement is low: 74% reported primary education as highest level achieved; 36% secondary and a very small proportion of 0.1% having attained tertiary education as the highest.

Relocation readiness/barriers

We measured relocation readiness/barriers through reported willingness to relocate to new areas of Masangula, Chisase and or Chingwizi farms, all in agro-ecological region 5 (Table 3). Four variables were used: compensation, livelihoods, agro-ecological regions and infrastructural development. Fifty-nine percent (59%) of the participants reported that they would relocate only after receiving compensation from

the government while 40% were reluctant to relocate even if they were compensated. This could be explained by responses to other variables, namely those concerning livelihoods, agro-ecological regions and infrastructural development. Ninety-six percent (96%) cited the occurrence of droughts in the new sites as the main barrier to relocation. Another barrier was related to the source of the community's livelihoods. Seventy-two percent (72) of the respondents were not willing to relocate because their livelihood activities were based in the dam basin. On the other hand, the absence of basic infrastructure such as schools, clinics, roads, water and sanitation in new sites were some of the barriers restraining residents from relocating to resettlement areas.

The findings of the questionnaire survey tallied well with interviews. Three of the interviewed variously had this to say: *"We need compensation first and then we can be relocated." "Why should we be relocated in a drought-prone area when we have been living well here?" "We had built our homes, schools and other infrastructure here, hence we can't be asked to go in an area without infrastructure."*

Table 3: Relocation readiness/barriers of Tokwe-Mukorsi Community (n=1,230)

Variable	Indicator	Frequency	%
Compensation	Willing to relocate only after compensation	720	59
	Not willing to relocate even if compensation is availed	500	40
	Willing to relocate even without compensation	10	1
Agro-ecological regions	Not willing to relocate because the new sites are drought-prone	1,180	96
	Willing to relocate to agro-ecological regions that are not drought-prone	50	4
Infrastructural development	Willing to relocate only after construction of decent homes, clinics, roads, boreholes, etc.	950	77
Livelihoods	Not willing to relocate because my livelihoods are based on the dam basin	880	72
	Will relocate because livelihoods are present in any place	350	28

DISCUSSION

This study answeredsatisfactorily our initial research questions: How vulnerable is the Tokwe-Mukorsi community to river flooding?Whatparticular conditions influence their relocation readiness? However, as many studies do (Chakraborty et al. 2005; Dash & Gladwin 2007; Kusenbach et al. 2010), it also raised anumber of more specific questions regarding evacuation and relocation. The findings demonstrated quite clearly thehigh-risk potential for Tokwe-Mukorsi residents.The whole communitycould be flooded in the event ofa high magnitude floods. The structural conditions of the built environment and socio-economic traits, pose serious threats to community membersin the face of an impending flooding event. The majority of all homeswere constructed without following building codes, and hence are susceptible tosevere damage, if not outright destruction during flooding. The absence of flood insurance or related schemes among residentsis a cause for concern. Their vulnerability is worsened by the absence of social security and other state support means which might lessen complications and delays in receivingdisaster assistance. Also, the riskexposure of residents is exacerbated by the advanced age of their homes, the lack ofphysical reinforcement of

homes, and the overwhelming absence of insurance coverage. Therefore, it means that the community members are likely to suffer a completeloss of their homes in the event of anotherflood, without the possibility of receiving compensation through insurancepayments.

It appears that the Tokwe-Mukorsicommunity experiences considerable socialvulnerability. Their poor socio-economic base has impinged on their recovery from the effects of floods. During the relocation, some tractors were used to move families from the water front to designated staging posts where they were ferried by trucks to relocation sites. But, due to certain challenges, some villagers resorted to using scotch carts and other means to go to staging posts in readiness for relocation. However, it is also important to emphasize that the community possesses a number of social and economic resources and strengths. For example, respondents generallyhave high literacy rates, household property worth more than US$ 1,000 and livestock. However, these assets did not reduce their vulnerability to flooding. Some household with a lot of livestock failed to transform their livestock into cash so as to recover from the floods.

Respondents' plans for relocation to safe areas encountered challenges. Chief among the barriers were the fact that their livelihoods were in the dam basin, unavailability of compensation for displacement, occurrence of droughts in the relocation sites, and absence of basic infrastructural development. The community was entirely dependent on subsistence farming in the dam basin; as such it resisted relocation to drought-prone places in agro-ecological region 5. Those who preferred staying in the dam basin were also not aware of the structural limitations of their dwellings. Another concernwas that only1% of the respondents were prepared to relocate without compensation, while 40% indicated that they would remain in the flood zone even if they were to be compensated. The total percentage of peoplewho stated that they were willing to relocate (60%) is considerably higher. However it is possible, too, that social desirability bias (Kusenbach et al. 2010), where respondents give answers perceived to be more favorable in order topresent themselves in a better light, may have caused residents to respond that they were morewilling to relocate than is the actual case.

The construction of the dam was a big dynamic pressure for the flood occurrence in the Tokwe-Mukorsi community. The rapid rise in the water level behind the incomplete dam caught authorities and communities by surprise. The relocation plans were overtaken by events, and the evacuation process was delayed by lack of funds. The government mobilised securities were forced to air lift the marooned individuals, erect tents as temporary shelter for hundreds of families and assist some families move their belongings. However, the whole process was moving slowly. The dam gave a false sense of security to residents because it then burst and destroyed crops and other livelihoods in villages downstream.The community has since been opposed to the construction of this dam for various reasons, including those explained here.

CONCLUSION

This study has explored the social and biophysical vulnerability of the Tokwe-Mukorsi residents to flooding. It has shown that the community was living in an unsafe location where a dam was under construction. The construction of the dam coupled with poor socio-economic status of most households and the environmental disturbance resulted in flooding vulnerability in February 2014. Given their increased exposure to flooding, the community residents have been forced to relocate to safe areas. Their relocation

readiness faced great challenges since the beginning of the construction of the dam. The main barriers were lack of compensation for displacement, lack of basic infrastructural development in relocation sites and the availability of their basis to livelihoods in the basin.

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Paper 16: Water policy and its influences in drought resilience: are we moving towards integration?

Sarah Ferreira[1]

[1]Lisbon University,Portugal, email: sarahmalta@campus.ul.pt

ABSTRACT

Good water management is a key issue for the development of society. The efficiency of this management becomes even more important in a situation of scarcity. Therefore, it is essential that the regulatory framework of water policy with its action structures is able to provide support to resilience building in communities susceptible to drought. The objective of this article is to understand how the development of institutional structures related to water policy can interfere with the establishment of measures that alter the capacity of drought resistance of a watershed. To understand this relationship between water policy and resilience to drought, the Guadiana basin in Portugal and the Piancó-Piranhas-Açu in Brazil have been studied. After analysis, the conclusion is that the development of structures and actions that increase resilience to drought are not directly related to the instruments of water policy. This demonstrates the difficulty in applying a truly holistic approach to water issues, resulting in actions that hinder the responsiveness of communities across the drought management.

Keywords: Brazil, drought resilience, river basin, Portugal, water policy.

INTRODUCTION

The quest for integrated water management has produced profound changes in environmental legislation in recent decades in Brazil and Portugal. This integration goes beyond natural features as it also includes social and management issues, highlighting something unprecedented in the history of water management of these countries. Therefore, the reforms proposed by the water policy, which aim to integrate the risk component on water management, provide assistance in the development of tools capable of mitigating the negative effects of water disasters. As there is a tendency in related risk management to highlight the role of resilience to disaster studies, there is also the need to understand what the strategies are that enable the development of resilience to natural and technological risk.

However, a critical analysis of the process is important to check if the water policy has succeeded in reaching the goals of creating mechanisms to mitigate the effects of drought in watersheds. To do this, the Piancó-Piranhas-Açu (PPA) watershed in Brazil, and the Guadiana in Portugal were chosen for analysis. These are regions that, due to their specific climatic characteristics, must be prepared for the occurrence of drought. In addition, there has recently been a restructuring of the water law in these countries. This in turn leads to the analysis of whether these policy changes are actually being applied in areas potentially affected by drought or not.

This paper begins with the approach of the resilience concept with its adaptations and popularization in the political and academic world, focusing on designing resilience to disasters. The peculiarities of drought and how these characteristics make the building of resilient systems difficult will then be discussed. Finally, how the water policies, in Portugal and Brazil, are implemented by the natural unity that is the basin area and how the risk of drought is discussed in this context will be analyzed.

METHODOLOGY

This study is part of a research project that seeks to understand how the water policy allows the management of the risk of drought. To analyze the water policy of Portugal and Brazil, two river basins were chosen two basins with similar characteristics related to the climate and environmental policies related to water resources management (Guadiana- PPA- Portugal and Brazil).

Starting from a qualitative methodology based on a literature review of drought and resilience, and in the analysis of Brazilian and Portuguese legal frameworks of water policy in order to highlight how the drought is handled within this legal framework.

Following this approach, the Guadiana and the PPA river basin management plan were analyzed ,as well as, how these guidelines are applied in developing capable strategies and mitigating the effects of drought. This is methodology focused on o identify the tendencies related to the influence of water policy in the management of drought, after this critical analysis the objective is to illustrates a situation that will serve to discuss some hypotheses regarding the management of drought.

THE RESILIENCE CONCEPT AND ITS IMPORTANCE IN DISASTER MANAGEMENT

In recent years the term resilience has gained great importance and is widely used in social, political and academic contexts. This rise in popularity means there is a risk that the term is unclear as many areas of science use the same word to describe situations that, although similar, have their own peculiarities that cannot be generalized.

From a brief look at the origin and the increasing popularity of this term, it is possible to understand why the concept of resilience has acquired so many meanings. With its origin in the laws of physics, the word resilience originally refers to the ability of an object to accumulate energy without breakage and able to return to their initial characteristics of equilibrium after being subjected to stress(Davoudi et al, 2012; Norris et al, 2008; Cutter et al, 2008).

In 1973, Crawford Stanley Holling defined the difference between engineering resilience from ecological resilience: for him the main difference between them is that the second rejects the existence of a single and stable equilibrium, recognizing the possibility of the creation of multiple new equilibria. (Holling, 1973; Davoudi et al, 2012). Although the discussion about resilience started in the 1970s it was only in the 1990s that the term strengthened in its influence in different areas from geography, psychology, to the study of science disasters.

The various scientific currents that appropriated the term resilience add transformations that if on the one hand spread the word, clarification is hampered on the other because they reflect the need to adapt the term to the various currents that depart from the logic of physics and engineering. In the risk sciences the adaptations of the term resilience are highlighted with the emergence of the debate of Hyogo Framework for Action, arisen in the United Nations International Strategy for Disaster Risk Reduction (UNISDR) which consolidated the idea of communities affected by disasters to create tools that respond to disasters without outside assistance (Manyena, 2006).

UNISRD (2009) defines resilience as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. So it is important to note that,

despite the diversity of definitions of resilience, there are two points that are common to them; the first point refers to the understanding that resilience refers to the process and not the outcome. However, the second point shows that this concept is more akin to an idea of adaptation than to an idea of stability. (Norris, 2008)

In studies of disasters, this concept has been reworked and refined for thirty years and the current definitions are a product of a long process of theory and practice. So the term resilience is largely used in daily life and scientific discourse, which makes it an umbrella concept. Despite the apparent flexibility in use, it is necessary to assume that this term imposes limitations, and therefore one must avoid its misuse (Lele, 1998).

However, what is happening is that this term has been considered as one of the meta-goals in the discourse of contemporary politics in disaster mitigation. This discourse brings a new way of seeking to minimize the negative impacts and from this point of view many responsibilities and duties of the sphere leave the state and pass to the community (Lele, 1998 Manyena, 2006).

THE CHARACTERISTICS OF THE RISK OF DROUGHT AND ITS INFLUENCE ON RISK MANAGEMENT

Just like the term resilience, drought also lacks a clear and objective definition. However the conceptual lack of drought is due to the fact that this is an event that does not establish a specific space-temporal pattern and each region has unique characteristics in their manifestation, requiring a number of variables that are difficult to account (Nagarajan, 2009).

This study will be guided by the definition which generally reproaches this phenomenon as a natural and temporary risk difficult to recognize, directly linked to the decrease in the average amount of expected precipitation for a certain period of time (Wilhite, 1993; Loucks, 2006; Nagarajan, 2009). Besides the characteristics exhibited by the above definition there are some boundaries that allow the distinction between drought and other risks. These include: a slow onset, making it difficult to determine the exact beginning and ending; a difficulty in defining the concept and the severity of drought; and specificity in causing "non-structural" impacts that although affecting much larger areas than other natural hazards, generates less obvious damage, which makes it more challenging for policy makers mitigation (Wilhite, 1993; Wilhite and Buchanan-Smith, 2005).

Through the various mitigation efforts that seek to develop resilient communities, drought characteristics make this task more complex because it is difficult to identify the impacts caused by the crisis. This consequently affects the interest in building structures, and actions capable of creating watershed resilient to drought. Parts of these reactive actions are justified by the peculiar characteristics of drought that cause the attention of public managers to disperse because there are always crises requiring quick solutions. Then, due to public administration seeking solutions in the short term, the gradual characteristic of drought is neglected by the state, private sector, and civil society (Loucks, 2006).

In face of the difficulties in creating strategies for living with drought, Rockstrom (2003) suggests the separation of the drought crises into two categories for which the manager can build a proposed resilient system to drought according to the characteristics of the phenomenon. So there are manageable droughts where there is the possibility of actions based on local resources and unmanageable droughts, requiring the external assist mechanisms for communities. From this point it is

necessary to develop flexible institutions grounded in resilience proactive spirit building a disaster-learning, with the construction of instruments and actions capable to adapting to changes imposed by the environment and counting with disruption of the *status quo* (Dovers and Handmer, 1992). This change of the institutional system focused on adaptability to the unpredictability of drought adds a differentiated sphere in its management because currently the actions are dedicated mainly to reactive responses to the phenomenon, such as are the creation of structural measures focused on water storage (eg, the construction of reservoirs) that expand the possibilities of providing water during drought.

Despite the importance of creating robust measures capable of mitigating the effects of drought, the importance of non-structural measures related to water management in periods of water stability should not be neglected. There should also be a reflection on the way the development and structuring policies are designed and implemented.

The development of the resilience of a community to the drought requires the analysis of policies that influence its management. As drought policy is closely linked to the policy of water, it is essential to observe the workings and openness to understanding the problems connected with drought, pointing out potential and limitations.

WATER POLICY AND ITS INFLUENCE ON THE MANAGEMENT OF DROUGHT

In the last few decades, especially in 2013 with the global campaign by the United Nations and World Meteorological Organization, focused on preparing and managing the risk of drought, there has been an effort of International institutions related to water management in supporting the construction of a resilient global community prepared for drought. (Ferreira, 2014).As water policy is the search for stable patterns of availability and water quality it interferes transversely in environmental, social, economic and cultural spheres. This context implies the need for creating a policy to regulate and integrate these issues satisfactorily. This is a big legislative and management challenge and it is necessary to be aware if there is an implementation of the efforts proposed by water policy and the international institutions highlighting the drought in the debate and effective measures. As the river basin is normally the territory of application of these arrangements it is important to check how this space adapts to the increasingly needs of an effective integration between the policy of drought and water.

Water policy in Portugal

The policy environment in Portugal, which integrates water policy, was historically marked by a infrastructural vision, strongly linked to Illuminist ideas with actions predominantly characterized by the engineering influence in its preparation process. Only from the 1980's, gradually this policy was giving way to an integrated view of public policies seeking an efficient, sustainable and socially equitable management of water resources, conditions that to some extent have not materialized until today (Queirós, 2002; Pato, 2013).Part of the search for this paradigm shift of Portuguese water management is due to the entry of this country to the then designated, European Community. Thus current policy of the Portuguese water is closely linked to the Directive 2000/60/EC (known as the Water Framework Directive, WFD).

Portugal embodies these guidelines through the Water Law (Law 58/2005), carrying the factors that influence the management of water proposed by the WFD including the search for mitigation of droughts and floods.The enactment of the Portuguese Law of

Water was a major restructuring in the water policy, requiring reform in institutions related to resource management. This process involved the mobilization of human and material, technical and scientific means, focused on the effectiveness of integrated water resources management. But it is essential to emphasize the need to create political structures able to reflect and encourage this integrated management. The implication is the aim of breaking the tendency for fragmentation of responsibilities caused by the high number of sectoral agencies (Soromenho-Marques 1998). However, this process of change was not accompanied by a hierarchical strategy that would reverse this trend of not assuming responsibility for agencies and institutions, so most of these integrative reforms until nowadays are in the process of being carried out.

Implementation of water policy through the Guadiana basin

The Guadiana River is an International river, which rises in Spain and flows in Portugal. It is the main river that supplies the Alentejo (Portuguese region, the downstream of Spain, being highly dependent on the flow from this country). This area coexists with around 800 mm rainfall/ year. However it is unevenly spread throughout the year with rainy winters and dry summers. The natural aridity makes the development of strategies focused on drought mitigation vital (APA, 2012). Historically the economy of this region has been strongly linked to mining and agriculture. Despite the unquestionable importance that agriculture is to the economy, this region has industries mainly related to cork, grinding, and more recently tourism. However most of these economic activities are strongly dependent on water availability, which aroused interest in creating conditions for the storage of water in times of drought (Fonseca 1998; APA, 2012).

The natural susceptibility to drought, combined with pressure from the changes in the water policy created the scenario in which the Guadiana management plan was made. Through the analysis of the Guadiana Basin Plan it is possible to verify two main approaches to the issue of drought. Firstly, the drought is treated as the objective to be worked on by the water policy, and secondly there is the diagnosis of the region through the data which highlight the regional susceptibility in relation to this risk. However there are no focused strategies of adaptation or mitigation of drought, despite recommendations in the Water Law, that highlights the need for the development of intervention programs on drought strategies. The same law recommends that the river basin plan has to establish programs of measures and activities necessary to accomplish the environmental objectives established by the law. As drought is the goal, the actions that include the creation of a contingency plan for drought should be included in the river basin plan of all regions, as drought is liable to be a phenomenon to occur in any area, but in regions such as the Basin Guadiana this action becomes even more evident.

So what occurs in Portugal is the perpetuation of political negligence to drought. Despite the existence of legislative support provided by the Water Law, there is a lack of interest from water managers to use it. This fact might be minimized by external pressure from the European Union with the creation of a new Directive focused on drought, which was made in Flood Directive (2007/60/CE). However it is crucial that an internal consciousness reflects a real effort, and it is vital to increase the interest of managers connected to the water to implement these tools in creating a drought resilient society.

Water policy in Brazil

Although Brazil is internationally renowned as a country with abundant water, there are regions where there are severe water shortages. The 9.433 law sanctioned in 1997, is the first proposal for a robust national water resource management focused on decentralized and sustainable planning of water.Just like in Portugal, prevention and protection against extreme hydrological events are the objectives of Brazilian law as well as adopting the river basin as the unit for the implementation of water resource policy. However, there are other policies and instruments in Brazil that are focused solely on the issue of drought, which tends to create a more targeted structure on this issue.

It is important to highlight a big difference between Portugal and Brazil. The former creates a temporary committee to build a strategic plan for the river basin that after its preparation is abandoned and there is no continuous monitoring of the implementation. Brazil, however, has a committee of the basin that acts continuously on its territory. This structure is able to develop, modify and oversee projects with the help of the local population according to their wishes. In view of this difference, it is important to check how water policy has been implemented through the watershed committees in order to understand the sensitivity that actors have referred to drought. The main aspects of the Brazilian and Portuguese water policy are described in the Table 1.

Implementation of water policy through basin Piancó-Piranhas-Açu

Located in northeastern Brazil between the states of Paraíba and Rio Grande do Norte, it is a river basin inserted in semi-arid climate, and the rivers are mostly intermittent requiring the presence of dams to ensure water for the population. (ANA, 2010) Besides this feature, the region coexists with a large inter annual variability of precipitation, which confers the necessity of developing strategies to minimize the regional vulnerability to drought. The situation of those who stay in the region during the drought demanded the creation of federal agencies, such as DNOCS (Department of Works Against Drought- acronym in Portuguese) that operates in areas susceptible to drought and builds infrastructures capable of storing water. Only in recent decades, under the influence of the law of waters has this agency sought to integrate the local communities, creating the managing committees of dams, with similar characteristics to the watershed committees.

Meanwhile in the PPA basin there is an agency dedicated to the management of dams and other dedicated water management. This situation becomes totally impractical because without the presence of dams, the rivers become intermittent. Water management therefore is closely linked to the management of dams. In the minutes of the meetings of the PPA watershed committee there is an effort to open talks between the managers of the basin with the dam managers. But water managers in the PPA region focus their attention to debates related to the cost of water and characterization of the basin, sometimes neglecting key issues related to communication between the DNOCS (organ devoted to building drought mitigation measures) and the agents of water policy in the watershed.So, despite being one of the goals of water policy the drought has been held by other institutions that have historically been responsible for developing tools focused on drought mitigation. Yet it must be noted that the examined committee was establishment in 2009 and the river basin plan was created in 2014, so it is natural that their discussions and issues are broad and varied and it requires a big effort of its members in selecting action priorities of the committee. However, due to the physical characteristics of the PPA watershed, the agenda of drought should not be

in the background, since it is one of the goals of water policy. There is a need for greater efforts to build a drought resilient system, and this process requires integrated and coordinated policy actions.

Table 1: Overview of Brazil and Portugal

	PPA	Guadiana
Year of establishment of water policy	1997 law 9.433/97	2005 law
Emphasis on the need for mitigating the effects of drought	Article 2˚line III: *prevention and defense against critical hydrological events occurring naturally or resulting from inappropriate use of natural resources.*	Article 1˚line "e": *To mitigate the effects of floods and droughts;*
Year of establishment of river basin management plan	2014	2012
Approach to the subject of drought in the management plan	Presentation of an overview of the current water infrastructure and actions that can assist in times of crisis beyond the characterization and mapping of critical events	Highlight the necessity of drought be an objective aimed of water policy, and characterization and diagnosis of the region to focus attention on its susceptibility.
Proposed measures to increase resilience to drought	Not included in the basin plan but there are actions focused on creating a strategy to respond to drought	Is not reported in the basin plan and is not expected to integrate this theme in current discussions.

CONCLUSION

The study shows that both Brazil and Portugal need strategies to assist a resilient model to drought disasters. Part of the difficulty in implementing a system resilient to drought is due to the misconceptions both words generate.The difficulties in the implementation of water policy demonstrate the inefficiency of top-down and isolated actions on the development for a resilient system at risk, since the complexity and ambiguity that contains risks require a change from traditional management methods. So, even with the creation of laws that encourage the integration of various components (social and environmental) that affect the water question, there is an inefficiency of these legislative instruments. This is a big challenge to both Brazilian and Portuguese policy, since there has been a trend to centralized decision making with reactive responses to disasters.

But the management of drought brings more complexity since there is a lot of confusion regarding the basic characteristics in the performance of this phenomenon. This scientific gap affects the development of drought preparedness measures in many countries of the world (Wilhite, 1993). On one hand, the characteristics of drought negatively affect strategies for risk mitigation. On the other, they encourage the need for creating a system of community resilience. Due to the fact that disasters act silent

and gradually, they aid in the construction of social engagement. In addition, it is possible to learn more than in other disasters because there is often less external support. This feature means that disasters such as drought assist in creating conditions that generate more relevant and profound learning on risk management, requiring self-adjustments and social, cognitive and cultural adjustments (Voss and Wagner, 2010).

For these changes to be effective and communities to be resilient, it is necessary that, during the pre-disaster there is a synchrony between social engagement and political interest. It is believed that this integration will help to develop measures that mitigate the adverse effects of drought. As water policy is a key tool for achieving this scenario it is the responsibility of this legislative framework to create conditions for society to play an active part in building local resilience.

However in Portugal and Brazil there is a big gap between water policy and drought management. Facing this reality it is important to question if this gap is due to imperfections of the legal instruments which provide water and drought management, to the complexities of issues that are covered in water policy, or it is a lack of political culture sensitiveness to drought. The most credible hypothesis is that it is through the junction of these three spheres that the drought in both countries has been managed. Among these factors it must be emphasized that in the process of creating a drought resilient system it is vital to have great socio-political interest since the range of issues addressed by the water policy allows its application be molded according to the prevailing political interests.

Meanwhile, the Brazilian and the Portuguese water policy has proven to be obsolete to the complexity of the performance of drought. Despite the apparent efforts to create a regulatory system that addresses the risk of drought, due to the complex characteristics of drought there is little social and political interest in applying the regulations laid down by water policy. This fact coupled with the tendency for the fragmentation and centralization of political decisions; further hinder the implementation of actions related to mitigating the negative effects of drought. Thus it can be concluded that despite the fact that drought mitigation is part of the objectives of Brazilian and Portuguese water laws, if there is no interest in the deployment of this reality, there will be no effort to achieve this goal. Thus, the fact that the drought is covered by water law may give the false idea that there are legal remedies, capable of creating bureaucratic efforts focused on increasing the resilience conditions in the watershed, which eventually may inhibit the creation of instruments focused on real integration between the management of drought and water.

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Session Five – Emergency, communication and psychological resilience

Paper 17: Women capacity, community resilience, and sustainable post disaster reconstruction: Case study from Indonesia

[1]Tri Yumarni, DilanthiAmaratunga and Richard Haigh

[1]*School of Built Environment University of Salford, UK; email: t.yumarni@edu.salford.ac.uk*

ABSTRACT

This paper aims to flesh out women capacity for creating community resilience and practices of sustainable post disaster reconstruction in Bantul district Central Java Indonesia. Based on case study, the findings show women grassroots organizations have insight, information, experience, networks and resources vital within earthquake reconstruction as such capacities increasing resilience. During reconstruction women demonstrated their capacity as income-earners, producers and managers of food production, providers of clean water and fuel, and participants in village voluntary labours for maintaining public infrastructures and environments.

Key words: women capacity, community resilience and sustainable post disaster reconstruction

INTRODUCTION

Understanding women capacity in the post-disaster reconstruction contexts is important to achieve better process of disaster management and to enhance sustainability of reconstruction and community resilience. However, the potential of women capacity for supporting community resilience and sustainable post disaster reconstruction is rarely explored (Enarson et al. 2009). This study aims to explore women capacities for creating community resilience and practice of sustainable post disaster reconstruction in Bantul district Central Java Indonesia.

WOMEN CAPACITY AND RESILIENCE

Resilience means the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2006). It relates to the ability to 'resile from' or 'spring back from' a shock. The resilience of a community in respect to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organising itself both prior to and during times of need.

Policymakers and practitioners are using the word 'resilience' to talk about the capacities of communities to cope with the shocks and stresses they experience as a result of natural disasters and climate change (UNISDR, 2006). Building community resilience to natural disasters and climate change includes several actions bundled together. They include actions taken both before and after disasters. All the actions are centred around one core idea: improving community capacities to reduce the impacts of disaster and climate change (Chandra, 2011). Resilience is the capacity of a community to organise itself to reduce the impact of disasters by protecting lives, livelihoods, homes, assets, basic services, and infrastructure (Plough, 2013). Capacities include skills, knowledge, resources, practices and networks. Resilience includes the capacities of communities to advance development processes, social networks and

institutional partnerships that strengthen the ability of the community including women to cope with and recover from disasters.

Enarson (2001) defines women capacity as the ability of women to cope with and recover from disasters. Women have proven that they are indispensable when it comes to responding to disasters (Delaney & Shrader, 2000). Though often against men's wishes, women have been willing and able to take an active role in what are traditionally considered male tasks. Women are effective at mobilising the community to respond to disasters since they form groups and networks of social actors who work to meet the most pressing needs of the community. Enarson (1999) describes how grassroots women's in poor communities are working collectively to improve the lives of their families and communities. These women work hard to make sure that that their families and communities have food, shelter, water, sanitation and that their livelihoods and homes are secure. Floods, droughts, landslides, volcanic eruptions, hurricanes and earthquakes deepen and worsen the problems poor women experience as a result of their poverty. Thus, any lack of resources resulting from disaster or climate change reduces their ability to fulfil not only their own needs, but also those of their families and the wider community.

WOMEN CAPACITY AND SUSTAINABILITY OF POST DISASTER RECONSTRUCTION

Sen (2000) have highlighted the fundamental role of women on sustainable development. He states, "Advancing gender equality may be one of the best ways of saving the environment, and countering the dangers of overcrowding and other adversities associated with population pressure. The voice of women is critically important for the world's future - not just for women's future." Accordingly, sustainable development is development, which meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nation, 1987). It therefore encapsulates the needs of both women and men. Intra-generational equity cannot be achieved without addressing the gender relations, which underlie prevailing inequity. Nor can inter-generational equity be obtained, or responsibility to pass on a more equitable world to future generations be met, if inequalities continue to be perpetuated. Without serious steps to address gender inequalities sustainable development cannot be achieved.

Gender and built environment studies also highlight that women capacity is one important aspect that should be considered to enhance the sustainability of post disaster reconstruction (Childs, 2006; Delaney & Shrader, 2000). The study of UN-HABITAT (2007) found that when women are empowered, they have the capacity and the inner will to improve their situation and gain control over their own lives and families. This capacity can lead to an equal share in economic and political decision making, and control of economic resources which reduces their vulnerability in disaster situations. Accordingly, integrating gender equality into post-disaster reconstruction practices makes the reconstruction efforts not only provide opportunities for women to make their decision but also develops their capacities to take up the responsibilities regarding what is better for the present and future of community development (Delaney & Shrader, 2000). This integration is strongly linked with the agenda of sustainable development, which is to promote women and men's role in solving environmental issues and to achieve sustainable development and a higher quality of life for all people (United Nation, 1987). Accordingly, this study aims to identify women capacities and their roles for creating community resilience and practices of sustainable post disaster reconstruction.

CASE STUDY

A single case study is used to explore women capacities, community resilience and sustainable of post disaster reconstruction. Case study was designed to explore women capacities for creating community resilience and practice of sustainable post disaster reconstruction in Bantul district Central Java. Primary data was collected through in-depth interviews of policy makers and beneficiaries who dealt with and had knowledge of Bantul earthquake reconstruction. Besides, the representatives of international and local NGOs whose programmes were related to the earthquake reconstruction were also interviewed. Beneficiaries' interviews were conducted separately between women and men in order to avoid male bias as well as to reveal women voices. The case study involves an in-depth interview with 20informants, and an additional ten respondents for the verification. This research adapts the grounded theory approach in the analysis of the data. The data was analysed using Strauss and Corbin (1990) three steps of coding: open, axial, and selective coding. First, open coding was used to identify and develop various dimensions of women capacity revealed in the field. Second, axial coding was used to create a linkage between those dimensions. Third, selective coding was used to select the core category or the central phenomenon of women capacity revealed. We used NVivo and MindMap software to help the coding and mapping process.

FINDINGS

Earthquake is one of most hazardous disaster in Indonesia. The 2006 Yogyakarta earthquake for example destroyed severely most of districts in this province. In less than a minute, the tremor with measuring 5.9 on the Richter scale, killed thousands of inhabitants, destroyed many houses and public infrastructures. Bantul district that located in the centre of Yogyakarta province was the most destroyed area. The powerful earthquake in Bantul left 4,659 people died and around 50,000 injured. The total amount of damage and loss was estimated at US$3.1 billion. Small and medium scale enterprises, especially in the area's important handicrafts sector, were severely affected. Many of these were home-based industries, and hence the damage to houses had a corresponding impact on economic livelihoods. An estimated 1.3 million workers who are majority women were employed in sectors affected by the earthquake, particularly in the ceramics, furniture, textiles and weaving, silver and leather manufacturing, and food processing industries.

Women are places at the most vulnerable group during Bantul earthquake. They were overrepresented among the 2,456 killed and 35,000 injured (60% of total victims). Limited knowledge about disaster management in the Bantul district contributed to the large number of victims. However, not only did the government lack skills and expertise when dealing with the crisis, the community itself had to face the unexpected and worst situation because they did not know what to do in an emergency. The vulnerability of women was increased soon following the damage of houses and many public infrastructures. The housing sector suffered the most severe damage and loss of any sectors. In total, 77,917 houses were destroyed with badly damaged 71,372 houses and light damaged 6,545 houses. In addition to the damage and loss in the housing sector, the impact in public and private infrastructure was estimated at 397 billion and 153.8 billion rupiah respectively (Bantul Bureau of Statistics, 2006). Large-scale damage to houses and public infrastructures is associated with a lack of adherence to safe building standards and basic earthquake resistant construction methods. Most of the private homes used low-quality building materials, lacked essential structural frames and reinforcing pillars, and collapsed easily because of lateral shaking movements. The poor are the least able to afford building safe houses and many of

their homes were damaged. Many public buildings also collapsed due to poor building standards, in particular schools and hospitals. Without proper houses and limited access to public services, women's survival was threatened. Statistics show that women and children mortality rate in Bantul district one year after disaster was increased by 11 per cent (Bantul Bureau of Statistics, 2006).

Women and community resilience

Despite women were the most vulnerable groups, their capacity were vital for strengthening community resilience during post-earthquake reconstruction in Bantul. Women capacities into community resilience were shown from their coping abilities, knowledge, skills and collective contribution during reconstruction (Figure 1). The roles of women were shown on three cores of community resilience: First – organisation (i.e. organisations, platforms and constituencies of grassroots women and communities). Second – skill, knowledge, and capacities (i.e. consolidating and transferring knowledge and practices that enable grassroots women to minimize losses and rapidly recover from disasters). Third – engaging institutional actors such as government and local authorities (i.e. engaging and influencing decision makers to ensure coordination between institutions and communities along with responsive, accountable institutional arrangements).

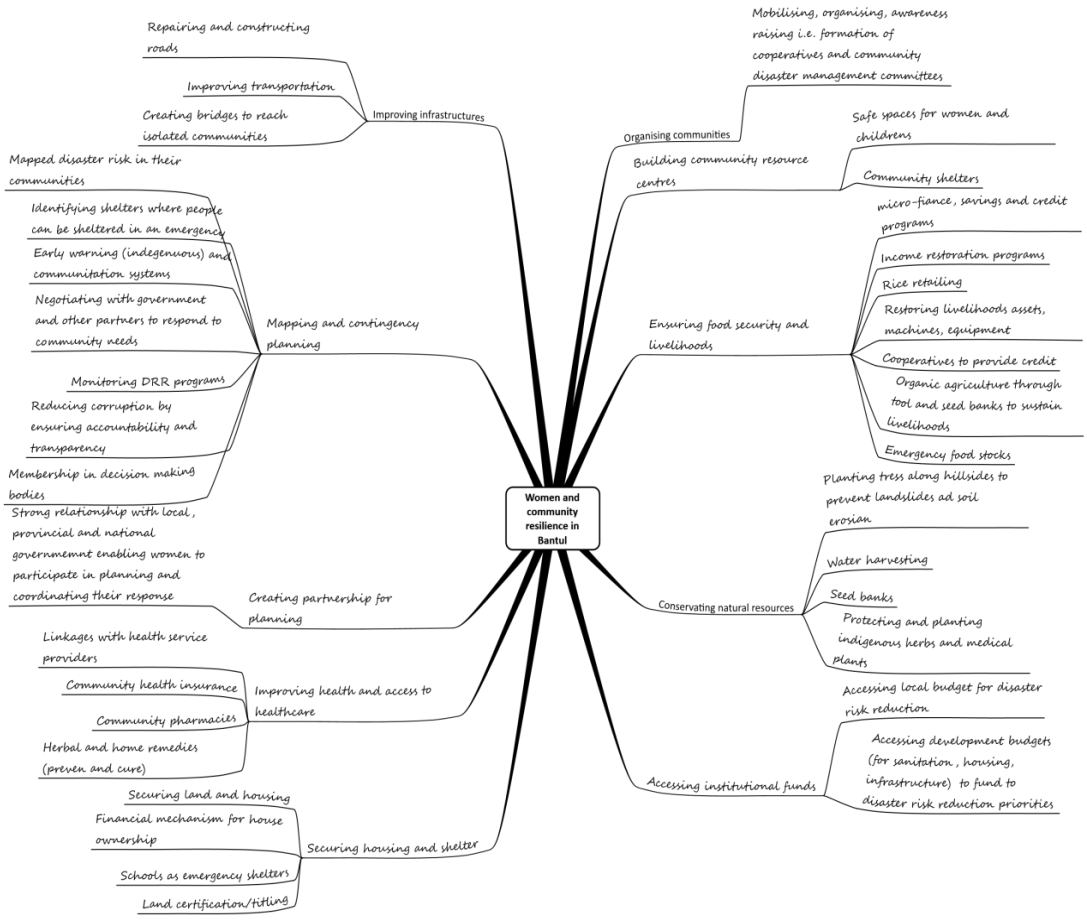

Figure 1 Cognitive mapping of women capacity in community resilience in Bantul

Women have active roles in mobilising and organising disaster management committees. For example, women grassroots organisation have actively involved in monitoring and evaluating reconstruction. Bantul's reconstruction has a different approach in terms of the ways of housing contracting out in which every single household head are a contractor for their own home. As Bantul's policy maker explains the following: "*Bantul's reconstruction is a community driven approach and differs from approaches in which contractors are hired to do the rebuilding. For example, say we were building 15,000 houses. One option would be to get 15 contractors and for each of them to build 1,000 houses. In that case, there would be 15 contractors as active participants of reconstruction and 15,000 passive beneficiaries. In our approach that is not the way to do it. The best thing is to have 15,000 people, each one of them working on their own home" (Interview with policy maker).* With this approach, women and men in the communities were equally involved in procurement and quality control as well as supervision of the construction. Beneficiary satisfaction with the approach is high since they could provide inputs and make changes in the design of the house

During reconstruction, women used their skills and knowledge to minimize losses and rapidly recover from disaster. For example, women grassroots have actively involved in mapping disaster risk in their communities by identifying the most vulnerable groups. They used their local knowledge to identify and to prioritize target groups for government funding. Using traditional and modern communication system, they initiated early warning and communication systems to protect community members from future earthquake. Bantul women grassroots organisation helps community to recover rapidly from earthquake. For example, they were actively involved in income restoration program, rice retailing, and restoring livelihoods assets, machines, and equipment. Even, in some villages women supports to repair and to construct roads, improving public transportation, create bridge to reach isolated communities. Numerous village women worked in construction: sifting sand, mixing cement, ensuring the right proportions of sand and cement, and supervising the masons to make sure that they were incorporating earthquake-safe features in the construction.

Women grassroots organisation also engaged with local policy makers within post-disaster reconstruction process. Women organised their work into several committees. First, a water committee responsible for ensuring that water is available for construction-arranging both access and transport to site. Second, a purchasing committee that is responsible for checking the prices and quality of construction materials before buying them. Third, a materials committee that is responsible for keeping records of the materials coming in and the amount used, and for informing the purchasing committee when more materials are needed. Fourth, an accounts committee that is responsible for recording the amounts spent daily on construction, literally tracking every expense from the day the foundation is excavated to the day the walls are painted. Fifth, a supervisory committee that is responsible for the overseeing construction and ensures that masons use appropriate, earthquake safe building techniques. These committees cooperate with local government in accessing local development budgets for sanitation, housing, infrastructure to fund reconstruction. Moreover, they were also active in monitoring program and reducing corruption by ensuring accountability and transparency within reconstruction process.

Women and sustainable post disaster reconstruction

Post disaster reconstruction can be seen as an opportunity to channel investments to upgrade the living standards of the poor, to enable the most marginalised to participate,

and to establish dialogue mechanisms between affected citizens and government to foster accountability. It is a chance to "build back better" and apply principles of sustainable development and hazard reduction to communities and regions that are likely to remain at high risk of future disasters.

Women roles into sustainable post disaster reconstruction in Bantul reconstruction can be seen in Figure 2. None of the three dimensions of sustainable development can be achieved without long-term investments in economic, social and environmental capital. In Bantul, reconstruction of housing, water and sanitation were not only creating healthy environments of affected communities but also protect land and its ecosystem from disasters in the future. Women grassroots include women voluntary labour organisations, women credit and saving associations, and women family welfare groups have vital roles in achieving sustainable post-disaster reconstruction through their capacity in improving environmental, social and economic sustainability.

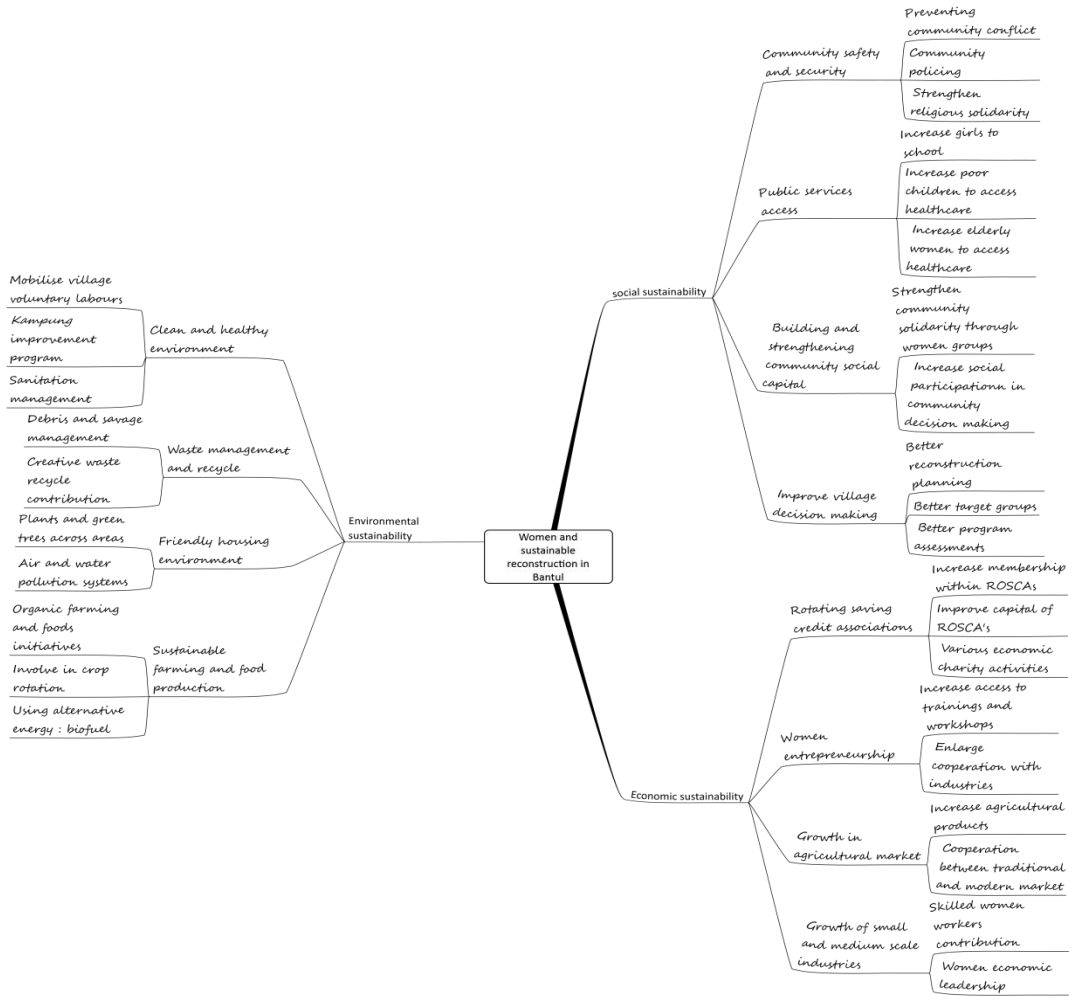

Figure 2: Cognitive mapping of women capacity in sustainable post disaster reconstruction in Bantul

Women capacity for supporting environmental sustainability was shown from several activities: sustainable farming and food production, friendly housing environment, waste management and recycle, and healthy environment. In agricultural sector, women have promoted to use organic farming and food production rather than modern

farming using pesticide. Organic agricultural products (i.e. organic rice, fruits, and vegetables) have become an iconic product of Bantul district since reconstruction. Women roles in creating friendly housing environment were shown across villages. They plants green trees along villages roads and garden. Women grassroots across communities build *TOGA* (*Tanaman obat keluarga*) groups, which is purposed to protect and to plan indigenous herbs and medical plantation around the houses. Debris and savage management were another issue in which women groups involved to solve it through creative waste recycle contribution (i.e. rubbish bank arcade, vertical garden from soda bootless, and handicrafts). Women were also actively involved within village voluntary labor or *kerja bakti* and *kampong* improvement program, which aims to create and to maintain healthy and clean community environment across villages in Bantul.

With regard to economic sustainability, women role at improving well-being is vital given the increasing of women poverty following earthquake. Generating income to support their families was a priority for most of the women in Bantul. However, to start their own business most of them did not have enough funding. Therefore, women grassroots organisation initiates to build Rotating and Saving Credit Association (ROSCAs) where each member can access funding. In some villages ROSCAs have enlarge their activities as an income generator. As an women activist explains the following: "*Not only do we save money by circulating low-interest loans but also we have started making and selling products such foods and drinks with the money that we have saved. The profits from the sales go back to our savings group. So it gives us both an income and great empowerment (Interview with a women activist)*. Micro, small and medium enterprises affected by the earthquake are assisted through access to finance combined with technical assistance. Gender inclusiveness is strongly embedded in this program. As reported, 57 percent of borrowers and 44 percent of beneficiaries receiving technical assistance are women, exceeding the target of at least 30 percent participation of women. Targets under the access to finance component have been achieved with 10,056 loans disbursed to micro, small and medium enterprises by 2011. Loans amounting to US 5 million have been disbursed to 26 microfinance institutions with majority were managed by women grassroots organisation.

Social sustainability emphasises that reconstruction activities should recognise the extent to which social values and identities, relationships and social institutions of affected regions can be maintained and adapt to future disasters. Women roles in creating social sustainability in Bantul were shown from their activities in creating community safety and security, strengthening community social capital, access to public services, and improve village decision making. Women groups working together with community members, district government and International donors during implementation. The Javanese cultural tradition of *gotong royong* - working collectively for the common good of the community - provided fertile ground for Bantul's community-driven approach. In times of need, people readily help each other and lend a hand in the spirit of cooperation. Neighbours work together and neighbouring villages and communities come to each other's assistance in rebuilding their home and business. Vulnerable women, children and elderly people are always prioritised first during program implementation. The spirit of *gotong royong* is well suited to a community-based approach; it helped communities in Bantul work together and pick up the pieces after the disaster. The survivors showed great resilience and community spirit. In the aftermath of the disasters, communities across Bantul's village supported each other in rebuilding their lives and their communities to be more secure and safer.

DISCUSSION AND CONCLUSION

Women are more vulnerable to the effects of natural disaster than men-primarily as they constitute the majority of the world's poor and are more dependent for their livelihood on natural resources that are threatened by disaster (Enarson et al., 2003). Furthermore, they face social, economic and political barriers that limit their coping capacity. Women and men in rural areas in developing countries are especially vulnerable when they are highly dependent on local natural resources for their livelihood. Those charged with the responsibility to secure water, food and fuel for cooking and heating face the greatest challenges. Secondly, when coupled with unequal access to resources and to decision-making processes, limited mobility places women in a position where they are disproportionately affected by natural disaster (Delaney & Shrader, 2000; Ariyabandu & Wickramasinghe, 2003). It is thus important to identify gender-sensitive strategies to respond to the environmental and humanitarian crises caused by natural disaster.

It is important to remember, however, that women are not only vulnerable to natural disaster but they are also effective actors or agents of change in relation to both mitigation and adaptation. Women often have indigenous skills, knowledge and expertise that can be used to create community resilience and sustainable post disaster reconstruction strategies. Furthermore, women's responsibilities in households and communities, as stewards of natural and household resources, positions them well to contribute to livelihood strategies adapted to changing environmental realities. This study shows that women grassroots in Bantul district have insight, information, experience, networks and resources vital within earthquake reconstruction as such capacities increasing resilience. During reconstruction women demonstrated their capacity as income-earners, producers and managers of food production, providers of clean water and fuel, and participants in village voluntary labours for maintaining sustainability of reconstruction outcomes and building back better community.

In sum, this study highlights that disaster reconstruction initiatives must be inclusive and equitable; that the economic needs and resources of both women and men must be anticipated by policy makers and addressed proactively, and that reconstruction must foster conditions empowering women rather than undermining their capacities and increasing their vulnerability to subsequent disasters.

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Paper 18: Lived Experiences of Disasters from Northern Pakistan: Examining Social Repair amidst Structural Violence

Omer Aijazi[1]

[1]*University of British Columbia, Canada; email: omer.aijazi@utoronto.ca*

ABSTRACT

Disaster studies and practice tend to focus on processes of *recovery*, which essentially prioritize restoring basic material needs, saving lives and preventing future deaths. However in addition to material devastation, disasters also cause profound disruptions to social life. They erode societal structures including networks of familial and intimate relationships that provide the foundations of community, preventing sustainable and equitable development. Current disaster scholarship recognizes social networks and capital as important, but only insofar as they stimulate recovery of material needs. Hence broader processes of remaking life and restoring/re-inventing social relationships following disasters remain relatively under-explored within disaster scholarship. These gaps in disaster studies and practice are addressed by bringing in concepts of social repair from literatures outside the subfield of disaster studies. Earthquake (2005) and flood (2010) affected Neelum and Siran valleys in northern Pakistan serve as case studies for this research, where everyday attempts at social repair intersect with structural violence and longstanding vulnerabilities. The research employs oral history interviews and photovoice for data collection. Research findings are expected to contribute to disaster scholarship as well as generate evidence-based policy recommendations for humanitarian organizations.

Keywords: disaster recovery, humanitarian policy, Pakistan, social repair, structural violence.

INTRODUCTION

According to the United Nations Office for Disaster Risk Reduction (UNISDR), in the last 12 years (2000-2011), 1.1 million people have been killed by natural disasters, 2.7 billion affected and 1.3 trillion USD worth of economic damage reported globally (UNISDR 2013). Some estimate that the fatalities from natural disasters even exceed those from war (Moseley 2002). The World Bank and Earth Institute estimate 3.4 billion people currently reside in regions at risk of natural disasters (Dilley et al., 2005). While disasters do not discriminate their impacts do. The Asian Disaster Preparedness Centre estimates that even though only 11 % of total exposed populations live in developing countries, they account for 53 % of reported deaths (ADPC 2010). In addition to the loss of human life, disasters also undermine progress towards sustainable and equitable development (Pelling et al. 2004).

Russell Dynes from the Disaster Research Center at the University of Delaware notes, existing approaches to disaster management ignore contextual realities of developing countries such as large rural populations, widespread displacement, structural violence and unresolved conflict (Dynes 2004). Additionally, existing disaster management practice tends to focus on restoring life to as before instead of addressing the root causes of disasters, therefore failing to contribute towards sustainable and equitable development (Chhotray & Few, 2012; Mustafa, 2003).

Disasters can be understood as forms of collective violence, which disrupt thelives of large numbers of people, and are intensified by prevailing political, social and economic conditions. Similar to mass violence, disasters erode societal structures

including networks of familial and intimate relationships that provide the foundations of community (Fletcher & Weinstein 2002). Unsettled in both material and social domains of life (Oliver-Smith 2005), disaster survivors must re-establish societal structures and relationships in addition to re-constituting their notions of the self. However, supported by literature on emergency management (Alexander 2002; Haddow et al. 2008) disaster recovery practice assumes that disaster survivors recover in linear and temporally bound ways and are primarily concerned with material restoration.

Current disaster scholarship recognizes social networks and capital as important, but only insofar as they stimulate recovery of material needs (Nakagawa & Shaw 2004). Hence broader processes of remaking life and restoring/re-inventing social relationships following disasters remain relatively under-explored within disaster scholarship. These gaps in disaster studies and practice are addressed by bringing in concepts of social repair from literatures outside the subfield of disaster studies. Being aware that social repair may take on different forms depending on features such as class, gender, ethnicity or culture; three forms of social repair have been identified which are relevant to this study. These are: i. resumption of daily life routines ii. restoration and/or formation of new relationships and iii. re-constitution of the sense of self.

Disaster scholars have established that while environmental and geo-physical changes may trigger natural hazards, their consequences are exacerbated by persisting socio-economic inequities and vulnerabilities such as those pertaining to gender, class, ethnicity or culture (Bolin 2007; Enarson & Morrow 1998). Similarly, several scholars have argued that recovery efforts themselves are also constrained by pre-existing vulnerabilities and ongoing relationships of inequity which typically influence responses to disasters far more profoundly than the physical forces of the disaster itself (Oliver-Smith 1999; Wisner et al. 2004). In attempts to link processes of recovery with the root-causes of vulnerability, agency with structure, and the local with the extra-local, the concept of structural violence is used. Structural violence refers to the subtle, often invisible ways in which social structures and forces systematically harm disadvantaged groups (Farmer 1999, 2003). Farmer et al. (2006) describe structural violence as follows:Structural violence is one way of describing social arrangements that put individuals and populations in harm's way… The arrangements are structural because they are embedded in the political and economic organization of our social world; they are violent because they cause injury to people … neither culture nor pure individual will is at fault; rather, historically given (and often economically driven) processes and forces conspire to constrain individual agency. Structural violence is visited upon all those whose social status denies them access to the fruits of scientific and social progress (Farmer et al. 2006, p. 1686).

The proposed research study examines processes of social repair after disasters in settings of structural violence, where populations are most vulnerable. It aims to contribute to the development of a social repair approach to natural disasters in settings of structural violence. Therefore the central research question guiding this study is: How do disaster survivors negotiate the impacts of natural disasters on their everyday lives, relationships and sense of self? Subsidiary questions informing this research include: i) How are impacts of disasters shaped by conditions of structural violence? ii) How do impacts of disasters vary across social disparities and inequities within a group? iii) How might attention to processes of social repair be relevant to the study of and responses to disasters, in particular to challenge current concepts of recovery?

The research contributes to both disaster scholarship and practice. It advances existing scholarship on disaster recovery by bringing into conversation disaster studies and interdisciplinary approaches to the concept of social repair and by making explicit the linkages between social repair processes, structural violence and long term disaster recovery. It also seeks to develop evidence-based policy recommendations for humanitarian practice based on the lived experiences of disaster survivors. The study will take place in Pakistan because of its natural hazard profile and embedded structural violence. The country is susceptible to sudden onset disasters such as earthquakes, floods, cyclones, and landslides as well as slow onset disasters such as droughts (PDKN 2011). Two recent, large scale natural disasters which have received substantial international attention are the 2005 Kashmir Earthquake, which affected some 3.5 million individuals (OCHA 2005), and the 2010 Monsoon Floods which disrupted the lives of another 20 million Pakistanis (OCHA 2010). These two disasters form the context of this study. Pakistan also ranks poorly on almost all human development indicators. Approximately 49% of its total 192 million population is classified by the United Nations as being in "multi-dimensional poverty" and another 27.4% in "severe poverty" (UNDP 2011). Most Pakistanis strive to carve out their lives within a climate of high unemployment rate and under-employment; gender based sexual violence; ethnic conflict; lack of political participation and ingrained systems of structural violence such as the feudal system and racism.

CONCEPTUALIZING SOCIAL REPAIR

Social repair is the process by which survivors of disruption (such as disasters, violence, conflict) strive to lead a *moral life* amidst overwhelming uncertainties, risks and constraints. Kleinman (2006) associates the moral with values, and therefore conceptualizes efforts at leading a moral life as "carrying on our existence, negotiating important relations with others, doing work that means something to us, and living in some particular local place where others are also passionately engaged in these same existence activities" (p.1-2). Taking this further, social repair can therefore be defined as the set of actions and embodied processes that individuals mobilize to reconstruct social relations, negotiate strategies for coping with violence, and to get on with daily life (Riaño-Alcalá forthcoming). While having very different epistemic and ontological foundations, social repair literatures also complement Sen's (1999) "development as freedom and capabilities" approach. Sen (1999) argues that for effective development, attention should be diverted from enhancing means (such as income) towards expanding real freedoms people that enjoy such as their ability to participate in community. A multi-disciplinary review of literatures has helped glean the following three, important dimensions of social repair:

Resuming daily life routines

Resuming life following social disruption means regaining confidence in everyday spaces and coming to terms with the limitations of the protective guarantees of the community and state (Mehta & Chatterji 2001). After communal violence in India, social repair for survivors meant reviving mundane routines such as sending one's child to school or having a roof over one's head (Das 2007). Das's nuanced engagement with survivors of communal violence draws attention to the delicate acts of self-creation embedded in the process of re-occupying the same spaces of daily life where one once experienced disruption. According to Riaño-Alcalá's (2006) exploration of urban youth and armed conflict in Columbia, it was important for actors to recreate a sense of normalcy in everyday life and manage uncertainty. In Chamlee-Wright's (2010) context of communities displaced from Hurricane Katrina, return to daily life meant being able to access familiar foods. In post-flood Pakistan, upon

returning from displacement camps to their destroyed homes, women reported making chapattis (flat bread) to regain a sense of normalcy as men embarked on the immediate tasks of repairing broken windows and doors (Aijazi & Panjwani forthcoming 2014).Similarly Baines & Rosenoff-Gauvin (2014) explore the stories of two women in post-war Northern Uganda who overcome their displacement from family networks by taking on culturally mediated notions of motherhood in the form of assisting other female heads of households trace paternal clans, and secure a future for their children.

Restoring and/or forming new relationships

This understanding of social repair is found within transitional justice literature and refers to processes of community healing, social reconstruction and reconciliation. Social repair, as found within transitional justice literatures, recognizes that top-down initiatives (such as those aimed at promoting community cohesion) often ignore existing "local dynamics aimed at reinforcing or transforming the power relations that are often most relevant to peoples' lives" (Arriaza & Arriaza 2008, p. 153). In the context of ethnically heterogeneous Bosnia and Herzegovina, social repair is understood as the restoration of relationships between historically differentiated groups (Haider 2011). In the context of protracted conflict in Uganda, social repair is described as the micro-processes of healing enacted through traditional, customary practices such as ritual cleansing allowing warring groups to co-exist peacefully (Baines 2010). In the context of post-war Peru, social repair refers to the local processes by which victims and local perpetrators of violence learn to live together in a community (Theidon 2006). In post-conflict Colombia, following the massive disbarment, demobilization and reintegration of former combatants, social repair also refers to the interaction between victims, ex-combatants and their surrounding communities (Prieto 2012). In the context of post-Communist Czech Republic, social repair is understood as a process of forgiveness enacted by restoring equality between victims and perpetrators, lowering the greater position of perpetrators, and perpetrator's gestures of repentance towards victims (David & Choi, 2006). These bodies of work frame social repair as the restoration or renewal of relationships between individuals and communities as grounded within local knowledge to allow for the continuation of communal as well as national life (Arriaza & Arriaza, 2008).

Re-constituting the sense of self

This refers to the processes by which survivors regain agency, historicity and confidence in local systems of meaning making (Freire 1970) as well as form new subjectivities and counter-narratives (Arias 1997). Survivors of violence in Ireland reconstituted themselves by sharing their stories and breaking the silence that surrounded their experiences in attempts to regain historicity (Donnan & Simpson 2007). Similarly, a survivor of abduction and forced marriage and motherhood in Northern Uganda, restored her sense of self through the act of storytelling (Baines & Stewart 2011). Her creative recollection of experiences in captivity, reinterpreted the past to defend her innocence and moral character throughout the war and maintained her rightful place in present society as a woman and mother (Baines & Stewart 2011). Survivors in post-conflict Uganda also learned to make meaning and re-establish historicity via processes of intergenerational knowledge transfer ensuring the preservation of local knowledge and maintenance of moral communities (Rosenoff-Gauvin 2013). In the context of ethnic violence in urban communities in the city of Karachi, Pakistan, older women attempted to reconstruct their life-worlds by reinventing themselves as ethnicized citizen-subjects and became active in an ethnic political party (Chaudhry & Bertram 2009). In the same context, women also

mobilized grief in the face of human loss and structural violence to raise and remember their dead, while embarking on the task of continuing to live in an unjust, unfair and inequitable world (Chaudhry 2014). Das and Kleinman (2000) remind us that the reconstruction of the self following conflict and structural violence is not a linearprocess, and there is no returning to a "normal" that may have existed before the encounter with violence, loss and pain. Therefore subjects/survivors must reconfigure their lives as well as their relationships to the world to continue on "living". This is exemplified in Deraniyagala's (2013) memoir that describes her journey of recreating herself following the loss of her family in the 2004 Indian Ocean Tsunami.

PROPOSED RESEARCH METHODOLOGY

The exploratory, qualitative research will be conducted with post-earthquake and post-flood communities in northern Pakistan. It seeks to capture everyday lived experiences of disaster survivors as they strive to recreate their lives following natural disasters. Data will be collected using oral history interviews and photovoice in two selected case locations. Since disasters are experienced differently by men, women and children, and these experiences cannot be understood in isolation from other intersecting features such as class, race and culture, an intersectional approach is proposed for this research (Crenshaw, 1994; Fordham 1999). An intersectional analysis will enable a more nuanced understanding of gender in relation to social repair. Not only are women typically more vulnerable to natural disasters and experience them differently as a heterogeneous social category, they are also at the forefront of recovery and relief processes. In the post-disaster space women must occupy new roles, develop new subjectivities and form new relationships to enable continuity of daily life. Therefore in order to theorize from everyday realities of both women and men, equal numbers of female and male research participants will be included in the study.

An intersectional analysis will also be useful in naming and analyzing features of structural violence which shape social repair in post-disaster spaces including a stronger conceptual rendering of how structural violence may influence localized processes of social repair. Finnstrom (2008) reminds researchers about the importance of complementing historical, political and economic meta-narratives with local ethnographies that encompass local understandings of morality, interpretations of history and expectations. Similarly Chamlee-Wright (2010) asserts the importance of "get[ting] on the ground and talk[ing] to people" (p. 3) to enable a deeper understanding of the various ways in which survivors mobilize culturally embedded resources after natural disasters. Kleinman (1996) also argues that there is a lot to be learned from the stories and lived experiences of those attempting to lead a moral life amidst social disruption.

Case selection: Neelum and Siran valleys

Field work will be conducted in two remote valleys in northern Pakistan; Neelum and Siran valleys. In addition to being highly susceptible to natural disasters, daily life in the two valleys remains rooted within specific historiographies of marginality and structural violence. Both valleys are located within deeply forested regions, on inaccessible mountainous terrains and rank poorly on human development indicators(Halvorson & Hamilton 2010).Unregulated deforestation and climate change have made residents of both valleys vulnerable to frequent natural disasters such as flash floods and landslides particularly during monsoon seasons (Sudmeier-Rieux et al. 2011).Both Neelum and Siran valleys were heavily disrupted by the 2005 Kashmir earthquake, which affected some 3.5 million people and killed some 72,000 residents across the nation (OCHA 2005). In addition to destroying houses, schools and

hospitals, the earthquake created new vulnerabilities such as large numbers of permanently disabled survivors, female headed households and children without guardians (Halvorson & Hamilton 2010; Özerdem 2006). In 2010, monsoon floods once again disrupted the Neelum valley submerging submerged nearly 1/5th of the country and affecting the lives of some 20 million residents (OCHA 2010). Additionally, Neelum valley also remains at the centre of a long lasting border dispute between Indian and Pakistan (Smith 2013). Even a decade after the earthquake, and four years after the flooding, disaster recovery continues to be an on-going concern in both locations.

Oral History Interviews and Photovoice Collections

Oral history interviews and photovoice are proposed as data collection methods to help understand how disaster survivors encounter and respond to social crisis brought on by disasters. Oral history interviews allow for grassroots recollections of daily experiences of past events (Larson 2006). These open-ended interviews will allow an exploration of participant experiences of disasters including the challenges they faced and steps taken to overcome them. With the help of research assistants, ten oral history interviews will be conducted with disaster survivors in each of the two study sites (total of twenty interviews). Female participants will only be interviewed in the presence of at least one female research assistant. Depending on participant's preferences interviews may be conducted in familiar settings such as interviewee's home or in more communal settings such as the local teashop. These decisions will be made in consultation with the participant. Depending on participant preferences, the interview process may also be directed at the family unit (instead of a single member); this however, may raise concerns about male dominance. Efforts will be made to conduct interviews surrounded by the rhythms of participant's daily life. Interviews will be conducted in two rounds. The first round will focus on building rapport with research participants and soliciting general information on participant's experiences of disasters. Interview transcripts will be reviewed and based on this preliminary analysis specific follow up questions will be designed for each research participant. Participants will be invited to bring objects or photographs that are meaningful to them as they narrate these oral histories particularly those that relate to natural disasters and their efforts at mitigating their consequences e.g. ration stubs from past humanitarian food distributions or a photograph of a deceased family member.

Interviews will be transcribed and coded for against specific themes (both predetermined and emergent) pertaining to social repair.Photovoice is a visual method that enables participants to identify and record their points of view by photographing scenes relevant to their social worlds (Carlson et al. 2006). In consultation with communities, and keeping in mind issues of comfort and familiarity with taking photographs, six male and six female participants will be selected from each study site for photovoice methods (total of twelve male participants and twelve female participants). Selection will be done to ensure diversity of participants such as gender, race and social class. Participants will be given cameras for one week and invited to take pictures in response to the following questions: What are some objects, places, people that make your everyday life easy, and what are some objects, places, people that make your everyday life difficult?

At the end of the week, they will be invited to a workshop to share and discuss their photographs. In the workshops they will be asked to think how the contents of their photographs were affected by recent natural disasters and what that meant for their

recovery. Workshops may be segregated by gender as per local cultural protocols and more importantly to create a safe space for female participants to voice their views.

EXPECTED RESULTS AND POLICY IMPLICATIONS

The study will be conducted in September 2014 with generous support from USAID and UN OCHA. Since it is essentially an exploratory study, it is difficult to predict the various forms social repair may take in selected communities. It is expected that local cultural, spiritual as well as religious beliefs and practices will intimately influence these processes of social repair as will persisting specificities of structural violence.

In terms of its policy implications, the study will draw attention of disaster researchers, humanitarian practitioners and policy makers to social repair processes after natural disasters, revealing their importance for long term disaster recovery and development. The study is expected to reveal the various inequities and resources that facilitate or hinder social repair encouraging practitioners to be mindful of them.

The study will also reveal to humanitarian policy makers and practitioners that within settings of ongoing poverty and political marginalization, communities and social relationships are further strained by natural disasters. It will highlight how survivors respond to natural disasters within contexts of everyday poverty and insecurity, and in particular how they repair the social that is necessary for long-term recovery and sustainable development. By shifting attention to processes of social repair the research is expected to propose ways to reconceptualise how and under what circumstances recovery occurs based on grassroots and community based mechanisms that foster and strengthen community relationships, and one's sense of belonging within it.

CONCLUSION

Social repair processes remain relatively under-explored and unnamed within existing disaster recovery scholarship. This study brings into conversation disaster recovery literature with social repair literatures. In doing so, it hopes to advance the field of disaster studies in this area, and encourage new directions on the processes by which disaster survivors remake their lives and repair their social for long-term recovery. A social repair orientation to disaster recovery recognizes people as complex and complete political beings and not just as abstract social categories. This allows researchers and practitioners to construct the subject (disaster survivor) and his/her aspirations of life after disruption as extending beyond mere survival. Das (2007) dispels the notion that such a rich rendering of the survivor is useless for policy makers who require a reduction of complexity in order to design any form of viable programming. She states that it is only when the meaning of an event is located in the everyday and bears the trace of how shared symbols are worked through those programs or policies become more effective.

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Paper 19: Investigating web-based communication between authorities and citizens in the disaster recovery phase

Serena Tagliacozzo[1]

[1]*University College London, UK, email: serena.tagliacozzo.13@ucl.ac.uk*

ABSTRACT

The advent of Web 2.0 has challenged the traditional "command and control" approach to disaster management and has called for active engagement of the population during all phases of an emergency. In order to develop mitigation strategies and reduce future vulnerability to disasters, research suggests that effective recovery requires collaboration between the affected community and decision makers. The purpose of the research is twofold: first, to understand the process of communication between the authorities and citizens during the disaster recovery phase, with specific attention to the role of new media. To this end, two case studies are considered and a mixed-mode survey has been administrated to a sample of citizens and authorities in selected areas affected recently by disaster.Secondly, the project will seek to understand the requirements for a Web 2.0 platform that is able to support communication between the authorities and citizens during the disaster reconstruction phase..This will contribute to the greater engagement of the population in the decision-making process during the aftermath of natural and anthropogenic disasters.

Key words: communication, community engagement, disaster recovery, Web 2.0.

INTRODUCTION

Web 2.0 technologies such as social media have dramatically changed the communication landscape and power relationships in the modern world. According to Reuters, Marx and Pipek (2011) social software "comprises a range of applications from the Internet which enable different people to contact and interact with each other. A community providing the data is the basis for these applications."While many disciplines and professions (e.g. journalism, sociology, geography, etc.) have traditionally been managed only by experts or decision makers, the advent of new media has called for a shift of paradigm and active inclusion of the ordinary citizens.

The shift from top-down, controlled data to crowd-sourced data, namely information collected and negotiated within a distributed network of people, is even more evident in disaster management practice. As a matter of fact, user generated information has great importance during a disaster because it allows rescuers and external helpers to increase their situational awareness, gain insight of what is going on and allocate resources to the most vulnerable and damaged areas (Lindsay 2011,Vieweg et al. 2010, Hughes et al. 2008).

On the other hand, the importance of Web 2.0 technologies for preparedness (Merchant et al. 2011, Holderman 2013) and early warning (WachterandUslander 2014, Earle et al. 2011) is well known. Emergency organizations have also harnessed new media for disseminating alerts to a larger public. As evidence of that, Twitter has developed a new function known as "Twitter Alerts" that enables signed up users to get accurate information from credible organizations during emergencies and natural disasters (Choney 2013). New media have the potential to create a two-way dialogue (Holderman 2013) between authorities and citizens in all stages of an emergency and fully to harness the resources from both government organizations and the local community.

Despite an increase, in recent years, of the literature on the use of Web 2.0 in disaster situations, it should be noted that researches have massively focused on the response phase.The benefits of new media in other stages of the emergency, such as the recovery phase, have often been overlooked. My research project aims to deepen the dynamics of the communication that occurs between authorities and citizens in the reconstruction phase following disasters and to understand which requirements should have a web based platform that is able to support and promote communication. Research has demonstrated that community participation in the recovery process is essential if we are to build up resilience to future disasters (Davidson et al. 2007, Kweit and Kweit, 2004)

This paper aims to introduce briefly the background and goals of the ongoing research project. The next section will consider the literature on disaster recovery and Web 2.0 technologies. Thereafter, the goals of the research project will be explained in more detail.

WEB 2.0 TECHNOLOGIES AND DISASTER RECOVERY

According to the Haas, Kates and Bowden model (1977), the disaster recovery process is made up by four different stages: response, restoration, reconstruction and community betterment. Every stage has different goals and timings and requires specific strategies. One of the main criticisms to this model is that these stages are not consecutive but they often overlap (Berke et al. 1993). Indeed disaster recovery should be seen as a social process that starts before the disaster strikes (Nigg 1995), rather than as a sequence of pre-determined stages. It worths noting that the last stage of the model includes going beyond pre-disaster levels of development and rebuilding to a higher standard in order to reduce future vulnerability to disasters. Indeed, disasters may be a catalyst for social change (Hastie 1997). On this point, Pelling and Dill (2006) suggest that disasters challenge the traditional boundaries between the State and citizens and open civil space for the renegotiation of power relationships.

Despite these criticisms, the model enables one to have a clearer understanding of how the recovery process unfolds. According to Shaw (2013), good disaster recovery requires a balance between governance, education and technology management. Indeed, new technologies, such as those associated with Web 2.0,might support all stages of the recovery process in different ways.

In the *response and early recovery stage*, urgent activities, such as search and rescue operations, are undertaken to limit damages and reduce loss of life. Researches have revealed the benefits of using remote sensing technologies and social media data for post-disaster damage detection and assessment (Liang et al. 2013) and disaster reconnaissance (Dashti et al. 2014). In addition, recent literature tends to discuss the opportunities and risks of the use of social media by governments and emergency organizations to communicateactively with people during and immediately afterdisasters (Giroux et al. 2013, Latonero and Shklovski 2011).

Once the emergency is over, *the restoration phase* can begin. In this, some lifelines are repaired, evacuees can return to their homes and infrastructureis restored. Semaan and Mark (2011, 2012) have demonstrated that Web 2.0 technologies may be able to aid restoration activities by supporting the maintenance and development of social infrastructures. Indeed collaborative practices might help to overcome the problems caused by the disruption of the physical environment and the breakdown of infrastructure following disasters or conflicts.

This element is also relevant in the *reconstruction phase*, when infrastructureis repaired and economic and social activities return to normal. This stage may require several years in order to be completed. Nevertheless the maintenance of the social fabric is essential for community recovery. Social media have proven able to sustain the maintenance of the people's social capital in daily life (Steinfield et al. 2008) as well as in post-disaster situations (Lev-On 2010, Shklovski et al. 2010). Social media might also support other aspects of community rebuilding, such as gathering together affected people around the common identity of "survivors,"helping define the meaning of the disastrous event, determining socio-political responsibility and creating physical and online memorials to victims so that they can be mourned (ProcopioandProcopio 2007).

The last stage of the recovery process includes the improvement of the community'ssafety with respect to pre-disaster conditions. Indeed,in order to reduce future vulnerability to disasters, effective recovery should always be linked with the development of mitigation strategies (Mileti 1999). In order to participate actively in the reconstruction of the social, economic and physical environment, the community should engage in discussion with decision makers. Recent literature (Cogburnand Espinoza-Vasquez 2011,Feezell et al. 2009) underscores the fact that social media are able to increase people's level of engagement in discussions of social and political issues and enhance their ability to mobilize co-operatively. Recent studies, and much anecdotal evidence, show that social media are used to generate social movements,whichhelp create an active role for citizens in the post-emergency phase and promote their activities via the World-Wide Web (Lev-On 2010,Padovani 2010).

RESEARCH PROJECT: OBJECTIVES

By supporting communication between authorities and citizens through the use of Web 2.0 technologies, the ongoing research project aims to promote a greater engagement of the population affected by the reconstruction process. In order to reach this goal, two intermediate aims have been established:

- To understand the process of communication between the authorities and citizens during the disaster recovery phase, with specific attention to the role of new media.
- To understand the requirements for a Web 2.0 platform that is able to support communication between the authorities and citizens during the disaster reconstruction phase

It is important to make it clear that the purpose of this research project is neither to propose a model nor to construct a new technological system. Rather it is intended to clarify the nature of the communication, which occurs in the reconstruction phase between two social actors (defined as "citizens" and "authorities"). It attempts to identify some trends in this communication that will need to be further verified with future researches. By establishing a base of knowledge on this topic, I hope to spur further investigation that might enable the understanding of how to support effective communication practices, especially between decision makers and citizens.

Investigating current communication between authorities and citizens in the recovery phase: methodology and case studies

Disaster recovery is the least understood phase of the disaster cycle (Berke et al. 1993). Additionally we have a little understanding of what type of communication occurs

between the population affected and the decision makers in this stage.In order to investigate this, I have adopted a quantitative approach. As a result, two different questionnaires have been created to be administered to a sample of authorities and one of citizens in selected areas that have recently bee affected by disaster.

The areas under analysis are:-

Emilia Romagna earthquakes (Northern Italy, 2012): On 20th May 2012 an earthquake of magnitude 5.2 struck the Emilia region in Northern Italy. The main shock was followed by several aftershocks and by another major event on 29th May (magnitude 5.8) with epicentre 15km northwest of that of the former event. In total, the two major events killed 27 people and caused damages throughout the region.

*Christchurch earthquakes (*New Zealand, 2010-2011): On the 4th September 2010 the Canterbury Region in the south island of New Zealand was hit by a strong earthquake (Magnitude 7.1). The earthquake caused damages but limited loss of lives. Several aftershocks followed the event; the most severe of those occurred on 22nd February 2011 and killed over 180 people.

Although these disasters may differ on some aspects such as the type of the area affected (a large city in New Zealand versus a set of small towns in Emilia Romagna), some other elements may be comparable: a) the recovery process is still going on in both these areas; b) the use of new media is free and widespread in both the analyzed countries; c) new media have proven to have a crucial role either in the response and recovery phase in both these disasters; d) a severe aftershock followed the first event. That means that many areas were still trying to recover from the first shake when the aftershock occurred; e)both these areas were pillars of the country's economy but they were experiencing a financial crisis when the earthquake stroke.

In order to reach a larger audience, I have planned to use a mixed mode to administer the questionnaire, either in person or online. In both cases, the questionnaire will be self-completed. Although a mixed mode might negatively influence the validity of the results, Bowling (2005) found that the bias is greater between different types of mode (e.g. self-administered versus interview modes), rather than within modes.

The matters tackledin the questionnaire include: (a) information received by citizens and provided by the authorities in the reconstruction phase; (b) channels and targets for communication between authorities and citizens; (c) aptitudes in the use of social media by authorities and citizens; (d) drivers of and barriers to the use of social media by authorities and citizens in the reconstruction phase; (e) how social media are used for bidirectional dialogue, and frequency of use for this purpose.

For both these case studies, the sample of authorities and citizens will be contacted by different methods, including direct emails and private messages on Facebook. In order to reach a sufficient sample of respondents, I am going to contact civic committees and those associations that were founded as a result of the disaster. The link to the survey will be published on some City Councils' webpages and on local journals besides to on the civic committees' Facebook pages. In order to overcome the problem of the digital divide and not to exclude the part of the population which does not make use of social media or web technologies, I'm going to harness existing networks in the areas affected and to ask to associations or groups of citizens to distribute in person the paper version of the questionnaire to their audience. Both the paper and the online versions of

the questionnaire will be self-completed.At the beginning of the questionnaire, respondents will be asked whether they experienced the earthquake in 2012 and they are still residents in the areas affected, Those who are going to answer "no" to these questions will be excluded from the analysis. For the authorities, the sample will include people who belong to an organization that deals with the reconstruction process of the disaster analysed. The sample of authorities will be reached out mainly by using direct emails to mayors and communication officers.

As the reconstruction phase may last more than ten years, the communication may change significantly over this time. Hence a mere quantitative analysis would not allow accounting for the evolution of the communication in terms of how the interactions and the change in the roles and specific duties of the actors involved might affect it. In order to address this problem, the project will include the use of qualitative methods (e.g. in depth interviews) to create a "narrative" of the communication during the reconstruction, in one or both the case studies analyzed, depending on the availability of funds.

Investigating requirements for a web 2.0 platform in disaster recovery: examples of existing platforms and future directions

The second objective of the research project is to investigate the requirements for a Web 2.0 platform that is able to support communication between authorities and citizens.Indeed, for many years, governments have exploited the potential of the Web to deliver services more effectively. E-governmentis defined as the use of information and communication technology to provide access to and deliver information and services to the public and other agencies. The most mature phase of e-government involves the use of Web 2.0 platforms that allow interactive communication between its various departments.

Although the literature on 'Government 2.0' is broad (Mergel 2012,Mejer et al. 2012), there is little understanding of whether the platforms currently in use are able to promote collaboration after disaster.The goal of this second part of the project is not to create a system to be used to support communication in the reconstruction phase. Rather I hope to integrate the knowledge about the communication in the reconstruction phase acquired during the first stage of the project, into the existing knowledge and systems of e-government services.

In recent years some platforms have been developed to support the reconstruction process. Two examples of existing platforms born in the wake of natural disasters follow. They were designed to promote the sharing of information between the authorities and citizens.

OpenRicostruzione (in English: Open Reconstruction).OpenRicostruzione (http://www.openricostruzione.it) is a free-access web portal founded after the earthquakes in Emilia Romagna in 2012. Its aim is to make the reconstruction more transparent by allowing citizens to follow the development of projects and track the use of donations. The project has been developed by collaboration between Emilia Romagna region, ANCI (the Association of Italian Municipalities) and other associations that workin civic participation (e.g. ActionAid and OpenPolis). Financial support is given by CiscoItaly. In addition toproviding citizens with relevant information on the reconstruction process, the project aims to give them the skills and tools to participate actively in the reconstruction. For this reason, ActionAid has organized a series of workshops on data journalism in order to train citizens to monitor

reconstruction by analysing data and maps on the Web and taking pictures of the recovery process (Shoot4Emilia). The blog page on the Web portal aims to chronicle these participatory initiatives. OpenRicostruzione also has Twitter and Facebook accounts. Nevertheless, there is little space on the Web portal for citizens to provide inputs and comments.

Recovers: Recovers (https://recovers.org) is a web platform that was born from an idea of Caitra and Morgan O'Neill after they experienced an EF3 tornado in their hometown of Monson (MA) in 2011. The project aims to provide an easy-to-use recovery software framework designed to support the recovery process by providing a hub for citizens to obtain and share information, for governments to monitor recovery efforts and for organizations to publicize their location and resources. Services for governments include collecting requests for help, seeing comments posted by residents, and posting information supplied by local organizations. Organizations may use this central hub to collect requests for help or donations and offers to volunteer, to provide information about the resources available and to share resources with other organizations. Finally, the platform allows residents to request help, donate and volunteer and find updates from the organizations involved in the recovery process. The website includes several examples of how this platform has successfully supported reconstruction after different type of disasters. Additional services for governmentsare also available at charge.

Although these web platforms are a relevant step towards inclusion of citizens in the reconstruction process, some questions remain open: what are the characteristics of the current communication between authorities and citizens during the reconstruction process? What are the targets and the channels of this communication? What has worked and what has not worked in the communication practices after previous disasters and why? Does the communication between authorities and citizens change according to the culture or type of disaster? To what extent is current knowledge about Government 2.0 platforms useful to enhance communication in the aftermath of a disaster? How can we reduce the effects of the digital divide and include in the reconstruction process the largest accessible proportion of the population? This research project aims to investigate some of these issues.

CONCLUSIONS

The Web 2.0 may herald a new period in which informed decisions about the future of the community can be made through collaboration between decision makers and citizens. This is particularly relevant when the community is affected by a natural or anthropogenic disaster. Literature suggests that new ways to engage the population in the reconstruction process need to be explored. This research project is an attempt to answer some of the unsolved questions about the disaster recovery phase and open new perspectives to support collaboration between citizens and their leaders.

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Session Six – Disaster management of urban areas and built environment

Paper 20: Urban Resilience and Urban Structure: Vulnerability assessment of historical Italian towns

Alessandro D'Amico[1] and Edoardo Currà[2]

[1] *University of Rome - Sapienza, Italy, email: alessandro.damico@uniroma1.it*
[2] *University of Rome - Sapienza, Italy, email: edoardo.curra@uniroma1.it*

ABSTRACT

Italy is one of the most earthquake-prone countries in the Mediterranean area. The close correlation among masonry constructive technique, typologies and morphologies in the historic Italian city, can be an important point in the analysis and definition of urban resilience, particularly regarding the role of the built environment. The paper proposes a methodology for assessing urban vulnerability of historical towns. The typological processes of growth of these cities are elements that can contribute to the development of resilient urban planning, and which can lead the research towards new elements of urban analysis. In Italy, some laws promulgated after the recent earthquakes, (LR11/2005-Umbria, LR16/2012-EmiliaRomagna) emphasize the attention to the vulnerability of the urban system, with particular focus to urban built heritage. The concept of urban system vulnerability has become part of the planning in some Italian regions, though it is still not properly connected to urban resilience assessments. Therefore, it is indispensable to investigate the relationship between resilience and urban structure with the aim of increasing urban resilience through vulnerability assessments, damage scenarios and priorities for action at urban scales for built heritage. The proposed method is based on the implementation of the tested approaches related to the seismic vulnerability in areas of heritage values.

Keywords: built heritage, resilient urban planning, urban morphology, urban resilience, vulnerability assessments.

INTRODUCTION

Italy is one of the most earthquake-prone countries in the Mediterranean area. Due to the frequency and intensity of earthquakes that have historically affected the area, it has developed a high awareness of masonry construction, which constitutes a significant portion of the urban built heritage in the country (Ar.Tec., 2009). Seismic risk is a daily problem faced at national level. Risk is understood as the measurement of damage expected in a given period of time, based on the type of seismicity, on the resistance of buildings and on anthropisation and it is determined by the combination of hazard H, vulnerability V and exposure E:

$$R = H \times V \times E.$$

Where H is the hazard: namely the probability that, in a given area and in a certain period of time, an earthquake exceeding a reference threshold of intensity may occur. The seismic hazard depends on the analysed area, and its definition is based on historical earthquakes and geological and seismological data. The vulnerability V can be regarded as the propensity of a structure to suffer a damage of a certain level, in front of a seismic event of a given intensity. The exposure E indicates the size and value of the assets and activities in the area that may be affected, directly or indirectly, by the catastrophic event, as defined by the Italian Department of Civil Protection.

The seismic hazard in Italy can be considered medium-high in the context of the Mediterranean area (ISAT, 2006). In Italy there has been a classification of the total national territory, initiated by the Ordinance of the President of the Council of Ministers - OPCM no. 3274 of 20 March 2003, entitled "First elements in terms of general criteria for the seismic classification of national territory and technical regulations for construction in seismic areas". It established the criteria for the definition of "seismic areas" and allowed the alignment of the regulatory system for buildings in seismic zones to European codes. With the new classification, the three seismic categories provided in the previous classification (1984) were replaced by four zones. A further update, with the OPCM no. 3519 of 28 April 2006, introduced the intervals of acceleration (PGA - Peak ground acceleration) for the four seismic zones defined. The highest seismicity is concentrated in the south-central part of the peninsula, along the Apennines, in Calabria and in Sicily, and in some northern areas, such as Friuli, Veneto and part of western Liguria. Only Sardinia is not particularly affected by seismic events.

The seismic classification is based on the seismic hazard maps (Figure1). In Italy, the seismic hazard map was defined on the basis of the earthquakes collected in the seismic catalogs and on a seismic-genetic zonation of region, reconstructed according to the spatial distribution and depth of earthquakes known (ISAT, 2006). Although the seismic hazard in Italy is considered medium-high, vulnerability and exposure are assessed as very high. The areas of high seismic risk are about the 44% of the national territory (131,000 km2) and 36% of the municipalities (2,893). The resident population in these areas is exposed to a potentially very high seismic risk, it is estimated is equal to 21,8 million people (ANCE/CRESME2012). With the term "high seismic risk areas", the exposed data refer to the area of the municipalities classified in seismic zones 1 and 2 (2A and 2B). In the report published by ANCE/CRESME (2012) regarding the state of the Italian territory and seismic risk, data show that in Italy there are more than 2,5 million residential buildings in poor or mediocre preservation status. Of these, over 2,1 million buildings were built before the introduction of the national seismic regulations for new construction in 1974, this figure is also indicative of the construction technique and the use of anti-seismic technologies.

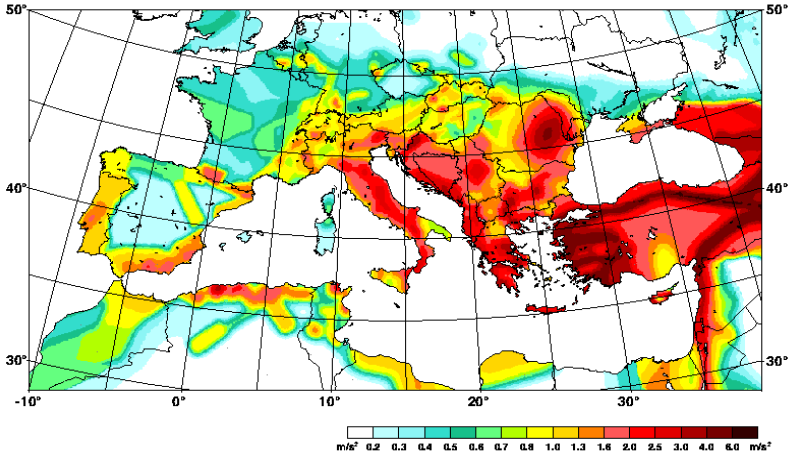

Figure 1 Map of seismic hazard in central and southern Europe

Source: IGCP Seismotectonics and Seismic Hazard Assessment, SESAME, http://www.seismo.ethz.ch/static/gshap/sesame/sesame99.html

The hazard level is expressed in horizontal peak ground acceleration (m/s^2) - as a result of an earthquake with a 10% probability of exceedance in 50 years.

Besides having a diffusely insecure built heritage from the point of view of the seismic response, especially in the historic centers of cities, often old and poorly preserved, Italy is characterized by high population density that makes every event potentially dangerous for a large number of inhabitants. Moreover, since 1909, the year of entry into force of the first seismic building standards in Italy after unification, a municipality was classified as a seismic area only if, starting from that date, it was hit by a destructive event, regardless of other previous earthquakes or that the seismo-tectonic knowledge would indicate it as exposed to high risk. Only in 1984 a uniform seismic classification of the national territory was introduced based on scientific criteria. As a consequence, in many of the most dangerous areas of Italy, especially in all those who had suffered disastrous earthquakes before 1908, we started to build with seismic criteria only since the mid-80s. Therefore in seismic areas classified in 1984 (Figure 2), covering about 45% of the national territory, only 14% of the residential heritage is built according to earthquake standards (Barberi, 2005).

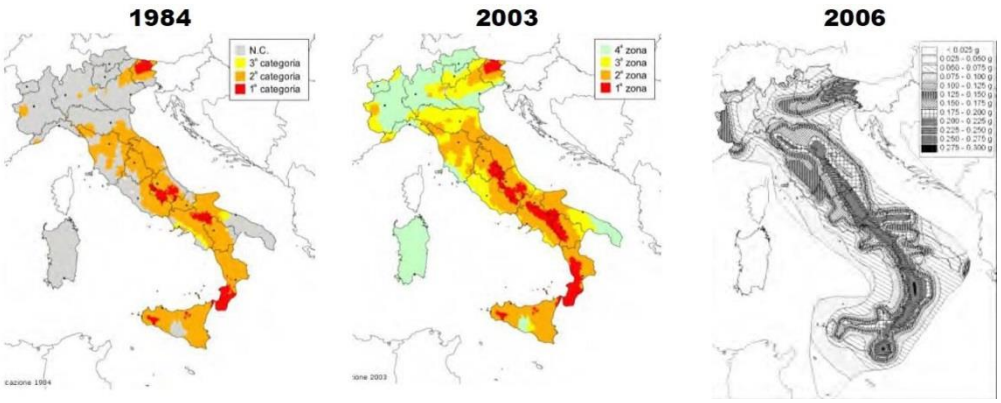

Figure 2 The seismic classification of the Italian territory (ANCE/CRESME2012)

All these factors contribute concurrently to determine the seismic risk in our cities. Paradoxically, the long periods during which the seismicity in Italy does not occur in a relevant way, make our country even weaker, because the tendency to underestimate or even remove the possibility of a new disaster insinuates itself in citizens and decision-makers. This tendency results in insufficient prevention activities throughout the country, and is presented as a problem of considerable size. It is estimated that only in the seismic zones classified in 1984 there are 7 million of insecure dwellings constructed before the classification. The cost of seismic retrofit of these dwellings could amount to nearly 150 billion euros. Although this amount appears huge, it is only twice the cost faced by the Italians to the post-earthquake reconstructions between 1980 and 2005 (Manfredi, 2005).

FROM BUILDING VULNERABILITY TO URBAN VULNERABILITY

The seismic vulnerability of buildings can be reduced by making the structures more resistant to elastic waves produced by earthquakes. This is possible through appropriate design for new construction, and suitable structural retrofit operations for the existing buildings (Munari et al., 2011). The close correlation among masonry constructive technique, typologies and morphologies in the historic Italian city, can be an important point in the analysis and definition of urban resilience, particularly regarding the role of the built environment.

In the last decade, it is possible to witness a change in Italy regarding the level of attention given to vulnerability reduction, moving from the building dimension to the urban scale. The concept is very important in terms of increasing urban resilience to disasters. However there are still no explicit references in formal documents produced by Italian authorities. In particular, a document of national relevance developed by the "Consiglio Superiore dei Lavori Pubblici" (Supreme Council responsible for overseeing public works), raises some important methodological issues to be addressed. Equally important are some experimentation in regional laws, among these are to be counted the Regional Law LR 11/2005 of the Umbria and the LR 16/2012 of the Emilia-Romagna, both enacted following the earthquakes that affected the respective areas. The "Studio propedeutico all'elaborazione di strumenti d'indirizzo per l'applicazione della normativa sismica agli insediamenti storici" ("Preparatory study for the development of tools to address the application of seismic regulations to historical settlements" - Superior Council of Public Works, 2012) is an important development at the national level of this change in the scale of attention. This document is based on the concept of "urban seismic vulnerability", which aims to promote a "policy of active seismic prevention" at the level of historic settlements, designed in both morphological and functional aspects as a vital component of urban centers.

The concept of vulnerability of an urban system comes from the assumption that the response of a city to a disaster derives, not only from the sum of the vulnerability of the individual building elements, but rather is the result of a systemic behaviour of the city. This type of behavior is related to the influence that the existing relations between the individual components of the urban structure have on urban vulnerability, within the urban organism (Gargiulo and Papa, 1993; Fistola and La Rocca, 2009). This approach in overall terms of the seismic issue is completely in line with the strategies defined by the recent UNESCO Recommendation on the "Historic Urban Landscape" adopted on 27.05.2011, which introduces a new approach to "urban conservation" (UNESCO, 2011). As described in the document, the historic centers are to be considered as "extended cultural heritage", and are in their entirety, a stratified representation of the culture of a community, a place of historical communal and individual memories, heritage of identity and self-recognition of the population (Superior Council of Public Works, 2012). The following quotes are part of an opinion of the General Assembly of the Superior Council of 23.07.2010, concerning "The aligning of <<The guidelines for the assessment and mitigation of seismic risk to cultural heritage>> to the Technical Regulations on New Buildings - NTC2008":

> "The seismic vulnerability of an urban system is understood as the susceptibility to physical damage and loss of organization and functionality due to the earthquake. The vulnerability assessments do not define absolute values, but relative and qualitative ones. These assessments, applied to the historical centers, presuppose the articulation of urban fabrics according to morphological, typological, structural and functional parameters. They are extremely useful for identifying the most critical parts, and therefore more at risk, for which may activate in-depth investigation of structural nature, not dissimilar to those performed for individual buildings, with the difference, substantially, of the need to take into account the constructive aggregate of which they are part."

The typological processes of growth, highlighted by the study of urban morphology of these cities, are elements that can contribute to the development of resilient urban planning, and which can lead the research towards new elements of urban analysis. The

awareness regarding the role of the built environment in the definition of urban resilience highlights the potential of the cultural heritage. This is no longer associated only with grandiose monuments and iconic archaeological sites, but increasingly include a broader array of places, such as historic and living cultural cities landscapes (ICOMOS 2013).

Regarding the definition of intervention policies, Italy already has some experience in this regard, such as enactment of the planning law no.11/2005 of the Region of Umbria, mentioned above. This law essentially introduces a principle of strategic importance in the reduction of seismic risk, and therefore it could act to improve plans, policies and interventions of urban renewal, relying on the fundamental concept of prevention. The LR no. 11/2005 introduces also the identification of an urban "resistant" structure, which transfers the category of prevention within the integrated policies for recovery, for many years experienced in Italy. The Minimum Urban Structure - "Struttura Urbana Minima" (SUM) is organized as a system of pathways, spaces, urban functions and strategic buildings for urban response to the earthquake during the emergence phase, and for the maintenance and resumption of ordinary urban, economic and social activities, in later phases following the earthquake. The SUM is designed as the essential system for the response to the earthquake of the urban organism, even after the possible consequentiality of events caused by the seismic event. The structure includes the minimum required components, none of which can be subtracted without compromising the overall functioning. In other words, the SUM is identified by answering the question "what should resist" in case of an earthquake. The systemic components of the urban structure for strategic urban response to the earthquake, ie the components of the SUM, include: the system of mobility and accessibility; the system of open safe spaces; the system of strategic buildings and structures; the system of major technological networks (lifelines). The system of cultural heritage and places of sociality and the system of economic and productive activities and main urban functions could be additional parts of the SUM, due to the specific strategic value of them given by Administration and local communities. The components of SUM can be buildings, structures or spaces belonging to the systems mentioned above, existing or planned. (Regione Umbria - DPTU University of Rome-Sapienza, 2010). The SUM is both an analytical and design category: regarding the urban response to the earthquake, in fact, it reads and interprets the existing context, considering the envisaged changes valuated in planning tools.

To ensure an improvement of the functionality of the SUM, it might be useful to provide redundancy of some of its elements. In this element it is possible to identify a strong correlation with the concept of redundancy, expressed as an element of Resilience. As described by Cimellaro et al (2010), Redundancy, as resilience propriety, could be defined as the availability of alternative resources in the recovery process of a system. It is important to provide at least one scenario allowing recovery, irrespectively of the extreme event, providing alternatives in case of failure. The concept is remarked by Jha et al., (2013) that highlights the interconnection between redundancy and uncertainty, because any disaster impacts cannot be completely quantified or known in advance. In particular the concept of redundancy expressed in this context, is related to the ability of the urban system to respond to the earthquake also in the case of collapse of one of its components. For example, consider an urban center in which the viability and the internal connections with the outside can be insured by a single main path, or by a network of smaller paths that, together, perform the same function. In the event that the main existing path present some critical elements not easily removable, the network of minors paths should become part of the

SUM as redundant element. The system is designed as redundant for two main reasons: the breadth and variety of situations that the urban system may face, and the uncertainty regarding the behavior of the system itself that, for safety purposes, should always be considered as characterized by margins of imperfection. In case of particular critical factors or uncertainties concerning the endurance of an element belonging to the SUM, is necessary to provide in the planning phase, a number of equivalent elements from the point of view of the response to the earthquake (Regione Umbria – DPTU University of Rome - Sapienza, 2010).

The points exposed above reinforce the switch from analyzing built fabrics through individual buildings and constructive aggregates, to the urban interpretation of the historical towns, with the purpose of seismic risk reduction. The "historical towns" represent the territorial context of reference and the field of application, as construed in an enlarged sense compared to that of the old urban "centers" as was traditionally understood. The historical center should not to be considered as the sum of buildings to be protected, but as complex settlements and urban structures to be enhanced. The need to preserve the characteristics of historical settlements makes it inadvisable as well as economically unsustainable to generalize the application of the highest levels of security. This is because it would require operations of consolidation that could alter the architectural, typological, constructive and material features of historical heritage. Furthermore a high level of safety of the accesses and of supplies to the buildings of the historic center may impose transformations of road networks and infrastructure such as to alter the original urban fabrics and morphologies.

The seismic risk prevention in urban scale, in contrast to what happens for the building scale, depends not only on constructive features of the elements, but is also related to the characteristics of functional systems that compose the city. The city is seen as a center of services and delivery of functions similar to a complex building system, in which the different parties assume roles related to each other. The purpose of prevention in historical centers is to maintain the "vital" functions active, the ones that constitute the characteristic, without which the urban system would collapse (Superior Council of Public Works, 2012). The relevant methodological approach, in dealing with the current issue of seismic risk in the historic centers, is also highlighted by a regional law enacted after the earthquake that hit the Emilia-Romagna in 2012, for the reconstruction of the territories involved. This law focuses on the importance of the protection and enhancement of the urban fabric of ancient formation, to ensure recognition of the settlement structure and stratification evolution processes, both in the built heritage and in the other elements of the built and unbuilt space. The recovery of the buildings and the main elements of identity of local communities becomes one of the main objectives, alongside the improvement of safety and quality of the urban fabric and the reduction of urban vulnerability.

A METHODOLOGY FOR ASSESSING URBAN VULNERABILTY OF HISTORICAL TOWNS

The definition of a methodological approach has allowed the identification of the main elements for assessing urban vulnerability of historical towns. These elements, which are discussed in detail in this section, are the result of a the critical reading of the literature and policies related to the seismic vulnerability in areas of heritage values and can be summarized in a series of steps:

- the analysis of the evolution of historical settlements;

- the identification of portions of the historical settlement with the greater seismic risk;
- the critical survey of "aggregates" in urban fabric;
- the cognitive synthesis.

By measuring the damage as the decay of performance level of urban functional systems, to reduce it in advance, the aim has to be the reduction of vulnerability (Cremonini and Balzani, 1994). In order to shorten the time to return to the situation preceding the disaster is necessary to increase the resilience, defined as " the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard promptly and efficiently by preserving and restoring essential basic structures" (UNISDR, 2011). Among the systems considered both by the national research and regional laws, it is important to highlight the relevance of typical settlement of the historical built heritage, characterized by the presence of typological and constructive layers of the urban fabric.

According to the Superior Council of Public Work (2012), it is possible to develop a classification of "aggregates" based on their importance and their degree of criticality: it is possible to consider for example aggregates that include strategic buildings for the Civil Protection, or sensitive to crowding, or important for the urban quality; in addition to aggregates that include buildings of historical and architectural interest, or aggregated in strategic position for the access routes to the city center.

The built heritage of historical settlements is the result of complex constructive events, endured over time, which have defined the current appearance of the urban fabric, so characterized by structural layers whose historical and testimonial value assumes cultural relevance. The awareness that in the historic settlements there are building related to different constructive and structural typologies, although the masonry construction remains the predominant, and that these are usually located within aggregates, highlights the difficulty in defining a unified approach contemplating the many issues arising from the complexity of the constructed reality.

The purpose is to identify portions of the historical settlement with the greater seismic risk, qualitatively evaluated, in order to establish a ranking of priorities, which is a list of sample elements that are significant from the typological point of view. It is important to reach the knowledge of the detail in the urban system, implemented through a critical survey. An important element is to identify the weaknesses and strengths of current configuration of urban structure, through the close examination of its evolutionary history, and qualitative assessment of its vulnerability by constructing the seismic predictable scenario.

To proceed with scientific rigor, the analysis of the urban fabric will be made starting from the cadastral and technical representations, for the comparison of the available cartography. This first study must be accompanied by site visits to confirm and/or clarify situations highlighted as dubious. This identification is mainly aimed to the organization of the subsequent analysis of vulnerability of buildings sample, representing the recurring types in the urban fabric.

In accordance to the "Preparatory Study", the themes and issues to be highlighted by the analysis can be summarized in a few points:

- the relationships between the processes of aggregation and organization of the urban fabric and the development of the road system;
- the major events that have affected the morphological aspects of the historical buildings, reviewed from historical sources;
- the morphology of roads, analyzing their pattern, width, and planimetric misalignments of the building fronts;
- the arrangement and hierarchy of the courts, with direct access or with entrance hall, and the positioning of the external stairs;
- the elementary spatial relationships of the individual masonry cell, as well as reports of regularity, repetition and modularity at different levels;
- the shape and position of the openings in the walls of the front, highlighting axiality, symmetry and repetition;
- the misalignments and the taperings of the walls, the walls without correspondence on the floors below, the staggering in elevation between adjacent floors.

The detailed examination extended to the aggregate scale, and then to the urban fabric of the historic city, must be done by the so-called "critical survey". This is based on the identification and localization of the factors that can influence the mechanical behavior of the construction, on the knowledge of the nature of materials, of the local constructive methods, of the signs of historical mutations and of recent alterations.

The cognitive phase performs the function of substantial support at the time of definition of design proposals, and it represents the first step in a methodological process for subsequent analysis. The assumption that it is impossible to define criteria and techniques of intervention is implicit, except on the basis of objective needs emerging from the built environment under consideration and respecting the original architectural, historical and constructive values.

CONCLUSIONS

The analysis of the evolution of urban structure allows us to assess the stages of transformation of the city, with relative timeframes, to guide the reconstruction, even hypothetical, of the succession of configurations. Having a critical interpretation of the configuration of the built urban heritage, at each historical and construction stage, is important to recognize information that may be relevant to highlight forms of vulnerability otherwise not detectable.

The comparison between the identified stages of evolution is intended to distinguish between the role that each one plays in the transformation towards the seismic vulnerability and to highlight, therefore, if the structure reached at the present stage is worsened or improved, compared to previous ones. Beside the repetitiveness of the dimensional and distributive solutions, there are frequent construction modalities. The purpose of this analysis is the recognition of the typological and constructive constants, and the consequent highlighting of vulnerabilities in the urban structure due to the generalizable configuration of the built heritage and to the significant variations.

The cognitive synthesis is produced from intertwining information gathered, from interpretation of the system to the analysis of the detail; often some constructive details provide useful evidence, confirming the hypothesis that can be defined at the global scale. The expeditious assessments of the buildings vulnerability, which can also be performed on sample cases, is usually done using one of several methods available for assessment in Italy: they are typological qualitative methods, based on descriptions of building and structural types, or semi-quantitative methods, based on the description of a number of the building parameters and on some quantitative simplified analysis.

The subsequent developments of the research can be summarized in the following points:

- the deepening of the vulnerability expeditious assessment and the possibility of applying mechanical models of urban scale on sample cases of significant buildings. As it has already been stated, it is impossible to implement a maximum level of protection and safeguard in widespread way throughout the historic urban fabric, therefore it becomes important to focus on some elements subject to a higher risk for the level of exposure or vulnerability, or both.

- the typing and localization of the strengths and weaknesses of the urban fabric in historical towns.

- the construction of seismic damage scenario, as the realistic representation of the mechanisms of damage for a given earthquake, to set the criteria for intervention for the mitigation of seismic vulnerability.

The damage scenario will highlight the mechanisms that can be activated, taking into account the constraints represented by the historical seismic principals, both for individual units concerning the additional ones due to aggregation, what is known as interaction and/or induced vulnerabilities. Although qualitative, this scenario should be adherent to reality and sufficiently detailed to allow the prefiguration of preventive actions to reduce the vulnerability that may be listed in the tools of urban planning.

Figure 3 Localization of the case studies within the Italian territory.
Scheme elaborated by the authors.

The case studies on which we are applying the research were selected on the basis of significant consistency of the historical built heritage and for belonging to relatively seismically active areas. It was decided to operate on San Gemini, Umbria and Rieti, Lazio (Figure 3). Figure 4 shows a first synthesis of the comparison between the current state and Gregorian cadastre of 1820, developed for the historic town of Rieti.

From this analysis it is already possible to identify significant elements of occlusion of the original urban fabric and changes that might be elements of vulnerability, and therefore need deepened analysis. From this development, the purpose is to proceed to the examination of the elements that allow an increase of the urban infrastructure resilience. If reducing the vulnerability of the historic built heritage allows to increase the robustness of the system, by analyzing the urban structure as a whole it would be possible to act on other characteristics of urban resilience, such as redundancy and resourcefulness, with the goal of making the historic fabric diffusely more resilient.

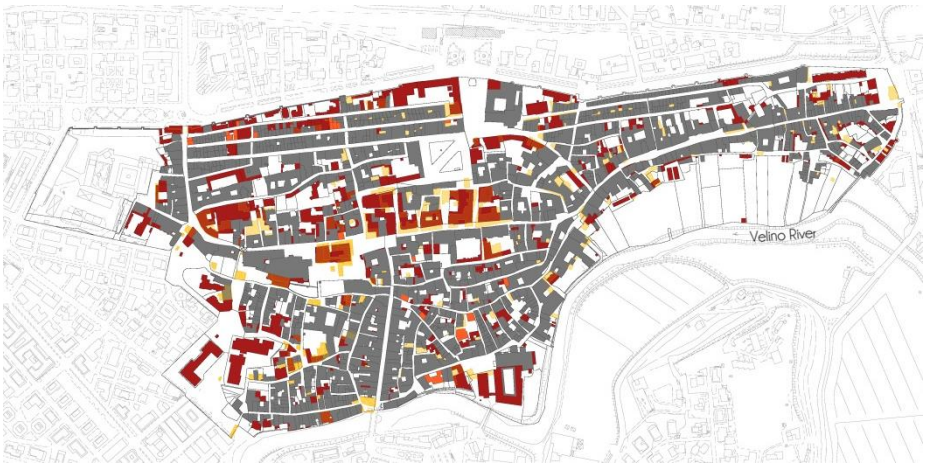

Figure 4 Scheme of comparison between the Gregorian Cadastre of 1820 and the current status. New construction in red, demolitions in yellow, demolitions and costruction with the same form in orange.Scheme elaborated by A. D'Amico, G. Liuzzi, E. Lidano, A. Vallone, I. Panzieri, M. Crisostomi.

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Paper 21: Assessing the Post-Earthquake Reduction and Recovery of the Shelter-In-Place Housing Capacity of a Residential Community in NOIDA India

Henry V. Burton S.E.[1]

[1]*Assistant Professor, Department Civil and Environmental Engineering, Universityof California, Los Angeles, USA, email:hburton@stanford.edu*

ABSTRACT

A performance-based methodologyis implemented to assess the post-earthquake reduction and recovery of the shelter-in-place housing capacity of a residential community in NOIDA, India. The framework incorporates a set of building-level limit states that have been defined based on their implication to functionality and recovery following an event. They include damage triggering inspection, occupiable damage with loss of functionality, unoccupiable damage, irreparable damage and collapse. Inventory data was collected on 1823 residential buildings using a combination of on-site surveys, remote sensing images and general information provided by local residents. Structural models are developed for a class of representative buildings and used to develop analytical fragility curves for the functionality-based limit states. A characteristic recovery path is defined for each limit state based on three distinct functional states, the time spent within each state and the level of functionality associated with each state. An "expected" recovery function is computed for individual buildings incorporating the uncertainty in the occurrence of each limit state and associated recovery path. The outcome is a probabilistic assessment of recovery of functionality at the building level for specified ground motion intensities. A community-level recovery curve is developed currently focusing on the shelter-in-place capacity of a residential community. However, the framework can also be extended to incorporate other metrics. A cumulative measure of loss of occupancy is assessed through numerical integration of the recovery curve.

Keywords: earthquakes, community resilience, shelter-in-place, post-disaster recovery.

INTRODUCTION

The San Francisco Planning and Urban Research Association (Poland et al., 2009) outlined a comprehensive set of performance objectives for its buildings and lifeline infrastructure that are needed to make San Francisco more resilient to earthquakes. Seismic performance targets for facilities and systems are defined based on their implication to post-earthquake functionality and recovery. Using these categories, specific target goals for building and infrastructure are established, considering city-wide needs. In addition to establishing these target goals, estimates of the performance of the current inventory were assessed. However, these estimates were based largely on "educated guesses about current standards for recovery time".

The immediate post-earthquake limit state of a community's building infrastructure has a significant impact on its ability to recover in a timely manner. For example, the SPUR report notes that the ability of a region to provide safe housing immediately following an earthquake influences the likelihood that there will be a significant outmigration of its residents. A rigorous evaluation of post-earthquake recovery requires probabilistic methods for assessing limit states that influence post-earthquake functionality that can be incorporated in modeling the recovery of the building stock.

This study implements a framework for assessing the immediate post-earthquake and recovery trajectory of the shelter-in-place capacity of a residential community. Guidelines are provided for the incorporating the effect of externalities on recovery.

Overview of Framework

An overview of the proposed framework is illustrated in Figure 1. In the first stage of the process, the PEER framework is exercised for each building within the target community incorporating new damage measures and decision variables. The outcome of this phase is a recovery function that is generated for individual buildings. In the second stage, building-level recovery functions are aggregated to model the recovery of the housing capacity at the community-level.

Hazard analysis requires quantification of the joint occurrence of ground-motion intensities at the sites of the individual buildings in the study-region, during the same earthquake. Structural response analyses are used to obtain the engineering demand parameters (story drift, residual story drift, floor acceleration etc.) that inform the damage assessment conducted in the following step. In the event that the numerical modeling of the entire building portfolio becomes unfeasible as a result of computational expense, the building damage fragility curves that are the outcome of the next step can be developed using empirical or heuristic methods.Fragility functions are developed linking ground motion intensity to the probability of exceeding each of the five limit states. The outcome of this step is different from that of the current PBEE framework which generates fragility curves for building components. The building damage states include (i) damage triggering inspection, (ii) occupiable damage with loss of functionality, (iii) unoccupiable damage, (iv) irreparable damage and (v) collapse. As discussed earlier, the fragility curves for each of these damage states can be generated using the engineering demand parameters obtained from response history analyses or from empirical or heuristic methods.

The next step introduces a new decision variable, namely, recovery of functionality at the building level. It captures the trajectory of the post-earthquake recovery of functionality for individual buildings. In the final stage of the framework, the recovery functions for individual buildings are aggregated to quantify community performance.

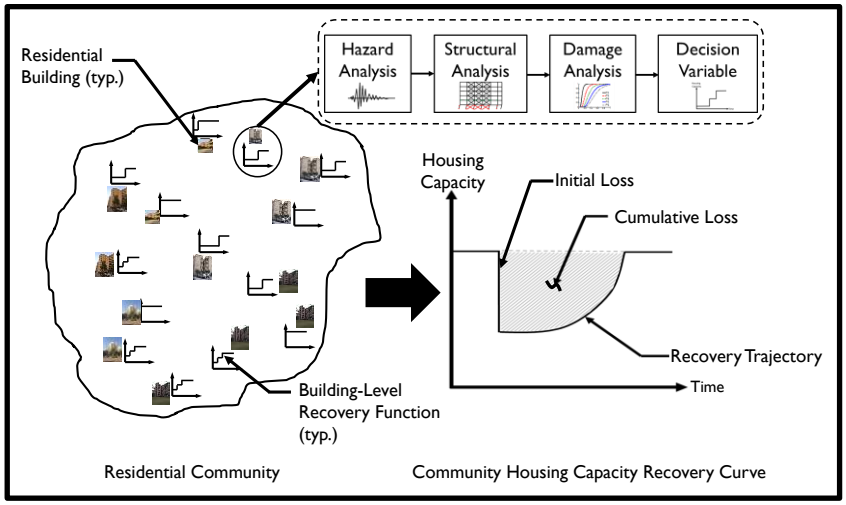

Figure 1 Overview of Proposed Framework

Functionality–Based Building Limit States

The framework incorporates five discrete limit statesthat are explicitly linked to post-earthquake functionality and recovery. Each limit state is associated with a unique combination of consequent actions and time required to complete those actions. These include (1) pre-construction activities i.e. post-earthquake inspection and/or evaluation, drawing preparation, financing and bidding preparation for construction work, (2) repairs needed to make building occupiable (3) repairs needed to restore functionality and (4) demolition and complete replacement. The limit states were selected to be sequential and mutually exclusive. Sequential limit states must occur in sequential order with one state occurring before another is possible. Mutually exclusive limit states exist when the occurrence of one precludes the occurrence of another (FEMA P-58, 2010). The following discrete limit states are considered:

LS_1 *Damage Triggering Inspection with Functionality Maintained*: This represents the minimum damage threshold that would require post-earthquake inspection and/or evaluation. It is also used to imply a level of damage where, despite the need for post-earthquake inspection, the structural safety and critical subsystems essential to the functionality of the building is not compromised. However, operations may be impacted if the owner/operator of the building makes the decision to close the facility until inspections are completed.

LS_2 *Occupiable Damage with Loss of Functionality*: This implies that the building is structurally safe and occupiable but unable to carry out its primary function. This loss of functionality can occur despite the preservation of structural integrity as a result of damage to non-structural components and contents that are critical to operations of the facility.

LS_3 *Unoccupiable Damage*: This infers that the building is not safe to occupy following an earthquake. This will likely be due to a substantial loss in the load carrying capacity of the gravity or lateral system that poses a life safety threat in the event of an aftershock. However, structural safety could be restored with the appropriate repairs. This limit state is of particular importance to residential buildings as it is directly related to the shelter-in-place limit state established by SPUR's resilient city initiative.

LS_4 *Irreparable Damage*: Experience with past earthquakes has shown that damage can occur to the extent that repairing the building becomes an insurmountable or cost prohibitive task, necessitating demolition and replacement. This limit state is intended to account for this condition. The three main earthquake-related situations that can lead to demolition include (1) large permanent deformations and story drifts that make repairs unfeasible, (2) direct economic losses that exceed the limit set by insurance providers that trigger full-value pay-out leading to complete replacement and (3) damage to key structural components that could significantly impede the repair process.

LS_5 Collapse: This limit state is associated with the complete or partial collapse.

Modeling Recovery of Functionality at the Building Level

This study proposes five distinct recovery paths that are explicitly linked to the building limit states. The recovery paths are described using three discrete functional states and the time spent in each of the three states. The functional states are used to

represent the changing condition of the building with respect to its ability of facilitate its intended operation. It serves as the link between the previously described limit states and the measure of functionality. The functional states used to model the recovery of housing capacity include (1) the building are unsafe to occupy (NOcc), (2) the building is safe to occupy but unable to facilitate normal operations (OccLoss) and (3) the building is fully functional (OccFull). Note that these are specific to the stated metric and would need to be re-defined for other measures of functionality. The key to defining the functional states are that (1) they must be explicitly linked to the building level limit states described earlier and (2) each functional state must be associated with a quantifiable measure of functionality.

The building level recovery path is conceptually described in Figure 2. It is important to note that the functional states that comprise the recovery path for a given building are dependent on the limit state of that building immediately following the earthquake. For example, a building that is in limit state LS_1 will only experience the NOcc and OccFull functional states. On the other hand, a building that is in limit state LS_2 or LS_3 following an event will experience all three functional states. This is illustrated more clearly later in the discussion of building recovery paths. The time spent in each functional state will also vary depending on the level of damage. For example a building that is in damage state LS_4 will spend a significantly greater amount of time in the NOcc state than a building in damage state LS_3. This is because the LS_4 building will need to be demolished and completely replaced whereas the LS_3 building will only require repairs.

The recovery time for an individual building is defined in this study as the period of time between the occurrence of the seismic event and the restoration of full functionality. The recovery time includes (1) the mobilization time which is the time required for building inspection and/or evaluation, finance planning, architectural/engineering consultations and a competitive bidding process, (2) the repair time needed to restore occupiability and (3) the repair time needed to restore functionality

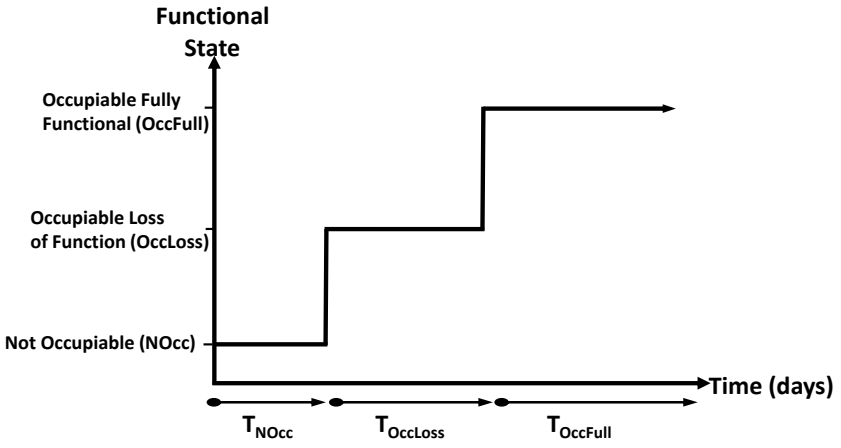

Figure 2 Conceptual illustration of recovery model for individual buildings

Each limit state is associated with a unique recovery path from the occurrence of the earthquake to the restoration of full functionality. The recovery paths for each limit state can be derived from the information provided in Table 1. For each recovery path,

it shows the relevant activities and time spent in the NOcc and OccLoss functional states.

- *Recovery Path 0*: This implies that the functionality of the building is not disrupted and the OccFull state is maintained throughout the period following the earthquake.

- *Recovery Path 1*: This path is associated with the occurrence of limit state 1 where the extent of damage triggers inspection but does not compromise the functionality of the building. This path is comprised of the NOcc and OccFull states. The NOcc phase is characterized by the time it takes to complete inspections. Following inspections, the building is deemed occupiable and fully functional and immediately enters the OccFull state which is characterized by full functionality.

- *Recovery Path 2*: For limit state 2, the recovery path is characterized by all three functional states. Like recovery path 1, the building enters the NOcc state immediately following the earthquake and the time spent in this state is the time to complete inspections. Following inspections, the building enters the OccLoss state because, despite being safe to occupy, repairs will be needed to restore functionality. The time spent in the OccLoss state is determined by the repair time for those non-structural components and content that is essential to the building function. Completion of these repairs is followed by the OccFull state which signals the restoration of full functionality and the end of recovery.

- *Recovery Path 3:* The recovery path associated with limit state 3 is also characterized by all three functional states. Immediately following the earthquake, the building enters the NOcc state. The time spent in this state includes the mobilization time and the time to complete structural repairs needed to restore occupiability. Since limit state 3 is associated with a significant amount of structural and non-structural damage, the mobilization time will include planning, architectural/engineering consultations and possible competitive bidding. Following the completion of structural repairs, the recovery will enter the OccLoss state during which the repairs needed to restore functionality are completed. These repairs are followed by the OccFull state and the end of recovery.

- *Recovery Path 4*: This recovery path is associated with the occurrence of limit state 4 in which the building is irreparably damaged. This path comprises the NOcc and OccFull states where the NOcc state includes the time to demolish and replace the damaged building. As the recovery of this building involves new construction, occupancy is not likely to be restored prior to full completion hence the absence of the OccLoss phase.

- Recovery Path 5: The recovery path associated with partial or complete collapse is very similar to that of the demolition case, comprising the NOcc and OccFull states. The only difference may stem from the additional time needed during the NOcc state of recovery path 4 to assess whether or not the building could or would be repaired. However, this additional time may be insignificant compared to the time needed to replace the building.

Each functional state can be linked to a quantifiable level of functionality. This level of functionality will ideally be specified by the owner or stakeholder of the facility. It will also depend on the measure of functionality for the individual building and/or community. Take the case of residential buildings in a community, where, from the perspective of the policy-makers, functionality is measured by housing capacity or number of persons housed. One approach could be to assign the pre-earthquake housing capacity to both the OccFull and OccLoss states since in this particular case, occupiability implies functionality (from the policy-maker's perspective). Another approach could be to compute the expected housing capacity at the OccLoss state by accounting for the probability that the building is evacuated by its residents given the loss of a particular service.Knowing the occupancy associated with each functional state allows us to convert the recovery paths for each damage state to recovery functions. This conversion is illustrated in Figure 3.

The recovery function for an individual building is probabilistically computed accounting for the likelihood of a building being in each of the five limit states for a given ground shaking intensity. Each limit state is associated with a unique recovery function. The uncertainty in the limit state of the building is incorporated by computing an expected recovery function using the following relationship.

$$E[q(t) \mid IM] = \sum_{1}^{n_{ls}} [q(t) \mid LS_i] P[LS_i \mid IM] \quad (1)$$

where $E[q(t) \mid IM]$ is the expected recovery function given *IM*, $[q(t) \mid LS_i]$ is the recovery function associated with the *ith* limit state, $P(LS_i \mid IM)$ is the probability that the building is in the *ith* limit state for a given *IM* level and n_{ls} is the total number of limit states.

Table 1 Activities and time spent in the NOcc and OccLoss functional states for each recovery path

Recovery Path/Limit State Number	Time/Acitivies in Functional State	
	NOcc	OccLoss
0	0	0
1	T_{INSP}	0
2	T_{INSP}	T_{FUNC}
3	$T_{INSP} + T_{ASMT} + T_{MOB} + T_{OCC}$	T_{FUNC}
4	$T_{ASMT} + T_{MOB} + T_{REPL}$	0
5	$T_{MOB} + T_{REPL}$	0

T_{INSP} - Time to complete inspections
T_{FUNC} - Time to restore functionality
T_{ASMT} - Time to conduct engineering assessment
T_{MOB} - Time to moblize for construction
T_{REPL} - Time to replace building

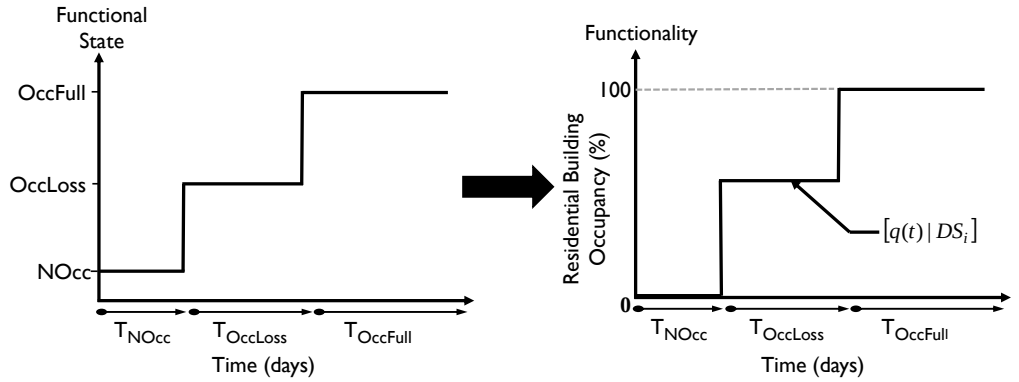

Figure 3 Conversion from recovery path for a given immediate post-earthquake limit state to the recovery function

Incorporating the Effect of Externalities and Socio-Economic Factors on Recovery Trajectory

Externalities are conditions outside of a building's footprint that can impact post-earthquake recovery of functionality. All buildings rely on a range of utility services to carry out their day to day operations. Disruption of these services can occur as a result of damage within the building footprint or system failure at a remote location. For example, damage to on-site non-structural electrical equipment may lead to electrical power outage at the building of interest. However, it is also possible for the electrical supply to be interrupted due to failure of the distribution network. This type of disruption can lead to loss of functionality at the building level as well as longer repair times since most construction processes rely on the availability of these services.Access to a building can be compromised as a result of risks from adjacent properties with falling or collapse hazards that can require an otherwise functional building to be vacated. In the 2011 Christchurch earthquake, a number of buildings in the central business district were rendered unusable because they were adjacent to collapse hazards. Conditions such as these have an obvious impact on immediate post-earthquake occupancy and functionality as well as repair times.There are a number of societal consequences that can impede post-earthquake recovery. For example there can be a shortage of the materials and skilled labour needed to conduct repairs due to sudden increases in demand immediately following the earthquake. The adverse economic effect of a large earthquake can also present challenges in obtaining financing for repair and replacement of buildings.

Two additional limit states are introduced to incorporate the impact of external conditions on the immediate post-earthquake functionality of an individual building. In the case where the extent of building damage is below the threshold for triggering inspection (LS_0), a loss of functionality can occur as a result of external effects ($LS_{0.5}$). This condition is also applicable to the case where inspection is warranted and there are no internal triggers for loss of functionality ($LS_{1.5}$). These limit states can be triggered by utility disruption or ambient damage that renders an undamaged building uninhabitable. The recovery paths for limit states $LS_{0.5}$ and $LS_{1.5}$ can be derived from the times and activities associated with these external disruptions.

Several aspects of the recovery for an individual building are affected by external conditions as well as the socio-economic status of its owner/occupants. These can be incorporated into the current framework by applying amplification/reduction factors to

the various time parameters (T_{INSP}, T_{ASMT}, T_{MOB}) that are used to compute the recovery path. For example, Comerio (2006) noted that the scale of regional damage as indicated by the number of collapsed and demolished buildings can be linked to the overall pace of recovery. Based on this finding, a single index-based indicator can be developed where the fraction of collapsed buildings within a particular region could be used as a proxy to account for the effect of externalities. We can also point to the work of Miles and Chang (2003) where a relative index that varies between 0 and 1 is used to account for several factors that affect recovery at the household, business and community scales. Some of the factors that are relevant to household recovery include (1) the level of indebtedness, (2) the availability of jobs, (3) lifeline and critical facility restoration and (4) the availability of shelters. The time parameters used in this study can be adjusted based on an appropriate combination of these indices.

Community-Scale Recovery Functions

The function that describes community-level housing capacity recovery is simply taken as the sum of the recovery curves for the individual buildings after accounting for the effect of externalities. Note that the contribution of individual buildings to the functionality of the region depends on the type of building and measure of functionality. For example, buildings that are used as fire stations would obviously not contribute to the housing capacity of the region. This aggregation of building-level functionality would require quantifying the contribution of each building to the defined measure of community function.

$$\left[Q(t) \mid EQ_j\right] = \sum_{i=1}^{n_{bldg}} E\left[q_i(t) \mid IM_i, EQ_j\right] \tag{2}$$

where $\left[Q(t) \mid EQ_j\right]$ is the function describing community recovery for scenario earthquake *j*, $E\left[q_i(t) \mid IM_i, EQ_j\right]$ is the function describing the expected recovery curve for building *i* at a given *IM* level resulting from scenario earthquake *j* and n_{bldg} is the number of buildings in the community.

Case Study

The previously outlined methodology is implemented to assess the immediate post-earthquake reduction and recovery of the housing capacity of a residential community in NOIDA, India. The buildings in the target communities are constructed almost exclusively with infill frames. An inventory of over 1800 buildings is acquired using a combination of field observations and remote sensing data. The building inventory comprises of both single and multi-family residences with over 70,000 occupants. The portfolio includes buildings ranging from 2 to 10 stories with a number of salient features including built-in soft-stories, basement parking and irregular plan configuration and infill layout. A set of 20 surrogate buildings are developed as archetypical representations of the inventory in the test-bed communities. Structural models are constructed and used to generate fragilities for the post-earthquake inspection, structural safety, and demolition and collapse limit states. A magnitude 7 event was simulated on the Rajasthan Great Boundary Fault in the southeast of Delhi. The joint occurrence of spectral intensities from the scenario event is combined with the building-level fragilities to assess the immediate post-earthquake distribution of damage and recovery of the housing capacity of the target community.

The distribution of simulated damage to the existing building stock is shown in Figure 4. The results show that immediately following the event, the community would lose approximately 55 % of its housing capacity i.e. the percentage of buildings that, at a minimum require inspection before re-occupation. However, about 35% of this lost capacity (19% of total capacity) is buildings that will be occupiable following inspection. The plot also shows that 3% of the buildings within the target community (≈ 52 buildings) have collapsed representing occupancy of approximately 1018 people. This gives some insight into the risk to life safety.

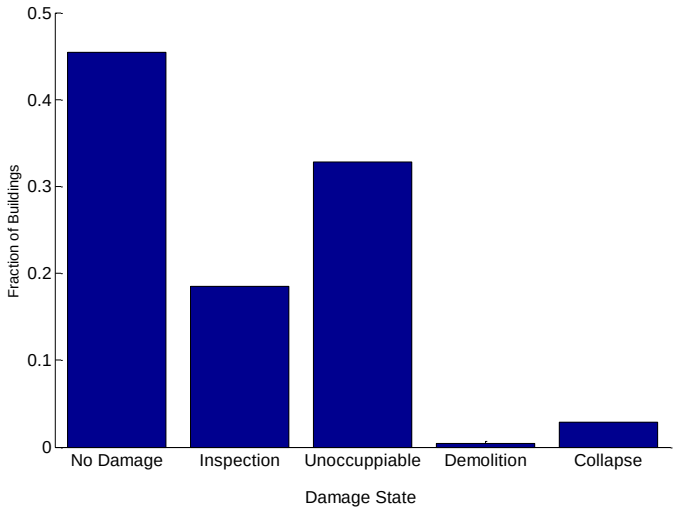

Figure 4 Distribution of damage to existing building stock for a magnitude 7 event

Figure 5 shows the shelter-in-place housing capacity recovery curve following the event. A comparison of between Figures 4 and 5 show a clear link between the distribution of damage and the trajectory of recovery. The slope of the initial stages of the recovery reflects the fraction of impacted occupants that are in buildings in the inspection limit state. For these buildings, the time to re-occupancy is the same as the inspection time. The larger the fraction of occupants in buildings corresponding to the inspection damage state, the steeper the initial slope of the recovery curve. The slope of the recovery curve following the re-occupancy of the inspected buildings is governed by the fraction of the residents in repairable buildings. The tail end of the recovery is primarily influenced by the recovery of the collapsed and demolished buildings.

A number of metrics can be used to measure the speed of recovery of the building stock and the cumulative impact on the shelter-in-place capacity.For the magnitude 7 it takes 633 days to restore 95% of the pre-earthquake housing capacity. This kind of information can provide valuable insights into the changing need for temporary shelter and the potential for significant outmigration of residents following an earthquake. Another useful metric that can be obtained from the recovery curve is cumulative loss of occupancy over the course of the recovery period in people days. This cumulative impact is computed to be 9.3×10^6 person-days. This metric can provide insights into the long term economic impact associated with the recovery of the housing capacity since we know that there will be a loss of household income for those displaced residents.

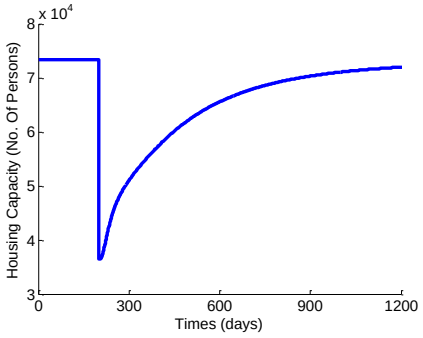

Figure 5 Housing capacity recovery curve for the existing building stock for a magnitude 7 event

CONCLUSIONS

A framework is presented that explicitly incorporates multiple functionality-based building limit states in assessing the reduction and recovery of the housing capacity of a residential community. The methodology is implemented for a residential community in NOIDA, India.The study finds that at the time of a magnitude 7 earthquake, the housing capacity is reduced by 55%. More than half of the lost housing (59%) are buildings that need repairs before they can be re-occupied. We also find that the number of occupants in collapsed buildings is 1018 for the same event. From the recovery curve generated for the existing building stock, we find that the time to recover to 95% of the pre-earthquake capacity if 633 days. The cumulative loss of occupancy was computed to be 9.3 x 10^6 person-days. The results also showed a link between the distribution of damage and the changing slope of the recovery curve. General guidelines were provided on incorporating the effect of externalities and other socio-economic factors. However, more work is needed to further develop these guidelines. This would facilitate modeling community-level recovery using other more complex metrics.

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Paper 22: Technologically advanced isolators for seismic-resilience of strategic buildings

Emanuele Gandelli[1]

[1]*Politecnico di Milano, Italy; email: emanuele.gandelli@polimi.it*

ABSTRACT

This paper summarizes the author's PhD research program whose aims is to identify solutions for the design of strategic buildings with an increased seismic resilience by means of base-isolation strategy. The cornerstones of the study are indeed the development of technologically advanced seismic isolators and the assessment, by means of numerical analysis, of the seismic response of strategic buildings protected according to these isolation solutions. The main expected goal is the development of an optimal design for the isolation of strategic buildings and its validation against current seismic codes. Up to now the research is still at an early stage and therefore only preliminary results will be here presented.

Keywords: strategic buildings, seismic-resilience, base-isolation, research program.

INTRODUCTION

Seismic isolation strategy

Seismic isolation is an effective technique used around the world to protect buildings, structures, non-structural components and contents from the damaging effects of earthquakes. The approach is based on the assumption of decreasing the acceleration response of the structure by shifting its fundamental period to higher values while trying to limit the its displacements by means of a damping increase (Figure 1).

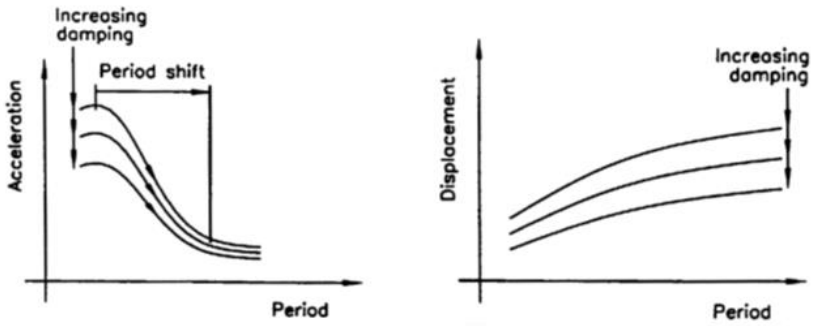

Figure 1 Theoretical basis of seismic isolation: shift of the fundamental period of the structure (left) and increase of its damping (right).

For this purpose, horizontally flexible isolation devices are introduced between the foundations and the superstructure in order to decouple the mass of the building from the ground motions limiting the transmission of accelerations and shear forces. This design approach is completely different from the more traditional "*Force Based Design*" (FBD) and "*Displacement Based Design*", (DBD) in which the structure is organized to resist the whole seismic action.

Figure 2 shows the different response of seismically isolated structures compared to that of traditional ones.

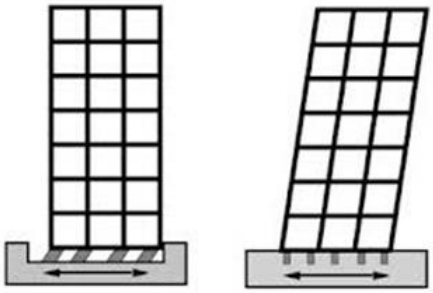

Figure 2 Seismic response of isolated buildings (left) and traditional ones (right)

Potential issues of this design approach are the need to accommodate the large movements of the isolated structure during seismic events which may be harmful for the lines for the supply of electricity, water, gas, etc., and cause "hammering" with adjacent buildings, as well as the presence of residual displacements at the end of the earthquake.Nowadays the European Standard EN 15129 (2009) and the American AASHTO (2010) identify two types of devices: elastomeric and sliding isolators (Figure 3).

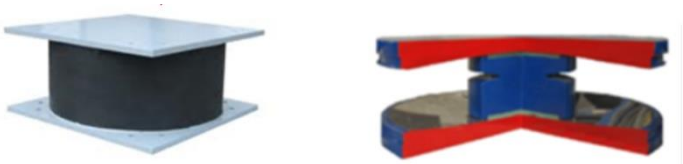

Figure 3 Elastomeric (left) and sliding isolators (right)

Elastomeric isolators are composed of alternating layers of natural or synthetic rubber bonded to intermediate steel shim plates. The bearings are manufactured by placing un-vulcanized rubber sheets and steel shims in a mold, then subjecting the mold to elevated temperature and pressure to simultaneously vulcanize and bond the rubber. The total thickness of rubber (obtained as the sum of each layer) ensure a low horizontal stiffness while the close spacing of the intermediate steel shim plates provides a large vertical stiffness and therefore compression load capacity.Among sliding isolators there is the Friction Pendulum System (Zayas, 1990): a very effective seismic isolator based on a smart operation principle which will be described in the following paragraph.

The Friction Pendulum System

The Friction Pendulum System (FPS), also known as Curved Surface Slider (CSS), compared to more established elastomeric isolators, offers some interesting advantages: (1) high load capacity and possibility to accommodate large displacements with compact dimensions (which makes them suitable for the retrofitting of existing buildings), (2) independence of the oscillation period from the

mass of the building (that makes easier to isolate light structures), and (3) absence of torsional effects in case of asymmetric buildings.The principal elements of a FPS device are two or more concave steel sliding surfaces in contact through friction pads of self-lubricant material (Figure 4).

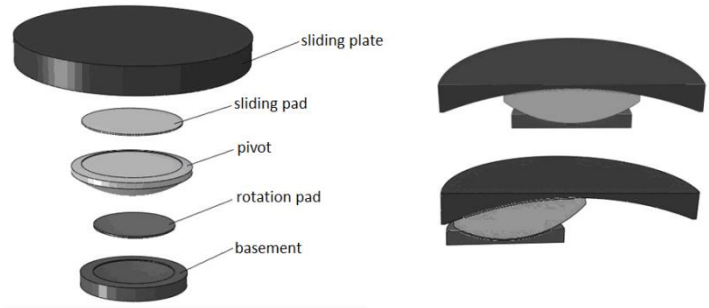

Figure 4 Friction Pendulum parts (left) and its typical kinematic (left)

The operational principles of FPS are the same of a typical pendulum: the relative motion along the steel sliding surfaces lengthens the natural period of the structure decreasing the seismic forces transmitted to the structure itself. The combined effects of the curvature of the sliding surfaces and of the weight of the superstructure provides a certain re-centering capability while the seismic energy is dissipated by means of frictional forces at the sliding surfaces.The typical hysteretic loop of the FPS isolator is represented in Figure 5. The undamped natural period of vibration T_{is}, the effective period $T_{is,eff}$, the characteristic strength Q and the stiffness k_2 can be determined through the following equations:

$$T_{is} = 2\pi\sqrt{\frac{R_{eq}}{g}} \tag{1}$$

$$T_{is,eff} = 2\pi\sqrt{\frac{R_{eq}}{g\left(1+\frac{\mu_{eq}R_{eq}}{d_{\max}}\right)}} \tag{2}$$

$$Q = \mu_{eq} \cdot N \tag{3}$$

$$k_2 = N/R_{eq} \tag{4}$$

where$N$is the weight of the supported structure, d_{max} is the amplitude of the cycle. Moreover, R_{eq} and μ_{eq} are calculated as follows:

$$R_{eq} = R_1 + R_2 - h \tag{5}$$

$$\mu_{eq} = (\mu_1 R_1 + \mu_2 R_2)/(R_1 + R_2) \tag{6}$$

being R_1, R_2 and μ_1, μ_2 respectively the radius and the friction coefficient of the two sliding surfaces, and h the height of the device (Fenz, 2006).

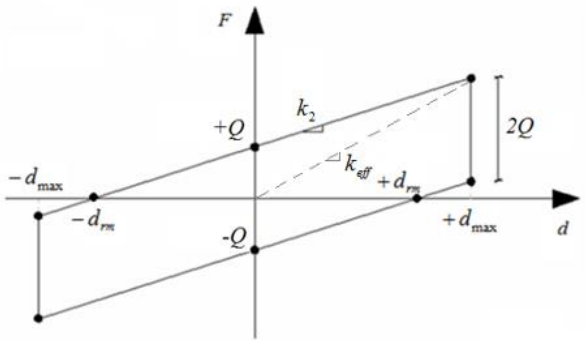

Figure 5 Typical hysteretic loop of a friction pendulum isolator

It is now evident that the dissipating capacity, as well as its dynamic behaviour, strongly depends on the characteristics of the material used for the sliding pads.

The availability of sliding materials with high wear endurance, stable coefficient of friction and resistance to the high temperatures developed during sliding will increase the reliability of the isolation system.

RESEARCH PROGRAM

Strategic buildings, such as hospitals, police stations, communication and first aid centers must be designed to achieve high performance levels under severe earthquakes because of their importance in the immediate emergency response following a catastrophic event.In this regard, the objects of the research are the investigation and improvement of sliding bearings for seismic isolation of strategic buildings by means of the study of self-lubricating materials to be used in the sliding surfaces, the proposal of design solutions for technologically advanced sliding bearings, and the final evaluation by means of analyses of seismically isolated buildings. In particular, hospitals are strategic buildings of vital importance for the management of post-earthquake emergency and therefore have been chosen as study case.

The research project consists of three tasks which activities are planned according to the Gantt diagram reported in Figure 6. Task 1 is focused on the assessment of current and novel self-lubricating materials for sliding bearings. These materials are experimentally tested to check their suitability to sustain high compression loads and to resist to wear and high temperatures. Another fundamental property to be assessed is the friction coefficient of the material and its dependence on the velocity within the range developed during earthquakes.Based on the experimental outcomes two goals are pursued: (i) identification of suitable friction materials with a large resistance to high loads and temperatures, (ii) formulation of mathematical models able to describe the dependence of friction coefficient on the investigated parameters (pressure, velocity, temperature).

Task 2 deals with the proposal of technologically advanced sliding isolators. Suitable materials identified in task 1 are included in the design of sliding bearings and several parametric studies are conducted to evaluate the dynamic performances (stiffness and damping) of the isolation devices. In particular, the re-centring capability of structures implementing FPS isolators is investigated in order to formulate an exhaustive re-

centring criterion. The considered variable parameters, in addition to the choice of different friction materials, are the geometry of the sliding surfaces and the intensity of seismic inputs.

The purpose of task 3 is to demonstrate the effectiveness of the technologically advanced sliding bearings identified in task 2 in the seismic isolation of strategic buildings. The Italian code "Norme Tecniche per le Costruzioni" (NTC 2008) requires that seismic verifications for public buildings must be met for severe events with a high return period. It follows that FPS isolators at the base of these structures are required to dissipate a considerable amount of energy by means of frictional heating at the sliding interfaces. Some different cases of base-isolated structures, with particular attention devoted to hospitals, are considered and modelled in finite element programs in order to evaluate their global response under strong seismic motions. The assessed analysis outputs are the seismic inertia forces and the movements of the structure during the seismic shaking as well as its residual displacement at the end of the event. The Performance of sliding bearings is also compared with those of elastomeric isolators with equal vertical load and displacement capacity. A desirable conclusion of this task is the formulation of design guidelines for seismic isolation of strategic buildings.

	months					
	1-6	6-12	12-18	18-24	24-30	30-36
task 1						
task 2						
task 3						

Figure 6 Gantt diagram of the research project: full color bars indicate partially completed activities while diagonal striped bars the ones to be done

The expected outcomes of the research project are the following:

(1) assessment of suitable friction materials;
(2) proposal of design solutions for technologically advanced sliding bearings and their validation for seismic isolation of strategic buildings;
(3) formulation of design guidelines for base-isolated strategic buildings.

The research results are therefore expected to have a significant impact from both scientific and social-economic perspectives. Indeed, in the near future, the development of technologically advanced anti-seismic devices shall contribute to the improvement of people safety as well as on building of reliable structures.

AVAILABLE RESULTS

Up to now the research is still at an early stage and therefore only interim results, mainly concerning task 1, are here discussed.As already mentioned the performance of FPS isolators during the seismic excitation strongly depends on the reliability of the sliding pad. Indeed, an optimal sliding material must guarantee an high resistance to compression loads, wear and high temperatures (due to frictional heating). In this regard, both the mechanical and frictional behaviours of current (PTFE) and novel sliding materials (PTFE with bronze filler, polyamide and polyethylene) have been experimentally investigated. Moreover, the dynamic response of a steel frame implementing FPS isolators was evaluated by means of shake table tests. Particular attention was paid to the assessment of the re-centring capability of the system.

Mechanicaltests

It's well known that contact pressure distribution on the sliding pad during the seismic shaking is strongly non-uniform and concentrated in some critical points. Therefore the mechanical properties of the selected sliding materials were carefully investigated by means of the following experimental tests: tensile tests, punch tool tests, confined and unconfined compression tests with monotonic and cyclic loading (Figure 7). The obtained experimental data willbe then processed and used to calibrate appropriate constitutive laws to be implemented in finite element models. Indeed, numerical analysis could be very useful to assess the suitability of these materials during strong seismic motion (task 2).

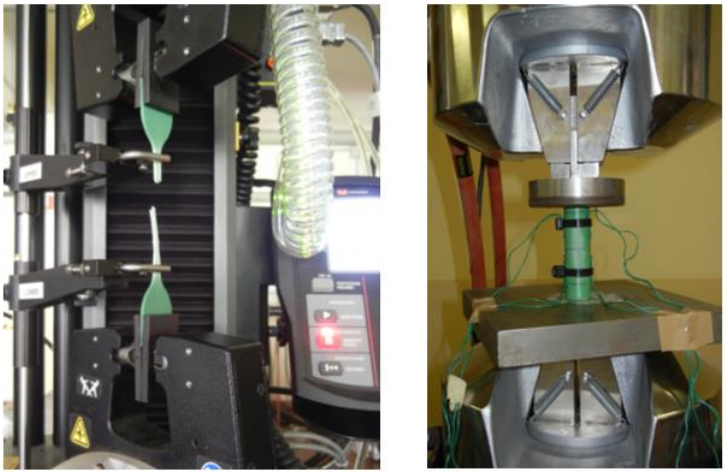

Figure 7 Tension (left) and compression (centre) tests on polyamide specimens

Friction tests

According to equations 1-4, the dynamic response of friction pendulum isolators depends on the friction coefficient at the sliding surfaces. It is well known that the friction coefficient of sliding materials strongly depends on the sliding velocity, the contact pressures and the temperatures developed during the seismic motion (Quaglini, 2012). Within this framework, several friction tests were performed on the selected sliding materials by means of a biaxial testing machine. The operational principle of this kind of test is represented in figure 8 (left): (1) a constant compression load F_v produces the desired contact pressure (up to 60MPa) at the sliding interface; (2) an horizontal force F_H is applied centrally to the sliding material test piece in order to perform various displacements laws (maximum velocity 200mm/s); (3) a climatic chamber controls the temperature at the sliding surface within the range ±70°C. At each instant of the motion, the friction coefficient of the specimen of sliding material rubbing on a stainless steel mating surface is calculated as the ratio between the horizontal and the vertical loads $\mu = F_V / F_H$.

Figure 8 (right) shows the typical loop of a friction test: the maximum friction coefficient is the static one measured at the breakaway while lower dynamic values are registered during the sliding motion.

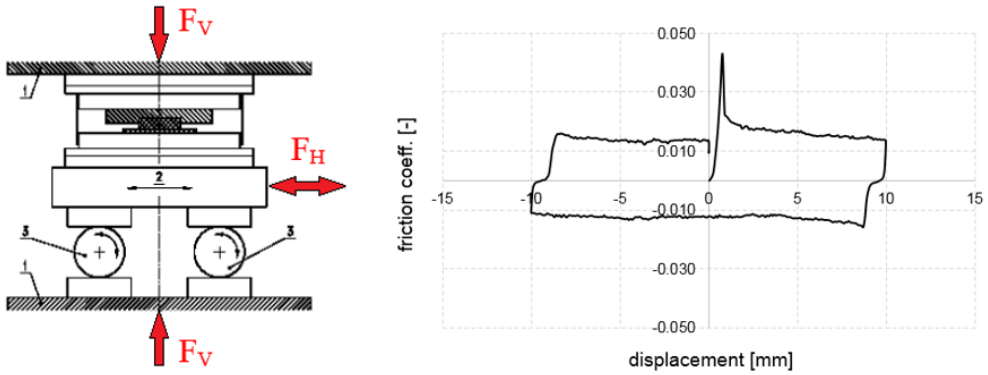

Figure 8 Friction tests: testing machine operational principle (left) and typical loop (right)

Friction tests were performed on the selected sliding materials at constant ambient temperature (23°C) and average contact pressure of 16MPa. Several repeated cycles were completed at two different sliding velocities (1mm/s and 200mm/s) respectively representative of service and seismic motions. In this regard, Figure 9 represents the trend of the dynamic friction coefficients obtained for each sliding material.

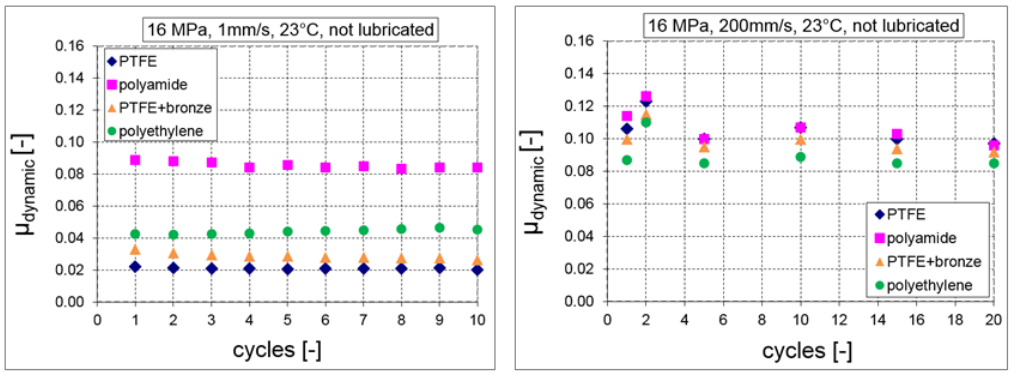

Figure 9 Dynamic friction coefficient calculated at each cycle (testing conditions: 23°C, 16MPa, 1mm/s – left - and 200mm/s - right)

It can be noticed that, for each materials, the dynamic friction coefficient significantly increases passing from the service velocity (1mm/s) to the seismic one (200mm/s). Moreover the dynamic friction coefficient is stable during the cycles at low velocity while at seismic one, after few cycles, tends to decrease probably due to the frictional heating (Gandelli, 2012). This phenomenon must be carefully taken into account by structural engineers since it can cause a significant alteration of the dynamic properties of the isolator during the earthquake. In order to strengthen the obtained results, in the next months, further tests will be conducted enlarging the range of sliding materials and testing parameters (contact pressure, temperature and velocity).

Shake table tests

The dynamic response of structures implementing FPS isolators has been experimentally investigated. This activity aimed to collect useful data for the calibration of numerical models provided in task 2. Shake table tests were carried out on a 3x3 m biaxial shake table at the laboratory of the Department of Structural Engineering of the University "Federico II" of Naples, Italy (but only unidirectional tests were performed in the investigation). The set-up is shown in Figure 10. It was designed as a steel structure, composed of a vertical frame with dimensions 2.5x2.5 m in plant and 2.9 m height, connected to a rectangular 2.5x2.5 m base frame. The whole structure was supported by four seismic isolation bearings fixed at the corners of the base frame. A reinforced concrete slab was placed on the roof of the structure and a rigid reaction mass consisting of 40 concrete blocks was placed at the level of the base frame. The total mass of the isolated structure was 8200 kg. Taking advantage of the symmetry of the prototype structure, each isolator supported a quarter of the total weight.

Figure 10 Shake table test set-up

Three isolation layouts, each one comprised of four identical FPS bearings, were assessed in the tests. Three different models of FPS bearings were accounted for (Table 1).

Table 1 FPS prototypes: pad material and manufacturing details

FPS model	pad material	R_1 (mm)	R_2 (mm)	h (mm)	R_{eq} (mm)
LF	lubricated PTFE	770	770	55	1475
MF	lubricated PTFE–bronze compound	770	770	55	1475
HF	PTFE–bronze compound	1270	300	70	1500

Seven accelerograms (Table 2), representative of a hypothetical seismic input for the site of Naples, were selected from the European Strong-Motion Database (Ambraseys, 2002). Accelerations of each input were scaled in order to have the same design ground acceleration level of 0.26 g.

Table 2 Selected ground motions and relevant characteristics

Earthquake name	Magnitude (Mw)	PGA (m/s^2)	Scale Factor
Bingol	6.3	2.92	0.87
Friuli	6.5	3.50	0.73
Montenegro	6.9	2.51	1.01
Etolia	5.3	1.73	1.47
Lazio Abruzzo	5.9	1.23	2.07
Campano Lucano	6.9	3.17	0.80
Campano Lucano	6.9	1.78	1.43

Figure 11 summarize the obtained experimental results. Here the distribution of the residual displacement d_{res}, normalized to the peak displacement d_{max}, is reported as a function of the peak displacement d_{max} normalized to the static residual displacement d_{rm}. The residual displacement is large compared to the peak displacement ($d_{res}/d_{max} \geq 0.5$) when d_{max}/d_{rm} is small (tipically less than 0.2), but the entity of the residual displacement d_{res}/d_{max} has a decreasing trend as the ratio d_{max}/d_{rm} increases, eventually becoming negligible when d_{max}/d_{rm} is equal to, or larger than unity. Specifically, for the FPS models assessed in the study d_{res} becomes an insignificant portion of $d_{max}$when d_{max}/d_{rm} is greater than 0.5. It is noted that for each isolation system there is a significant scatter in the observed data which reflects the dependence of the re-centring capability on the characteristics of the ground motion.

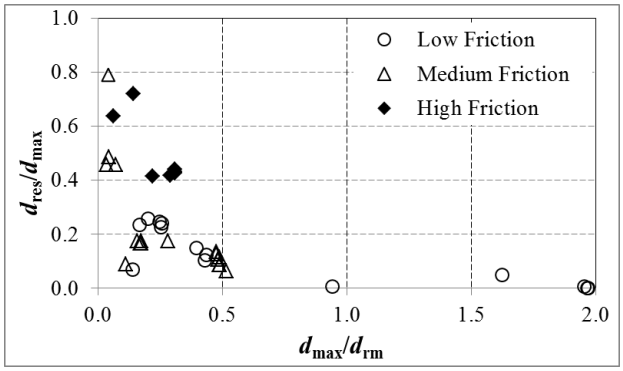

Figure 11 Normalized residual displacement d_{res}/d_{max} as a function of d_{max}/d_{rm} for each FPS prototype

CONCLUSIONS

The paper summarizes the author's research program concerning the development of technologically advanced sliding isolators for the design of strategic buildings with an increased seismic-resilience. It is well known that the performance of sliding isolators protecting buildings and their contents during the seismic shaking strongly depends on the reliability of the sliding pads. An optimal sliding material must guarantee an high resistance to compression loads, wear and high temperatures due to frictional heating. In this

regard, interim available results of the research mainly concern the experimental assessment of mechanical and frictional properties of current and novel sliding materials. Moreover, the dynamic response of a base-isolated steel frame was investigated by means of shaking table tests. The collected data will be used in the next research steps for the calibration of numerical model able to predict the response of real base-isolated buildings.

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Paper 23: Lightweight and energy efficiency technology to support Disaster Resilience: the Air Shelter House

Cristina Pusceddu[1], Marco Imperadori[2] and Graziano Salvalai[3]

[1]*Politecnico di Milano, Italy, email: cristina.pusceddu@polimi.it*
[2]*Politecnico di Milano, Italy, email: marco.imperadori@polimi.it*
[3]*Politecnico di Milano, Italy, email: graziano.salvalai@polimi.it*

ABSTRACT

In the last 10 years, there were about 20.850 catastrophes, which have hit the entire world. During these events, in 2012, 138.911.506 people were killed or affected.To answer to the needs of displaced people, the project of building element for emergency architecture is investigated, assisting the phase of response, and construction. The solution has to be lightweight, for guarantee safety during disasters and modular, easy to assembly and transport according with shelter design features. Analysing the construction materials and architectural example of temporary shelter, the Thermal Reflective Multi-layer System (TRMS) is a way to satisfy these requests.The result of the work is an innovative technology for building applications made with TRMS characterized by low conductivity (0,038W/mK) and lightness (lower than 1 kg/m2). This housing solution, called Air Shelter House, is a technological skin, to apply externally, to different kind of structure, according to the local construction tradition. Moreover, it can be used as a tend ensuring more technological features, concerning thermal performances and durability.Conclusion of research is a building component prototype system, which allows using high technology within emergency architecture,to answer needs of reconstruction process in an economic solution.

Keywords: Lightweight, Technology, Thermal Reflective Multi-layer System, Emergency, Reconstruction.

INTRODUCTION

Considering the last 10 years, it is around 20.850 the number of disaster, which have hit the entire five continent (Em-Data 2014). Between 2010 and 2013, natural disasters have killed around 376.643 people, and 757.041.987 was affected. (Em-Data 2014) In 2012, especially, it was estimated that 32.4 million people, in 82 countries, were newly displaced by disasters associated with natural hazard events. Over five years from 2008 to 2012, around 144 million victims were forced from their homes in 125 countries. (iDCM& NRC 2012) Only in Japan, in 2011, during the Great East Japan Earthquake, in fact, the tsunami levelled 130,000 houses and severely damaged 260,000 more. (GFDRR &The World Bank 2012) It should also be considered the large number of people which is displaced because of conflict and violence: around 33,3 million of people in the end of 2013 (iDCM & NRC 2014) They are usually dislocated in temporary camps, for an average period longer than 12 years.

In the view of the global warning, furthermore, it is raising the devastating of natural events (NOAA 2009; Arndt et al. 2010), and combined with the new conflicts, as the Syria situation, these numbers may increase in the future. These conditions suggest the study of appropriate technology in support of disaster management. In fact, technology could help, in terms of vulnerability, to find appropriate solution for the mitigation phase, and in terms of durability, safety, and internal comfort to support the response, and reconstruction phases.

The Thermal Reflective Multi-layer System (TRMS) is considered a satisfy technological answer for these needs, thanks to the lightweight, durability, resistance, and thermal performance of this insulation system.

METHODOLGIES

The research follows a transversal overview between the concept of Disaster Resilience and the available materials. Aims of the study is to demonstrate the possibility to use TRMS to achieve the best solution in this contest.

The methodology is performed in four different task:

- Task 1, Literature and Cases. Review to summarize the presently state of art of shelters, shelters features and response phase needs.
- Task 2, Material study. Study of the material to identify potential of TRMS according with shelter needs, through laboratory test too.
- Task 3, economic analysis. Evaluation and comparison between present reconstruction projects and Air Shelter House (ASH) technology.
- Task 4, Cases studies. Application of ASH to reconstruction and new design buildings.

In the first task the present scenario are studying, dividing the shelters between micro-architecture or normal buildings, and between shelter and tent solutions. Contemporary, the guideline, and shelters parameters indicated by international community are examined to recognise the compatibility with TRMS.

In the second task, after the individuation of possible scenario for the technology design, the TRMS in analysed through laboratory studies. The literature, in fact, presents different studies concerning TRM, but considering the numerous typologies of materials present in the market, it was not possible to found specific data to use as research base. In order of this need, one specific typology of insulating system was chosen, to better analyse and understand material potential and thermal performances. In this phase laboratory test, performing by hot plate apparatus with guarded ring, gave data useful for the design section, and central data for the implementation of the system compose by Thermal Reflective Multi-layers materials and Air gaps (TRMS). Cases studies of the use of TRMS in the civil architecture are also analysing to better understand performance in normal conditions.

Between the second and the firth task is located the proposal, which is the implementation of housing technology based on the use of TRMS. Name of the technology is Air Shelter House (ASH). It is a system made by modular components, which are assembled as a thermal, flexible skin to use as internal or external envelope for the reconstruction of damages buildings, for new buildings, and micro-architecture or tent, according with the local construction technical and materials.

In the third task, in view of this new solution, ASH, there is an economic and technical comparison between these innovative solution and presently solution, commonly used in the response phase. Considering; in fact, data from World Bank (2014), 358 are the project activated in support of affected regions; 32% of these projects are concerning housing reconstruction. $430 million have been allocated to finance these operations, especially in support of Latin America, Caribbean, East Asia and Pacific Regions. (World Bank 2014) A good management of these funds would allow to optimize the project improving the result.

In the last fourth phase is investigated the application of ASH in one case of reconstruction, and in two new design buildings. During this application it will be possible understand potential of material application to different structure, in support to the design process, considering the prototype study of the two building, and the real system behaviour.

AIR SHELTER HOUSE

The study of the state of art, especially concerning emergency, suggests the investigation of envelope system, with a balance between lightweight and thermal performances. In the same time, laboratory test about TRMS show the real possibility to find this balance with this innovative technology. The design of a building component, to adapt to different environmental, cultural conditions, structure and function allows having a wide adaptation to different cultural and environmental, with a low total cost. Compositions of these building components are the Air Shelter House (ASH), a thermal, flexible skin easier to assembly, according with different internal function, and composition.

ASH is projected starting from the observation of Thermal Reflective Multi-layer materials, and their thermal improvement in the combination with air gaps (TRMS), which allows having a lightweight system, whit high thermal features, and strong technical characteristics, in agreement with shelter and users' needs. (Imperadori, Pusceddu & Salvalai 2013)

Thermal reflective multi-layer system

As A.M. Papadopoulos (2005) asserted the insulating materials are the most-effective way to rehabilitate or construct buildings in view to achieve reasonable energy consumption, satisfactory internal thermal comfort, and low operation cost.

In view of the emergency architecture, especially, considering the sensible scenario, the design has to ensure the higher possible performances, according with the contest, to ensure psychological needs and safety of the users, but with particular attention to cost. During the events, in fact, the economic situation is always compromise, producing issues to users and government. It suffices to observe that, merely in the last four years, it is around 6,694,019 US million of $ the economic damages registries in the world wide, related only to natural disasters. (Em-Data 2014) For this reason, the direction of insulation system was chosen to find a possible adequate answer to emergency architecture needs, in relations to the response and reconstruction phases.

In particular, the TRMS showed certain characteristics, in according with this particular contest. The system is composed by the combination of Thermal Reflective Multi-layer Materials (TRM), and air in twice-external surface.

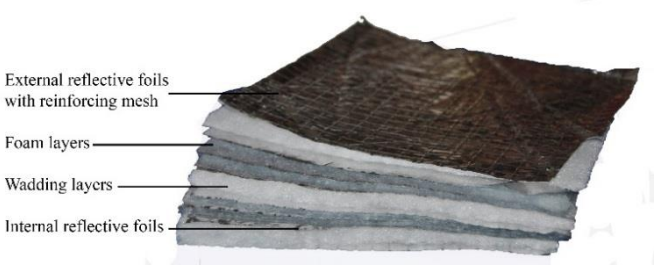

Figure 1 TRM composition.

As shown in Figure 1, TRM selected for ASH is composed by 19 different layers of aluminium foils, wadding and foam, 2,5 cm thick . The use of low-emissivity surface for reducing heat radiation is a technology developed from space applications, where heat reflection is particularly important. (Pazstory et al. 2011; Li & Cheng 2006) Pazstory et al. (2011) assert that from the observation of multi-layer materials, composed by reflective barberries and others insulating, both theoretically and experimentally, it is demonstrated that it could reflect a high percentage of heat energy. Especially in hot climates, which are the most affective areas of natural disasters, where the effectiveness of reflective layers at higher temperature was higher. (Pazstory et al. 2011; RIMA-I 2002)

The air layers created using external membranes of polyester materials, in twice side, have a thickness from 1cm to 2 cm. Larges layers are excluded to avoid convective mote, which can compromise thermal performances. (Seriacaroupin et al. 2007)

Laboratory tests, during the research, provide the data of 0,04 W/mK for TRM and 0,038 W/mK for TRMS, with 1 cm of air gaps, considering polyester membranes too. Tester using during the experiment, and hot plate apparatus using to achieve the data, are showing in Figure 2. (Imperadori,Pusceddu& Salvalai 2013)

a b

Figure 2 (a) TRMS tester (b) Hot plate apparatus

The tests procedures are in agreement with the method and the standard ISO 6946:2007, Thermal resistance and thermal transmittance: calculation method (International Organization for Standardization 2007). Temperature was set at three different values, but especially set point of 40° C was investigated, because of the situation closer to reality. Following the thermal balance between the two heaters, the unilateral thermal flow is guaranteed. In this condition, when system goes in full speed, measurement errors are under the 2%, according with ISO standard.

Data analysis was performed on the last 30 values on each repetition (100 in total) at each temperature set point. Data were recorded when the system was working at full speed and with thermopile voltage imbalance lower than 100μV. Software in LabView DSC graphic interface allowed the storage of the measured data. To enable the development of the control, all the measuring devices were connected to the multiplexer. According to the UNI CEI ENV 13005:2000, Guide to the expression of uncertainty in measurement (Italian Organization for Standardization 2010), results are expressed with measurement uncertainty, a non-negative parameter characterizing the dispersion of the values attributed to a measured quantity.

These high thermal performances are guaranteed with a light-weight of 20 g/m^2 for the TRM, and 18 g/m^2 for polyester. (ACTIS SA 2010)This kind of insulation, moreover, is non-toxic for user and building owner, and environmentally safe building material, considering that it could be recycled too. (RIMA-I 2002)

Air Shelter House application

The Transitional Shelter guideline, related from Shelter Centre et al. (2011) state that the government rarely have sufficient resources to assist displaced people in the reconstruction of their damages homes. Anyway, international community said that it is important to support all affected persons by the disaster. (Shelter Centre, DFID & OCHA 2008) Transitional shelter could be an appropriate instrument to support displaced people, but to be adopted "it has to optimise protection from further hazards, health, livelihoods and give maximum flexibility in recovery. Transitional shelters use mainly local materials, thereby contributing to local and regional economies. The materials and construction methods are chosen to be familiar to those affected, requiring skills and tools that they have access to. The designs and materials are also chosen so that after reconstruction is complete, the transitional shelters can be upgraded, reused for other functions, sold or recycled into permanent housing." (Shelter Centre et al. 2011)

According with these considerations, ASH is not a prefabricated or already projected house, but it is a building component, a thermal skin, which could be adapted to different kinds of structures, to the internal or external side (Figure 3). Thus, the users, governments, or international humanitarian communities could adapt ASH to the local construction technology and materials. In the same times, refugees people or general victims, which cannot build a structure, or want to stay close their damages homes, can use the ASH as tent. (Figure 3) In the second case, they can incorporate the Shelter in the new, or rebuild, permanent house, using the ASH as an envelope insulating.

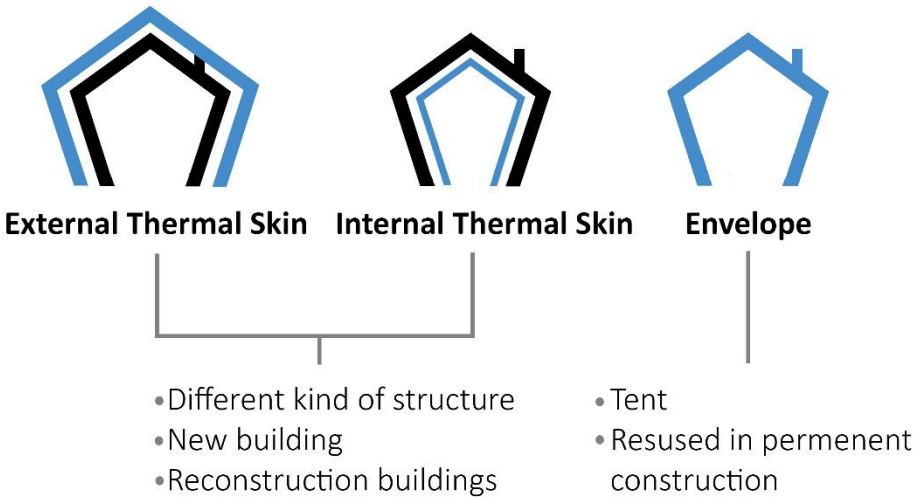

Figure 3 ASH applications.

In the traditional way, TRMS is assembly through different steps, which contemplate the installation of bearing structure, with the support of wooden posts with staples or galvanized steel around 14 mm /20 mm overlapping the foils for 50–100mm. (ACTIS SA 2010) Process requires a skilled labour and some days for the application. ASH,

conversely, allows application of the system as a normal insulation panel. The combination of TRM and air is already created, and the support structure for TRMS is inside the modular building component, which composes the ASH. According whit the lightweight of the system, the ASH could be easy assembly by unskilled workers, in a short time.

Air Shelter House and Transitional shelter

Transitional shelter is defined, from Transitional Shelter Guidelines (Shelter Centreet al. 2011) as an "incremental process which supports the shelter of families affected by conflicts and disasters, as they seek to maintain alternative options for their recovery."

They identify five main characteristics to achieve an appropriate transitional shelter process (Shelter Centreet al. 2011):

(1) upgraded into part of a permanent house;

(2) reused for another purpose;

(3) relocated from a temporary site to a permanent location;

(4) resold, to generate income to aid with recovery; and

(5) recycled for reconstruction.

These parameters could be improved from the UN-HABITAT(2009) state of "all displaced people have the right to have an adequate housing". This sentence suggests not only to provide a shelter, but we have to design an adequate shelter, which will able to ensure psychological needs to victims, and safe, resistance, comfortable housing solution during their stay.

ASH is based on these evaluations, and study of the state of art, as indicated in the first task of methodology process.Starting from the five main characteristics indicated to the Shelter Centreet al. (2011) the ASH could be upgraded into part or permanent house. Modularity of the system, in fact, is studied to be disassembly and use as an insulating envelope, for the reconstructed buildings. According with the fourth and fifth point too.The thermal skin, moreover, could be reused in different occasion. The system it is easy to pack, with a weight around 500 g/m2 per roll, it could be easy transport by simple track, containers or helicopter, to different sites or countries. It is also easy to assembly, as indicated in the previous paragraphed, for the modularity of the single elements.

Resistance and durability ensure the possibility to use ASH as a temporary shelter or permanent housing. TRM have an estimated durability around 10 years. (ACTIS SA 2010), and a good physical and humidity resistance, for that reason it can be used as a vapour barrier too. (RIMA-I 2002) The system, farther, is provided of connection to tie the envelope with the structure. As indicate to ISDR et al. (2007), to prevent envelope movement and damages, it must to be tie to the structure, in the case columns systems.Particular of joint connection could not be showing, causes of the possibility of a probable patent.

RESULTS AND DISCUSSION

The state of art of emergency architecture was divided, in Task 1, between Shelter of small dimensions (micro-architecture), and shelter of normal size, more similar to

permanent housing. In the same time the shelter indication for the construction, concerning international community was studied, to identify the basic parameters. The result was a scenario where it is fundamental to find a balance between economic issues, caused from events, and "adequate housing" for users (UN-HABITAT 2009). There are different case studies, in fact, where the cost of temporary shelter, preferablyprefabricated cases, is higher than reconstruction (Shelter Centreet al. 2011). The answer to this need it was, in this research, to study especially the envelope technology, examining the potential of TRMS, which is a lightweight material, with a high thermal performance.

In parallel, in the Task 2, was analysing the state of art of this insulation system, concerning case studies related to civil architecture. The study shows the increasing of the thermal performance with the support of TRMS, in a limited thickness. The provision of laboratory test, moreover, confirms the increasing of TRM performance with the support or air gaps. (Imperadori, Pusceddu & Salvalai 2013) Considering measurement uncertain the conductivity of TRM is 0,040 +/- 0,0047 W/mK, and TRMS conductivity is 0,038 +/- 0,0048 W/mK.

Combination of these results suggest the design of ASH, a technology system composed of modular building element based on TRMS, created with the support of simple and low cost material, presently not showing because under investigation for a possible patent.In the last two phases of the research the economic situation and application cases was investigated to understand feasibility of the ASH.

Compare with tent solution, used in the refugees camp, with a durability of 12 months, and prefabricated solution used in the response phases, usually expensive, the ASH could have a longer lifespan, with a price amortized to the wide option of application from the situation of first answer after events, to the possibility to be part of reconstruction. In fact, Fujimi & Tatano (2012) state that "the very high value accorded to respondents' own homes suggests that policies to subsidize the repair and rebuilding of private homes constitute the most effective recovery support strategy", from here the importance to have a support for shelter design which could be re-located to different uses. In this way psychological aspect are preserved, according with physical needs, energy efficiency and economic aspects.

Case studies show different situations, sometimes after response and reconstruction phases, to recover some of the cost, it happens that authorities also sell the units or parts once they are no longer needed. In Turkey, for example, many of the government owned units were sold to families, businesses and institutions for approximately US$1200 each, thus recouping one third of the $3300 initial unit cost, around 40% (Johnson 2007)

However, to reuse unit sometimes involves some additional cost that could be also around the 40% more of initial building cost. As in the case of Duzce, where the cost to move one 200m^2 building (8 units) to a nearby community for use as a Sports Centre was US$8000, which included transport and labour, installation of electricity and water, and a new roof (Johnson 2007). In view of these effects, the use of ASH and not the insertion of a shelter construction could help the phase of Temporary solution reuse, facilitating the transport and insertion phases with lower costs by considering the characteristics of easy application and transfer of the system.

Case studies related to Task 4 demonstrate the flexibility ASH in this regard, using the technology system as a thermal skin, shelter of single building component (as roof, walls, etc.) according with emergency architecture safety parameters too (ISDR et al., 2007). These aspects are better described in a future paper, in the 4th International Conference on Building Resilience, Salford Quays, United Kingdom, 8th-11th September 2014.

CONCLUSIONS

According with the result of State of art, laboratory test and economical behaviour during emergency management, the conclusion of this research is the design of ASH, which showed the possibility to use technology in support of response and mitigation phases.

ASH, in fact, is a versatile housing technology, based on TRMS, to use during the response phases as first aid. Furthermore, it could be involved in the reconstruction and mitigation phases too, in terms of vulnerability related to buildings, using the ASH for reconstruction of damages buildings; or as tent in the refugees' camp, with a durability of TRM of 10 years (ACTIS SA 2010), more close to the behaviour of permanent house.

The Air Shelter House could be safe during earthquake, thanks to the ability to tie the system to the structure (ISDR et al. 2007), and lightweight of the materials used. This characteristic and the ability to pack the system in a roll achieve an easy transport and disassembly. With the dimensions of 0,06 m^3 of roll it could be transport by simple track, containers or helicopter. It could also use in the humidity areas, after storms or floods, because of the resistance of TRM to water, which allows to the insulated system the function of a vapour barrier too. (RIMA-I 2002)

Thermal performance of 0,038 W/mK, and modularity, flexibility, of the system ensure to combine the ASH with different types of structures, and with different kind of materials. These features guarantee first, the possibility to design with the maintenance of local building technology construction, and materials, to be in agreement with local culture. (Shelter Centre, UN & DFID 2010) This is in agreement with the needs to involve the local people in the process of shelter construction (Shelter Centre et al. 2011), considering easy assembly of the system and the combination with local tradition. Second, it ensures internal comfort for the users, which needs particular attention considering traumatic experience and possible psychological and physical disease, caused by the events.

Moreover, the procedure to implement the use of particularly technology components in support of these areas allows matching the design using local resources. As the cases show to Johnson (2007) concerning Turkey situation after 1999 earthquake, where was used factory-made prefabricated panels and components that were bought locally from local manufacturers; or as the Japan case, after Kobe earthquake on 1995, which established prefabricated housing industry, to develop rapidly available temporary housing drawing on local industries.

Generally, however, in the present active projects financing for disaster recovery the 31% total cost projects are using for housing construction sector (World Bank 2014). Inserting ASH technologies to support reconstruction phase, considering temporary shelter and the ability to re-use the technology in the permanent construction, according whit local building construction methodologies and materials, the percentage

of total cost use for housing could be reduce. In this way, the found saved should be used for others sectors, as educational for Disaster Risk reduction or others social needs.

Adaptation of ASH from recovery phase to mitigation phase, crossing the reconstruction period, allows supporting disaster resilience, contributing to reduce vulnerability too. Households encounter many problems during reconstruction, including high prices for repairs, poor quality work, and contract breaches (Bolin 1993).The possibility to locate the system in combination with local structures and materials permits to reduce the cost of reconstruction, creating an incentive for a resumption of local economy. Moreover, it allows involvinglocal community inside the reconstruction phase, and in this way, the project process fosters a strong sense of ownership and acceptance, and helps to facilitatecare and maintenance of buildings following construction, as suggested to SKAT & UNEP (2012).

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Paper 24: Building Disaster Resilience by using community labour, 3D Lightweight Panels and the BIM system to provide housing post-disaster

Alicia Flores[1] and Peter Fenn[2]

[1]*University of Manchester, UK; email: alicia.salas@postgraduate.manchester.ac.uk*
[2]*University of Manchester, UK; email: peter.fenn@manchester.ac.uk*

ABSTRACT

A holistic research study using an explorative approach was conducted to examine how community members can help to reconstruct their own housing after disasters, and how traditional construction materials can be replaced by 3 Dimensional Lightweight Panels (3D-LPs). A prototype basic housing unit of 50 sqm using 3D-LPs was simulated in Building Information Modelling (BIM). Using 3D-LPs was faster than standard construction and their monolithic design offers superior performance due to great load-bearing capacity and resistance to NM-MDS. Post-disaster housing researchers were consulted about the involvement of the post-disaster community. They suggest that those affected can be trained in construction skills to rebuild their own homes. The conclusion is that 3D-LPs, community members and the BIM system can be used to create a systematic framework to produce a large-scale housing prototype and for building Disaster Resilience. Consequently, a basic permanent housing can be built in ninety days by unskilled people trained by skilled people in the 3D-LPs construction system and thus saving up to 45% of the total cost required by using traditional construction materials.

Keywords: BIM, 3D-LPs, disaster management, housing recovery, man-made disasters, natural disasters and Resilience Disasters.

INTRODUCTION

Management of construction projects is proposed to study the housing rebuilding problem after Natural and Man-Made Disasters (NM-MDs), because millions people in developing countries are more prone to suffer damage in their housing due to the lack of preparation and risk mitigation (Andrade and Cernat, 2013). United Nations revealed that more than 263 million people were affected by NM-MDs in 2010 and the Department for International Development of the United Kingdom states that over 375 million people could be affected by natural phenomena caused by the climate change in 2015. (UKaid 2013) Consequently, a systematic construction framework for building Disaster Resilience, which is defined as the ability of communities to return to ordinary life through anticipated actions that contribute to quickly overcoming the problems caused by NM-MDs (UKaid, 2013), is proposed to rebuild housing and to give a sense of belonging to those affected after they have lost their homes and livelihoods and to teach them how to recover from NM-MDs. It is also proposed to reduce the cost and time of housing construction post NM-MDs by using community participation, the 3D-LPs construction system and the BIM system.

Implementation of systematic construction frameworks requires the active participation of all stakeholders. This was widely shown after the Indian Ocean Tsunami occurred in 2004. However, community participation and new construction systems were only used in isolation by Non-Governmental Organizations and Governments during housing reconstruction in countries affected by the Indian Ocean Tsunami in 2004. To

understand how community members and the 3D-LPs construction system can help with the reconstruction of damaged housing post NM-MDs, an online survey questionnaire was carried out with post-disaster housing researchers and an interview with 3D-LPs manufacturers all over the world. Data collected from questionnaires and interviews was qualitatively analyzed in Nvivo 9 software (UoD, 2013).

Participation by consultation should be considered after NM-MDs, because those affected can be consulted to give their opinion about materials, design, labour and financial management (Davison et at., 2007); but they should not be consulted about the technical situation. However, in the opinion of the post disaster housing researchers consulted by questionnaire those people affected should be given the opportunity to participate in housing reconstruction after they have been provided with training in construction activities by construction professionals. Post disaster housing researchers consulted by questionnaire also suggest that new construction materials can contribute to improving seismic behaviour of dwellings if they have shown higher performance than traditional construction materials. Finally, a permanent housing model prototype was modelled in the BIM system with the 3D-LPs construction system to create a template that can be implemented anywhere affected by NM-MDs. Since any modification made on any plan automatically affects the entire project, it is thus possible to reduce the architectural, structural and installation design time.

Background and point of departure

Five housing recovery programmes used after the Indian Ocean Tsunami occurred in 2004 that simultaneously affected 14 countries were studied to determine the actions carried out to rebuild damaged housing (Jha et al, 2010). Since these countries lacked the approaches and plans to overcome housing damage caused by the unexpected disaster in 2004 (Nikbakhsh and Zanjirani, 2013), different approaches were used to build dwellings, and therefore the community participation was limited by Governments, Agencies and NGOs. Table 1 shows the participation of the affected communities in the main approaches used for housing recovery after the Indian Ocean Tsunami in 2004.

Housing Recovery Programme	Community participation	Country
Cash Approach	Total Participation	Indonesia and Sri Lanka
Owner-Driven Reconstruction	Limited Participation	Thailand and Sri Lanka
Community-Driven Reconstruction	Limited Participation	Indonesia (Aceh)
Agency- Driven Reconstruction in site or Donor Driven	No participation	India (Tamil Nadu) Sri Lanka
Agency- Driven Reconstruction in relocated site	No participation	India and Indonesia (Tamil Nadu and Aceh)

Table 1 Approaches used and community participation to build damaged housing Post-the Indian Ocean Tsunami in 2004

A cash approach was used in Indonesia and Sri Lanka in 2004. Cash was granted to households and builders to build permanent housing. This approach consisted of allowing management cash to buy construction materials and hire labour. However, the Cash Approach resulted in corruption problems and poor dwelling construction (Lesley, 2007). Owner-Driven Reconstruction (ODR) is an approach used to improve social-economic conditions in developing countries ((Jha et al, 2010) see, e.g.

Barenstein, 2006). ODR was implemented on a large scale in Thailand and Sri Lanka post-disaster in 2004. ODR is a programme that allows those affected to make their own decisions to rebuild damaged houses through providing them with technical support, without community members needing to use their labour. ODR receives other names depending on the Agencies and NGOs that manage it. The successful use of ODR has also been acknowledged in urban and rural areas (Red Cross, 2010). Despite its success, ODR faced some problems in housing recovery, because Agencies and NGOs gave support for housing rebuilding without previous experience of housing construction (Steinberg, 2007; Ophyandri, 2013).

Community-Driven is a housing programme which arose from the Kecamatan Development Project and the Urban Poverty project in Indonesia to aid communities hit by the Indian Ocean Tsunami in 2004. Community-driven gave technical and financial support to communities through facilitators who were responsible for training and supporting individuals and groups in managing economic funds, construction techniques, accountability and taking decisions. This approach empowers communities so that they can build homes by themselves where spend their life and feel that they belong rather than built a type of house; and facilitators are an important piece of the successful programme (Multi Donor Fund, 2012).

Agency-Driven Reconstruction in site (ADRIS) or Donor Driven Reconstruction (DDR) is another approach used to build dwellings after NM-MDs. Agencies and NGOs in this approach hire builders and consultants to manage financial and technical sources so that they can build damaged housing in site. Those experts are free to design and build housing under construction regulations. However, the builders built housing without previous knowledge and consultation on the needs of the affected people after the Indian Ocean Tsunami in 2004 (Karunasena and Rameezdeen, 2010). Hence, DDR faced construction quality and design problems (Lawther, 2009). Agency-Driven Reconstruction in relocated site (ADRRS) works on the same principles as ADRIS in new areas chosen to reduce risk of NM-MDs (Jha et al, 2010).

Methodology

A holistic approach was used to answer the three research questions that arisen from literature review. (1) How can displaced people use their own labour to save money and time? (2) , How does the 3D-LPs construction system contribute to housing recovery after NM-MDs?, and (3) How can the BIM system show the cost-benefit in building housing with the 3D-LPs construction system and displaced people's own labour? Management of the housing recovery after the Indian Ocean Tsunami occurred in 2004 that simultaneously affected 14 countries is the case study for this research. This disaster has been considered the biggest economic-social and political challenge in recent decades. In addition, this challenge has left sufficient knowledge on management of construction projects post- NM-MDs.

Thirty open online survey questionnaires were carried out with post-disaster housing researchers all over the world to consult them on how community members affected by NM-MDs can be involved in building disaster resilience in the four aspects such as: architecture design, choice of building materials, management of financial resources and unskilled labour.Six open semi-structured interviews were also conducted with 3D-LPs manufacturers to determine how traditional construction materials can be replaced by 3D-LPs to build houses after NM-MDs. The subjects enquired about are shown in table 2.

Physical and Mechanical behaviour of 3D-LPs.
Quality control and availability in the Market.
International prices.
Capacity to supply 3D-LPs in areas hit by NM-MDs.
Capacity to give technical support in areas hit by NM-MDs.

Table 2 Interview topics that Manufacturers were asked about

Finally, a computer simulation in the BIM system Revit 2013 from Autodesk was used to create a database for the simulation of the permanent prototype house of 50 sqm using the 3D-LPs construction system.

Results from open online survey questionnaires

A qualitative analysis carried out in Nvivo 9 using collected data from questionnaires with thirty experienced post-disaster housing researchers all over the world revealed how community members affected by disasters can help in architectural design, choice of building materials, management of financial resources and labour after disasters.

Architecture design

The opinions about housing design of those affected should be considered to give them a sense of belonging, since they know their needs and the experts know how to build appropriate, adaptable and sustainable structures able to withstand NM-MDs, which contribute to preserving the culture, architectural heritage in affected areas and for building Disaster Resilience. Opinions from people affected can also be used to improve spaces and social conditions; given that an NM-MD is an opportunity to make a major impact on construction techniques and to build housing that really fits the homeowner's needs. However, consultation should take place after the emergency phase, when the people affected may be more equable. House builders should empathise with the real needs of those affected, to provide adequate spaces where people can go back to their daily routine in the shortest possible time. Additionally, the housing design should be left to professionals who can mitigate the impact of future disasters and who can assertively use people's opinions.

Choice of building materials

Regarding choice of building materials post-disaster, housing researchers suggest that traditional housing construction methods, techniques and materials should be preserved, as long as these can contribute to improving Disaster Resilience. The nature of the disaster, the area affected, cultural and economic, social and political conditions are variables that should be included to choose methods, techniques and materials to build housing able to withstand NM-MDs. In addition, new construction materials should be considered to build housing, when they are best suited for better future performance in a possible new disaster, given that traditional construction materials that failed to perform well need to be changed. However, construction materials should be chosen by technical professionals to ensure low cost, high performance toward NM-MDs, sustainability, reduction of construction time, easy maintenance and able to contribute also to building Disaster Resilience.

Management of financial resources

Financial resources, according to post disaster housing researchers consulted by questionnaire, should be managed by construction professionals to avoid fraud, corruption, misuse and waste of funding. However, people affected can receive intensive guidance and monitoring to manage cash so that they can build their houses under building regulations, so it is important to know the local culture, because this is different from one area to another.

Unskilled labour

Unskilled people from countries affected should be given the opportunity to participate as much as possible in construction activities. However, skilled and professional labour might ensure correct performance of unskilled people, because there is the opportunity to provide those affected with better quality housing, skills training and a livelihood, in addition to a sense of belonging and ownership. However, there are limits to this and there are items that require professional attention. Control systems need to be put in place that stop dangerous activity but permit homeowner engagement should that be desired. So training is a viable solution to spread a good building culture and to allow people to recover from natural disasters quicker and more autonomously. However, realistic expectations should be held of the time needed for training people, and what kind of activities will be performed, as well the place, culture, social and economic conditions.

Results from semi structure interviews

A qualitative analysis carried out in Nvivo 9 using collected data from interviews with six manufacturers all over the world showed that housing can be built using the 3D-LPs construction system because of Physical and Mechanical behaviour, quality, availability, price of the 3D-LPs and due to the technical support provided by manufacturers.

Physical and Mechanical behaviour of 3D-LPs

The 3D-LP is a construction system that was designed to build housing of up to two storeys without resorting to the use of additional steel. The system is composed of two panels, one of which is called structural and other semi structural. 3D-LPs have a truss made of galvanized steel wires to form 3D panels. The separation between the galvanized steel wires in the structural panels is 5 x 5 centimetres, because the wires are placed to bear a tension load of up 632 kg/sqm and shear loads of up to 112 kg/sqm. However, the separation in the semi-structural panels is 10 x 10 because they are designed to resist lighter loads. Those panels bear up to 20 tons axial load. The 3D-LPs construction system shows good physical and mechanical behaviour due to being manufactured in accordance with steel construction regulations and reinforced concrete. Buildings built with the 3D-LPs system construction weigh less than traditional blocks or bricks. It was also found that 3D-LPs had low thermal conductivity that provided high thermal insulation, and resisted up to 225 mph wind load. Additionally, 3D-LPs construction system is installed in half the time required by traditional construction techniques used for masonry houses. The structural panel is also used to build the roof. However, some manufacturers have special structural roof panels that improve the system due to the roof panels' performance as slabs able to bear tension and shear loads. Figure 1 shows the 3D-LPs construction system composed of walls and roof.

Figure 1 3D-LPs construction system, structural walls panels and structural roof panels.

Figure 2 and 3 The 3D-LPs construction system used to build houses.
Photos Credits: 1 and 2 from W Panel Company; Photo 3 Convintec Mexico

The 3D-LPs construction system is faster than standard construction and their monolithic design offers superior seismic robustness. Figure 2 shows the 3D-LPs construction system used to build housing with structural panels without resorting to the use of additional steel. Additionally, figure 3 shows the 3D-LPs load capacity when 3D-LPs are hit by a big rock.

Availability in the Market and quality control of the 3D-LPs

3D-LPs are available in the international market for instance a manufacturer settled in the European Continent has supplied these panels to Ghana, Nigeria, India, Oman, and Northern Morocco. This company expects to expand its business to Arabic countries and the Asiatic Continent next, in 2015. Several companies were found in the American Continent that supplies 3D-LPs all over the American Continent. In addition, it was found that several Chinese companies supply 3D-LPs in China and all over the world. 3D-LPs manufacturers showed evidence that the 3D-LPs construction system has been certified in the European Continent, the American Continent and the Asiatic Continent for their quality. The quality control is done in worksites and manufacturing plants. At the worksite, the quality control is done by engineers who validate that installers have made homogeneous installations in accordance with the 3D-LPs construction system. The mortar and concrete layers placed on the panels are also verified, in order to ensure that the system works monolithically as reinforced concrete walls. Figure 4 shows placing of mortar layers on panels and figure 5 shows finished housing using the 3D-LPs construction system.

Figure 4 Mortar layer on 3D-LPs walls and figure 5 housing finished. Photo W Panel Company, 2013.

At the manufacturing plant steel and polystyrene are pre-inspected before producing panels. Providers are required to comply with standards to supply raw materials. The quality control includes verifying wires and weldingcorrectly to avoid tension forces. Hence, essays in nodes and welding points are conducted to guarantee3D-LPs qualityin the market. Additionally, a visual inspection and batch sampling were also carried out.

International prices

Prices of 3D-LPs are competitive in the international market in comparison with traditional materials, because the 3D-LPs construction system can reduce construction time by up to 50%, which represents a considerable saving of money. This is because 3D-LPs are easy to install and use fewer steel bars or wooden beams, less formwork, and they produce no material waste.

Capacity to supply 3D-LPs in areas hit by NM-MDs

Manufacturer's findings suggest that the supplying of 3D-LPs after NM-MDs in areas hit by disaster can be carried out through their own logistical operations, by sea, train and road. Manufacturers point out that they have supplied 3D-LPs to house builders after earthquake occurred in Chile 2010 and a flood occurred in México 2013, even on foot or by horse and cart in areas of difficult access. Figure 6 shows people loading 3D-LPs after a flood occurred in Mexico 2013. Figure 7 shows a horse and cart transporting 3D-LPs in an area of difficult access.

Figure 6 and 7 Transportation of 3D-LPs in areas of difficult access. Photo W Panel Company, 2013

Capacity to give technical support in areas hit by NM-MDs

Technical support is widely provided by manufacturers to customers; hence they maintain that they are able to give technical support in areas hit by NM-MDs via their technical team, video conference and training in the zones affected. Manufacturers claim that the 3D-LPs construction system can be easily learned by unskilled people in

a few days and those unskilled people can improve quickly after they have practised using the system, as has already occurred in several places where the system has been taught.

Results from computer simulation

Quantitative data from manufacturers was used to design a computerized simulation about a housing prototype of 50 sqm using the 3D-LPs construction system in the BIM system Revit 2013 from Autodesk. Architectural, structural and installation housing prototype plans were created in the BIM system to determine how the 3D-LPs construction system and the BIM information Modelling system can show the benefit of using 3D-LPs after NM-MDs. It found that the characteristics and appearance of 3D-LPs can be loaded into the BIM system to create a housing prototype template that includes architectural, structural and installation plans. See figure 8, 9 and 11.

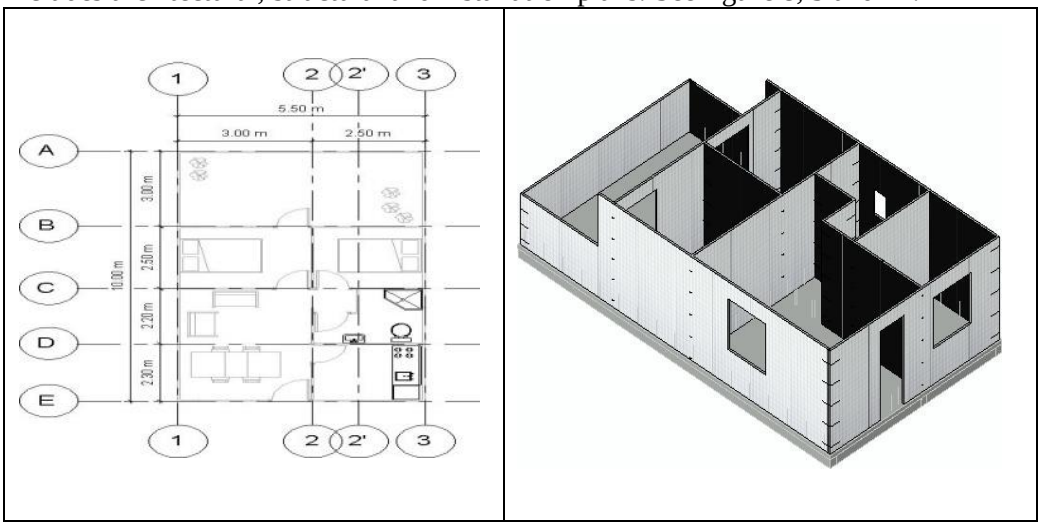

Figure 8 and 9 Architectural and 3D plans modelled in the BIM system

Also it was found that modifications carried out in any plan affect the whole project without needing to update each plan, thus saving architectural, structural and installation design time. The housing prototype simulated in the BIM system to replace traditional construction materials is shown in figures 10 and 11 using the 3D-LPs construction system. Figure 10 show a structural plan in 3D and figure 11 shows the finished housing in the BIM system using the 3D-LPs construction system.

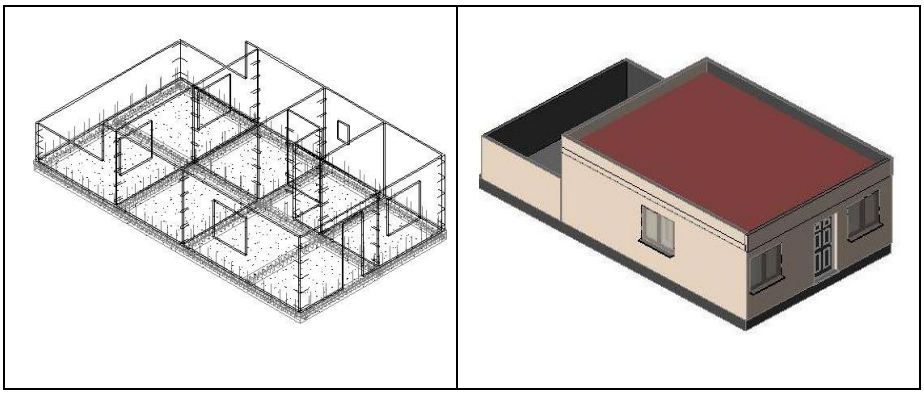

Figure 10 and 11 Structural and finished housing prototype Modelled in the BIM system.

Additionally these designs were compared using data from the BIM system and from the materials construction database of the Mexican Institute of Cost Engineering in Excel software to estimate the housing cost of a 50 sqm unit using the 3D-LPs construction system and floor area method, which takes into account the total cost of the structure multiplied by the surface area of the floor with the average cost per square meter built (Pettang, Mbumbia & Foudjet 1997). It was found that housing built through this system is 45% less expensive than housing built using traditional systems (Flores and Fenn, 2013). The BIM system was found useful to simulate a housing prototype with the 3D-LPs construction system, because projects modelled in the BIM system can be shown in 3D (geometric model), 4D (time) and 5D (cost estimation) (Vico, 2012). Additionally, the BIM system provides documentation to manage the whole project and a template to design architectural, structural and system plans that allow control of the life cycle from demolition up to completion of construction. The BIM system also creates material takeoff to estimate the construction cost and a list of activities to estimate the time that the project will take.

Discussion

The construction time of the housing prototype was estimated based on the expertise of 3D-LPs manufacturers, who maintain that houses over 50 sqm can be completely built in less than three months including 10 days of training. However, the aim of this research is to create a systematic construction framework to produce a large-scale housing prototype in the BIM system using the 3D-LPs construction system to help to build Disaster Resilience anywhere affected by NM-MDs.The BIM system thus offers a platform to manage all project information, and community members can be trained, supervised and monitored by expert professionals who can be responsible for management of the economic fund, construction techniques, and accountability and for taking decisions, while the opinions and labour from those affected can be used to improve design and social conditions. Hence a systematic pyramidal frame, where those affected can learn only one construction phase from skilled people trained in the 3D-LPs construction system, is proposed to help with housing reconstruction after NM-MDs. A systematic pyramidal frame can be developed to enable those affected to rebuild their affected areas in a short time. If ten construction experts are trained in the 3D-LPs construction system then they can train groups of ten people in one construction stage and these can teach more groups to build full houses to save money, time and give a sense of belonging.

Conclusions

A holistic approach is an option to build a theory for housing recovery after NM-MDs, which actively involves community members' in construction activities, replacement of traditional construction systems by the 3D-LPs construction system and the BIM system, in order to overcome the economic, social, political and cultural challenges posed by NM-MDs for building Disaster Resilience. Empowering affected communities' members post-disasters is significant because they are part of the solution, since those affected know their needs better. The 3D-LPs construction system and labour from affected people can then be used to build Disaster Resilience after NM-MDs, because a protocol can be developed for skilled labour to train unskilled labour to produce the prototype simulated in the BIM system using the 3D-LPs construction system. 3D-LPs are more resistant than traditional construction materials and 3D-LPs are available all over the world. The 3D-LPs construction system can be taught to unskilled people to build houses in three months at the first attempt. 3D-LPs were also found less expensive than construction materials and easy to assemble.

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Paper 25: Safety Management Systems and Safety Culture at Airports: A comparative analysis of practices and procedures

Ermenado Silva[1]

[1] *Instituto de Investigação Interdisciplinar da Universidade de Coimbra', Portugal; email: ermenandosilva@gmail.com*

ABSTRACT

Safety culture, and in particular organizational safety culture, is increasingly recognized as an important link to reduction of industry accidents probability.Furthermore this importance increases with the complexity and diversity of the developed activities in an organization.Accidents known for its catastrophic consequences, as was the case at Three Mile Island, Bhopal, Challenger, Chernobyl, Piper Alpha, and in particular, the accident at Tenerife Airport where caused by technical reasons, precisely from engineering field. But after a deeper investigation, firstly because of its catastrophic consequences for society and secondly by the need of safety assurance in the organizations, it was found that the root causes derived from the organizational jurisdiction, including options adopted by organizations top management. Aviation is one of the fastest growing industries in global economy. Over the past 20 years, this industry grew at an annual average rate of 5%. Studies and tests showed that the increase of technology is not always synonymous of better safety systems. Nowadays aircrafts have more capacity for transporting passengers, which means that a single accident can cause more fatalities. The present work aims to study several airports, and check both fulfilment of explicit procedures of the Safety Management Systems, and State Safety Programmes. The goals are also to study and compare the differences and similarities between national and safety organizational cultures of the same airports.

Keywords: Airports; Safety Management; Safety Culture; Organizational Accidents;

INTRODUCTION

Safety culture, and in particular organizational safety culture, is increasingly recognized as an important link to decrease industryaccidents probability.This importance increases with complexity and diversity of the developed activities in an organization.Accidents known for its catastrophic consequences, as was the case at Three Mile Island (Perrow, 1981), Bhopal (Shrivastava, 1987), Challenger (Vaughan, 1996), Chernobyl (Reason, 1987) Piper Alpha (Cullen, 1990), and in particular, the accident at Tenerife Airport (Weick, 1990), early research was looking for technical causes, particularly engineering ones. But after further investigation, firstly because of its catastrophic consequences for society and secondly by the need to ensure the maintenance of safety in organizations, was found that the root causes derived from organizational jurisdiction, including options adopted by organizationstop management.Recently there was a significantly rise of technology incorporation in aviation industry, which on the one hand, offers more safety for those who choose this option to travel, on the other hand, the use of complex technologies and a significant growth in passenger capacity, could meant that a single accident can cause, now, more victims than in the past, as noted in the current data EASA (2009).

Aviation is one of the fastest growing industries in the global economy. Over the past 20 years the industry grew at an annual average rate of 5%. Aviation contributes

considerably to the countries gross domestic product, around the world, generating a remarkable amount of jobs. Despite the current recession that hit all countries in general, including the crisis in air transport, it is estimated that the growth of this industry remains a global phenomenon with the projections of a global growth rate of about 4.2-5.1% (IATA, 2009, Boeing, 2009, ACI, 2008, Airbus, 2007).

Due to a significant increase in air traffic, airports now need to increase their operating capacity, accommodating more passengers and thus secure the safety conditions in order to prevent accidents from occurring.

Airports are regulated, internationally, by the International Civil Aviation Organization, which, in turn, propose recommendations and standards for national aviation authority. The national aviation authority replicates the same rules and recommendations to the airports management and organization, ensuring that they are certified by the same requirements applied to all the airports around the world.

The document that standardizes the Safety Management Systems at Airports is the DOC 9859 (ICAO, 2009) Safety Management Manual. In addition to a series of recommendations, it elucidates the reader to the importance of in-depth study of the safety culture, and in particular the safety organizational culture. Our goal is to study several airports, and verify the compliance with the rules implicit in the DOC 9859 (ICAO, 2009) and the organization relationship between legislative, and executive oversight of the National Authority. We also intend to study the connection among National Culture between the Organizational Culture, and particularly the active involvement and commitment of organizations top management in safety culture.

As final result of this work, and following the detailed comparative analysis of the airports and national authority procedures, it is our intention to make recommendations in order to get a closer approach of what is meant by a positive safety culture.

The first question we enunciate is: Does the greater the involvement of top management in the field of airport safety lead to smaller likelihood of accidents?

STATE OF THE ART

In complex industries modern technology and human actors can often only achieve its objectives through their interaction, thus creating interdependence between them. These systems made by humans and "technical artefacts" are often assimilated into complex social structures with a political, cultural, legal, economic and environmental issues, among others.The "sociotechnical" theory argues that "human agents" and social institutions are integral parts of technical systems, then the achievement of organizational goals are only achieved through the optimization of technical systems, but by the combination of technical and social aspects (Trist & Bamforth, 1951). Therefore, the study of modern complex systems requires an understanding of the interactions and interrelationships among the technical, human, social and organizational factors.

Civil aviation is a complex public transport system, with technological artefacts such as: aircrafts, runways, baggage transport systems, security and safety systems, air traffic control and communication equipment, among others. These artefacts have various inter-connections and relationships, and they all play an important role in the functioning of this transport system (Kroes et al., 2006). These operating systems and technical artefacts in a "socio-organizational" environment consist in various regulated policies and procedures. From this point of view, the functioning of this transport system is also dependent on the functioning of social elements and the behaviour of various human agents, not just the function of technical artefacts.

Charles Perrow, in his work titled Normal Accidents: Living with high-risk technologies (1984), help us to understand the cause of accidents through risk management in complex organizations, as is the case of nuclear power plants, aviation, petrochemical, between others industries. These organizations, due their complexity, are equipped with redundant and rigorous safety systems, that prevent accidents from occurring, or happening with less frequency, on the one hand, but on the other, they cause gaps in the "mechanization" of behaviour in the case of an accident occur. In particular, these organizations have a high investment in safety training, including table top, sectorial and full scale emergency drills.

James Reason (1990, 1997) developed an organizational model to explain the accidents causes in complex technological systems. The organizational accidents, according to the author, do not happen due to a single human error, but by the interconnection of several factors, that occur at various levels of the organization. Reason (1990, 1997) emphasizes the organizational concept of safety and how the defences (protection barriers, materials, human and procedures) may fail. In this approach, the immediate cause of an accident, or near miss, is of those who are directly involved in the regulating process or in interaction with technology (Reason, 1990, Woods et. al. 1994). Reason (1997) defines organizational accidents as situations in which latent conditions emerge from the practical aspects of decision making process or cultural influences, combined with adverse local events (such as climate, location, etc..) and active failures (errors and / or violations of procedures) made by individuals or teams, within the limits of an organization generating an accident.

Reason (1995) identifies the latent failures as the main cause of aircraft accidents. Latent failures are caused by the decisions or actions of the top management of an organization such as wrong procedures produced by office managers with a lack of technical and field experience.Investigation reports of the Challenger and Columbia accidents (Vaughan, 1996) identify a "broken safety culture", that is a product of several latent failures, as the focal point of the organizational causes of accidents. Vaughan acknowledged similarities between the accidents of Challenger and Columbia, as both accidents occurred due to flaws in the organizational system. The author presents a causal explanation that relates the culture of production, the normalization of deviance and structural secrecy at NASA. According to Robert Merton (1938), a system / social structure characterized by the discrepancy between the rules and procedures produces the "anomie", defined as the normalization condition of social inequality where the "rules" do not govern, since the conduct lost all his strength.

According to the questionnaire conclusions of Silva (2010) there were a number of documented procedures within the airport safety, but there were no evidences of it´s implementation concerning the large number questions that weren't answered in these aspects. Silva (2010) states that there was a documented and bureaucratic safety culture, which didn't allow a horizontal communication of safety concerns. There was a limited reporting and monitoring system and a reduced risk evaluation or even non existent, in contrast to a positive culture, generative, which promotes a positive safety culture. Therefore, it appears that there was a top management involvement, in the airport Safety Management System at a documentation level but not at the practical level of implementationand execution, which seriously conflicts with the safety notion.

The concept of safety culture emerged from the nuclear power plant accident analysis, in Chernobyl, which caused a political and social worldwide shock, making it

imperative that the causes of the accident must be fully understood (Taylor, 2010). Despite the initial accident causes, being considered technical failures, from the engineering field, which had contributed to the equipment operational failures, remained a considerable discomfort that the immediate causes may not have been the root cause. Because of these doubts, and the severity of the accident, the industry developed best practices, in order to avoid future accidents. Therefore, it is necessary to look beyond technical failures, immediate engineering. The events analysis of the Chernobyl accident used this approach.

The theory suggests that organizational culture emerges from shared beliefs (Taylor, 2010). These beliefs lead to collective behaviour in an organization, which are not always evident, but in reality is embodied in "layers" of observable values, attitudes and artefacts. Therefore to an organization with strong safety cultural values and attitudes it's easier to generate a positive safety culture.

It is suggested that the resulting beliefs and culture can only be indirectly evaluated and interpreted through the observation of human behaviour. The generic models of the elements of culture include (Taylor, 2010): beliefs defended values; attitudes; artefacts and behaviours. The combination of these cultural elements (beliefs, values, attitudes, and artefacts) manifests itself in human behaviour or performance. Although the behaviours have a strong bond with the elements of culture, the generic model suggests that the shared beliefs of a particular organization "shape" the behaviour of employees. Additionally, if a set of shared beliefs and behaviours associated with bringing the "success" to an organization, its validity will be enhanced leading to a stable long-term culture (Taylor, 2010).

Hofstede's (1984) research states that National Culture affects the values in the workplace. And the findings showed that: the work-related values are not universal; the underlying values persist when a multinational company tries to impose the same standards in all its interests abroad; the local values determine the need of regulation and how is it interpreted by implication, a multinational company that insists on uniformity, in its interest, has the danger of creating moral problems and inefficiencies. Thus if the country of the workers as a lack of safety culture it will be more difficult to improve it.

According to ICAO (2009) there are three distinct types of culture in an organization: National, Organizational and Professional Culture.The National Culture is distinguished by the characteristics and National values systems:

People of different nationalities differ, for example, in his response to authority, in dealing with uncertainty and ambiguity in expressing their individuality;

People are not all "in tune" with the collective needs of the group (team, organization) in the same way. In collectivist cultures, for example, there is an acceptance of differences and different status for leaders. What can affect the ability to question the decisions or taken actions - for example: an important consideration in teamwork. The allocation of work to "mix" national cultures can affect the performance of the team through the emergence of misunderstandings.Organizational Cultures are distinguished by the characteristics and values systems of private organizations**:**

The behaviour of one organization members versus another organization, or public sector versus private sector;

- Organizations create a "shell" to National and Professional cultures. For example, an airline, pilots may come from different professional backgrounds (military versus civilian experience). They can also come from different organizational cultures due to mergers or layoffs.

The Professional Culture is distinguished by the characteristics and values systems of a particular profession:

- Groups (the typical behaviour of the drivers in contrast with air traffic controllers and maintenance engineers). Through recruitment, education and training, on-job experience, peer pressures etc…;
- Professionals (physicians, lawyers, pilots, drivers) tend to adopt a value system and develop behaviour patterns, consistent with their peers, they learn to walk and talk in the same way;
- Share usually pride in their profession and are motivated to excel them. On the other hand, can adopt a value system that leads to the development of a sense of personal invulnerability, a sense that performance is not affected by personal problems, or even that did not make mistakes in high stress situations.

Today is being paid attention to the cultural approach of safety systems, partly the result of the safety management systems limitations recognition as a mean to achieve safety. In recent decades, safety professionals, regulators, among others, have argued that safety is not simply a matter related to compliance with the regulations imposed externally. Instead, organizations need to proactively manage safety in the same way they manage other activities. It is necessary to develop safety management systems (Hopkins, 2010).

Experience with Safety Management Systems, suggests that these, however, are not infallible. Major accidents are strongly related to failures in safety management system (Appleton, 2001 cited in Hopkins, 2010), and investigations sometimes reveal that safety management systems are a little more than a set of manuals with little regard with what is practiced in the workplace. These are virtual security systems exist in theory but not in practice (Hopkins, 2010).Therefore, it is important to scrutinize the procedures for regulated airports coincide with reality practiced.

HYPOTHESIS

The basis of this work is underpinned by the following assumptions:

H1 - The higher is the separation of powers, between the legislative regulatory oversight and organizations executive, greater is the effectiveness of a safety management system;

H2 - The greater is the involvement of top management in a Safety Management System, greater is the operating perceived risk;

H3 - The greater is the intervention of regulator, greater is safety management system effectiveness;

H4 - The greater the differences in beliefs, values and attitudes between the countries, greater are the differences in risk perception and safety culture.

RESEARCH METHODOLOGY

This research uses both quantitative and qualitative methods, the techniques used to data collection, in order to test the presented hypotheses, are:

• Survey application to the operational personnel that works in the airport airside, namely those operating during aircraft turn-around operation;

• Interviews with the airports safety management teams;

• Interviews with the state safety programs responsible;

• Analysis and comparison of the results.

The main data collection methods are interviews that will be analysed by Grounded theory method and on-line survey designed by Qualtrics software and analysed by the SPSS (Statistical Package for the Social Sciences) software.

The sample

The unit of analyses are operational workers that assist the aircraft during turn-around operation, the airport safety management teams of several airports and the state safety programmes responsible. This sample will follow well defined guidelines, namely:

• Distribution of questionnaires considering 30% of the population operating during aircraft turn-around operation;

• Stratified sample by the type of professional categories;

• Interviews with the airport safety management teams;

•Interviews with the State Safety Programme responsible.

The nature of the sample is stratified and intendeds to cover most of the professional categories that operate during the aircraft turn-around operation.The sample size tends to be set through statistical procedures, estimating the minimum size that allows performing a statistical analysis, appropriate data, including variance analysis, One Way ANOVA, and Chi-Square with SPSS.

Data collection

The data collection will comply with the following steps:

• Presentation of the study;

• Distribution of the surveys according to 30% representativeness of the airside workers, those operate during the aircraft turn-around operation;

• Interviews with airport safety management teams;

• Interviews with the State Safety Programme responsible.

Data analysis

To analyse the survey data there will be applied a set of statistical analysis, including:

• Tests on various assumptions (normal distribution, linearity of relationship and homogeneity of variance);

• Changes to normalize data, or to obtain homogeneity of variances between groups and achieve a linear relationship between variables;

• Descriptive statistics (mean values, medians and variation measures);

• Inductive statistics analysis, namely parametric. These tests include coefficients correlation, Chi-Square and ANOVA Factorial.

Interviews will be analysed using the Grounded theory method.

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Paper 26: The Institutional Factors of Local Government Road Maintenance Capacity – Evaluating the Maintenance of Road Reconstruction Assets in Aceh, Indonesia

Ezri Hayat[1] and Dilanthi Amaratunga[2]

[1] *University of Salford, UK, email: e.hayat@edu.salford.ac.uk*
[2]*University of Huddersfield, UK, email: r.d.g.amaratunga@salford.ac.uk*

ABSTRACT

The post-tsunami reconstruction in Aceh and Nias, Indonesia resulted in more than 3600km of road sections rebuilt and repaired. Since most of the local governments were also affected by the disaster, the reconstruction of the road infrastructure was mainly implemented by the national government and donor agency, and the reconstructed assets were transferred back to the local government for their maintenance. Due to the renowned poor capacity of the local governments in road maintenance, there are concerns over the sustainability of the reconstruction assets. The institutional factors affecting the capacity of the local government in the maintenance of the road infrastructure assets are discussed. Twenty-eight semi-structured interviews were conducted with representatives of road infrastructure stakeholders at the local, provincial and national level. The analysis reveals the main institutional issues perceived as the affecting factors to the local governments' road maintenance capacity.

Keywords: localgovernments, road infrastructure, disaster reconstruction, road maintenance.

INTRODUCTION

In major disasters, road transportation infrastructure is one of the largest sectors which frequently suffer the most damages and losses. Hence, reconstruction of road infrastructure is among the highest post-disaster reconstruction priorities and is expected to help accelerate the overall recovery process. The earthquake and tsunami on the 26th December 2004 in Aceh, Indonesia resulted in more than 2700km of the roads destroyed and impassable. Within the four-year period of reconstruction, more than 3600km of roads were rehabilitated and reconstructed Sihombing (2009). However, to achieve the maximum benefit of the investment, road infrastructure requires adequate maintenance. In the decentralized system in Indonesia, the authority and responsibility for the management of the local road infrastructure facilities have been transferred from the national government to thelocal governments. As nearly 80% of the road networks in Indonesia are district roads, the overall quality and sustainability of the road infrastructure are significantly dependent on the capacity of the local government in road management. This paper, which is based on an ongoing PhD study, discusses the issues identified in the maintenance of the district roads. The discussion will be focused on the institutional factors affecting the capacity of the local governments in the maintenance of the road infrastructure; factors which arerelated to the organisational and managerial arrangement of the road authorities.

METHODOLOGY

This paper is produced based on the findings of an ongoing PhD study. The scope of the study is focused on three districts in Aceh province included as the case studies; Aceh Besar, Aceh Jaya, and Aceh Barat Daya.

As the study is trying to obtain profound understanding behind the road management issues, semi-structured interview was considered as the most appropriate technique. Accordingly, twenty-eight semi-structured interviews were conducted between January and April 2013, involving stakeholders of the road infrastructure at the national, provincial, and the local levels and representing the government, donor agencies, and the private sectors. The basic profile of the respondents is summarized in Table 1.

The interviewees were selected using a combination of purposive sampling and a snowballing method and were conducted in a face-to-face approach. Prior to the interviews, the prospective interviewees were briefed about the purpose of the study and the topics of the interviews. Each of the interviewees was advised to subscribe the Participant Consent Form confirming whether the interviews could be voice-recorded and to highlight that interview results, and respondent profiles would be kept with strict confidentiality. The locations and time of the interviews were selected and agreed by both the researcher and the interviewees. The interview result was transcribed into nVivo 10 and the content analysis was then conducted using the aid of the same software.

The transcriptions were coded on multiple stages approach; open coding, axial coding and selective coding process. In the open coding process, information from the interviews was coded and named based on the main ideas of emerging information. At the later phase, the axial coding, the nodes was then classified and grouped into relevant themes. Once the axial coding process is finished, the transcription codes were exported to word documents for further elaboration and discussions. Information from the transcription was selected based on its appropriateness and relevance to the themes. Accordingly, this process is called selective coding. The analysis of data were then classified and presented in a series of matrices of themes and the case study locations. The findings were then triangulated with the literature and validation interviews with experts in the road management and local government subjects.

Table 1 - Basic Profile of the Interviewees

Agency	Local	Provincial	National	Total
Consultant	***-***	***1***	***4***	***5***
Contractors	***-***	***3***	***-***	***3***
Donor Agency	***-***	***-***	***1***	***1***
Transport	***-***	***1***	***-***	***1***
Planning Agency	***3***	***2***	***1***	***6***
Public Works	***6***	***1***	***2***	***9***
Disaster Management	***-***	***-***	***3***	***3***
Total	***9***	***8***	***11***	***28***

MAIN FINDINGS

Following Robinson et al. (1998) classification of road problems, the internal factors of the road maintenance capacity are divided into two broad categories; those which are related to the institutional aspects and those which are technical. The institutional factors refer to the organisational and managerial arrangement of the road authorities, whilst the technical factors refer to the capability of the road authorities to perform the physical and engineering tasks (Robinson et al., 1998). The institutional factors affecting the capacity of the local governments in the road maintenance, as listed in the Table 2, combined the factors and responses gathered from both the literature and the data analysis process as they emerged from the interviews. As shown in the table, the main institutional factors accordingly include financial management capacity, human resources and organisational management. The “number of responses” column

illustrates the number of respondents discussing and highlighting the related issues as the affecting factors of road maintenance capacity.

Table 2 – Institutional Factors of Road Maintenance Capacity

Affecting Factors	Local	Provincial	National	Total
Financial Management	***7***	***3***	***6***	***16***
Fund is not allocated in sufficient amounts	***6***	***2***	***4***	***12***
Fund allocation is not spent	***1***	***1***	***1***	***3***
Fund allocation is not spent effectively	***2***	***-***	***-***	***2***
Fund allocation is not spent efficiently	***1***	***-***	***4***	***5***
Human resources	***5***	***2***	***5***	***12***
Technical capacity	***1***	***2***	***2***	***5***
Planning capacity	***4***	***1***	***4***	***9***
Poor recruitment system	***2***	***-***	***-***	***2***
Organisational management	***3***	***3***	***5***	***11***
Leadership	***2***	***2***	***2***	***6***
Political stability	***-***	***2***	***1***	***3***
Lack of motivations and initiatives	***1***	***1***	***2***	***4***

Table 2 summarises the Local Governments' road maintenance capacity affecting factor from the institutional perspective. Detailed discussion on these factors will be presented in the following section.

DISCUSSIONS

Financial management

The financial management issue of road maintenance, as suggested by ADB (2003), are rooted to four problems; fund is not allocated in sufficient amount; fund allocation is not spent; fund allocation is not spent effectively; fund allocation is not spent efficiently. The four financial issues were also identified in the case study district. The vast areas of the districts, the extensive length of the road networks, and the limited budget availability indicate that the budget allocation for road maintenance may never be sufficient to cover the maintenance needs of the entire road networks. The global experience indicates that the financial resources for road maintenance are rarely sufficient to cover all the road networks, even in the developed worlds (Zietlow and Bull, 1999, ADB, 2003, UNESCAP, 2005). However, as (Donnges et al., 2007) argue, the fact that the whole maintenance financial needs can never be met does not mean that maintenance cannot be done effectively with the available funds.

Fund is not allocated in sufficient amounts

The first financial problem with road maintenance is that the budget allocation for proper road maintenance is not sufficient. As a result, as expressed by PG03, the maintenance of the district roads seemed to receive insufficient allocation and were frequently neglected. One of the main causes of the insufficient budget allocation for road maintenance was due to fund competition with other sectors and expenditure needs. With regards to competition with other sectors and other expenditure needs, CO04 revealed that maintenance needs always lose their competition to the capital projects. Additionally, LG02 also expressed that even within the infrastructure sector the road maintenance needs were given lower priority as the limited budget will need to be distributed to other infrastructure needs. The resulting consequence was that the road maintenance did not get optimum allocation.

Furthermore, the political condition greatly affects the budgeting decision. However, whilst on the one hand the parliament holds the authority of approving the budgeting, the governments also have the authority to justify and defend their development proposal and their budget expenditure plan. Unfortunately, the governments also gave lower priority for the road maintenance needs. As a representative of the provincial government, PG02 explained, "We do (have intervention authority to the budgeting process). But in the end it depends on the budget allocation needs… the priority (for maintenance) loses to other more urgent needs." Even though the sufficiency of budget allocation for road infrastructure maintenance was experienced widely, CO05 suggested that the main financial issue was rooted in the capacity of the local government to distribute and make priority of the limited budget allocation. Additionally, the Local Governments' capacity on budgeting was also seen as a threat to the road maintenance by CO04. It was argued that the willingness and the capacity of the Local Governments in setting up the priorities of their budget expenditure as the real problem to road maintenance.

In addition to the lack of fund, the post-disaster reconstruction activities have resulted in Local Governments receiving a substantial number of new assets that they need to maintain. Accordingly, there would be an increase of maintenance allocation needs for the new assets in the annual budget. CO05 emphasised his concern and warned that even though the post-disaster reconstruction resulted in a large number of new assets to the Local Governments and therefore increase the needs of operational and maintenance allocation, it will be difficult for the local government to suddenly change the pattern and trend of their budget expenditure. CO05's emphasis was referred to the resulting political pressure and complaints coming from the other sectors if their annual budget allocations were suddenly and drastically reduced for the benefit of road infrastructure.

Fund allocation is not spent

In addition to the issue of insufficient maintenance allocation, there was also an issue regarding unspent budget allocation. Regarding the financial capacity of the local governments, NG03 argued that Aceh province had been given a lot of privileges. Due to the special autonomy status, Aceh province accordingly received a large amount of additional sums in the annual budget, called as the special autonomy fund, totalling 1%-2% of the total national Block Grant (DAU). However, NG03 suggested that the problem is rooted in the financial management capacity to spend their annual budget allocation. NG03 supported his argument by stating that "A lot of privileges have been given to Aceh, but the spending quality is so poor. So it is a matter of their public finance (capacity)." Supporting NG03 above, CT01 also argued that financial resource sufficiency was not actually a problem in Aceh. He based his view that annually the local governments have not been able to spend their budget allocation and that a large amount of the unspent budget needs to be returned to the central government.

The average budget realisation ratio in the three case study district between 2006 and 2012 is shown in Table 3. As shown in the table, the average budget realisation ratio of the case study districts is 91.48%, representing an average annual unspent allocation of more than Rp 41 billion per case study district.

One of the causes of the unspent budget allocation was due to the delays in the approval of the annual budget proposal. Delays in the annual budget approval were commonly experienced in Aceh. Accordingly, the budget expending period was shortened as it would need to be expended by the 31st of December of the running year,

regardless the time the budget was approved and the time the local governments were starting to use it. Another consequence is that the delay in the budget approval also means that the road infrastructure project may not start according to the initial schedule and that the projects schedule frequently has to be implemented in the rainy season. Accordingly, not only do the delays shorten the project implementation period, such delays would also force contractor to works in a poor site condition resulting from the rainy season, aggravating the already bad situation.

Table 3 - Budget Realisation of the Case Study Districts (x 1,000,000)

Year	Kab. Aceh Besar		Kab. Aceh Jaya		Kab. Aceh Barat Daya	
	Spending ratio	***Unspent Allocation***	***Spending ratio***	***Unspent Allocation***	***Spending ratio***	***Unspent Allocation***
2006	***99.99%***	***Rp 36***	***94.75%***	***Rp 7,633***	***101.64%***	***Rp -4,397***
2007	***91.14%***	***Rp 48,378***	***59.07%***	***Rp 203,725***	***92.95%***	***Rp 23,564***
2008	***90.37%***	***Rp 58,040***	***76.92%***	***Rp 114,135***	***98.06%***	***Rp 6,722***
2009	***88.56%***	***Rp 68,183***	***116.17%***	***Rp -51,337***	***97.52%***	***Rp 7,687***
2010	***90.95%***	***Rp 56,651***	***92.65%***	***Rp 30,888***	***94.48%***	***Rp 19,145***
2011	***96.07%***	***Rp 28,032***	***90.32%***	***Rp 44,310***	***88.66%***	***Rp 49,179***
2012	***92.15%***	***Rp 64,726***	***85.95%***	***Rp 66,856***	***95.14%***	***Rp 26,595***
Average	***92.75%***	***Rp 46,292***	***87.98%***	***Rp 59,459***	***95.49%***	***Rp 18,356***

Note: negative numbers indicate the overspent budget
Source: Analysed from raw data Provided by DJPK (2013)

Table 4 - Budget approval date of the case study district

Financial Year	Aceh Besar	Aceh Jaya	Aceh Barat Daya
2005	***June 13th 2005***	***June 3rd 2005***	***July 20th 2005***
2006	***May 1st 2006***	***July 7th 2006***	***June 19th 2006***
2007	***April 12th 2007***	***March 27th 2007***	***May 5th 2007***
2008	***April 8th 2008***	***May 14th 2008***	***April 1st 2008***
2009	-	-	-
2010	-	***April 5th 2010***	***January 28th 2010***
2011	-	***April 2011***	-
2012	-	***April 2012***	-
2013	-	***May 2013***	***February 8th 2013***
2014	-	***January 10th 2014***	***January 23rd 2014***

Source: GoA and Syiah Kuala University as cited in World Bank (2008) and Public works
Note: "–"data not available

Fund allocation is not spent effectively

The next category on the financial management issue is that the allocation for the road maintenance is not effectively spent. The ineffective use of road maintenance budget allocation was identified in the case study districts. As expressed by LG02 the local government did not allocate budget for the routine maintenance. Hence, the immediate needs of routine maintenance works were simply neglected and delayed until the road sections would require rehabilitation.

In addition to the road maintenance neglect, LG02 also explained that the limited budget also led to improper road maintenance interventions. Consequently, the budget allocation spent on such intervention was virtually wasted. Two examples of ineffective maintenance interventions were identified. First due to the limited fund, the damaged roads would only get the potholes repaired, and the cracks on the surface would accordingly need to be left untouched. Patching potholes would indeed help

reduce risk of accident to the road users and somewhat reduce the road deterioration rate. However, leaving the cracks opened would allow water ingress and would soon result in new potholes and structural degradation. Second, there are cases where new road construction projects being disguised as road maintenance works. This was done particularly due to the high interest on the capital projects and on providing wider access to the community by expanding the road networks. Disguising a capital road project as a maintenance work was also done in order to receive the financial assistance from the national government. The financial assistance would only be given under the condition that the fund would be used for road maintenance. Since the financial assistance for road maintenance was disguised to fund road expansion projects, the use of fund would then be ineffective to solve the road maintenance problems in the case study districts. It is accordingly argued that until this issue was solved, pouring in more financial assistance for the maintenance of the road district would not likely to improve the road infrastructure condition.

Fund allocation is not spent efficiently

ADB report (2003) suggests that another financial issue in the road maintenance is that the road authorities use their budget allocation inefficiently. The typical problems include large workforce with low productivity, resulting in more funding goes to the wages than to perform the actual maintenance works; weak planning and programming, and inefficient functioning due to political interference. The issue of inefficient use of budget allocation was also experienced in Aceh. As also suggested by CO01-NAT, most of the budget allocation was spent on the routine expenses which mainly include the salary, official trips, and office administration. Similar complaint was also raised by NG05. He argued that the government should start to improve their budget efficiency, particularly by increasing personnel efficiency. NG05 also added that improvement must be made simultaneously. Accordingly, whilst on the one hand the road maintenance problems need to be improved by establishing a proper system and building the capacity to maintain the roads, on the other hand the local governments need to improve their expenditure efficiency.

Human resources

One of the most important issues in the discussion of institutional factors affecting the capacity of the local government in road maintenance is regarding the human resource. As suggested by Karunasena et al. (2010), capacity building is a key concept to achieving sustainability in developing countries. The analysis of the semi-structured interviews suggest that the human resources problems in the local governments include the lack of interest on road maintenance, as well as the technical and planning capacity issues. These findingsare supported by Donnges et al. (2007), who identified that the capacity of the local road authorities are frequently insufficient to deal with the responsibility they had been assigned to. More detailed discussion will be presented in the following sections.

Lack of interest

Describing the general problem in the maintenance of assets, as highlighted by respondent CO01-NAT, the road maintenance problem is affected by the mentality and the capacity of the local government in asset management. It was argued that the assets of the local governments had not been used optimally to provide income to the district and therefore the operational and the maintenance of the local assets were generally seen as a burden to the local budget. It appeared that this was primarily due to the lackof interest and the capacity of the local government to produce creative programs

and work plans. As further stipulated by the CO01 He stressed "That is not a matter whether there is regulation or not. Its personnel matter. First, it's about capacity, the other is about interest."

Technical capacity

In addition to the lack of interest of the local government personnel, there was also an issue about the technical capacity of the government personnel. Even though admitting that the technical capacity of the local government personnel was not as great as a problem in the road infrastructure sector, the maintenance of the post-disaster reconstruction assets would have to deal with the poor engineering knowledge of the local government personnel.

Similarly, NG04 also argued that the maintenance of the reconstruction assets should not have problem with regards to the financial sufficiency. He reasoned that the provision of the special autonomy fund would be sufficient to cover the financial needs of the governments in Aceh. However, the poor technical knowledge of the local government might hinder the road maintenance efforts. This was highlighted by NG04 as he argued "We realise that there will be special autonomy fund which is very big. But indeed the capacity is so limited in terms of technical knowledge."

Additionally, the personnel capacity is one of the main threats to road maintenance, particularly since at the district level road maintenance works were commonly performed using force-account method, which was by using the in-house staff and management. Consequently, the quality of the road maintenance works was highly dependent on the personnel capacity. Whilst the local government personnel was argued to have limited capacity, interviewee CT02 and CO04 proposed a contrasting view. According to CO04, the technical capacity of the Local Governments' personnel to perform road maintenance tasks was not the main concern. He based his argument on the relatively standardised technology of the road construction. CO04 argued "For road infrastructure, is not the case (technical capacity problem), it is normal, because the technology is the same. So in the road sector, from the human resource aspect there is no problem". Additionally, from the contractor point of view, interviewee CT02 also stated there was no problem with regards to personnel availability.

Planning capacity

With regards to the road maintenance work plan, the Ministry of Public Works, as the agency responsible for the management of the national roads was seen to be much more advance compared to the district government. The ministry of public works would have intervention programs for each of the national road section, whether it was reconstruction, rehabilitation, surface upgrade or routine maintenance. However, the regional governments did not seem to be adopting a similar approach, particularly since the financial capacity has been accused to be limited.In addition to the local governments' commitment on the road maintenance, there was also an issue about the quality of the road infrastructure maintenance plan produced by the local governments. Referring to the general development planning issues, Solihin (2009) concludes that failure in development planning can be caused by a number of reasons including improper planning process, poor planning execution, inappropriate planning, and that planning is frequently translated as the total control of human life by disregarding the potential and initiatives of the community. Particularly addressed at the post-disaster reconstruction process, Kenny (2007) suggests five major reasons for the exclusion of the local community in the reconstruction process in Aceh, which are related to the urgency and the need for a quick action, the curtailed freedom to work with the locals

by the government and military surveillance, pre-disaster condition level of government authority, Eurocentric paradigm, and marketization or commercialisation of disaster aid programs.

Additionally, as revealed by CT01, the local governments were too much focused on the physical structure of the road construction but neglecting the supporting infrastructure such as drainage and road shoulder. Confirming CT01's view, LG02 suggested that the road agency faced a great challenge in the planning of road maintenance works due to the lack of an information system. As a consequence, the road agency could not know in advance which road sections required maintenance interventions and accordingly could not produce a reliable maintenance needs estimate and work plan.

With regards to the maintenance plan, it is strongly suggested that the Local Governments need to develop a reliable road management system which can be used to justify the needs to perform maintenance works, as well as the consequences of not performing the maintenance. Actually, an effort to provide the local governments with more accurate input for the road maintenance planning had been made. During the post-disaster reconstruction period, a GIS-based road information management system was developed and was offered to the local governments. By adopting the system, the local government would know how much allocation is required to maintain a particular road section and therefore produce a reliable and well-justified road maintenance budget proposal. However, regardless the benefit of adopting such a system, NG01 later explained that the proposal for development and utilisation of the road information management system was rejected by the Local Governments, alleging that it was based on the reduced chances and gaps for corruption.

Organisational management

The organisational management refers to the performance of the local government or the road authorities in performing the day-to-day operation of their internal organisation. Also included in this category is the decision making process of the local governments.

Leadership

Linking all of the factors affecting the performance of road management agency, Brooks et al. (1989) adapted Adair model (1983) of effective leadership to the relevance of the road administration. Despite showing the elements of the environmental (institutional), task (technical), and individual (management) capabilities as being interdependence factors to effective organisation, their study shows that improving the institutional arrangement is more difficult than introducing specific management or technical advances. They therefore conclude that improving institutional capacity forms the basis for an effective and sustainable managerial capability to be developed.

Accordingly, the first issue emerging from the interviews regarding the organisational management was that there was a conflict of interest in determining development of road maintenance program. As suggested by CO04, the local governments did not pay adequate attention to the road maintenance issue, particularly roads that were far from the government centre. He further argued that the local governments commonly decide based on personal desire and motivation instead of based on needs as the development priority. During the post-disaster reconstruction, it was also identified that the process

of determining the road project locations was also spoilt by the conflict of interests from the local government officials. As revealed by CO04, "The challenges was, too many road projects were forcefully requested to be done in certain locations… Why did they have to be there? After we did a field observation, we found that there was the house of the head of parliament, or it was the Bupati's village. That happened." Furthermore, he also suggested that such information was frequently found out during the construction process, when it was too late to make any changes.

Regarding the leadership issue, the emotional bond between the head of the governments or road agencies was argued to be one of the most influencing factors in the decision making process. This condition was confirmed by LG03, as he accused that in the reconstruction of post-disaster affected areas the emotional bond of the leaders to certain locations greatly affected and determined the scale of works in the respective area. Additionally, LG03 further suggested that even though such condition was difficult to prove, the unbalanced distribution of the projects was felt widely.

Political stability

Another factor emerging from the interview regarding the organisational management is that the officials in the local governments were often affected by the political pressure that may be imposed onto them. In the decentralisation system in Indonesia, head of Local Governments are elected by the public in an election system. Additionally, as stipulated in the Law (2004), the autonomy status in Indonesia is placed at the district level, reducing the power of the governor as the head at the provincial level to intervene the programs at the district level. This is mainly because the local governments hold the authority and responsibility to manage their own districts and accordingly make their own development program.

However, this condition may be different if the Bupati are from the same party as the governor. As indicated by PG01, if the Bupati were from the same political party with the governor, the Bupati would be more compliance with the governor instructions. For instance, NG02 described that the provisions of road maintenance allocation for the road sections which transfer process have not been completed was actually possible if the head of the regional governments issued a discretion on the needs. However, he understood that the resulting political pressure hindered such action as other head of local governments might not agree with such decisions. As further suggested by PG04, the political stability was highly determined as the head of the local governments would often need to make political lobby to the higher level of government in order to obtain the financial assistance or road maintenance projects in their areas.

Lack of motivations and initiatives

In addition to having a conflict of interest and being under political pressure in determining road maintenance project, the local governments were also suggested to have lack of motivations and initiatives to perform and improve their infrastructure condition on their own resources. This view was suggested by NG04. He argued that instead of showing efforts and ask the central governments to help filling the gaps, the local governments tend to ask for assistance from the very beginning.

Providing a balanced view from the local governments' perspective, NG04 also revealed that the provincial governments also played an important role in the poor financial capacity of the local governments in Aceh. As a province with a special autonomy status, Acehreceives an additional budget as the special autonomy fund. NG04 explained that the provision of the special autonomy fund was expected to help

the transition between the post-disaster reconstruction and the normal development process in terms of the financial resources sufficiency.

CONCLUSIONS

The reconstruction of the Indian Ocean tsunami in Aceh resulted in more than 3600 km of roads rehabilitated and reconstructed. Since most of the reconstructed road networks are under the responsibility of the local governments, there are concerns over the maintenance of the assets, particularly when the capacity of the local governments in the road maintenance had been renowned to be poor. Based on the semi-structured interviews with twenty-eight respondents representing the disaster management agency, public works, the regional development planning, donor agency, as well as the contractors and the consultants working in the road sectors, the institutional affecting factors of the local governments' road maintenance have been identified.

From the financial management aspect, the justification of having poor allocation for road maintenance is aggravated by the poor capacity of the local governments to spend their annual budget, and by the fact that fund allocation has not been spent effectively and efficiently. The maintenance of road infrastructure is also challenged by low interest on road maintenance, the poor capacity of the human resources to produce well-justified maintenance plan, and the poor technical capacity required to execute the tasks. Furthermore, lack of motivation to initiate changes and the high interest to maintain political stability has also been considered as the major constraints from the organization management point of view. Accordingly, it is argued that the leadership holds a major role in raising the awareness on the importance of road maintenance, as well as in determining development priorities, particularly since improving institutional capacity forms the basis for the development of an effective and sustainable managerial capability.

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ANDROID Doctoral School in Disaster Resilience 2014

The Doctoral School (DS 2014) is the second edition of the doctoral school programme of the ANDROID network, established as part of ANDROID Work Package 3. Its main objective is to bring together doctoral candidates from academic institutionsworldwide and provide them a multidisciplinary learning and knowledge sharing platform. It will enable them to interact and network with experts in disaster resilience and allied fields encouraging peer learning and access to wide pool of resources provided by the network.

The first part of the DS 2014 comprised of the online doctoral school where 44 doctoral candidates from 27 countries participated. Twenty six of these candidates participated in the three day residential programme (RDS2014). It involves candidates submitting abstracts and full papers for presentation at the sessions. The papers were submitted to a rigorous double blind expert review process and the final papers are compiled and published as this edited book of proceedings. The candidates were required to present their papers to an expert panel which were then critiqued with verbal and written feedback provided. The candidates were required to submit their final papers addressing all recommendations of the doctoral school panels to be incorporated in to these proceedings.

This year a total of 25 ANDROID doctoral school scholarships were awarded to the RDS 2014 candidates. All candidates received certificates of attendance and an award for best paper of the RDS 2014 was made.

Further details of the doctoral school activities can be found at: http://www.disaster-resilience.net/index.php/doctoral-school-2014 or www.northumbria-qs.org

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