

**ANDROID**

**DISASTER  
RESILIENCE  
NETWORK**

# Proceedings

## ANDROID Residential Doctoral School Work Package III

**Limassol, Cyprus - 23-24 October 2013**



**Edited by:**

**Prof. Srinath Perera**

**Mr. Hans Jorgen Henriksen**

**Ms. Alexandra Revez**

**Dr. Irina Shklovski**



**Proceedings of the**  
**First**  
**ANDROID Residential Doctoral School**  
**Work Package III**  
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## **INTRODUCTION**

The Doctoral School initiative which was set up by the ANDROID network is a core element of the overall project that aims to strengthen the link between research and teaching in the area of disaster resilience. The mixed teaching space that we have developed as part of this ongoing project has attempted to encourage and promote the work of doctoral students in this field.

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 varied number of teaching and research driven objectives. The online doctoral school which was conducted in Spring 2013 provided an innovative platform to transfer and develop the knowledge base of doctoral candidates. This was achieved through the conduct of a series of domain expert presentations along with thematic sessions aimed at engaging the doctoral researchers in knowledge discovery through detailed discussion. The online doctoral school will be rolled out again in Spring 2014.

The Residential Doctoral School programme (2013) has aimed to actively engage the students in presenting and discussing their research projects. It has involved the development and submission of an original piece of research which has been peer reviewed by experts within the field. The RDS process included a scholarship award to attend a two day event which entailed a panel review of the work of the students and dissemination of this work to a wider audience. For this purpose the ANDROID network international conference in Cyprus ran parallel to the Residential Doctoral School. All selected candidates were also able to join the International conference which included key contributions from UNISDR 'Making Cities Resilient campaign' delivered by Jerry Velasquez and Abhilash Panda from the Advocacy and Outreach Section (UN Office for Disaster Risk Reduction). Additionally the three best papers from the students were selected to be presented at the main ANDROID conference. The papers were:

- *'Vietnam: Post-disaster housing reconstruction as a significant opportunity to building disaster resilience - a case in Vietnam'* by Tran Tuan Anh, RMIT University, Australia
- *'Ghana: Participatory approaches to develop indicators for multiple risk assessment linking different scales in West African social-ecological systems under climate change'* by Daniel Asare-Kyei, United Nations University, Germany
- *'Iran: Social inequalities and vulnerability to natural hazards: Case of Afghan women in Tehran'* by Ahoo Salem, Università degli Studi di Milano, Italy

This programme will run again in Autumn 2014. The online Doctoral school is running in March 2014 and the Residential School will run in September 2014.

This volume brings together a concise summary of the contributions of all the doctoral researchers taking part in the RDS (2013). The papers collated here demonstrate the richness and interdisciplinary nature of research topics and problems being addressed by disaster resilience researchers. The submissions cover a wide spectrum of topics such as risk assessment, post-disaster reconstruction, vulnerability, collaborative management, gender issues and communication barriers.

The work of the doctoral researchers presented here is a valuable contribution to a body of knowledge which given the growing vulnerability and exposure to disasters of human and natural origin depends on the development of expertise of young students.

A summary of the papers presented are given below.

### **Paper 1**

Asare-Kyei et. al. presents their work on participatory approaches to develop indicators for multiple risk assessment for socio-ecological systems under climate change by conducting expert workshops in three West African countries. They revealed that some indicators being common to all three countries while there are unique indicators as well. The study concluded that participatory indicator development allows for the recognition of multiple stimuli beyond those related to climate.

### **Paper 2**

Nguyen et al., identified the factors associated with vulnerability to climate change in central coastal areas of Vietnam. Local experts asserted that erosion, storms, floods, drought and sand drifting are the main events associated with climate change stimuli in Quy Nhon city. Some factors related to social vulnerability and 'soft' solutions were mentioned in this research, but gained low rankings.

### **Paper 3**

Gambatesa studied the urban resilience in historic centres damaged by the earthquakes conducting a case study in Emilia Romagna Region in Italy. The research uses a SWOT analysis to evaluate the importance of development of resilience in urban planning as well as investigates the relationship between resilience and territorial risk in working out a new approach to prevent damages and improve resilience due to natural and anthropogenic events.

### **Paper 4**

Anh identifies post-disaster housing reconstruction as a significant opportunity to building disaster resilience in Vietnam. This paper examines issues of resilient housing to identify key factors required for developing resilient housing systems. Findings suggested that, to build resilient housing, physical unsafe conditions should be focused at the same time as enhancing socio-economic and institutional aspects.

### **Paper 5**

Pusceddu1 and Imperadori explored metabolizing metabolism in reuse of Nakagin Tower elements for a community in Fukushima, integrating high technological



performance with cultural heritage and psychological needs of displaced people. It experiments alternative designs in using advanced technology systems for emergency architecture to improve thermal performance, durability, ensuring psychological and environmental needs of people for areas affected by disasters.

### **Paper 6**

Uddin, and Ciavola focused on Sediment characteristics and Coastline Change of a Low-lying Island (Sandwip) in the Eastern GBM Delta in Bangladesh. Study discovered the island has accreted between 1978 and 2006 in the northern and eastern parts while there is severe erosion in other parts. It also found that there are almost negligible amount of coarse materials in almost all sections and highest proportion of fine sediment is in the most accreted newly formed northern profile section.

### **Paper 7**

Armia and Amaratunga studied the impact of foreign aid in supporting disaster risk reduction in Indonesia. This study revealed that there is good level of flow in the distribution of UK Aid which then acts as a catalyst in further related developments. Future studies intended investigate the level of positive contribution to the sustainability of disaster risk reduction programme implementation at the national level, regional level and in the community, especially in the implementation of policies, programmes and budgets.

### **Paper 8**

Hidayat and Egbu concentrated on the barriers for knowledge communication in post-disaster reconstruction projects in Indonesia. The paper highlights the inadequate time to seek or acquire knowledge, limited ability and lack of prior knowledge, different organisational backgrounds, and cultural differences as key barriers to knowledge communication between key stakeholders of post disaster re-construction projects.

### **Paper 9**

Yilmaz et. al., presents a critical insight in to communities affected by earthquakes in rural eastern turkey. The most significant finding within the socio-economic context of this study was that the earthquakes and post-earthquake permanent housing implementations change the way people live, in particular with respect to livelihood resources. The study also points out that development and investment plans should follow the reconstruction period in the rural settlements in order to improve the quality of life of dwellers.

### **Paper 10**

Mohammad and Collins explored disaster risk reduction in Bangladesh as an adaptation strategy for climate change. Study was carried out amongst disaster survivors and local level practitioners in focal regions of Bangladesh. It was evident from the study that they use present knowledge and past experience of disasters in managing climate change adaptation.

### **Paper 11**

Liu focused on event and agenda setting after severe acute respiratory syndrome (SARS). This paper attempts to explore the role of crises in agenda-setting structure

of Chinese central government. The research, based on a respondent analysis concludes that crisis provides a fertile ground for political interpretation and nature of crisis where political considerations play a core and dominant role in agenda setting.

### **Paper 12**

Yumarni et. al., analysed gender mainstreaming and sustainable post disaster reconstruction related issues. The paper identified awareness of gender needs and concerns, a strong gender policy framework, women participation and leadership as an agent of change, gendered institutional capability, flexible and decentralised structure of gendered policy planning as pre-requisite conditions for mainstreaming gender within sustainable post disaster reconstruction.

### **Paper 13**

Salem examined the need for an integrated vulnerability analysis studying the case of the Afghan population in Iran. The paper highlights that Afghan women face increased restrictions due to their “female” status while their livelihood options result in increased social vulnerability, both in daily life as well as in case of a disaster. She stress that consideration of how social structures and power relations impact people’s differential vulnerability to everyday hazards and disasters is an important component in achieving environmental justice.

### **Paper 14**

Patrão analysed the context and challenges in collaborative wildfires management in Portugal. Results suggest that since 2003 many changes were implemented in the system, setting a positive context for wildfire prevention. But these measures still reveal a low potential for community participation and empowerment towards wildfire risk. Therefore, author stresses the need for new models in the decision process.

### **Paper 15**

Salas and Fenn experiment with lightweight W Panels as an option to build post-disaster sustainable housing. They discovered that W panels can be an expedient alternative for post disaster housing during the recovery phase. It can save up to 45% of the total cost compared to traditional construction materials and therefore a viable economic proposition.

## **Paper 1: Participatory approaches to develop Indicators for multiple risk assessment linking different scales in West African Social-Ecological Systems under climate change**

Asare-Kyei, D<sup>1</sup>, Kloos, Julia<sup>2</sup> and Renaud, Fabrice<sup>3</sup>

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### **ABSTRACT**

In this study, the classical approach in indicator development for risk assessment was extended to include a participatory process through expert workshops in three West African countries. The methodology allowed for representative participation of all stakeholders (in particular farmers) dealing with climate change. Semi-structured questionnaires were presented to each of the four technical working groups formed to elicit what they see as important processes shaping drought and flood risks in their areas. The results showed that 58% of the indicators deemed to be relevant by the local experts are rarely used in risk assessments in the region. Also, although, an indicator may be common to the three countries, their differential rankings will result in differences in explaining the risks faced by different societies. However, there were indicators that were unique to each country and this is particularly important and has wider implications for risk assessment that uses common indicators for a number of countries and makes an effort to derive relative vulnerabilities. The study concluded that participatory indicator development allows for the recognition of multiple stimuli beyond those related to climate and revealed significant indicators that have never been used in traditional risk assessment in the region.

**Keywords:** experts, indicators, multi-risk, participatory, West Africa.

### **INTRODUCTION**

Countries in West Africa are among the most vulnerable globally to the effects of climate change because of the reliance of much of the population on agriculture, particularly rain-fed agriculture. The vulnerabilities are worsened given a host of biophysical and human related issues in the region including erosive rainfall, recurring drought, soil qualities and fertility, low input farming systems, decreased fallow period, deforestation, frequent bush fires, and overgrazing (USAID, 2011; FAO, 2012). These phenomena are being worsened with increasing climate variability in the region.

Damm (2010), Mohan & Sinha, (2011) measured vulnerability to climate change at different scales from local to national assessments. Studies such as Cardona (2005), Dilley et al., (2005), UNDP (2004), Birkmann (2006b) and USAID (2011) have measured vulnerability, resilience and adaptation using a variety of concepts and approaches. However, it is impossible to reduce the concept to a single equation or model that has a universal application. This is due to inherent complexity of Social Ecological Systems, multi-dimensional aspects (Downing, 2004; Birkmann, 2006a; Mohan and Sinha, 2011); and a variety of terms and their sometimes copious (Thywissen, 2006) definitions. The non-universal applicability of developed vulnerability and risk assessment methods to areas such as the West African sub region means that different methods be developed. Such methods should tackle complex settings of hazards occurrence as well as the dynamic socio-economic and environmental exposure; such methods need to be able to capture all relevant processes shaping vulnerability and risk at various scales and, more importantly, still be applicable to

local communities affected usually by multiple hazards (Adger et al., 2004; Africa Adapt, 2011). Indicator based risk assessment where the indicators have been selected from a rigorous scientific process involving active participation of populations at risk themselves as well as the authorities governing these risks is thus a prerequisite in meeting these criteria. This important consideration has however, been missing in many risk assessments particularly, for the West African region.

It is implausible to involve large numbers of affected community members in evaluating a set of potential indicators; yet, to develop hyper-localized indicators of risk at both the community and sub-national levels, it is still imperative to involve government officials and development experts from non-governmental organizations. This is because, these officials by training, prolonged contact with vulnerable people- (most of them live in the communities - and long experience working with these communities have become experts in their own right and have excellent perspectives of the processes shaping vulnerabilities. The present paper explores appropriate methodologies to develop local and sub-national indicators for multiple risk assessment for rural populations in the Sudan Savanna ecological zone of Ghana, Burkina Faso and Benin.

### **Indicators and Indices**

The complexity of the concept of vulnerability and risk requires a reduction of the various processes with models or frameworks which are evaluated either quantitatively or qualitatively with a set of indicators. Indicator based risk assessment are thus “assemblages of indicator variables” (MEA, 2003). Its reliance on representative indicators makes it selective and able to cover the wide array of issues required for an adequate depiction of human well-being, state of environment and socio-ecological interactions (MEA, 2003).

Moldan and Dahl (2007) definition of indicators in which indicator is viewed as representations of certain construct or issue too complex to be measured by a unit variable is adopted in this study. Like models, indicators are abstraction of reality and limit itself to the realm of the measureable. Variable is a raw data with no symbolic representation and benchmark values, an index according to Moldan and Dahl (2007) is the “densest state of information”. It takes the form of a single number with no dimension. Its computation usually needs a prior transformation of several indicators measured in their respective units to produce a unit-less number.

### **Indicator based Vulnerability and Risk Assessment**

Indicators have been conveniently used to estimate vulnerability and to understand the risk patterns of societies at risk from both natural and anthropogenic hazards. Several examples abound in literature of the use of indicators to measure vulnerability, risk and resilience. Yet, comparing the indices resulting from aggregates of the indicators is often checked by the requirements and peculiarity that each study had to face. Damm (2010) opined that the development of vulnerability index strongly relies on the scale of the assessment, objective of the study, place of assessment, dimension of vulnerability and type of hazard in question.

As an example of a community level approach, Bollin and Hidajat (2006) developed community based risk index based on indicators and showed how indicator based approach could be implemented at the community level where risk outcomes are first materialized. Within the case study countries, USAID (2011) developed vulnerability profiles at the sub-national level in Ghana. Also, Raschid (2011) undertook water mediated climate impact assessment for urban areas in Ghana. In the three countries, other risk assessment have been done in much smaller scales and on decoupled SES such as Simonsson (2005) and Arnold et al., (2012) in Burkina Faso; World Bank (2009a) and IFPRI (2010) for Ghana, Benin and Burkina Faso. All these studies however, are based on traditional risk assessment and did not involve the vulnerable themselves.

As a global approach, the Alliance Development Works led by the researchers of the United Nations University Institute for Environment and Human Security (UNU-EHS) has been issuing the World Risk Reports since 2011. These are also based on traditional approaches. The 2012 report in particular, showed a risk index in which 28 global level indicators depicting current conditions underlying exposure, susceptibility, coping capacity and adaptive capacity were aggregated to produce the World Risk Index. This index allows for the identification of the most high risk and low risk countries of the world (Beck et al., 2012).

## METHODS

Within the realms of the WASCAL project, three watersheds in Ghana, Burkina Faso and Benin have been selected for detail assessment of risk patterns at the community level. These watersheds are (i) Veia in the Upper East region of Ghana (ii) Dano in the province of Sud-ouest of Burkina Faso and (iii) Dassari in the Commune of Materi in North West Benin. These areas which belong to the Sudanian Savanna ecological zone have similar climate and are under varying forms of agricultural systems. The Veia and Dano watersheds are more intensively used for agricultural activities whilst the Dassari site is less intensively used. Climatic factors show high instability and there is a high frequency of droughts and floods (Challinor et al., 2007).

### Risk and vulnerability conceptual framework

The first step in developing a set of indicators for risk and vulnerability assessment is development or selection of appropriate conceptual framework. In the social and ecological fields, the literature on natural hazards predominantly revolves around the conceptualization of several key terms. These key terms are risk, hazard, exposure, vulnerability, resilience, coping and adaptation. It's critical to have a good conceptual framework that establishes clearly the relationships, interactions and feedback mechanisms that exists within these terms. The present study relies on an on-going effort to broaden the theoretical concepts underlying two commonly used models, SUST model by Turner et al., (2003a) and the MOVE model by Birkmann et al., (2013). Details of the proposed framework are beyond the scope of this paper and will be discussed in a related paper. However, this proposed framework served as the conceptual basis to categories the various dimensions of vulnerability and risks in the present study.

### Participatory indicator development -Selection of local experts

In Figure 1, the step-wise approach to indicator development is summarized. The first step is the preliminary indicator selection from literature, conceptual framework, personal experience and knowledge of the processes leading to vulnerability of rural farming communities to multiple hazards of droughts and floods. This first step which produced the "Indicator Pool" has been the status quo in risk assessment including all global indices described above. Studies such as Adger et al., (2004), Damm, (2010), Brooks et al., (2005), Smit and Wandel, (2006) have used expert judgment complimented with the results of correlation analyses and other statistical procedures in selecting indicators for risk assessment. Morgan (1996) asserted that "this type of expert focus group" is commonly used to elicit, refine information and produce new data and understanding through interactions with stakeholders. The uniqueness of the approach used in the present study stems from the fact the selection of local experts themselves was done in a highly participatory process where vulnerable communities had the opportunity to recommend who they consider as experts in the area of floods and droughts. This was based on snowball principle where a core group of local experts comprising people from local agricultural departments, farmers, disaster managers, rural development experts and local government authorities were asked to recommend institutions involve in drought or flood prevention, impacts mitigation or involve in supporting communities to reduce their vulnerabilities to floods and droughts. Twenty-five each of such

institutions were identified in Veia watershed in Ghana and Dassari watershed in Benin whilst seventeen were identified in the Dano watershed of Burkina Faso

### Expert workshop

A day's technical workshop was held in each case study country. Participants were asked at the registration desk to indicate which of the four technical areas they have expertise and competence. Four experts groups were thus constituted to become the four technical working groups. These four technical working groups are: {i} Agriculture {ii} Socio-economic and health {iii} Disaster management/meteorologist and {iv} Environment. Each participant identified with one working group based on his/her professional background. Table 1 below summarizes the expert's categories at the various workshops:

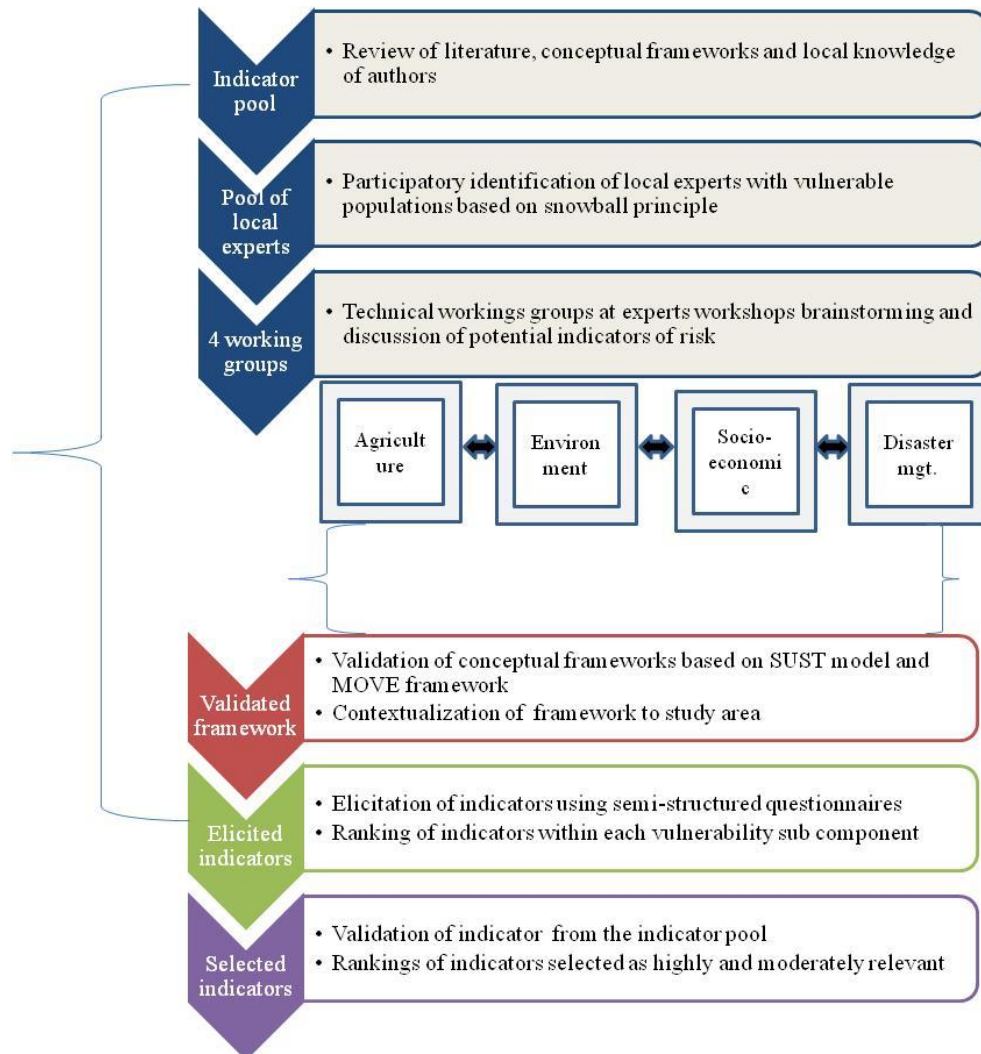


Figure 1 Procedural representation for indicator development



**Table 1 Category of experts for the technical working groups**

Working group	Ghana	Burkina Faso	Benin
Agriculture	6	5	7
Socio-economic/health	4	4	5
Disaster management/meteorology	7	4	4
Environment	4	4	4

(Source: authors)

Three major tasks were assigned to each group as shown in the bottom section of **Error! Reference source not found.** The first task was the validation of the proposed vulnerability and risk assessment framework. A conceptual framework of vulnerability was presented to the groups and they were asked to make comments regarding the various components of risks, impacts and perturbations within first, the context of the watershed and second, the wider Savanna agro-ecological zone of the respective countries. After this, a separate semi-structured questionnaire with questions ranging from indicators of exposure to coping and adaptive capacity to ecosystem robustness was presented to each technical group. Each technical group was also expected to provide rankings which will later feed into the weighting of the selected indicators. As a result, all indicators were supposed to be presented in the order of the most important in terms of defining vulnerability and risk of people living in the area. After this task, each group was given the “indicator pool” to determine indicators relevant for the present study. This pool of indicators also served as a reference check for the indicators to be derived from the semi-structured questionnaire procedure. The experts were to determine the relevance of the indicator within each vulnerability sub-component. They had to choose between three options:

Option 1: highly relevant, Option 2: moderately relevant and Option 3: irrelevant

The indicators that are selected as either highly relevant or moderately relevant were then ranked in order of the most important by the experts within each vulnerability sub component. In selecting the final indicators, preference is given to elicited indicators from the experts. This means, where the same indicator is chosen as relevant from the indicator pool and also appears from those elicited directly from the experts and are within the same vulnerability sub-component, the ranking from elicited indicator is used. Working with indicators and vulnerability is a relatively new field and quite complex and even not all experts invited to the workshop understood clearly what constitute good indicators of risks and vulnerability. The use of the “indicator pool” served to ameliorate this handicap among those experts as it made it easier to match the terms used by the experts to the standard indicators on the pool.

## RESULTS AND DISCUSSION

A total of fifty-five (55) indicators were deemed to be relevant for all the three countries. Experts from Ghana validated and elicited 41 indicators, those from Benin produced 42 and Burkina Faso 39. A number of the indicators were common and run through all the three countries. However, there were indicators that were unique to each country (Table 2). This is particularly important and has wider implications for risk assessment that uses common indicators for a number of countries and makes an effort to derive relative vulnerabilities of those countries. Even more significant is the fact that even for the indicators that were

common to all the study countries, they differ in their rankings. The differential rankings of the indicators in each of the study countries will affect the weights that will be applied in the estimation of composite vulnerability index and subsequently the risk index.

This differential ranking arises from differences in perceptions of risks, cultural, political and socio-economic disparities in different countries. For instance, whereas experts from Ghana ranked “prevalence of poverty” as the ninth most important determinant of susceptibility out of a total of ten indicators (9 out of 10), their counterparts in Benin ranked the same indicator as the first most important (1 out of 7) and those in Burkina Faso ranked the same indicator also as the first most important (1 out of 6). This is probably due largely to major economic gains Ghana has achieved over the last two decades becoming the first country in Sub-Saharan Africa to reduce poverty by half (USAID, 2013) and achieving a per capita output twice as much as all the countries in West Africa except Nigeria (British Council, 2012; World Folio, 2013).

**Table 2 Summary of indicators unique to each study country**

<b>Ghana</b>	<b>Vulnerability component</b>	<b>Burkina Faso</b>	<b>Vulnerability component</b>	<b>Benin</b>	<b>Vulnerability component</b>
Crop type	Sus.Es	Household size	Sus.Ss	Forested area	Eco. robust
Unimproved drinking water source	SUS.SS	Agroforestry cover	Sus.Es	Erosion rates	Eco. Robust
Magnitude of disaster	Coping capacity	Soil depth		Land ownership	Adaptive capacity
Physical infrastructure	Exp. assets	Number of bas-fonds (small reservoirs)	Eco. robust	Total soil nitrogen	Eco. robust
Population density	Sus.ss	NDVI	Sus.Es		
Female headed households	Sus.Ss	Early warning system	Adaptive capacity		

(Source: authors. Sus.Es = susceptibility of ecological subsystem, Sus.Ss =susceptibility of social subsystem, Exp.assets=exposure of assets, Eco.robust =ecological robustness)

A number of the indicators have not been used or are rarely used in classical risk and vulnerability assessment literature. This was confirmed by a comprehensive search of relevant literature on risk assessment particularly for Africa. These indicators numbering thirty-two (32) constitute more than 58% of all indicators deemed to be relevant in the context of the study countries. In some cases, proxies or derivatives of these indicators have been used. For instance, a typical indicator used to express the exposure of people to droughts and floods is “Agricultural Employment”. This indicator measures the percentage of people in an area engaged in agricultural employment. Though, it has been extensively used (see for example, Brooks et al., (2005), O'Brien et al., (2004a), USAID (2011). Adger et al., (2004) criticized the use of such indicator has been “biased towards wage labour”. In this study, the experts agreed with the assertion of Adger et al. (2004) that the “Agricultural Dependant Population” gives a more accurate depiction of people who may potentially be exposed to natural hazards since it accounts for all people directly or indirectly engaged in the climate sensitive sector of



agriculture. Of the 32 indicators, 3 describe the exposure of the SES to droughts and floods, 4 describes the susceptibility of the social sub-system, 7 describes the susceptibility of the ecological sub-system, 4 describes the robustness of the ecological sub-system to withstand impacts whilst 7 each describes the coping and adaptive capacities of the SES to droughts and floods.

Indicators such as insecure farms which measures the percentage of farm plots located in slopes of more than 5% was reported in Ghana and Burkina Faso and shows the extent how slope exposes the agricultural system to both hydro-climatic hazards. Such farms were said to be extremely vulnerable to high episodes of rainfall through increased erosion whilst at the same time more prone to the impacts of droughts as a short dry spell leads to significant crop failures due to poor water infiltration rates. Other conspicuously missing indicators in the literature of existing risk assessment are “Number of herds per household” and “Gross Margin per Hectare”. These indicators were found to be extremely important in influencing the adaptive capacities of farmers in all three countries. Gross Margin per hectare was seen as far better indicator than crop production which is the one commonly used. This is because gross margin analysis incorporates all four aspects of productivity including area cultivated, production cost, yield and market prices. The keeping of livestock in the Sudanian region was also seen as a social security and offers diversified livelihood especially in times of old age or crisis. Households with livestock are more likely to withstand hazards events than those who depend solely on crops for their livelihoods. The study found that a major coping and adaptation capacities lie in the number of livestock owned by the households. It offers both the means of immediate liquidation to cope with a present disaster and also offers long term capacity to recover from a disaster.

## CONCLUSION

In this study, a participatory approach was followed to select hyper-localized indicators for both the quantitative and qualitative assessment of risks faced by farmers in West Africa under climate change. The methodology allowed for representative participation of all stakeholders (including farmers) dealing with climate related hazards of drought and floods. The study, as a first principle used a conceptual risk assessment framework being developed to categorize vulnerability components.

In a review of vulnerability indices by the World Development Report in 2010, two major vulnerability-driven indices –Disaster Risk Index, DRI (UNDP 2004) and Index of Social Vulnerability to Climate Change for Africa, SVA (Vincent, 2007)- created spatial patterns out of tune with development-driven indicators and consistently showed a pattern contradictory to expert knowledge (World Bank, 2010a). The results from the present study have showed that such poor results are expected because they ignore the salient indicators deemed to be relevant by the vulnerable themselves. Studies in the region that ignores indicators such as “Number of herds per household”, Gross Margin per hectare, insecure farms etc. will lead to conclusions that are “contradictory with expert knowledge” as found by (World Bank, 2010a). It is important to note that the relevance and weights of such indicators can only be realized by engaging with the vulnerable people themselves. Again, this study has showed the dangers involved in using the same set of indicators for a number of countries and make comparisons between them. Besides the indicators that are unique to each country, differences in risk perceptions, socio-economic conditions and other factors will mean that even the same indicator will invariably be ranked differently by different societies. A fundamental mistake will be done by assigning the same weights to indicators for different countries or when countries are treated with the same set of indicators ignoring obvious heterogeneity in many fronts. The effect of this is that risk and vulnerability comparisons among countries could lead to policy interventions that do not reflect reality and ill-informed allocation of scarce resources. Alternatively, sub-national risk comparisons from a participatory process could

result in better identification of high and low risk areas and lead to better targeting of development resources.

Although this study has not estimated the actual risk faced by the farmers, the participatory indicator development has allowed for the recognition of multiple “stimuli beyond those related to climate” (Smit and Wandel, 2006) and revealed significant indicators that have never been used in traditional risk assessment in the region. It has highlighted that major attention should be paid to differences in risk perceptions, culture, political, institutional and socio-economic dynamics in assessing risk faced by farmers in different countries particularly, for West Africa.

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## **Paper 2: What about the people? Perceived key factors influencing vulnerability to climate change induced disasters in central coastal Vietnam**

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### **ABSTRACT**

The purpose of this research is to identify the factors associated with vulnerability to climate change in central coastal Vietnam. An analysis of the literature, together with a three-round Delphi survey and interviews in a coastal city in central Vietnam indicated a sound understanding of geo-physical exposure and impacts. Thus, the perceived key factors in increasing local adaptive capacity are mostly related to physical infrastructure. This research has identified that social and economic factors are not well understood by local experts and decision makers. The risk in this is that adaptation planning may ignore the importance of building community resilience and the adaptive capacity of households, businesses and social institution and systems.

**Keywords:** adaptation, climate change, Delphi technique, social vulnerability.

### **INTRODUCTION**

Using Quy Nhon, a city in central coastal Vietnam, as an example, this research seeks to find out how climate change decision makers, in Vietnam, can learn how best to make decision on strategies for building community adaptive capacity as a way of reducing social vulnerability. It does this by trialling the use of participatory system dynamics modelling as a tool to assist climate change decision makers. While climate change adaptation is the focus, the research recognizes that participatory system dynamics modelling may also prove to be a valuable strategy for enhancing the capacity of decision makers to address other environmental and related problems in Vietnam.

The research is being conducted in four phases. Phase one will identify factors related to climate change to build a conceptual model which is the basis for establishing a simulation model in the second phase. This model will be run in phase three and use different scenarios to develop the most effective strategy for responding to climate change in Quy Nhon city. The last phase will evaluate the outputs of the model as well as propose a plan for using this system dynamics modelling on other socio-economic and environmental problems in Vietnam.

This paper presents findings from the research in phase one, which used a three-round Delphi survey and in-depth interview to identify significant variables about exposure, sensitivity and adaptation, which could be used to build the conceptual model. The key findings from this phase of the project indicates that the local expert scientists and policy makers who participated in the research - and who are largely responsible for managing disaster risk in Quy Nhon city - had strong expertise in the physical environment and engineering aspects of disaster risk reduction but limited experience in the social and economic aspects, so important in reducing social vulnerability.

## BACKGROUND

### Study area

Quy Nhon is the capital city of Binh Dinh province, a coastal province in the central Vietnam (see Figure 1), and is located just south of the Ha Thanh River, with 286 km<sup>2</sup> in general area, 55.6 km in coastal length, and is home to about 300,000 persons. All areas in this city are currently affected by flooding, particularly peninsula and coastal areas and along the banks of Thi Nai lagoon. Flash floods and river flooding, both originating in the mountains on the western side, are frequent during the rainy season. During storm-related flooding, the city often also experiences storm surges and sea flooding along the coastline, leading to inundation of portions of the city from two sides (ACCCRN 2009).



Figure 1 (a) Location of Quy Nhon city; (b) Boundary of Quy Nhon city [Google maps]

According to a report on climate change scenarios for Quy Nhon city (IMHEN 2009) average temperature in all months and seasons will increase by an average 1.50C by 2050. In line with the national trends, by 2050 rainfall will decrease by about 14.5 mm in the dry season and increase about 82.2 mm in rainy season, with a predicted sea level rise of about 30 cm. This will increase the area of annually inundated land by about 1.47 km<sup>2</sup> (approximately 0.8% general area of the city). The number of people in Quy Nhon city who will be affected directly by flooding will double by 2050 and increase again by 300-400 per cent by 2100 depending upon different scenarios of the Intergovernmental Panel on Climate Change.

Climate change is already impacting on the socio-economic system of Quy Nhon city, especially by increasing social vulnerability. In 2008, there were 2,699 poor households in this city (about 4.45% total population of the city). These are the most vulnerable people with regards to climate change. The migration of rural people to the city is rapidly increasing the number of poor people. Quy Nhon city is also facing severe environmental problems related to storm-flooding, the pollution of underground water, solid waste management and increasing health epidemics. The basic infrastructure of transportation, the electricity system, and the water-supply system are also considerably influenced by climate change (IWE 2009).



### Conceptual framework of vulnerability

The purpose of this research is to investigate ways in which the adaptive capacity or resilience of communities and cities can be strengthened as a strategy for reducing vulnerability. The research is based upon the conceptual framework in Figure 2. A system which has both exposure and sensitivity to climate change is a potentially vulnerable system. Exposure and sensitivity determine the magnitude of potential impacts on a system. Adaptive capacity refers to the resilience of the system, which can be built via adaptation, to reduce vulnerability or to cope with, and manage these impacts. Vulnerability, therefore, is a function of potential vulnerability and adaptive capacity. Moreover, adaptation could also help a system reduce its exposure and sensitivity. In this research, adaptation can be represented as adaptive strategies or adaptive activities.

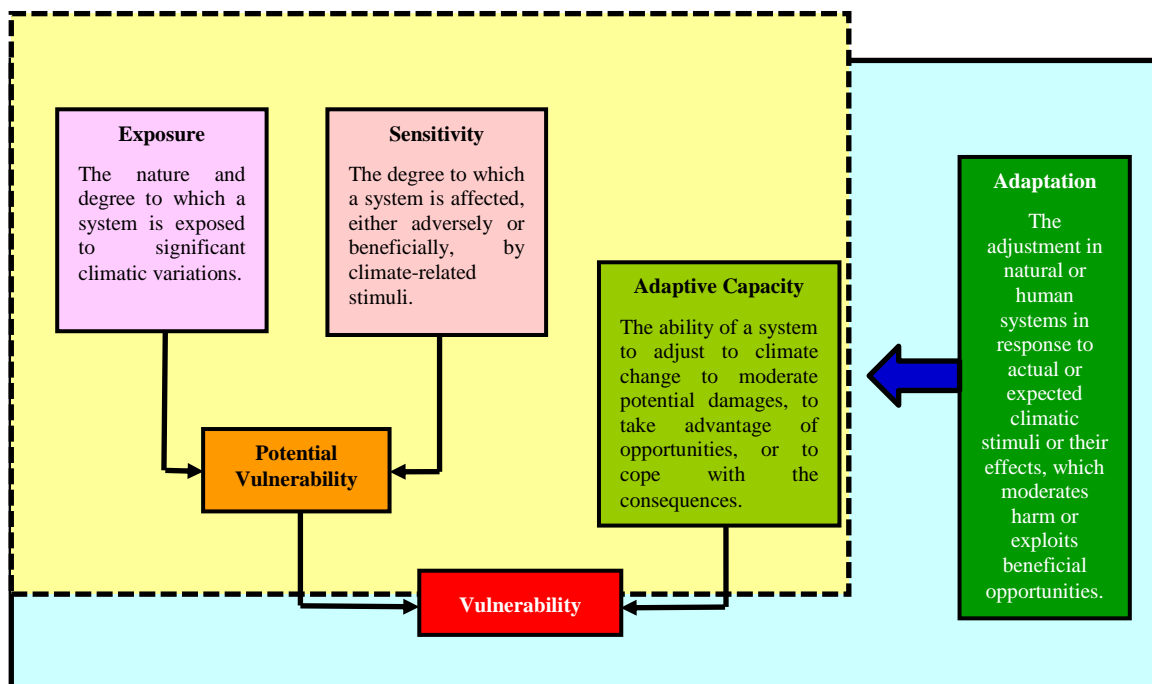


Figure 2 Conceptual framework of vulnerability to climate change (adapted from Houghton et al. (2001))

### LITERATURE REVIEW

Since 2009, under the sponsorship of the Rockefeller Foundation, the Asian Cities Climate Change Resilience Network Vietnam (ACCCRN) implemented research on climate change in Quy Nhon city, including establishing scenarios of climate change and sea level rise, assessing vulnerability to climate change and proposing climate change resilience action plan for Quy Nhon city (IMHEN 2009; IWE 2009; Tien et al. 2010). The Challenge to Change organisation conducted an investigation to assess hazards, adaptive capacity and vulnerability for building resilience to climate change in Quy Nhon city, in which social factors such as gender, livelihood, health, education were mentioned (CtC & DONRE 2009). Generally, most previous researches on climate change in Quy Nhon city was qualitative and did not investigate the social aspects in detail. Therefore, this study used mixed methods research with both qualitative and quantitative methods to contribute to a more rigorous assessment of social vulnerability of Quy Nhon city and to support decision making processes for responding to climate change.

## RESEARCH DESIGN FOR PHASE 1

The aim of Phase 1 of the research is to develop a conceptual model of social vulnerability in Quy Nhon city. It clarifies the generic model in Figure 1 with specific information of Quy Nhon city. This information was obtained through the use of Delphi technique and interviews.

### Delphi technique

The classical Delphi process was used in this research. Keeney, Hasson and McKenna (2011) describe that the original form or classical form comprises two or more rounds of questionnaires. The first round asks members of an expert panel for their opinions on a topic in an open-ended manner. These responses are analysed by the researchers and sent back to the expert panel in the form of statements or questions. In the second round, the expert panel rates or ranks the statements or questions according to their expert opinion on the subject. Rounds continue until a consensus is reached on some or all of the items as required.

In this research, twenty experts were selected for an expert panel of the three-round Delphi survey. They were four academic experts working in institutes and universities, twelve experts from provincial agencies and four decision makers from Quy Nhon Peoples Committee. All members of the expert panel were working in fields directly or indirectly related to climate change in Quy Nhon city. Three rounds of questionnaires were sent to the expert panel and their feedback was obtained by email. The consensus level was set at 70%.

### Interviews

The results of the Delphi survey seemed to indicate a wide familiarity with all aspects of disaster risk reduction. However, the one-on-one semi-structured interviews with fourteen (from P1 to P14) of the twenty experts in the expert panel revealed a different pattern. Three questions were asked to identify explanations to each factor generated from the Delphi survey as well as its behaviour over time and relationships, especially high-ranking factors. Moreover, experts were also asked other open-ended questions in order to get a deep understanding on each factor as well as complex interactions inside urban system of Quy Nhon city under climate change conditions.

## RESULTS AND DISCUSSION

### Results

#### *Delphi survey*

- **Round 1.**

The expert panel identified a total of 76 factors associated with climate change issues in Quy Nhon city. The detailed number of factors within each category and sub-category is presented in the Table 1.



**Table 1 Factors related to climate change issues in Quy Nhon city generated from round 1**

	Category/Sub-category	Number of factors
1	Category 'Exposure': Factors related to climate-related stimuli	17
2	Category 'Sensitivity': Factors susceptible to climate change	
2.1	Sub-category 'Groups of people'	10
2.2	Sub-category 'Socio-economic sectors'	12
3	Category 'Adaptation': Factors related to the current adaptive capacity and the proposed adaptive strategies to climate change	
3.1	Sub-category 'Adaptive capacity'	20
3.2	Sub-category 'Adaptive strategies'	17

Table 2 presents the top five factors in each category and sub-category based on their frequency of responses of the expert panel. Temperature and rainfall rise are the two primary 'exposure' factors that most experts identified. These are followed by three secondary factors: floods, storms and drought. The impacts on agriculture and aquaculture were identified much more frequently in two sub-categories of 'sensitivity' category than other social or economic factors. The most frequently mentioned 'adaptation' factors related to both physical and social sectors, focused on dike systems, hydro-meteorological monitoring and forecasting systems (physical or 'hard' solutions), as well as the capacity of authorities and officials, and the use of education and communication strategies (social or 'soft' solutions).

**Table 2 Top five factors and their frequency (freq.) in each category and sub-category generated from round 1**

Exposure		Sensitivity - Groups of people		Sensitivity - Socio-economic sectors		Adaptation - Adaptive capacity		Adaptation - Adaptive strategies	
Factor	Freq.	Factor	Freq.	Factor	Freq.	Factor	Freq.	Factor	Freq.
Temperature rise	17/20	Fishermen	17/20	Agriculture	17/20	Dike systems	14/20	Improving education and communication programs	14/20
Rainfall rise	16/20	Farmers	16/20	Aquaculture	15/20	Officials in local agencies	11/20	Consolidating the dike systems	12/20
Flood	15/20	Old people	14/20	Natural resources and environment	7/20	Hydro-meteorological monitoring and forecasting systems	8/20	Improving Hydro-meteorological monitoring and forecasting systems	12/20
Storms	13/20	Young people	12/20	Transportation	6/20	Authorities related to climate change	7/20	Strengthening capacity of authorities and officials	7/20
Drought	12/20	People living in areas near the sea, lagoon and in lowland areas	11/20	Health	6/20	Education and communication	7/20	Adjusting and implementing Quy Nhon master plan suitable for climate change	7/20

### • Round 2

The factors identified in round 1 were then ranked by the expert panel in round 2. The consensus level among members of the expert panel for each factor ranged from 35% to 85%. The number and percentage of factors having the same consensus level are shown in Table 3. The most frequent consensus level is 55% which was held by 17 factors (22.37%). Only five factors (6.58%) reached consensus levels of 70% and above. This low level of consensus may be due to the complexity of climate change issues and their many uncertainties (Houghton et al. 2001). Because such a few factors reached the 70% consensus level, all 76 factors were used in round 3 in order to strengthen the agreement of the expert panel.

**Table 3 Number and percentage of factors having the same consensus level in round 2 and round 3**

Consensus level (%)		35	40	45	50	55	60	65	70	75	80	85	90	95
Round 2	Factors	4	11	12	13	17	10	4	1	3	0	1	0	0
	Percentage (%)	5.26	14.47	15.79	17.11	22.37	13.15	5.26	1.32	3.95	0.00	1.32	0.00	0.00
Round 3	Factors	0	0	0	0	0	3	4	21	11	15	13	7	2
	Percentage (%)	0.00	0.00	0.00	0.00	0.00	3.95	5.26	27.63	14.47	19.74	17.11	9.21	2.63

### • Round 3

The consensus level for each factor increased significantly from round 2 to round 3 with 69 factors reaching a minimum of 70% consensus (Table 3). This revealed the fact that there were limitations in the local experts' cognition of issues related to climate change. There were only seven factors reaching 60% and 65% consensus.

The mean score of each factor represents its importance level. Based on the 5-point Likert scale from 1-‘very unimportant’ to 5-‘very important’, all factors in the top five in each category and sub-category in round 3 scored a mean above 4 (see Table 4). This means that these factors were identified as important or very important in the context of climate change in Quy Nhon city.

**Table 4 Top five factors and their mean score in each category and sub-category generated from round 3**

Exposure		Sensitivity - Groups of people		Sensitivity - Socio-economic sectors		Adaptation - Adaptive capacity		Adaptation - Adaptive strategies	
Factor	Mean	Factor	Mean	Factor	Mean	Factor	Mean	Factor	Mean
Erosion	4.15	Fishermen	4.65	Agriculture	4.70	Flood drainage system	4.85	Adjusting and implementing Quy Nhon master plan suitable with climate change conditions	4.85
Storms/typhoons	4.10	Poor people	4.60	Aquaculture	4.65	Hydro-meteorological monitoring and forecasting systems	4.85	Improving hydro-meteorological monitoring and forecasting systems, and warning systems	4.80
Floods	4.10	People living near the sea, lagoon and lowland areas	4.25	Salt manufacturing	4.20	Dike systems	4.80	Consolidating the dike systems and sea water impoundments	4.80
Drought	4.10	Farmers	4.20	Irrigation system	4.20	Mangroves, forests for stopping sea-wave, wind and sand drifting	4.80	Improving flooding drainage systems	4.80
Sand drifting	4.05	Old people	4.15	Natural resources and environment	4.05	Rescue equipment	4.80	Planting and protecting mangrove and protective forests	4.30

**‘Exposure’ category:** Erosion, storms, floods, drought and sand drifting are five exposure factors related to climate change stimuli in Quy Nhon city. These are the five most frequent hazardous events that seriously affect Quy Nhon city identified in previous research by IMHEN (2009), IWE (2009) and Tien et al. (2010).

**‘Sensitivity’ category:** Fishermen/aquaculture and farmers/agriculture were rated as most vulnerable to climate change in Quy Nhon city. The explanations of the expert panel focused

on damage to both fishing sectors and aquaculture and to farm cultivation activities. People living under the poverty line and those living near the sea, lagoons and lowland areas were also seen as very vulnerable to storms, floods and other hazardous events.

**‘Adaptation’ category:** All the factors rated highly by the expert panel were associated with the physical or ‘hard’ infrastructure. The ‘soft’ infrastructure factors of capacity building, education and communication dropped out of the top-five most important factors (Round 1). Further evidence of this emphasis on ‘hard’ infrastructure solutions is the close correlation between pairs of factors in the two ‘adaptation’ sub-categories (adaptive capacity and adaptive strategies), for example ‘dike systems’ and ‘consolidating the dike systems’, ‘flood drainage systems’ and ‘improving flooding drainage systems’ and ‘mangrove, forests for stopping sea-wave, wind and sand drifting’ and ‘planting and protecting mangrove and protective forests’. The results of the Delphi survey exposed the issue that the expert panel placed more attention on physical or ‘hard’ solutions with high cost and low sustainability for responding to climate change, otherwise, social or ‘soft’ solutions did not get enough concern.

The Delphi survey stopped after three rounds because of the strong level of consensus that was reached (see Table 3) (Keeney, Hasson & McKenna 2011).

### Interviews

Fourteen (from P1 to P14) of the twenty members of the expert panel were available for a detailed one-on-one interview. Their responses on each of the category ‘exposure’, ‘sensitivity’ and ‘adaptation’ are presented below.

**‘Exposure’ category:** The experts’ discussion of key factors affecting exposure was very detailed. Every expert had different perspectives on issues related to each factor. Some experts suggested more information based on their expertise, but a little or nothing on other factors. Table 5 shows their perceptions associated with explanations of the top five exposure factors as well as their behaviour over time and relationships.

**Table 5 Experts’ perceptions on the top five ‘exposure’ factors**

Factors	Explanation or adding information	Behaviour over time	Relationships
Erosion	Erosion occurring in beaches, river and lagoon banks (P2, (P4, P12, P13).	Erosion is not remarkable at the moment but it will increase significantly in the future (P1, P13)	Erosion is caused by tide rising (P2, P12), rain and storms (P12), and urbanization (P4); Erosion affects directly resident houses (P2, P11)
Storms/typhoons	Spatial and temporal distribution of storm change significantly (P1, P4, P6, P10, P11)	Storms changed irregularly over time (P3, P4, P6, P7); Intensity of storm increases significantly (P3, P6)	Storms often occur simultaneously with flood, heavy rain and rising tide (P1); Storms affect basically resident houses, anchorage places, industry and services (P1) as well as fishing, aquaculture (P11)
Flood	Temporal distribution of flood change significantly (P1, P3, P11)	Frequency and intensity of flood increases (P4, P7, P12);	Flood is caused by rain (P1, P2, P3, P4, P10), rising tide (P1, P3, P10); Flood helps decrease saline intrusion (P1), affects agriculture and aquaculture (P3, P11) as well as industry and services (P1)
Drought	The climate change issue affected most seriously on agriculture is drought (P7)	Quy Nhon city locates at a downstream area, so drought issue is not much at the moment (P3). Drought will increase significantly in the future, especially in dry season (P1, P4)	Drought is caused by South-West monsoon, lack of rain in previous rainy season (P4, P7, P10); Drought causes lack of water resources (P1, P7, P11), saline intrusion (P1, P7, P11) and forest fire (P10); Drought affects aquaculture (P6, P11), agriculture, especially cultivation (P1, P6, P7).
Sand drifting	Sand drifting mainly occurs in Nhon Hoi economic zone (P4)		The main reason of sand drifting in Nhon Hoi economic zone is artificial activities (P7)

The interviewees asserted that erosion mostly happen in the beaches, river and lagoon banks with some specific areas. The experts also pointed out that flooding was a great climatic threat to Quy Nhon city. In this city, it was caused by some reasons, such as heavy rain and rising tide (P1, P3, P10). Flooding affected seriously most socio-economic sectors, especially agriculture, aquaculture, industry and services. Interestingly, some experts mentioned the benefits of floods, for example: ‘Flood fertilises fields and supplies breeding stocks for

aquaculture' (P3) and 'Flood helps remove contaminated substances from aquatic-breeding ponds' (P11).

**'Sensitivity' category:** The interview answers integrated the social groups and economic activities that are most sensitive to climate change impacts, with agriculture and aquaculture attracting more concern from interviewees. Storms, floods and drought were identified as key reasons affecting agriculture and aquaculture, besides some other factors, such as saline intrusion and lack of water. Besides the reasons of climate change, most experts highly agreed that areas of cultivation and aquaculture will decrease considerably in the near future because of urban expansion and economic development requirements.

**'Adaptation' category:** The experts paid most attention on physical factors in the 'adaptation' category. Dike systems, especially the current East dike system, were cited as examples of adaptation to climate change conditions such as storms, flood and saline intrusion in the past as well as in the future. Interestingly, mangrove forests, a logical solution, gained specific attention from interviewees. P6 said: 'The mangrove forest in the Thi Nai lagoon in Quy Nhon city not only protects dike systems, reduces effects of storm, floods and erosion, but also establishes a convenient logical environment for developing aquatic species, contributing to the livelihoods of the local residents'.

In spite of the low ranking in the Delphi survey, some 'softly' adaptive solutions were mentioned in the interviews, such as: 'Strengthening capacity for responding to climate change', 'Improving educational and communicative programs on climate change', 'Improving livelihood and changing jobs' and 'Improving researching and implementing activities on climate change'. The local experts pointed out some limitations of the current adaptive capacity of Quy Nhon city, particularly the ability of authorities and officials at both provincial and city scales. P2 and P3 noted a lack of official agencies which are responsible for climate change issues, while P10 assessed the situation of as limited professional attitude on climate change from local leaders.

## DISCUSSION

'Hard' infrastructure is very important for responding to climate change. This is clearly presented in the context of Quy Nhon city which is seriously affected by many hazardous events such as storms, floods, erosion and drought. Consolidating dike systems and planting mangroves may be appropriate solutions to prevent and reduce damage and loss from disaster risks not only for Quy Nhon city but also for other coastal cities in Vietnam. However, it is only one approach to adaptation and building adaptive capacity. A special concern is that it does not account for social vulnerability.

Social vulnerability is the exposure of groups or individuals to stress as a result of social and environmental changes, where stress refers to unexpected changes and disruption to livelihoods (Adger 1999). It is determined by factors such as poverty and inequality, marginalisation, food entitlements, access to insurance, and housing quality (Adger & Kelly 1999). It also is affected by other factors, such as gender, ethnicity, religion, class and age (Cutter 1995). It is helpful to disaggregate social vulnerability into the two distinct aspects of individual and collective vulnerability in order to clarify the scale and unit of analysis for assessments of social vulnerability. According to these explanations of the term 'social vulnerability', the experts' perspectives obtained from the Delphi survey and interview did not enough mention the susceptibility of social aspects and their solutions. Moreover, they just pointed out several factors belonging to collective vulnerability, such as institutional structure and infrastructure, but not individual vulnerability. Absolutely, these limitations will be a great constraint to completely develop a policy framework for building adaptive capacity to reduce social vulnerability.

Adaptive capacity to climate change represents a variety of ways for reducing social vulnerability and, thus, reducing the risk associated with a given hazard (Brooks 2003). Adaptive capacity comprises the resources and capabilities that a society of community can bring to the task of reducing risk and vulnerability, including physical, institutional, social and economic means as well as skilled personal and collective attributes such as leadership and management (UNISDR 2004). These issues reveal a requirement for this research that more factors associated with adaptive capacity, especially specific ones in the context of Quy Nhon city, should be explored in order to select suitable adaptive strategies. Indeed, the factors in the conceptual model listed by the experts need to be supplemented by social vulnerability and 'soft' adaptive capacity factors.

## CONCLUSIONS

Climate change is a complex issue with many uncertainties, especially in the specific context of a coastal city in Vietnam, a fully socio-economic system under the effects of many hazardous events. This research engaged experts for exploring factors related to climate change in Quy Nhon city through the three-round Delphi survey and in-depth interviews. The local experts recognized many elements, including three categories (exposure, sensitivity and adaptation), which are closely associated with changes of climate. However, this research recognized that there were limitations in the local experts' cognition of issues related to climate change, partly because of their complexity.

The outputs of the Delphi survey and the interviews of local experts asserted that erosion, storms, floods, drought and sand drifting are the main events associated with climate change stimuli in Quy Nhon city. Agriculture and aquaculture with two their specific groups of people, such as farmers and fishermen are very susceptible to climate change. Besides, some other groups such as poor people, salt workers and people living near the sea, lagoons and lowland areas also got the concern of the expert panel.

In terms of the 'adaptation' category, experts appreciated existing 'hard' infrastructure, for example the current dike systems, flooding drainage systems and mangroves, as main elements of Quy Nhon's adaptive capacity to respond to climate change. However, the panel also indicated some of the limitations of these systems, including their degradations over time. As a result, consolidating the dike and flooding drainage systems and planting mangroves were emphasized as the best solutions of Quy Nhon city for adapting to climate change.

Some factors related to social vulnerability and 'soft' solutions were mentioned in this research, but gained low rankings. This revealed the fact that most experts and local decision makers in Quy Nhon city or other areas in Vietnam as well as developing countries still pay more attention to physical and engineering solutions with high fees, short-term benefits and unsustainability for responding to climate change, while 'soft' solutions focusing on social aspects do not get appropriate concerns.

The next step of this research is to identify the human factors associated with social vulnerability and adaptive capacity in order to develop a comprehensive policy framework to respond to climate change in Quy Nhon city.

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### **Paper 3: The urban resilience in historic centres damaged by the earthquake: the case of Emilia Romagna Region (Italy)**

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#### **ABSTRACT**

The earthquake that struck the Po Valley in May 2012 caused deaths, injuries, considerable damages to the cultural heritage and to the economic activities. After the seismic event, the images of the rubble and the frightened faces of the local people have expressed the imminent need of interventions and appropriate strategies to face similar dangers. The tools, which we can use to answer the question of safety and of liveability of our cities, involve various issues such as the political choices, regulations and building codes, scientific knowledge applied to the construction sector, the involvement of the community and the need to increase understanding of the possible risks. These aspects contribute to develop a resilient urban planning and stimulate the research into new methods of urban analysis.

While vulnerability assessment procedures were proposed in Italy by National Group for the Defence of Earthquakes (GNDT/CNR) already after the seismic event of Friuli Venezia Giulia Region in 1976, the evaluation of the urban resilience is not yet quantified and it is not adopted to identify solutions against natural/anthropogenic hazards. Therefore, it is indispensable to investigate the relationship between resilience and risk and work out a new approach to prevent damages due by natural and human event.

**Keywords:** resilient urban planning, Seismic hazard, SWOT analysis, Vulnerability assessments.

#### **INTRODUCTION**

The Making Cities Resilient campaign support the public policy for implementing disaster risk reduction and resilience activities. The campaign offers «the Ten Essentials» actions which should guide the local governments towards the disaster risk reduction planning process (UNISDR 2012, p. 25). In 2005 the members states of the United Nations have endorsed a global agenda and campaign to building resilient nations and communities, the Hyogo Framework for Action 2005-2015 (UNISDR 2012, p.11). Moreover the UN Sustainable Development Solutions Network (SDSN), launched in 2012 to identify the next targets post-2015, has organized several thematic working groups on key issues of sustainable development. The Leadership Council of SDSN has indicated among the topics «Empower Inclusive, Productive and Resilient Cities» (SDSN 2013, p. 18). One target of this point is «Ensure safe air and water quality for all, and integrate reductions in greenhouse gas emissions, efficient land and resource use, and climate and disaster resilience into investments and standards» (SDSN 2013, p. 30).

In reference to these considerations, recently some Italian cities have developed proposals to implement their own level of urban resilience (Prasad et al., 2009): Milan has adopted environmental protection measures for the reduction of air pollution; Venice, after repeated events of “high water”, studied a futuristic design, the MOSE (Modulo Sperimentale Elettromeccanico - Experimental Electromechanical Module), to avoid flooding and the consequent damages to economic activities, buildings and social unrest.

The cities of Emilia Romagna Region, damaged by the earthquake of 2012, are preparing to begin a process of socio-economic recovery but which are the actions that will make these

cities more resilient in the future? The Making Cities Resilient campaign gives us many considerations to identify the image of the resilient city but one of the five Hyogo Framework for Action priorities is very helpful to meet the needs of the people affected by the earthquake: «Know your risk: Identify, assess and monitor disaster risk and enhance early warning» (UNISDR 2012, p. 11). Risk and resilience seem to be linked and it is important to understand what these concepts mean to increase the ability of the cities to absorb the sudden events. The knowledge of the issues of our cities promotes the developing of post-event reconstruction plans or pre-event mitigation plans.

Risk can be considered as the possibility that a natural or human event can bring harmful effects on the population, human settlements and productive infrastructure, within a given site, in a given time period (Italian Department of Civil Protection 2013) and it is determined by the relation:

$$R = H \times V \times E.$$

Where H is the hazard, namely the probability that a phenomenon in a given time period, such as the seismic activity, exceeds the thresholds of alarm. The seismic hazard varies from area to area, we can study it seeking historical earthquakes and using the geological and seismological data collected. The vulnerability V can be regarded as the propensity of peoples, buildings or infrastructures to suffer damages. Finally, the exposure E indicates the cultural, the social and the economic consequences corresponding to different levels of damage. For example, if an earthquake occurs in a desert, the exposure will obviously be anything; conversely, in a town with a high density it will have rather high values.

Resilience, instead, is a term used in several disciplines, from engineering to sociology, urban planning with different meanings. We will assume the definition originally referred to the ecological systems that resilience 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, p. 14). The resilience put beside by the concept of stability, considered as «the ability of a system to return to an equilibrium state after a temporary disturbance» (Holling 1973, p. 17). In essence resilience and stability are two properties that describe the behavior of a system, such as an urban center or a small settlement. We can observe, as the same Holling highlights, that does not necessarily resilient systems are also stable, such as the forests, which can show some flexibility for adaptation to climate change but have a low stability.

### **Background on the 2012 seismic event**

The plain of Emilia Romagna Region has been hit by a long seismic sequence in the provinces of Modena, Ferrara, Mantova, Reggio Emilia and Bologna. The more intense quake of magnitude MI = 5.9 was felt on May 20th, 2012, at 04:03 Italian time (02:03 UTC) and localized by INGV National Seismic Network at 6.3 kilometers depth with epicenter in Finale Emilia town. Another similar shock occurred on May 29th, 2012, the magnitude was of MI = 5.8 at 09:00 Italian time (07:00 UTC), at 10.2 kilometers depth and the epicenter localized in some municipalities of the province of Modena. Later, June 3rd, 2012, there was a quake of magnitude MI = 5.1 that has affected even the provinces of Mantova, Reggio Emilia and Modena.

The cause of the earthquake is the geological condition of the Po Valley, consisting of fluvial sediments, which absorb the tectonic thrust of the Adriatic plate in North-South direction (Paolini et al., 2012, pp. 8-9). From historical data it appears that in the same geographic region and in the close areas there have been similar earthquakes already in 1117 with epicenter near Verona. Between the thirteenth and the sixteenth centuries several earthquakes had struck the municipalities in the provinces of Bologna, Modena and Reggio Emilia. Other shocks of intensity IX MCS (Mercalli-Sieberg Cancani) were felt on the Apennines' chain in



1501. The city of Ferrara in 1346 and later, in 1570, was badly damaged by two memorable earthquakes that devastated especially the medieval core of the city. We also remember the tragic events of 1624 in the nearby town of Argenta of intensity VIII-IX MCS.

In 1996, new shocks were felt in the provinces of Reggio Emilia and Modena. In that occasion the expert's group of ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) made an experimental dynamic characterization of the San Giorgio in Trignano Church and the Bell-Tower Complex, in San Martino in Rio (Reggio Emilia, Italy) and it was realized an innovative restoration, including the insertion of 4 vertical steel ties in series with Shape Memory Alloy Devices (SMADs) (Indirli et al., 2012, pp.70-73). The studies on the masonry building and the new technologies have made this church more stable.

Also the earthquake of 2012 caused many damages to churches and other building of historical interest, as the Fortress of San Felice sul Panaro, called Rocca Estense. The Fortress was built in the XIV century and in the next century it were added further fortification by architect Bartolino da Novara, giving to the monument the present-day configuration (Indirli et al., 2013). Now the Fortress and many churches wait interventions and restoration works that could help them to absorbing the next possible natural events.

In addition to the damages suffered by the real estate there were twenty-seven confirmed dead and many evacuated families. Six months after the earthquake the authorities evaluate damages for more than € 12,202,000,000 and many people now are without work. Manufacture and trade sectors were the most hit by economic damages to the productive activities and also heavy impacts occurred in agriculture and in the food chain. It is a summary budget but it is representative of the material consequences of the event, to which it must be add the social unease and the fear, not quantifiable but no less important.

## **THE QUANTIFICATION OF THE SEISMIC RISK**

While the study of the seismic hazard is dealt through the catalogues of the historical earthquakes, supported by documentary evidences, the vulnerability of the historical centres is analyzed with different assessment procedures and the exposure of the cities, instead, is measured by damages suffered. In the following we examine these topics in reference to the case of Emilia Romagna.

### **Seismic hazard**

At the present time the Italian seismic zoning has been defined according to the conventional probabilistic approach (PSHA, Probabilistic Seismic Hazard Assessment). The estimation of the likelihood that different levels of ground motions will be exceeded requires the division of the territory into zones. The probabilistic approach considers the contribution from all seismogenic sources. Finally it is required the determination of the sources' effects, which vary according to distances, through attenuation relations of the parameter seismological chosen as indicator of the hazard: the maximum acceleration of the ground or macro seismic intensity. The first is useful to define the structural characteristics necessary for the buildings in seismic areas, the second one describes the level of damage done by earthquakes. The hazard maps, worked out in reference to the maximum acceleration of the ground, show the shaking corresponding to a 10% change of being exceeded in 50 years on the rigid and flat ground. Maps made are related by suppositions on the recurrence of the strong earthquakes, which are uncertain.

The seismic hazard maps have been updated after the earthquake of San Giuliano di Puglia (Molise) in 2002 and afterwards in 2006 but nevertheless, the maximum horizontal peak ground acceleration (PGA) recorded in Mirandola (Modena) is about 0.30g, while the values

of the current zoning are between 0.150-0.175g (Marzo et al., 2013, pp. 139-140), data indicating a limited reliability of the probabilistic method.

More recently the scientific community has got great interest in the neo-deterministic approach (NDSHA, Neo-Deterministic Seismic Hazard Assessment). The realistic synthetic seismograms allow constructing earthquake scenarios. The ground motion parameters are based on the seismic wave propagation modelling. The hazard maps, with the NDSHA method, consider the maximum values of the acceleration of the project (DGA), the displacement and the speed. This methodology measures the ground shaking expected considering all earthquakes, which are referenced to a given geographic location, and all available information, such as the geological data collected, the characteristics of the sources, the propagation and the site effects without resorting to the attenuation relations (Panza et al., 2005, p. 87).

### Vulnerability assessments

The evaluation of the seismic safety/usability/damage/vulnerability of the building uses assessment forms depending on construction technology, such as masonry, reinforced concrete or building type, such as churches, palaces.

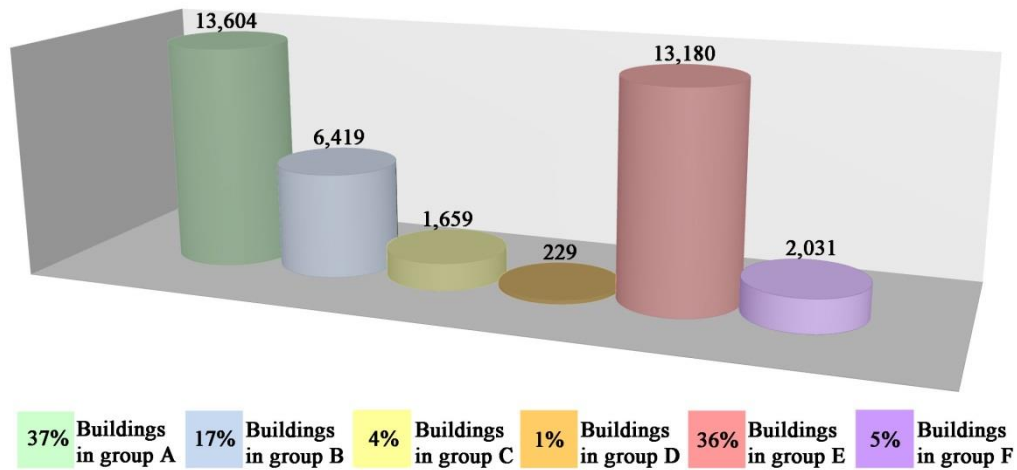
The forms called AeDES (Agibilità e Danno nell’Emergenza Sismica - Fitness for Use and Damage in the Seismic Emergency) are result of experience gained by Civil Protection after the earthquake of Umbria and Marche in September 1997 to identify the damages and the level of usability of the buildings. These forms have been also used after the seismic event that struck Abruzzo Region in 2009 and Emilia Romagna Region in 2012, during the inspections carried out by teams of experts. The outcomes is expressed on a scale, from A to F namely from the class of buildings declared usable to the category of buildings declared unfit for structural risk or external risk, as shown by Table 1. Both E and F groups should be considered unsafe and subjected to the mandatory evacuation.

**Table 1 Outcomes of fitness for use, AeDES**

A	fit for use
B	fit for use with prompt interventions
C	partially fit for use
D	not fit for use, necessity of a deeper analysis
E	not fit for use
F	not fit for use, due to risk from neighbouring structures

(Source: Department of Civil Protection 2012)

The test carried out until August 1st, 2012, in the provinces of Bologna, Ferrara, Modena and Reggio Emilia after the seismic sequence and spread by Civil Protection are reported by following figure. On a total of 37,122 buildings analysed it can be observed that only 37% (group A) of these is still usable, 41% (groups E and F) is not usable and 22% (groups B, C, D) is made up of buildings partially or temporarily uninhabitable.



**Figure 1 Chart of the usability of buildings in Emilia Romagna Region (Source: Author)**

Instead the methodology developed by National Group for the Defense of Earthquake (GNDT/CNR) dates back to early 80s, after the earthquake of Friuli Venezia Giulia Region in 1976 and especially after the seismic event of Irpinia in November 1980 but it has been applied for the first time in 1983, after the earthquake of Parma (Emilia Romagna, Italy). The approach is based on the direct study of the structural characteristics of the buildings. There are two kinds of GNDT forms: the first takes the general information of the buildings, the second identifies their level of vulnerability, using information about the resistant system, so as to obtain an index, namely a numerical estimation. Exactly first level forms are divided into eight sections: data form, locating of building, metric data, use, age of the building and interventions, state of the finishes, structural type, referring to the vertical and to the horizontal structures, stairs and roofs, extent and level of damage. The forms of the second level, for example for masonry buildings, identify eleven parameters, shown in Table 2. To every parameter is assigned a class from A, the best, to D, the worst and to each class corresponds a score. All parameters have a “weight”, which represents their importance. The product of every score for its importance provides a partial index, from their sum; we get the vulnerability index that indicates the propensity of the building to suffer damages. This model requires more processing than the AeDES forms. It is useful to manage the operational phases of the reconstruction. It also provides information on large urban areas, from single aggregate to entire city centers. Although these forms not yet been applied to the case of Emilia Romagna, they were used in others circumstances like the recent Reconstruction Plan of Arsita (TE), a town damaged by the earthquake that struck Abruzzo Region in 2009.

Lastly we briefly recall the methodology MEDEA (Manuale di Esercitazioni su Danno Ed Agibilità - Manual of Exercises on Damage and Fitness for Use), which was worked out by National Seismic Service of the Civil Protection to describe with a qualitative approach which are the mechanisms of damage suffered by buildings. The MEDEA is useful to evaluate large build-up areas and have been used, for the first time, after the earthquake in Molise in 2002. The analysis of the buildings is carried out with the relief of the cracks presented in the walls of buildings, which are associated with the mechanisms catalogued in the data sheets MEDEA. The mechanisms are divided into local and global: the first one looks at the structures as a whole, latter concern only some elements of the buildings.

**Table 2 Scores and importance of the individual parameters of GNDT forms, level II**

MASONRY BUILDING					
PARAMETER	CLASS				WEIGHT
	A	B	C	D	
Type, organization of resistant system	0	5	20	45	1.00
Quality of resistant system	0	5	25	45	0.25
Conventional resistance	0	5	25	45	1.50
Location of building and foundations	0	5	25	45	0.75
Horizontal elements	0	5	15	45	Var.
Planimetric configuration	0	5	25	45	0.50
Configuration in elevation	0	5	25	45	Var.
Maximum distance between the walls	0	5	25	45	0.25
Coverage	0	15	25	45	Var.
Non-structural elements	0	0	25	45	0.25
Condition of the building	0	5	25	45	1.00

### Exposure

Providing with a quantitative assessment of the exposure is certainly not simple because it is necessary analyze the relationship of the buildings with the socio-economic urban system. The damages of the real estate affected should be quantified like physical damage and like functional impairment for the loss of the services offered to the community.

The risk's estimate is calculated multiplying the assessment of the expected damage by the correction factor, which will be called index of exposure, dependent by the function of the building, the index of the function and by the quantitative data on the number of users of the building, the index of users, in their turn separable in other parameters (GNDT 1993, p. 106). The expected value of the damage is determined using the data of seismic hazard and vulnerability, previously collected; it is a fraction of the value of the building. If we assume that this is equal to its unit cost of construction, so the expected value is estimated as the value of the cost of damages for unit of volume and its determination must be correlated with the frequency of earthquakes of the year (GNDT 1993, p. 123).

### A METHODOLOGY FOR THE URBAN RESILIENCE



In the introduction we have outlined the concept of resilience in reference to the ecosystems, which are the set of populations, habitats and organisms that live together in the same territory. The complexity of ecological systems, the human need to manage the life in the cities, the demand of sustainable development have fueled, in recent years, the trend of urban planning toward the resilience approach. An idea shared by many countries that aims to ensure the urban balance, which is very brittle, as demonstrated by natural disasters, from earthquakes to floods to cyclones. The low level of adaptability to the forces acting suddenly on the systems is witnessed of the consequences that the events mentioned may do.

Strategic planning, which is adopted in recent years by many Italian municipalities and also by the cities of Emilia Romagna Region, is considered as a process and not as a product of planning. It is supported by the community approach and it is carried out in participatory policy. Moreover it is sensible to the topics of the sustainable development. The strategic plan is action oriented, it is opposed to urban plan that impose rules, as it was the General Town-Planning Scheme, used in Italy (Fera 2008, p. 91). We would like put in the strategic planning also the concept of the resilient city and apply to this the methodologies of urban analysis, which are currently the most interesting.

In order to make the urban resilience the target of planning and in order to achieve the evaluation of the urban resilience, we would propose the use of the SWOT analysis. It is a methodology employed to study the local contexts and it is considered a real technique for the urban diagnosis. SWOT analysis was born over fifty years ago in the corporate sector and then it was imported into other areas. It has been supported by EU policies for European development programs, such as the Community Support Frameworks 2000-2006. SWOT stands for Strengths, Weakness, Opportunity and Threats, each of this topics is inserted inside a matrix to analyze any theme, such as the urban resilience, by four different points of view (Table 3).

In summary, the application of the method requires the identification of internal and external elements to the context. The first will be classified as strengths and weaknesses while the latter will be represented by opportunities and threats. All elements identified may relate to various areas: environment, administration, economy and finance, society, culture.

**Table 3 Building of a matrix SWOT**

Internal elements to the framework 	STRENGTHS	WEAKNESS
External elements to the framework 	OPPORTUNITY	THREATS

The strengths are represented by the resources available to the community, with meaning very broadly of the concept of resource, including human capital and scientific research, also the values of one's community can be counted in this category. Fall in the group of the weaknesses, instead, the set of conditions that may hinder the desired objectives, such as the lack of technical knowledge in the field of the risks or the low level of collective involvement. The category of opportunity represents all opportunities that are waiting to be identified and cultured, the same regulations become an opportunity if used wisely. Finally, the threats are represented by the factors that generate imbalances in the system, the seismic risk can be understood as one of these.

The elements that are internal to the context may be modified by the provisions of the plan, while the external elements are independent of our choices. All data collected in the four categories will be evaluated using the numerical assessments or the public opinions or both ratings to a possible confrontation. Therefore the evaluation of the resilience requires the identification of indicators and the research of mathematical models to estimate each parameter. At the end of the analysis we can develop a plan that will enhance the strengths, taking the advantages of the external opportunities. The plan will be able to remove or minimize the obstacles namely the weakness, lowering the level of threats. This methodology has been widespread in many field, such as local policies for the development of the employment and there is already the application of SWOT analysis in some Italian areas like Calabria Region.

## CONCLUSIONS

Increasing the resilience of the our cities is useful to develop new models of urban planning, more sustainable, which requires an interdisciplinary approach, as evidenced by the SWOT analysis and the active participation of experts and community. According with the Making Cities Resilient campaign it is possible assume a resilient city «one where disasters are minimized because the population lives in homes and neighbourhoods with organized services and infrastructure that adhere to sensible building codes» (UNISDR 2012, p. 10). Furthermore the resilient cities protect the cultural heritage and the environmental, they are able to restore basic services and economic activity. In short the resilient cities react to the risks.

The next objective should be the estimation of the resilience and the consequent relationship with the costs required to have more resilient cities because we consider the disaster risk reduction as an investment.

The governance is an important tool to raise awareness towards the nascent social issues as that of resilience and everybody is called to interact on the issues of our city. We hope that the public attention and the interest in these topics is not related to the emergencies, following the natural disasters but it is constant and it produces valid results in a reasonable time for the mitigation of the risks.

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## **Paper 4: Post-disaster Housing Reconstruction as a Significant Opportunity to building Disaster Resilience: a Case in Vietnam**

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### **ABSTRACT**

Housing and climate disasters have a close relation in Vietnam. Cyclones have been seen as the most common and dangerous hazards associated with critical damage and losses of local housing and livelihoods. Besides destructive strengths of climate events, fragile physical and socio-economic conditions also contribute to increased housing vulnerability to storms. In addition, post-disaster housing reconstruction (PDHR) is still commonly seen as a single recovery action separated from the process of building resilience in this country. This paper, therefore, examines issues of resilient housing in the light of PDHR to identify key factors required for a resilient housing system. A Case study is applied to investigate these factors with a focus on the NGO Development Workshop France's donor-built housing and the people's self-built housing in Vietnam as the selected case. The results show that housing reconstruction can improve pre-disaster fragilities and needs to be viewed as one of key stages of housing development processes. Findings also suggested that, to build resilient housing, physical unsafe conditions should be focused at the same time of enhancing socio-economic and institutional aspects such as supporting local economy development, applying building permits for safe construction or improving governance mechanisms that low-income vulnerable families can access local professional services (i.e. local architects and engineers) for consultations on safety-related instructions.

**Keywords:** natural disaster, resilient housing, housing vulnerability, post-disaster housing reconstruction.

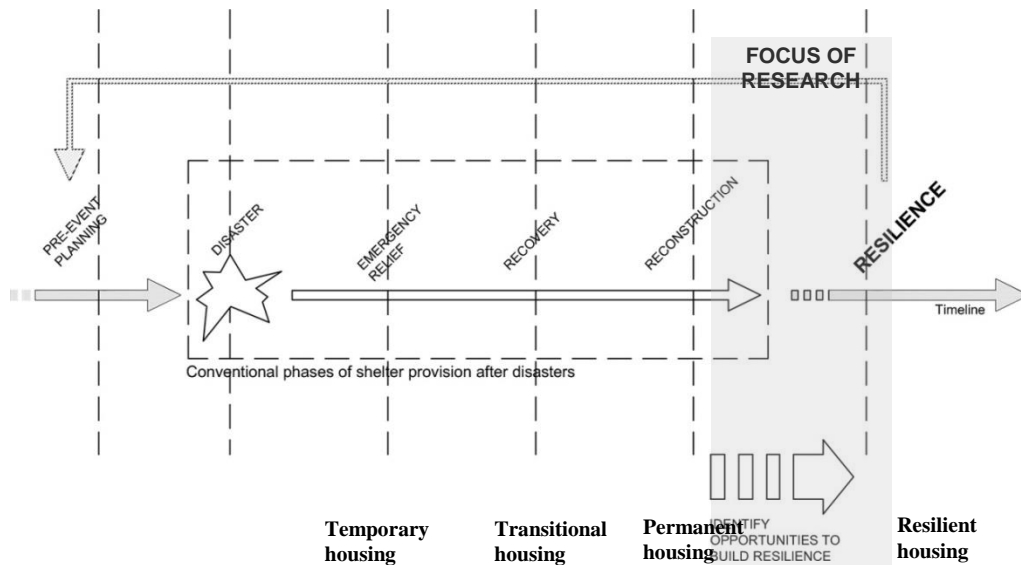
### **INTRODUCTION**

Housing often represents one of the most vulnerable sectors to climate change in Vietnam. Many authors (e.g. Amaratunga and Haigh, 2011; Bosher and Dainty, 2011; Johnson and Lizarralde, 2012) and implementing agencies (e.g. UN-HABITAT, International Federation of Red Cross and Red Crescent Societies, and Habitat-for-Humanity) have highlighted the link between post-disaster housing reconstruction (PDHR) and the achievement of long-term housing resilience in which demands of resilience can be identified and met in the reconstruction period. In Vietnam, this link is still limitedly addressed so far because of excessive concentrations on physical aspects of housing (i.e. adding strong beams, pillars or connections between elements) while socio-economic and cultural dimensions are less considered or even neglected. This paper, thus, examines this relationship through a case study in Vietnam in order to provide an overview of disaster resilient housing and to identify key issues for housing resilience.

Many studies and practices clarify three clear stages of housing provision following a disaster: temporary housing in emergency period, transitional housing in recovery, and permanent housing in reconstruction period (Davis, 2011; Johnson and Lizarralde, 2012; SKAT and IFRC, 2012) (Figure 1). The reconstruction of permanent housing after disasters, targeting better housing than pre-disaster conditions (Schilderman and Lyons, 2011), can bring opportunities for development for the affected communities (Lizarralde et al., 2010; Amaratunga and Haigh, 2011; Archer and Boonyabancha, 2011). In addition to recovering damaged parts, housing reconstruction also enables the enhancement of social, economic and environmental functions (UNEP and SKAT, 2007) that existed before disasters. In line with



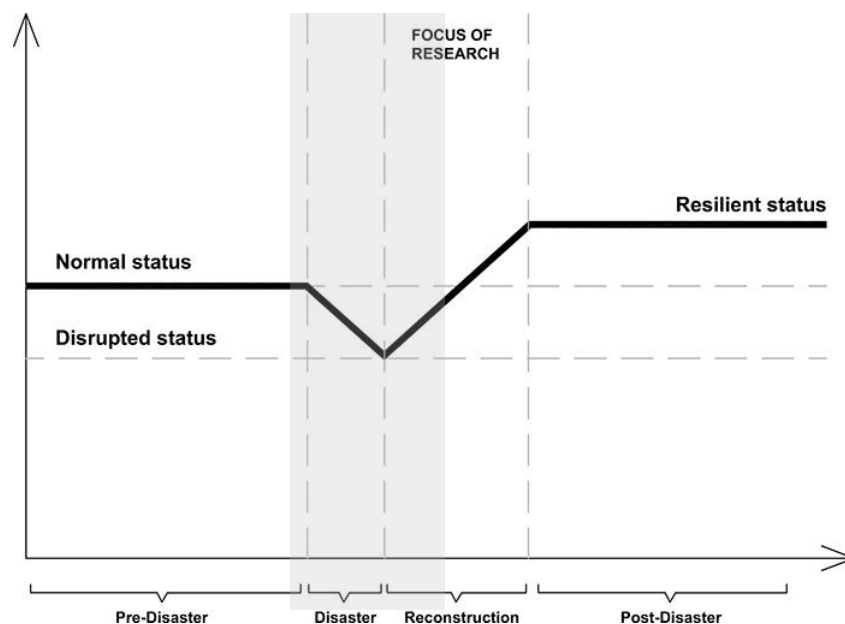
this, the paper focuses on PDHR to investigate chances and challenges for building long-term housing resilience.



**Figure 1** The significance of post-disaster housing reconstruction in building long-term resilience

(Based on Davis, 2011; SKAT and IFRC, 2012; Johnson and Lizarralde, 2012)

As mentioned before, PDHR in Vietnam is still considered as a single recovery action with a limited relation to housing and community development toward a more disaster resilient society. Literature suggested that the development of disaster affected communities should be integrated into the course of PDHR since it plays a key role in the process of creating housing in pre- and post-disaster periods (UN, 2006; Archer and Boonyabancha, 2011). Its roles should be broadened to making households and community more resilient to future shocks, stresses or changes associated with natural hazards (Schilderman and Lyons, 2011). By this way, PDHR is likely to improve housing status from normal conditions, usually non-resilience, to resilient levels (Figure 2) for the stable development of vulnerable communities (Archer and Boonyabancha, 2011). Within this sense, this paper investigated core issues of disaster resilient housing in the light of permanent shelter after disasters.



**Figure 2** Post-disaster Reconstruction as a significant opportunity to reach a more resilient status

### **Definition of Disaster Resilient Housing**

As building housing resilience is the key aspect of this research, the understanding of resilience is critical to capture the meaning of disaster resilient housing (DRH). Among several writings reviewed, disaster resilience is perceived in different ways and, sometimes, is used interchangeably with the term climate resilience. However, an agreement among authors is made concerning its meaning, that resilience is the ability of an individual (i.e. a house) or system (i.e. community) exposed to a hazard to resist, absorb, accommodate the effects of that hazard and to bounce back to normalcy in a timely and efficient manner without significant changes of its basic structures (ISET, 2012; UNISDR, 2009; Amaratunga & Haigh, 2011; Pendall et al., 2010; IFRC, 2012).

Housing is not an exception as it is considered one of the most vulnerable sectors in Vietnam (MONRE, 2008). Based on the above concept, it can be understood that DRH is only achieved once shelter and settlements are able to effectively reduce impacts of hazards without critical changes of their functions and settings.

### **Targeted Housing Reconstruction Approaches**

In the aftermath of a disaster, there is usually a vast population whose houses were totally destroyed or collapsed. Despite attempts of local governments and agencies to rebuild collapsed houses, there was always a considerable amount of victims standing outside these aids, known as non-beneficiaries, and seeking various ways of reconstruction on their own. In research community, most literature tends to focus on post-disaster housing reconstruction with external supports from donors, such as the housing reconstruction projects funded by the Red Cross or Habitat for Humanity (HFH), but very few texts discuss the self-built reconstruction without external supports. In order to understand the overall perspective of post-disaster housing, this study aims to examine both approaches, as follows:

- **Self-built** where people rebuild their houses on their own without supports (non-beneficiary) (e.g. Marcillia and Ohno, 2012 for Japan case).
- **Donor-built** where donors help to rebuild their houses (beneficiary) (e.g. Karunasena and Rameezdeen, 2010 for Sri Lanka case; Shaw and Ahmed, 2010 for India).

These two approaches have been pursued in Vietnam for years, especially after the 1999 big flood. The flood attracted a lot of international attention to PDHR. However, self-built post-disaster housing is still limitedly addressed whereas donor-built ones are heavily discussed and praised in forums, such as the IFRC-funded houses built after the 1999 flood and HFH-funded houses built after the 2009 typhoon. Since the reconstruction approaches and stakeholders involved are far from similar between donor-built and self-built post-disaster housing, it is necessary to identify the factors affecting housing risks and resilience in each approach to gain an in-depth understanding of their strengths and weaknesses.

## **METHODOLOGY**

### **Case Study Approach**

As this research tends to deal with qualitative issues related to social pressures and settings beyond the formation of resilient housing, case study, one of the most common frameworks for qualitative research (Bryman and Burgess, 1999), is selected to investigate core issues for achieving resilient shelter. This approach helps provide in-depth insights about socio-cultural driving forces to the development of disaster resilient housing (Bryman and Burgess, 1999). Because housing solutions are context-specific due to different local backgrounds of communities and people in need (Jha et al., 2010), there was no 'perfect' approach for all

cases (or contexts). Therefore, the seeking of a framework suitable for the case of Vietnam is essential to investigate resilient housing options for this region.

A project site of the NGO Development Workshop France (DWF) in Loc Tri Commune, Thua Thien Hue Province, Vietnam was selected as the case study, because it was considered as one of the most successful cases of DWF. Housing reconstruction, known as donor-built, after typhoon Xangsane in 2006 was examined in parallel with self-built houses (rebuilt by owners). This provides a comprehensive vision to PDHR and links to resilient housing. The examination of DRH in the real situation of this case-study area enables the identification of strengths and weaknesses of donor- and self-built housing and offer significant chances for the development of DRH in Vietnam.

### Data Collection

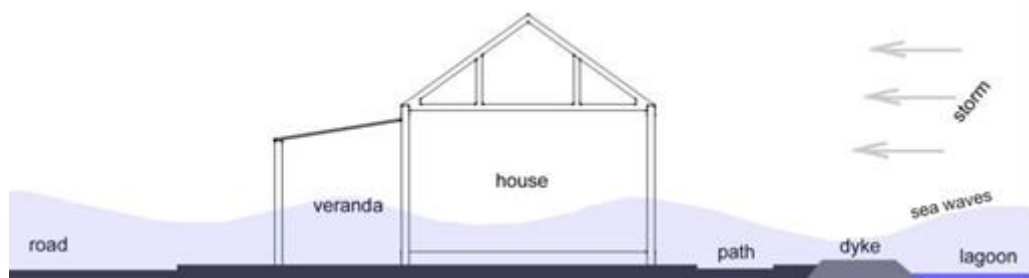
Data were collected by two methods: in-depth interviews and focus group discussions (FGDs). In addition, photography and hand-sketches of some surveyed houses were also collected to double-check the information gathered from interviews. Ten semi-structured interviews with ten households, five donor-built and five self-built, were undertaken, followed by two open-ended FGDs with local representatives (local authority at commune level and community-based organisations) and local builders (10 persons per group). The themes for household interviews and FGDs were related to people's awareness, stakeholder's roles, responsibilities, and contributions in the field of PDHR and disaster risk management.

### Data Analysis

Categorisation, grouping and comparison techniques were used to compare and contrast themes between self-built and donor-built post-disaster housing for a further assessment and identification of their strengths and weaknesses towards the development of resilient housing. Key lessons learnt from this comparison will be provided as the main outcomes of this paper.

## CASE-STUDY DESCRIPTION

Loc Tri Commune is located near a lagoon and next to the sea in Thua Thien Hue Province, Vietnam, an area where post-disaster houses were constructed by DWF after typhoon Xangsane (2006). This area was selected as case study. In this community, storms and sea waves resulting from storms are considered as the main hazards to local housing (Figure 3). Storm winds intensify the strength of sea waves which, subsequently, press huge pressures on local houses when it approached the main land. According to household interviews, impacts of sea waves during storms are more intense and more dangerous than impacts from storm winds because they can destroy house's walls easily. According to FGDs, about 85% of local houses here still contain critical unsafe conditions in different degrees.



**Figure 3 Storm and sea waves are seen as the main hazards to local houses**

*The most hazardous threat is from sea waves. They are high and very strong in storms, may cross the dyke and cause insecure walls and risk of collapse of houses. All houses in this area must incorporate concrete beds and altars to protect the house's walls. (HI 1)*

The typhoon Xangsane in 2006 triggered critical damages to this commune in which nearly 100 houses were totally destroyed and over 300 houses were damaged. After this typhoon, DWF supported the reconstruction of seven houses, known as donor-built houses whereas the number of self-built post-disaster houses were much higher, about 30-40 houses according to local authority.

The difference between self-built and donor-built houses here was clearly seen in the roof structure (Figure 4). Donor-built houses contain more structural elements than self-built ones such as the use of reinforced concrete frames on both sides and at the middle of the house. This makes the roofs of donor-built houses stronger than self-built ones. Household interviews also revealed that the main reason of using fewer elements for roof structures was from their economic constraints. Most self-built households supposed that such elements would cost much more money while the stability of their houses did not significantly rely on their presence.

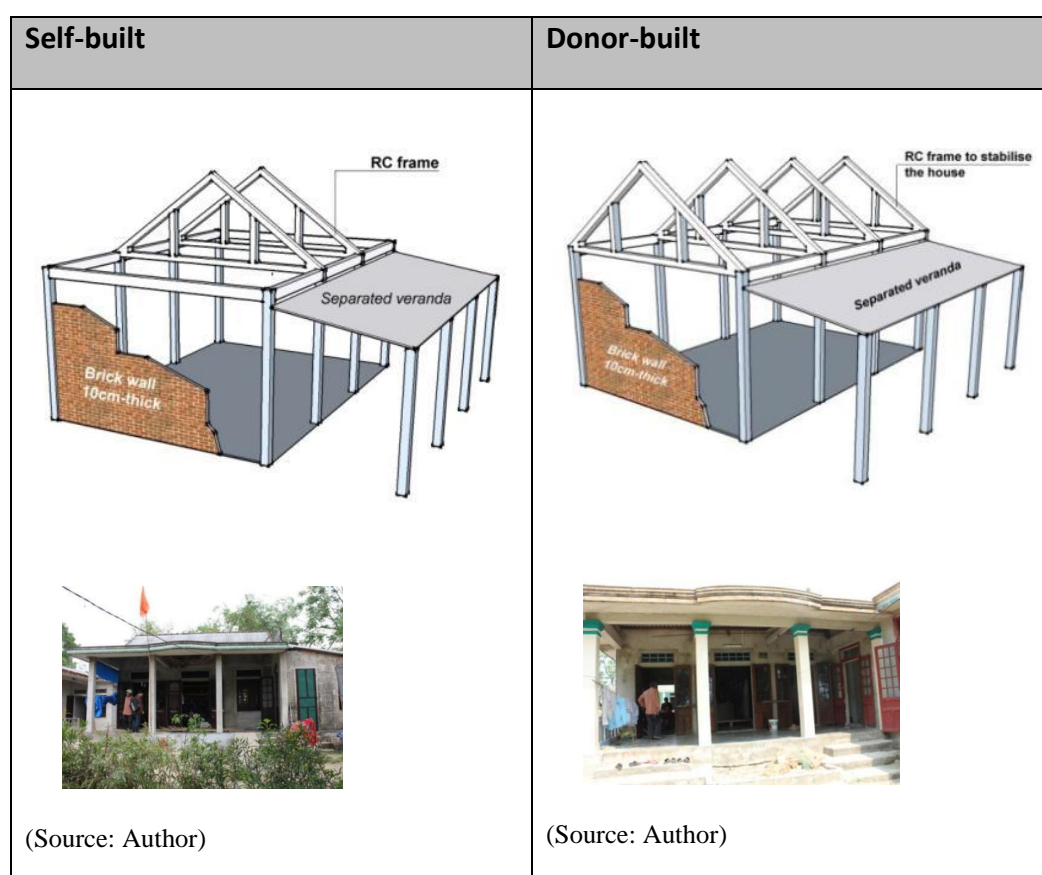


Figure 4 Difference between self-built and donor-built houses

## KEY FINDINGS

### Economic constraints undermine efforts for resilience

According to household interviews, people here have a long history in coping with extreme climate events and they take serious considerations to the preparation for disaster risk reduction (DRR). In 8 out of 10 houses surveyed, there were always some items for consolidating the house when stormy seasons come such as the wooden bars for putting on roofs, the tough fishing net to cover roofs, or the iron cables to anchor roof structures to the ground. They are not surprised when the Xangsane (2006) came as there were several similar

storms in the past. However, due to economic constraints, they prefer the use of immediate solutions in response to cyclones because they were much cheaper and easy for installation.

*My family has to buy these iron cables and nets to consolidate the house when storms come. They cost not much money but can help avoid unexpected damages. (HI 8)*

At the community and authority level, according to FGDs, the awareness of persons-in-charge seemed to be satisfactory since they could identify the main climate hazards and the most vulnerable sectors in their region and be worried of the worsened trend of future climate caused by climate change and global warming. Most of them believed that climate hazards will increase in the future and local housing, particularly the poor and low-income, is critically inadequate to cope with future disasters.

### **Local experiences prove their value in terms of DRR**

It can be inferred from the fieldwork that all 10 surveyed houses were well responsive to local needs. Self-built houses are not discussed here as owners were free to decide housing designs based on their needs. Within donor-built houses, even designed by the outsider (DWF), they still demonstrated a high level of responsiveness to people's lifestyles. For instance, spaces for cultural and livelihood demands were provided in donor-built houses. Spaces for fishing tools (livelihoods) and worship (culture) can be found in all five donor-built houses. As one donor-built householder said:

*The project team was highly respectful of local needs and allowed us to participate in the project as much as possible. For construction, we self-organised with local masons and all construction work was under a very strict supervision of the project's technical staff. (HI 3)*

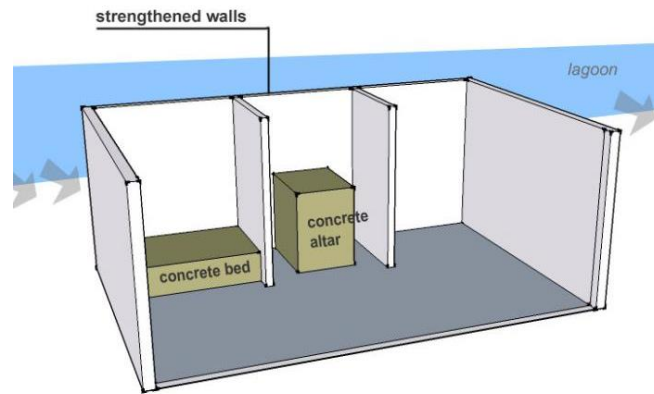
Another aspect showing high responses of local housing to disasters is the use of light-weight furniture like plastic tables and chairs to reduce damage. The light weight furniture is easy to move or lift up to hang on the ceiling during storms or floods. This could be found in both self-built and donor-built houses.

Interestingly, reinforced concrete (RC) beds and altars were commonly used in local practices of housing construction to consolidate the foot of the house's walls (Figure 5 & 6). As mentioned earlier, impacts of sea waves are more dangerous than storm winds and are more likely to destroy house's walls. The creation of such RC beds and altars is actually a valuable local wisdom in terms of DRR.

*You can find RC beds in all houses here. Because of their long experiences facing strong typhoons and sea waves every year, people here, by themselves, created this measure which is very effective, cheap, and durable. (HI 6)*

Learning from this local experience, the DWF applied it in their houses and RC beds and altars could also be found in all five donor-built houses.





**Figure 5 RC beds and altars work as consolidating elements for housing structure**



**Figure 6 RC bed (left) and RC altar (right) were found in all surveyed houses**

(Source: Author)

### **Limited governance and lack of consultation for disaster resilience**

In terms of governance, there has been no legal documents stipulating or instructing the construction of disaster resilient housing. Short-term solutions for protecting people and property are preferred in current governance systems whereas long-term strategies for building housing resilience are still absent. Most DRR actions are based on an action plan adopted from higher levels (i.e. from district and province/city levels). And those actions mainly involve immediate responses to disasters. In addition, building permits are not required for housing construction not only after Xangsane but also at the present times, particularly in the construction of low-income housing. People freely decided what their houses are without regulations, instructions or guidelines (building codes) for safe construction.

In terms of community consultation, there was no consultation for self-built reconstruction while community consultation was utilised for donor-built ones. While the construction of self-built housing was done by owners and local masons mainly, donor-built housing was co-designed with the collaboration between people (beneficiaries), community leaders, community-based organisations, local authority, local builders, and built-environment professionals. The process of community consultation applied by DWF followed two stages: a community meeting at the beginning with stakeholders involved and individual consultations later on with each beneficiary household to finalise design solutions before construction. With a full use of community feedback in housing designs, DWF provided effective housing products for this region after Xangsane that was highly appreciated and adopted by local people.

## DISCUSSIONS

In Loc Tri Commune particularly and in Central Vietnam generally, the difference between self-built and donor-built housing is quite transparent in reality but still limitedly mentioned in literature. Self-built houses are more culturally appropriate to local lifestyles but often less technically safety performance whereas donor-built often faces problems related to cultural appropriateness and local responsiveness despite the outcome of robust or strong structures.

Findings from case study show that although local communities have increasingly realised threats from climate, responses and measures for resilient housing seem to be limitedly addressed in Vietnam so far. Economic constraints are often the root causes of vulnerability (Wisner et al., 2004) and it was clearly seen in the case study in Vietnam where financial shortages reduced the improvement of disaster resilience for low-income groups.

While local knowledge and experiences of residents have proven their effectiveness in DRR and been extensively applied by the donor (DWF) in the donor-built houses, local governance mechanisms for disaster risk reduction on housing are still limited, particularly to the poor and low-income groups. As highlighted by ISET (2012), resilience is unlikely to be achieved if the institutional performance of local administration mechanisms is ineffective. Governance issues in DRR are widely discussed in literature. In Indonesia, they are limited to the problems of social conflicts, national security, decentralisation of top-down policies, and lack of political commitment (Seng, 2013). In Senegal, governance issues are scoped down to the constraints posed by topographical and geographical difficulties of vulnerable locations, unclear land tenure, extremely poor people, limited healthcare, and environmental degradation (Diagne, 2007). In New Zealand, higher levels of disaster governance were applied with the involvement of national legislations and government acts (Tierney, 2012). The case-study findings in Vietnam emphasises the necessity of applying institutional and governance solutions to build an enabling environment where the design and construction of disaster resilient housing become possible (i.e. applying safety-related building permits for hazard prone areas). So far, the master plans of Vietnam provinces and cities where building permits are applied only for urban areas have hindered the use of building permits for peri-urban and rural ones, frequently disaster prone regions.

It can be inferred from the case study that, in local regions of Vietnam exposed to disaster risks, there has been a big gap between low-income groups and local professional services (i.e. local architecture and construction offices, or local architects or engineers) where professional knowledge, expertise and skills for resilient construction are inaccessible for local people. The main reason comes from a lack of governance through building permits where design drawings must be included, and also from economic constraints of low-income families who cannot afford a hire of building professionals for their housing construction. Therefore, their practices, without technical supports, are likely to generate new risks to future disasters and potentially contribute to increased housing vulnerability. This poses a more responsible role from local governments and necessitates their active involvement to bridge this gap and release appropriate policies or supportive programs for building disaster resilience of low-income housing.

## CONCLUSIONS

This paper has introduced key considerations for the development of disaster resilient housing through a case study of PDHR in Vietnam. Donor-built and self-built post-disaster housing were examined to investigate opportunities and challenges in terms of building housing resilience. Within the context of an undeveloped country as Vietnam, challenges are often bigger than chances that require more assistance from external stakeholders for resilience capacity building. Derived from the case study, three main challenges to the achievement of disaster resilient housing in Vietnam are presented, as follows: (1) to improve household's economy, (2) to manage local housing construction for DRR, and (3) to bring professional



knowledge and expertise to the poorest and the most vulnerable groups and communities. On the other hand, the only one opportunity that was found in the case study is the strength of local knowledge and experience in DRR despite it is considered as inadequate for reaching disaster resilience.

This paper also provided a discussion on the relationship between PDHR and housing resilience where PDHR should be viewed as part of housing development process rather than a separate single recovery action as before. In this sense, the role of PDHR is extended to the improvement of fragile conditions existed before disasters rather than the construction of safe structures merely. This paper, through a case study in Vietnam, has concluded that PDHR is a significant opportunity to the development of disaster resilient housing.

## ACKNOWLEDGMENTS

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## **Paper 5: Metabolizing Metabolism: Reuse of Nakagin Tower Elements for a Community in Fukushima. Integrating High Technological Performance with Cultural Heritage and Psychological Needs of Displaced People**

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### **ABSTRACT**

A devastating natural disaster occurred in Japan, on March 11, 2011. It killed more than 20,000 people and displaced at least 340,000 more.

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

In principle with Japanese Metabolism movement, represented by Nakagin Tower, with the number of cultural proprieties damaged exceed 1000, and displaced people needs originate the idea to Metabolize Metabolism using the capsules to create a Village for displaced people after 2011 Tsunami.

To the psychological aspect, in fact, the most immediate and typical reaction to disaster is shock, which at first manifests as numbness or denial, and with suicide. The combination of 4 capsules, used to family or single people, can improve socialization and help traumatized victims.

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

**Keywords:** Emergency, Psychological needs, Lightweight, TRMI.

### **INTRODUCTION**

Japan is the example from which is possible to learn about the past disasters, to improve policies, laws, regulations investment patterns, and decision-making processes.

The Meji-Sanriku Tsunami on 1986, in fact, killed 40 percent of population. The Great East Japan Earthquake, in mass media GEJE (Shibahara 2011), claimed only 4 percent, in the equivalent effected zone. In the same way, the famous "Kamaishi Miracle" was the result of virtuous resilience and prevention processes based on continuous learning (GFDRR et al. 2012).

In principle with this good practise, 340,000 displaced people, significant cultural property losses and Japanese and Metabolism style movement, originated the idea to "Metabolizing Metabolism". (Japan ICOMOS. 2011) The modules of Nagakin Tower can be used to build emergency shelters and to create a village in Fukushima prefecture, for displaced people after 2011 Tsunami.

In this way a Metabolism icon can be "metabolized" in a modern solution, it is useful to meet Japanese social requirements and a historical heritage is preserved. According to the needs of displaced people, in fact, the village can be used to create new opportunities for socialization to get back a sense of normal life to the population and to help them to overcome the trauma (Kuwabara et al. 2008). At present the capsules are disposed on two interconnected concrete tower, from eleven to thirteen floors. The units furnished with kitchen and bathroom can be recombined in different configuration of four units, totally independent and covered by a curved roof. These modules can be a village up the safe hills closer to Fukushima prefecture cost a balance between psychological needs, safety, internal comfort and heritage.

### Tohoku quake

On March 11, 2011, a natural catastrophe occurred in Fukushima recorded at 9.0 on the Richter scale. It was the largest earthquake that has hit Japan (Japan ICOMOS 2011) and, it killed more than 20,000 people and displaced at least 340,000 more. 130,000 houses was levelled: 129,316 totally collapsed; 263,845 half collapsed; and 725,760 partial damaged (GFDRR et al. 2012).

Earthquake and Tsunami particularly affected the Fukushima, Iwate, and Myagi prefectures. Communications and economy were stopped: in fact, 638 prefectural and municipal roads were closed, 270 railways ceased operation, and 24,000 hectares of agricultural land were flooded (GFDRR et al. 2012). The disaster, furthermore, damaged or closed down key ports, and some airports which were shut down in a short time. These consequences of this hazard also disrupted the global supply chain of semiconductor equipment and materials, in fact, Japan who produces 20% of the world's semiconductor products, including indispensable electronic part of Apple's iPad. According to these data, the World Bank estimated that Japan's disaster would cost between \$100-\$235 billion, and five years to rebuild. This is worse than the \$125 billion cost evaluation for Hurricane Katrina (250 billion). The impact was 10 times worse than the 1995 Great Hanshin earthquake near Kobe, which resulted in over 6,000 casualties and cost of about 10 trillion yen (\$100 billion). In this occasion the rebuilding latest for seven years (Fengler et al. 2011).



**Figure 1-2 Post Earth quake image from Fukushima Prefecture. Sources: Cristina Pusceddu, Politecnico di Milano; Marco Imperadori, Politecnico di Milano.**

Despite the violence of earthquake, magnitude of 9.0, the decisive factor for the catastrophic consequences of earthquake event was the cascading effects of the subsequent tsunami that followed.

In fact, the crisis began when, after earthquake event, a devastating wave swept over cities and farmland in the northern part of the country, prompting warnings as far away as the West Coast of the United States and South America. The impact of tsunami has been extensive approximately for 200 km wide and 450 km long (Japan ICOMOS 2011).



## Nagakin tower

The Nagakin Tower Capsule is the icon of Metabolism style. It was designed by Kisho Kurokawa in 1972, in the Japanese Metabolism style, which is the icon.

Metabolism was the most important urban architectural, philosophical and artistic movement produced in the 20th century in Japan. Its influence went beyond the utopian concepts of a society that was experiencing rapid economic growth in the early 60s. Metabolic flow and circulation, with the meaning of regeneration, were the keywords of Metabolism style (The Japan Architect 1995). The manifest, in fact, opened with the following statement: “Metabolism is the name of the group, in which each member proposes further designs of our coming world through his concrete designs and illustrations. We regard human society as a vital process. The reason why we use such a biological word, metabolism, is that we believe design and technology should be a denotation of human society. We are not going to accept metabolism as a natural process, but try to encourage active metabolic development of our society through our proposals” (Lin & Zhongjie 2010). In order with this aim Kurokawa's initial Capsules concept for the building was an interchangeable and replaceable system. From this base, the building is composed by two towers built on-site rise, executed with a steel frame and reinforced concrete, and by 140 mobile capsules. When the Tower was built, it served as a hotel for business men; today it is still used as a second resident by commuters. The Nakagin Tower was the first building of its kind in the world and greatly influenced the architecture Capsule-hotels, which are common in Japan. Despite every Japanese architectural association has argued for preserving the building, the capsules owner residents have voted to demolish the structure and rebuild a "modern" tower on the same location, which is now a valuable property. In 2005 Kisho Kurokawa and Taisei Corporation put forward a plan to replace the old capsules with new ones.



**Figure 3-4 Nagakin Tower views; Capsule view. Sources: Cristina Pusceddu, Politecnico di Milano.**

In spite of that, in 2007 the management association of the 40 year old Nakagin Capsule Tower are moving forward with plans to demolish and rebuild the metabolic structure

A recent sale listing for a capsule on the 11th floor mentioned that owners will be liable for some costs that arise during reconstruction. It is expected that the new building will increase the floor space of each unit by 60%. The main reason for demolition is aging and asbestos using for fire proof and thermal insulation. Although no final date has been set, demolition and reconstruction plans have been in the pipeline since 2007.

## PROJECT: METABOLIZING METABOLISM

According with the concept of regeneration the research produce the proposal to reuse the Metabolism Icon to build an emergency village, giving new life to this historical building in principle to social needs.

The research was supported by a study period in Japan. Different meeting with Taisei Company, and Nakagin Tower partner designer, Professor Nobuo Abe, were attended to better analyse the local culture and design parameters. To understand the causes of failure during disaster the structural assessment launched to the Japanese Government was examined.

Locals governments, actually, was encourage promoting structural measurement through technical guidelines and manuals, and conducting training for professional staff concerning construction processes. The GEJE demonstrate that each community have to find the best program for its situation, analysing damages and resources (GFDRR et al. 2012). Especially in the Fukushima coastal prefecture, considering quake damages the scenarios should be further investigated according with the risk of tsunami events. East Tohoku Pacific area is located in the plate boundary. For this it will possible that there are other quake episodes started as a regular small earthquake but triggered large amounts of slow slip to arrive to devastating disaster as a 2011 quake (Chu et al. 2012). In principle with these consideration, in agreement with Resilience aims, the project is planned to be located in the highest area of Iwaki City, close to the coastal line but in in the top of headland. This solution limits the action of water, allowing displaced people to stay closer to sea resources. Economic activities, in fact, were situated on the coast, and it is important to guarantee continuity with this aspect.



**Figure 5-6 Fukushima Prefecture creek view; Fukushima village entrance. Sources: Cristina Pusceddu, Politecnico di Milano; Yi Chi, Atelier 2.**

After the Meiji-Sanriku Tsunami in 1986 it was planned that all design have to be coordinated with accessible evacuation routes, appropriately designed structures and emergency plan as a Digital Rights Management educational plan system (GFDRR et al. 2012) his aspect agrees with psychological needs (Costa 2009). The most immediate and typical reaction to a calamity is shock, which at first manifests as numbness or denial. After the Niigata-Chuetsu earthquake, in Japan, 59.3% of sample people had psychological distress. 5 months later 21,8% people was still affected by post traumatic disorder (PTSD) (Kuwabara et al. 2008). The bodies afterwards, indeed, are at risk of PTSD, pathology directly connected with suicide, and when it overlaps with depression, the chance of suicide rises significantly. Through a plan designed with the aims to create area of socialization and service it will be possible respond to limit and reduce this psychological disease. To assist this processes, and to generally help victims, the design proposal is to enable and improve internal comfort, through the substitution of capsules air ducts and internal retrofit concerning thermal performance.

### **Background case studies for the Fukushima project**

Singular approach for reuse the historical Tower has earlier been suggested in relation to two different case studies: “ The ApeTau kinder garden in Aquila, Italy”, and “ The Souan Tea House in Yamagata prefecture, Japan”.

#### **Ape Tau**

This technological kindergarten, by Atelier2, was inaugurated on October 2006.

Ape Tau is a pre-fabricated structure easily disassembled but resistant to earthquakes, fire, and wind perfectly insulated both acoustically and thermally. Principal aims of the system



building is to bring back a sense of normality the population affected by 2009 Aquila earthquake. The name underlines this goal. The meaning of Ape (Bee), represents the ability create a community, as a hive. The second word Tau recalls Saint Francis Croce, symbol of peace, rebirth and union. Energy efficiency is optimized through building orientation, efficient natural ventilation (chimney effect), natural day-lighting, integration of solar and photovoltaic panels and geothermal system (Imperadori & Doust 2007). The use of thermal reflective system gives optimum performance to the envelope. Average thermal conductivity value is 0.04 W/mK (Tenpierik & Hasselaar 2012). The innovative use of thermal reflective multilayers system (TRMS) in the central layer of envelope ensure high thermal performance reflecting the solar heating during the summer and preserving internal comfort during the winter (Imperadori & Doust 2007).

These performances suggest the application of this insulating for capsules retrofit, to ensure internal thermal comfort, preserving space and using lightweight solution, best to guarantee safety during earthquake and resolve thermal bridges issue. The lightweight, the flexibility and the reduced thickness dimension, of this technological solution suggest the use of this insulation system to guarantee safety, internal comfort and easy assembly of each module. Considering limited dimension of unit the reduced thickness is significant and the lightweight is important to guarantee safety during earthquake situation.



**Figure 7-8 Ape Tau view; TRMS application. Source: Atelier 2**

## Tea House

The second case study, by Toshihiko Suzuki, was constructed in 2003 on a mountain slope in Yamagata Prefecture. The house was composed of internal cubic tea room and external aluminium roof.

Aims of the project were to play with the changing combinations of interior and exterior light; to blur the actual dimensions when sitting inside (Freeman 2007). For these reasons the roof is a simple elements of aluminium sheet, self-portant and easy to assembly in different contest. Simplicity of this solution, and respect of Japanese culture, suggests the use of this roof to create outside common area in the module achieved by combination of more capsules.

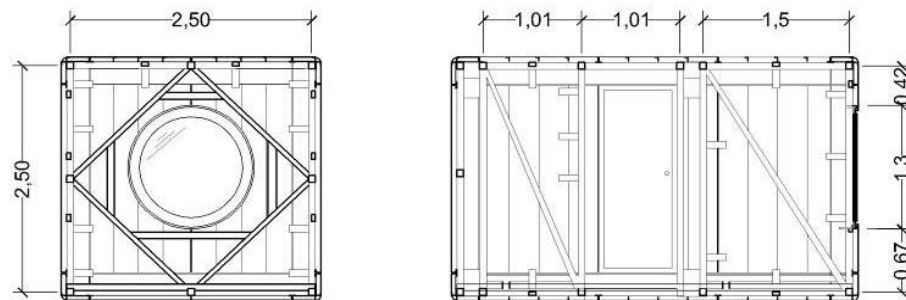


**Figure 9-10 Souan Tea House external view; Souan Tea House room internal view. Source: Atelier OPA**

## Fukushima project design principles

Starting from the 8 capsules typology presently using in the Nakagin Tower, the design considers the option to combine 4 different single units to reach one functional modules.

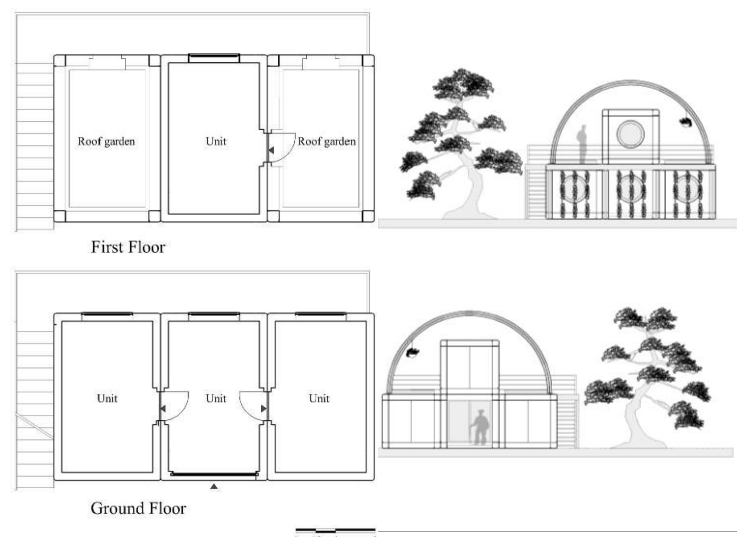
The prefabricated capsules are from shipping containers technology. The system developed by Kisho Kurokawa allowed each unit to be installed to the concrete core with only 4 high-tension bolts, which keeps the units replaceable. This structure permits to disconnect the individual units and to be transported with a truck from Tokyo to Fukushima.



**Figure 11 Capsule section.** Source: Cristina Pusceddu, Politecnico di Milano, based on Taisei Company design.

The unit measure 4.18 x 2.5 x 2.5 meters, is provided by a circular window of 1,30 m of diameter. and features a bed, bathroom and kitchen. Capsules are all-welded lightweight steel-truss boxes clad in galvanized, and the envelope is made of rib-reinforced steel panels. Rust-preventive paint was used to finished it, and they were coated with Kenitex glossy spray. One capsule is completed with appliances and furniture, and was designed to accommodate the individual as either an apartment or studio space.

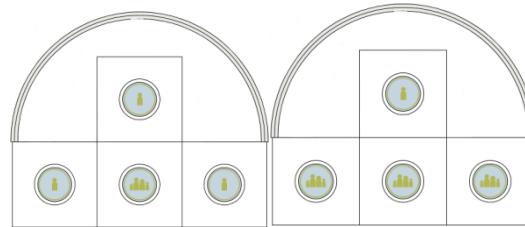
In agreement with the new building standard, the project design a new envelope for the capsules, improving thermal performance. Asbestos layer used for fire proof and thermal insulation it will be removed.



**Figure 12 Module plants, Module élévations.** Source: Cristina Pusceddu, Politecnico di Milano.

Considering the restricted thickness of thermal reflective multilayer system, internal layer of 7 mm is added in the inner side with a sub-structure of wood slats. Internal finishing are made by paper with vegetable fibres, traditional use in the Japanese house.

With this combination the ground floor can be the area for a family or for two single people, and first floor the single area for ancient or disadvantaged person that need stay close to other people.



**Figure 13 Module organization.** Source: Cristina Pusceddu, Politecnico di Milano.

Limited area, in fact, encourages the interaction between people and mutual aid. (Freeman 2007) Otherwise, second floor can be used for a single person, victim of disaster which has lost his family. This solution is a way to give new opportunity to people to socialize and don't live alone. Anyhow, it is also possible to all these solutions for one family group.

### Common area

Inside the village are located different concepts typology of common area. Crowded space are not useful to encourage socialization. Inside crowd people lost his identity and are less stimulated to socialize (Costa 2009). In agreement with these studies, small common room is located in each module. It can help to improve people to join and help each other, besides; it can be living room for the family combination. In particular, these rooms have glass door to stimulate vision of outside to limit negative effects of small place, and controlled lux to enjoy public relation. Otherwise, it is plan to have bigger common area too.



**Figure 13 Master plan;** Source: Yi Chi, Atelier 2

Common bathroom, according with Japanese live tradition and service areas for daily requirement are planned. Units disposition are around internal square where open space are provided for citizen festival. This common area can be a Japanese Garden or can be furnished with a minimalist design, ensuring design balance between common and private area.

All are in agreement with safety needs. All the services are collocated in a central line. In this way is possible to find a connection between square and close common areas, to improve

socialization moments. Straight line ensures safety way too according with law after 1986 quake (GFDRR et al. 2012).

## CONCLUSIONS

The proposal are from the elaboration data of research period in Japan and, the study of state the art of Shelter Architecture and Civil Architecture performed by TRMS form the PhD Research "Lightweight materials in the Emergency Architecture". Aims of the research will be to use technology system, as a TRMS, inside the emergency architecture to improve thermal performances, durability ensuring psychological and environmental needs of people and, area hit from disasters.



**Figure 14 Master plan view, Source: Yi Chi, Atelier 2.**

The conjunction between probable deconstruction decision of Nakagin Tower and Tohoku earthquake drive to think about reconstruction but, in the same time, to heritage preserving. Reference of traditional buildings, as the "Tea house", by Toshiko Suzuki, and high thermal performances of "Ape Tau", by Atelier2, suggest a mix of these two different important aspects. According whit these features the design is based to capsules plants and psychological needs of displaced people.

In this way the result is a community where the high technological performance are in according with the history of the country, and psychological needs of displaced people. Urban system became not only a reconstruction moment but also a phase where heritage is preserved with attention to particular social requirements of disaster victims. However, final design are still working in progress, until the end of PhD program.

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## **Paper 6: Sediment characteristics and Coastline Change of a Low-lying Island (Sandwip) in the Eastern GBM Delta, Bangladesh**

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### **ABSTRACT**

Erosion and accretion rates induced by cyclones in the eastern GBM delta of Bangladesh are extremely high and the island of Sandwip has been reducing its original size in the last few decades, making its community more vulnerable to the impacts of climate change. An attempt has been made in this study to observe recent shorelines changes using remote sensing and GIS tools. In order to understand the nature of the small cliffs that occupies most of the island's shoreline, a series of shorelines and cross-shore profiles were also surveyed in 2013 and sediment samples collected.

The analyses indicate that the island has accreted between 1978 and 2006 in the northern and eastern parts, while the cliffs on the south and south-western parts have been eroding alarmingly. The accreted coast is very gently sloping while the eroding coast on the south-west of the island has a steep coastal slope. The eroding side is only about 5 meters above MSL while the accreting side of the island is 7.6 meters high. Grain size analysis found almost negligible amount of coarse materials (>0.63mm) in almost all sections and highest proportion (98%) of fine (<0.63mm) sediment in the most accreted newly formed northern profile section.

**Keywords:** cliffed coastline, cyclones, storm surges.

### **INTRODUCTION**

The identification, mapping and analysis of coastal geomorphology and shoreline changes is one of the biggest challenges facing states with long coastlines and offshore islands. Acquisition of such fundamental data using conventional means like ground surveys is generally a lengthy and expensive process. The challenge is particularly difficult to perform for poor developing countries like Bangladesh, where both skilled personnel and capital resources are limited. The use of Satellite Remote Sensing data and Geographic Information Systems (GIS) has gained prominence in recent years as high-resolution satellite (metric resolution) data have become readily available, albeit with a certain cost to bear. On the other hand, middle level resolution imagery (e.g. Landsat TM) is now available for free and can provide longer-term time series to examine coastal change. The method of obtaining geomorphological information from satellite imagery has the potential capability to provide quantitative information quickly and relatively inexpensively (Shaghude 2004). Sediment characteristics and shoreline profiling are still needed to provide ground truthing information, especially for muddy and flat landscapes like those examined in the current paper.

Bangladesh is geographically situated in the area of the deltaic GBM (Ganges-Brahmaputra-Meghna) system, having the Himalayas in the north and the Bay of Bengal in the south. The country exposed to tropical cyclones originating in the northern Indian Ocean and moving along north-easterly tracks. The 710 km of coastline contains approximately 28% of the total population (15 million people). Due to its dense population, a wide and shallow continental shelf and a complex coastal configuration with a shallow bathymetry, the Bangladeshi coast has suffered enormous storm-related casualties. Recorded storm surge flooding devastation due to tropical cyclones is the worst in the world. Coastal areas are struck by storm surge flooding which causes widespread damage to living communities and properties, along with

pulses of coastal erosion and accretion of the mainland coasts and offshore islands. Moreover, the increasing migration trend of the population towards the coastal areas for livelihood opportunities and the increasing trends of tropical cyclones along with extreme erosion are likely to increase vulnerability in the context of climate change.

In Bangladesh 62% of the coastal land has an elevation of up to 3 m whereas 86% only reaches heights of 5 m in the GBM delta (as cited in Talukder 2012, p. 16 and Ahmed 2011, p. 1). The GBM delta front is strongly dominated by tidal processes: tides are semi-diurnal with a tidal range of up to 4 m, and generate shore-normal tidal currents of up to 0.3 m/sec (Barua et al., 1994). Barua (1990) notes that during periods of low river discharge, the eastern distributary channels (Hatiya and Sandwip Channels) serve as flood channels. The delta has been growing both upward and seaward since its creation and geological evidence shows an average progradation rate of about 80-100 m /year.

The active delta is characterized by low and flat deltaic islands such as Hatiya, Bhola, Sandwip, and many smaller ones. Typically the elevation of the islands is less than 5 m, and most commonly between 2-3 m. Additionally, the sediments of the islands are very soft, unconsolidated silts and clays offering low resistance to the erosive forces of waves during storm events. Thus, the landforms of the active delta are extremely temporal and are easily changed by the river flood flow, tidal and wave action, river discharge and attack of cyclones. Especially the islands in and around the mouth of the Meghna have been easily eroded by river flow and wave action (Umitsu, 1997, ed. Pernetta 1993).

There is however evidence that in the last two centuries the delta grew little towards the sea and faced severe erosion. The “back water effect” is considered by the scientific community as one of the basic reasons for coastal erosion in the area. The backwater effect is generally referred to as the retardation of a river outflow by a rise in the level of water at its mouth (Ali, 1999). Due to rises in sea level, brackish water may even start flowing inland, in the reverse direction of natural flow. The backwater effect may happen for various reasons though. In the coastal region of Bangladesh the principle reasons can be pointed out as a strong southwest monsoon wind in the rainy season, high astronomical tides as well as high storm surges (Huq et al., 1999). Eventually these are the principle reasons for coastal accretion as well. In addition, sea level rise is also considered as one of the most important factors having a long-term effect on coastal erosion in the area (Pramanik, 1983). Even during the last two centuries the Ganges-Brahmaputra delta did not grow significantly towards the sea, the Meghna estuarine delta has changed significantly during this period. Considerable developments occurred mainly on the islands of Sandwip (and adjacent islands), Hatiya, Bhola and on the coastline of the Noakhali mainland. Some accretion happened in its northern part due to closure dam (Muhuri Project, an irrigation project) on the Feni River. Earlier Sandwip Channel was nearly isolated from the distributaries but is now tide-dominated, allowing net import of fine sediment. Available data show that between 1896 to 1979, Sandwip Island has been reduced about 50 per cent of its original size due to considerable erosion in the northwestern part. Map comparisons show that erosion accelerated after 1963 and it grew from 3 km<sup>2</sup> in 1963 to 46 km<sup>2</sup> in 1981 (Hoque, 2006). Erosion in Sandwip Island of the Ganges delta has assumed serious proportions. From 1913 to 1988 (i.e. 75 years), the island has been reduced further to about 50% of its previous size. The rate of erosion was 200m/year between 1913 and 1960 and about 350 meter/year between 1963 and 1984 (Barua, 1997). The causes of erosion were attributed to strong wave action due to strong southwest monsoon winds, high astronomical tides, frequent and extreme storm surges in the Bay of Bengal (BOB) (Hegde, 2010).



**Table1. Land Area of Hatiya and Sandwip Island measured from 1779 to 1979 (in km<sup>2</sup>)**  
(Source: Pramanik, 1983)

Year	Map Source	Hatiya (km <sup>2</sup> )	Sandwip
1779	Delta of Ganges (Rennel)	370	579
1896	Survey of India	469	502
1945	Survey of India	1070	500
1959	Aerial Photograph	1030	391
1973	Landsat-1	399	290
1976	Landsat-2	399	269
1979	Landsat-3	370	290

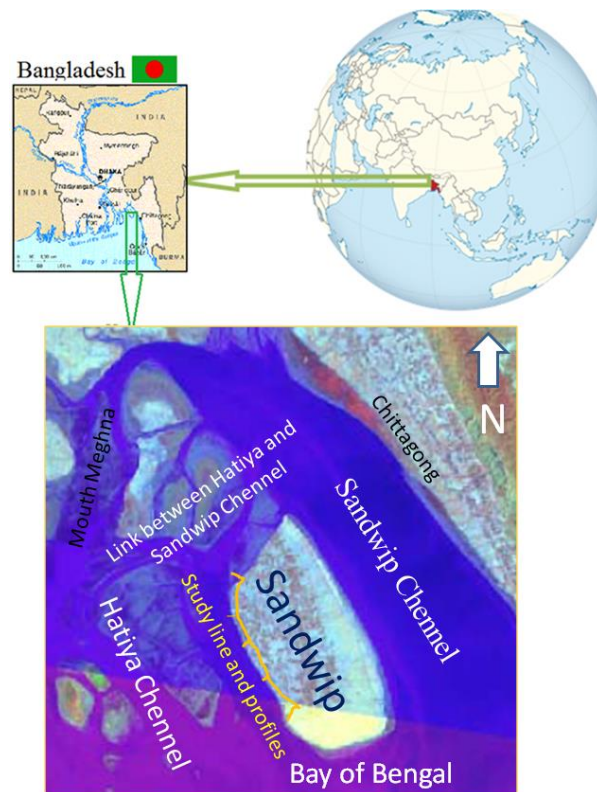
Accretion has been coupled with erosion of the island for the last few decades. The island's shape and area has been dramatically changing with erosion in the south western part and accretion in the north western part. This has led to a number of questions as to whether the island, where 400000 people currently live, can continue to exist in the future. It also puts into question as to what are the direct impacts on risk exposure of the dramatic geomorphological changes driven by storm surges along the island. An attempt to answer these questions has been taken by reviewing the platform development of Sandwip Island and measuring geomorphological change rates in relation to sediments characteristics and shoreline profile shape.

## STUDY AREA

Sandwip Island is situated at the confluence of the Lower Meghna River Estuary (LMRE), the most dynamic estuarine and coastal system of the Eastern active part of the. Sandwip belongs to the Chittagong and is located at 22°22'-22°34'N and 91°26'- 91°34'E. It is bounded by Bamni river to the north, Meghna river and Hatiya island to the west, Sandwip channel and Sitakundo upazilla (sub district) to the east and the Bay of Bengal to the South (Fig 1). Sandwip is surrounded by the tide dominated East Hatiya Channel, the Sandwip Channel, and the link channel between Hatiya and Sandwip Channel (Barua, 1997).

## Hydrodynamics around the island:

Running off from the large catchments of the mighty GBM river system, the Lower Meghna River drains into the Bay of Bengal through the Western and Eastern parts of Sandwip, being characterized by a distinct seasonality, with variations in discharge from approximately 10,000 m<sup>3</sup>/s to 100,000 m<sup>3</sup>/s during the dry and monsoon seasons respectively (DHV, 2001). The island stands in the macrotidal area of the Bangladesh coast with tidal variation in a range of about 3 to 6 m (Hayes, 1979). In the eastern part of the lower estuary, the flow is dominated by the tidal influence whereas the western part is dominated by freshwater flow.

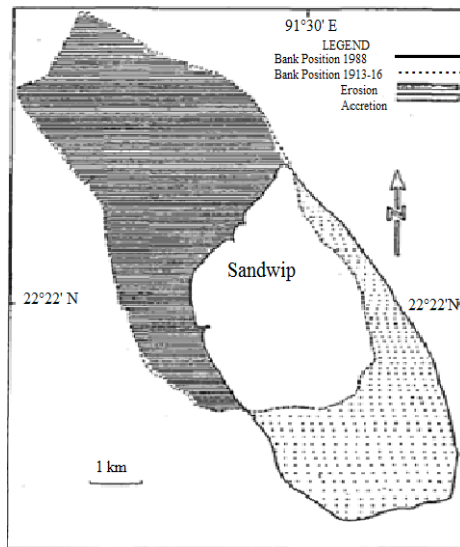


**Figure 1** The target study area (Sandwip Island)

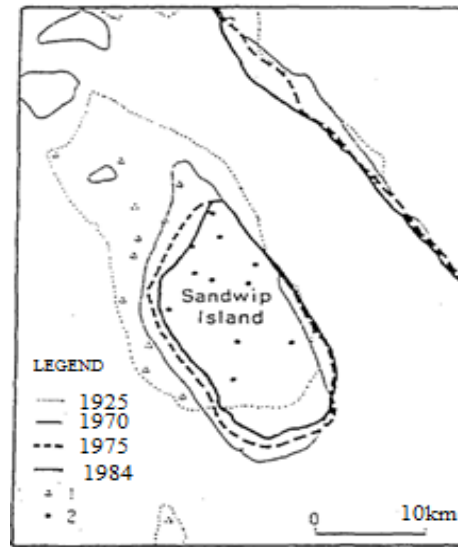
A prominent counter-clockwise residual circulation, which is very turbulent in nature, is present around Sandwip. Current speed values up to 4 m/s were observed in the Sandwip Channel and upper reach of the estuary during spring tides and rainy seasons respectively. Salinity distribution is mainly influenced by seasonal changes of freshwater discharge in the estuary. Saline water found around the island is almost well mixed with a strong stratification found only in the deep Sandwip Channel (Sokolewicz et al 2007).

### Geomorphological Characteristics:

The main bed materials of the LMRE are silt and fine sand. The Lower Meghna River has one of the highest sediment discharges of all the river systems in the world (Coleman, 1969). A recent study revealed that about 700 Mtons enter the lower part of the estuary, forming new lands through accretion either laterally or vertically of the shelf and islands area. One third of the sediment load is deposited in the flood plains of the upper estuary while the rest is deposited in the bay (Goodbred and Kuehl, 1999). Allison (1997), on the basis of the comparison between historical maps of 1840 and a Landsat scene of the 1980s, clearly identified dominant erosion of the north-western part of Sandwip, whereas accretion was dominating the south-eastern part.



**Figure 2 Development of Sandwip Island between 1913-1916 and 1988(Barua, 1997)**



**Figure 3 Change of coastlines around Sandwip Island (Umitsu, 1997).**

The morphological evolution of the LMRE was enormous during the 20th century due to the hydrodynamic and sediment transport rates at stake. Enormous mudflats have emerged in the northwest and southeast of the island (Fig 3). A general trend of southward island migration was clearly observed by Barua (1997). Figure 2 shows the bank line comparison of Sandwip Island carried out by Barua (1997) for the period 1913-1916 and 1988. Sandwip Island reduced to about 50% of its original size in those 75 years, with considerable erosion on the northwest side and accretion on the southeast side. Map comparisons also showed that the average erosion rate on the northwest coast of Sandwip accelerated after 1963. It was about 200 m/year between 1913 and 1963 and about 350 m/year between 1963 and 1984. In a cross-sectional study he also revealed a link between the erosion of Sandwip Island and the simultaneous infilling of a deep channel nearby and development of a completely new channel.

Historic changes of the coastal line of Sandwip Island contained in the study of Umitsu (1997) are showing a southward (seaward) migration of the island with extreme reduction of the northern side (almost 50% of the island) due to erosion from 1925 to 1970. From 1970 to 75 to 84 the erosion was extend all around the northern, western and southern part while a little bit of accretion was noticed in the eastern side of the island (Fig 3).

## MATERIALS AND METHODS

Multi Spectral Scanner (MSS) of 1978, Thematic Mapper (TM) and Enhanced Thematic Mapper Plus (ETM+) of 2001 and 2006 Landsat scenes covering the target island were downloaded from the Global Land Cover Facility (<http://glcf.umd.edu/>). These images are available already orthorectified in UTM zone 46N, WGS84 datum. ILWIS, the free user-friendly raster and vector GIS software (v3.7) was used digitize on screen the cliff base and the shorelines (land-water boundary).

Ground truthing on the entire study area was conducted during a four-day visit in March 2013. A shoreline survey of the eroding and accreting southern, northern and western coast of the island was done using state-of-the-art survey technology, a total station, scale and leveling. The survey was topographically calibrated using the CDBM (Chart Datum Bench Mark) RL point of the BIWTA established for tide gauge measurement on a culvert at the western ship Ghat of Sandwip referred to as BM in this study. Additionally 4 more TBM (Temporary Bench Mark), 2 north of BM (TBM1N and TBM2N) and 2 south of BM (TBM1S and TBM2S) were established on some permanent structures considering the

morphological changes noticed (Table 2). Finally, 5 cross section profiles of the shoreline starting from the established TBM and BM were surveyed down to the watermark including existing embankments.

Sediment samples were collected from all section profiles starting from the cliff to the water mark and referred as BM1...BM2 or TBM1N1...TBM1N3 ((Table 2) for further analysis in the laboratory. Wet sieving through a 0.63mm mesh separated the sand and mud fractions. Sediment moisture percentage was determined by loss of weight drying at 65° C. Furthermore, Sediment Organic Matter (SOM) was determined after drying the samples at 105°C and using Loss On Ignition (LOI) at 500°C for 6 hours. The loss in dry weight was measured and organic matter content was expressed as a percentage (Parsons et al., 1989).

## RESULTS AND DISCUSSION

### Coastline Change from Satellite Images

According to our preliminary analysis of satellite images, the northern and northwestern coastlines of the island have been growing about 3.8 km (maximum) and 0.7 km in the eastern protected part from 1978 to 2001 (Fig 4a). During the ground truthing visit to the accreted area, it was found that the accretion started after 1991 (after the disaster of 29 April 1991 of category 5 which washed out about 13000 people living on the island) and it has already extended about 3 km to the north-western part. This observation is in opposition to the trend of coastal change observed in previous works that studied coastal change up to the 1990s. For example Barua (1997) and Allison (1997) identified the extreme erosion of the north-western part of the island from 1884 to 1988. Landsat study also shows that the south and south-eastern cliffs had been eroded from 1978 to 2001 respectively of 1.8 km and more than 2.6 km during this 23 year period (Figure 4a).

The comparison of coastlines from the images of 1978 and 2006, shows that the erosion is migrating towards the southern and south-eastern parts of the island. By this time (from 1978 to 2006) the south-western part has already lost about 4 km whereas the northern and north western parts continue to accrete (Fig 4b). This erosion caused inundation of villages on several occasions, generating a deterioration of the environment by washed out sediment and salinity intrusion. The current aspect of the north western, western and southern shores can be seen in Fig. 7. The comparison between the digitized images outlines an intense transformation of the coastline. A reason for this can be due to the interaction between tidal energy and fluvial discharge due to circulation driven by the Coriolis Effect. Barua (1990) indicated an anticlockwise sediment motion in the area resulting primarily from the net export of sediments through ebb channels and net import of sediments through flood channels. The finer fraction of sediments is thus recycled back into the estuary.

The generation of an erosive trends in the southern and south-eastern part of the island is assumed to be due changes in the river discharge flow pattern, together with changes in the tidal current regime, after the development of the Muhuri Project on the Feni river in 1985-86. The Sandwip channel has become isolated from the Meghna river estuarine discharge, which was feeding sedimentation in the south eastern part of the island. On the other hand, the sediment carried by the lower Meghna river to the Bay of Bengal could now been trapped by the tidal influence and precipitate in the north eastern part and eastern part of the Hatiya channel.

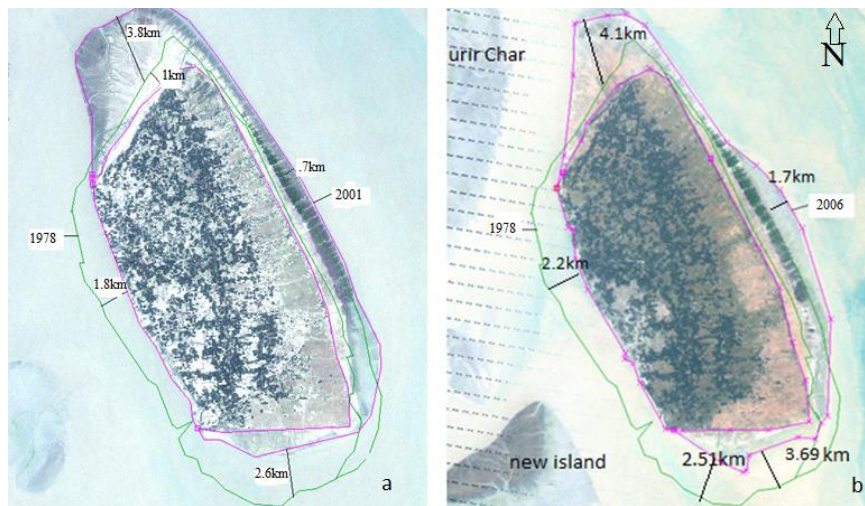


Figure 4 a), Shoreline overlay of 1978 and 2001, b) Shoreline overlay of 1978 and 2006

### Field survey of the shoreline

The topographic survey found that the accreted coast of the north western side is very gently sloping (2N in Fig 5) whereas it is extremely steep sloping for eroding (1N, 1S and 2S in the Fig 5)south western coast. Additionally, the island's western coast at the southern eroding side is only about 5.4 meter higher than MSL while the northern accreting side has an elevation of 7.4 meters.

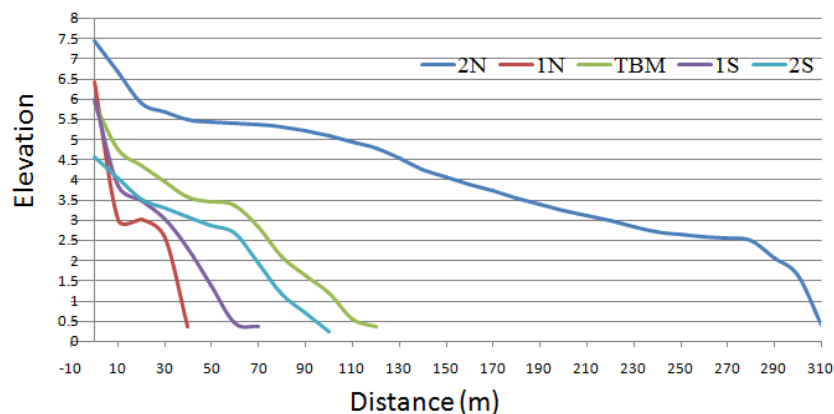


Figure 5 Comparison of elevation in 5 different profiles

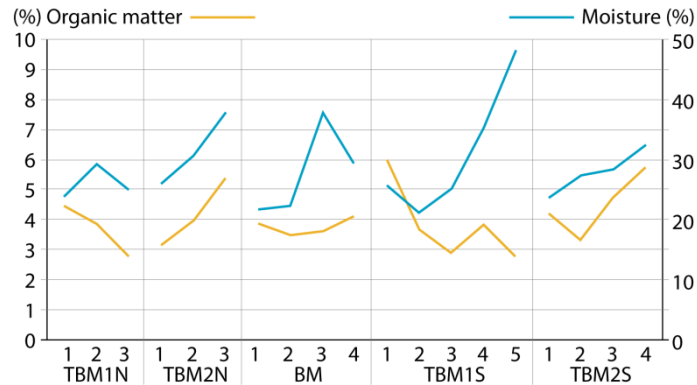
The cliff profile at the eroding site was found to be steep, we believe because of the role of wave and tidal action. On the other hand, at the accreting site the coastal profile was found to be gently sloping because of the continuous sedimentation due to the huge supply of fine sediments from upstream of the GBM estuary and tidal counteraction of the river flow in the area as suggested by Umitsu (1997).

### Sediment Characteristics

Sediment moisture analysis ( Fig 8) showed that the percentage of moisture has been increasing from the shore cliffs towards the water mark making sense with some irregular variation results for TBM1N and BM. Highest moisture content was found in the south western (TBM1S) profile section where huge loose and fine sediments was loaded followed by northern accreted profile (TBM2N). Organic matter content was also distinctly characterized by increasing trend available in the accreted northern section in comparison with very irregular and in most cases decreasing trend in the eroding and stable profile

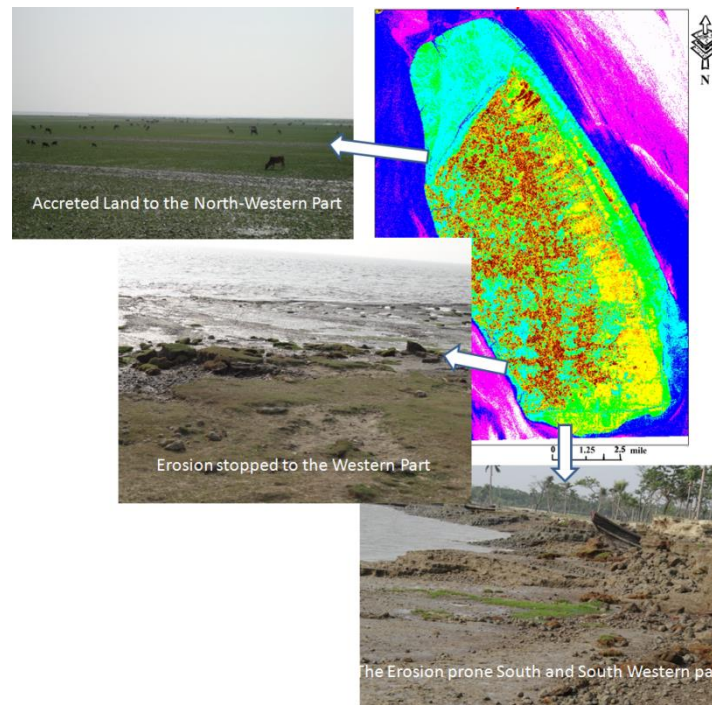


sections starting from cliffs to water level. Grain size of the sediment analysis by the present investigation found almost negligible amount of coarse materials ( $>0.63\text{mm}$ ) in almost all sections and highest proportion (98%) of fine ( $<0.63\text{mm}$ ) sediment in the most accreted newly formed northern profile section which also agreed with the findings of Umitsu (1997), Coleman (1969) and Goodbred and Kuehl (1999) for LMRE.



**Figure 6 Organic matter and Moisture content in sediments of 5 Profiles.**

It was not possible to find large differences in grain size composition of the cliff material but currently the mineralogy of the clays is being studied, to see if there are similarities or differences with the materials coming from the river and estuary sources. In any case it is evident that the material forming the cliffs is poorly consolidated at least for the recently deposited material. Future research will explore the behaviour of the cliff profile under wave action considering the geotechnical characteristics of the material.



**Figure 7 Three different environment of the Island in March 2013**



## CONCLUSION

Accretion has resulted to be dominant in the northern part of the island. The erosion in the western part along the Hatiya channel has almost stopped over the last 5-7 years. Erosion has however continued in the southern and south eastern parts of the island which was previously accreting in the period in between 1916-1988. We explain this inversion of trend as related to river engineering works, which have changed the discharge characteristics of the LMRE.

Accurate topographic and bathymetric information would allow quantifying the sedimentation of the LMRE and the hydrodynamic behaviour of marine and fresh water in and around the island for a comprehensive understanding of the erosion-accretion patterns. The understanding of the island's dynamics is a prerequisite for a complete and effective management plan to restore settlements and plan new land occupation by the government and relevant organizations.

The work presented here has laid down the basis for future flood protection, preparedness and management of risks around the island. It is advisable that in the future the competent authorities will plan the development of early warning systems for inundation due to storm surges and cyclones; such as that being done at a European level (Ciavola et al. 2011a and b). As a simple first step, a flooding model of the island should be run for a number of significant scenarios of cyclones to determine safe corridors for population escape and sheltering during high energy events.

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## **Paper 7: Impact of Foreign Aid in Support of Disaster Risk Reduction in Indonesia**

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### **ABSTRACT**

Disaster risk reduction (DRR) is a practical, systematic approach to identifying or recognising, assessing and reducing risks caused by disasters. The disaster risk reduction objectives are to reduce socio-economic vulnerabilities to disasters and to deal with environmental hazards, among other things, which lead to vulnerability. For example, the aftermath of the earthquake and the tsunami which hit Indonesia late in 2004, is considered as one of the greatest natural disasters of the 21st Century. In 2006, the Indonesian government launched a programme of DRR, and successfully completed the challenge of launching the first National Action Plan for Disaster Risk Reduction (2006-2009) and found success in the integration of an Annual Work Plan into governmental policy. Foreign Aid support has had significant impact after the implementation of the programme in Indonesia. The British Government, through DFID, is now known as UK Aid and it has delivered support smoothly through the DRR programme in Indonesia. The successful implementation of the project not only brought in support, but also had the impact needed to draw attention to the situation so studies, as presented briefly in this paper, could be conducted. It is expected to be a lesson learned about the best practices to be adopted in other countries attempting to integrate foreign aid and DRR across the country and across different levels.

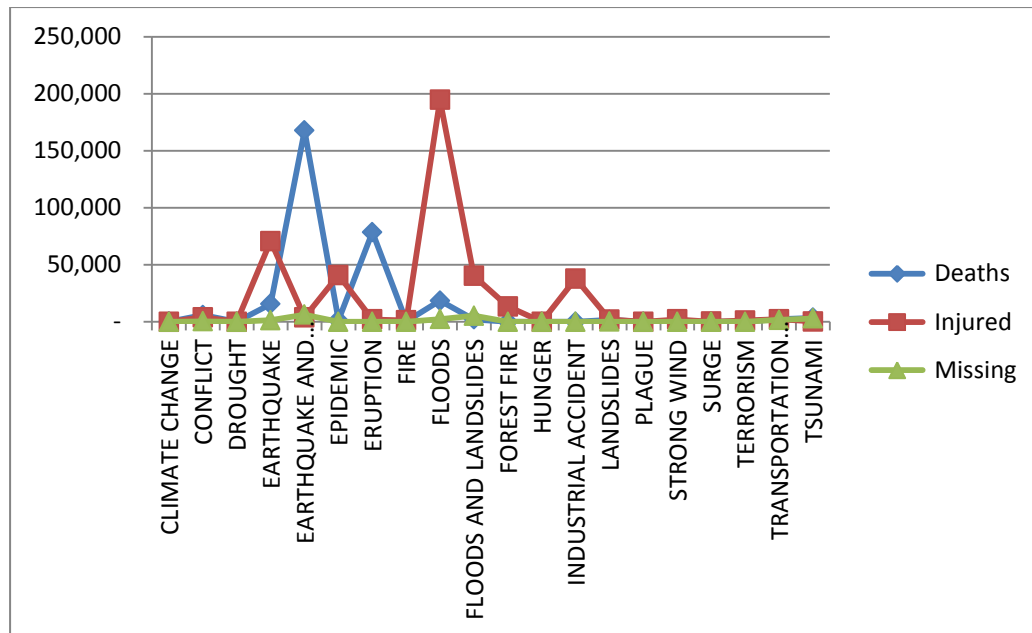
**Keywords:** action plan, disaster risk reduction, foreign aid, impact.

### **INTRODUCTION**

Geographically, Indonesia is an archipelago situated at a juncture of four tectonic plates: the Asian Plate, the Australian Plate, the Indian Ocean Plate and the Pacific Ocean Plate. The southern and eastern parts of the country feature a volcanic arc stretching from Sumatra to Java to Nusa Tenggara to Sulawesi. The remainder features old volcanic mountains and lowlands partly dominated by marshes. They make for a lofty potential and proneness to natural hazards and disasters, caused by volcanic eruptions, earthquakes, tsunamis, floods and landslides. Particularly for the Republic of Indonesia, there are 20 types of potential disasters, all of which can be the cause of death, damage and losses. The following graphic, as seen (Figure 1) shows the number of deaths, and the number of people injured and missing in the various disastrous events that often occur in Indonesia:

The graphic below depicts the high number of deaths caused by earthquakes and tsunamis, as well as a high number of injuries caused by floods and landslides.

Governments, international agencies and millions of people across the world donated to help the communities devastated by the tsunami. As one survey of the disaster (Bernhard et al. 2005: 82) observed: "The nature of the tragedy, combined with the clear and constant communication through the media, led hundreds of millions of individuals around the globe to donate funding to various national and international charities and relief organizations. An outpouring of this magnitude from individuals has never been witnessed before for a single event." Most of the affected countries were entirely unprepared for the disaster. This was not surprising. Strengthening the local community's capacity for preparing to face various hazards, and reducing its impact, is considered to be one of the strategic moves needed to reduce the risk of damage (Jayasuriya and McCawley, 2010).



**Figure 1: Graphic of Events Disaster in Indonesia**

Source: Disaster Information System Database. <http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=idn> (accessed 27 Sept 2013)

The purpose of this paper is to provide a brief overview of the influence of foreign aid on a disaster risk reduction programme, using the example of Indonesia. However, it is still important to consider the fact that there is still a requirement for the development programmes to be sustained after the end of aid assistance.

## LITERATURE REVIEW

### Foreign aid and mainstreaming DRR in Indonesia

Lessmann and Markwardt, whose studies concern foreign aid, tried to build a model fitting two perspectives: 1) an optimistic view and 2) a pessimistic view. In the optimistic view, a first possible theoretical justification for foreign aid is grounded in the so-called “gap models”, whereas in the pessimistic view, the relationship between aid and growth, decentralisation and growth, and their interaction, is the main concern. According to several observers, the positive effects of foreign aid on growth in developing countries can be dismissed (Lessmann and Markwardt, 2012).

Furthermore, Jayasuriya and McCawley noted that the international donors are also under strong pressure from head quarter of agencies in capitals to ensure high standards of accountability and transparency. It is therefore perhaps not surprising that foreign aid officials, faced with all sorts of problems of accountability when dispersing funds under high-risk conditions in the field, were reluctant to give up responsibility for financial control. However, it is also not surprising that officials in recipient governments felt that this approach reduced national ownership of activities in their own countries (Jayasuriya and McCawley, 2010).

Knack cited the nation that a donor's trust in a recipient's aid management systems is determined within an official development assistance framework by three broad considerations (Knack, 2013):

1. Confident it will reap sufficient benefits from investing in recipient country systems;
2. Trustworthiness of those systems, as measured, for example, by corruption ratings;
3. Trust in aid's effectiveness in general, on the part of its domestic constituents.

The effectiveness of foreign aid through DRR in Indonesia forms part of a similar effort at the regional and global levels. Several international forums have produced agreements that provide the basis for disaster risk reduction efforts at the national and local scales. To be effective and efficient, disaster risk reduction efforts in Indonesia require a strong platform that refers to the above-mentioned international agreements and the national laws and regulations.

As Arbon noted, in 2007, the National Government declared Disaster Risk Reduction a development priority, and this has resulted in substantial increases in budget allocations at the national and sub-national level for Disaster Management (DM) and DRR. Furthermore, distinctions between DM and DRR are becoming evident in budget lines. (Arbon, 2011). There has also been success in developing the project for Safer Communities through Disaster Risk Reduction (SC-DRR), which was funded through a grant of £ 4,312,500 by UKAid. It was specifically targeted for DRR, as it was a development issue for the first time in Indonesia. SC-DRR's strategic approach includes legal and institutional strengthening, as well as integrating DRR into local development planning, creating institutional partnerships, establishing crisis management systems, creating knowledge sharing systems and networks, and integrating DRR into the school curriculum. It became integral to focus on a decentralised government and on ensuring there was sufficient capacity at both national and sub-national level to effectively integrate DRR into development planning. The result after the project was completed was the formulation of the first three-year National Action Plan (2006-2009) for Disaster Risk Reduction (NAP-DRR). After the 2004 Tsunami, Indonesia enacted a new law on Disaster Management number 24/2007, but implementation still remains a major challenge.

### **Identification of intended outcome in impact perspective**

Defining the impact of the project in DRR activities can be monitored from various perspectives. The organisation for Economic Co-operation and Development (OECD) noted impact as the positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended. This involves the main impacts and effects resulting from the activity on the local social, economic, environmental and other developmental indicators. The examination should be concerned with both intended and unintended results and must also include the positive and negative impact of external factors, such as changes in terms of trade and financial conditions (The Organisation for Economic Co-operation and Development, 2013). Hilman and Sagala have classified the resultant impact of the projects through SC-DRR project components as shown (Table 1) below. Also included is expenditure per activity to help in classifying the impact.

The impact, according to Jayasuriya and McCawley, is the overall assistance programme on local economies varied greatly over time. Many communities devastated by the tsunami experienced first undergo a collapse of almost all local economic activity and a period of heavy dependence on emergency assistance in the post-disaster period following the tsunami (Jayasuriya and McCawley, 2010).

**Table 1 Impact SC-DRR based on Project Components**

No.	Project Component as Intended Outcome	Impact based on the project result
I	the establishment of a disaster risk reduction policy, legal and regulatory framework	<ul style="list-style-type: none"> <li>• Project stakeholders are overwhelmingly in agreement that SC-DRR has made critical contributions to the advancement of DRR in Indonesia.</li> <li>• At the national level, SC-DRR has been instrumental in supporting the government to establish the necessary policy and legal frameworks for integrating DRR into development processes</li> </ul>
II	the establishment and strengthening of institutional systems that support decentralised disaster risk reduction, integrated with local level development (with expenditure: USD 3,553,992)	<ul style="list-style-type: none"> <li>• Has been instrumental in establishing national and regional forums for information sharing and advocacy.</li> <li>• While more effective in some places than in others, these forums are instrumental in promoting DRR as “everybody’s business”.</li> <li>• The DIBI database is a tool with great potential for helping governments to ensure that disaster risks are taken into account in planning and decision making.</li> </ul>
III	the strengthening of education and awareness programmes established and strengthened to make development/ disaster linkages understood	<ul style="list-style-type: none"> <li>• More impact on public awareness had more resources been allocated to public awareness campaigns instead of to education and curriculum design.</li> <li>• While education is important for DRR, a new curriculum takes years to develop and many more years to have an impact. It is also targeted toward a narrower audience (children aged 6-18).</li> <li>• Public awareness campaigns can reach a wider audience and have a more immediate impact.</li> </ul>
IV	the demonstration of disaster risk reduction initiatives that make communities safer	<ul style="list-style-type: none"> <li>• Most SC-DRR activities undertaken at the community level are better classified as disaster preparedness rather than disaster risk reduction activities.</li> <li>• While valuable work has been done in the target communities, it is questionable how much this work has contributed to making DRR “a normal part of the process of development”.</li> <li>• While CB-DRR activities can be seen to have raised DRR awareness in the communities, they have not produced a model or ideas that a government can use to help make communities more resilient.</li> </ul>

(Source : SC-DRR Evaluation Report (Hillman and Sagala, 2011).

## **RESEARCH METHODOLOGY AND FRAMEWORK: approach on impact of foreign aid in support of DRR programmes in Indonesia**

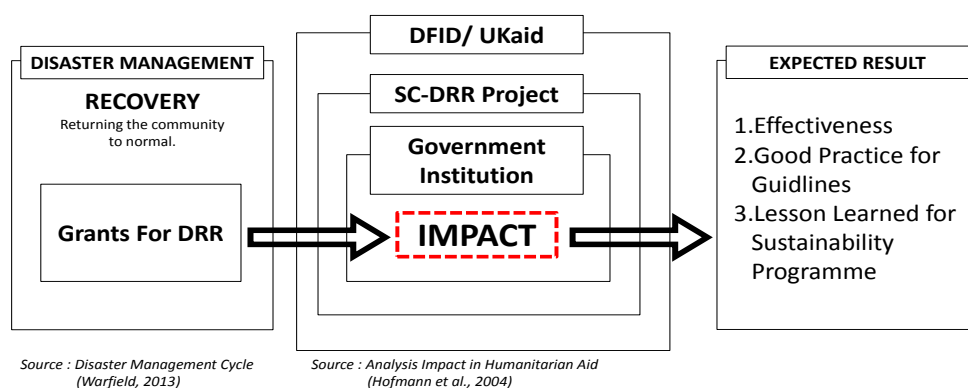
This research methodology will be based on case studies as it seems the most suitable strategy for this research. The importance of the case study as a research method is not to be underestimated. Like other research methods, it is a way of investigating an empirical topic by following a set of pre-specified procedures (K. Yin, 2009). K. Yin elaborates: a case study is “an empirical inquiry which investigates a contemporary phenomenon within its real-life context: it is conducted when the boundaries between phenomenon and context are not



clearly evident and is a medium in which multiple sources of evidence are used” (K. Yin, 2009). This means of study is used here because the study was conducted with a sample of people who were part of a single DRR project in Indonesia, the first to be funded by DFID after the biggest earthquake and tsunami in Aceh. This is a unique opportunity for study for researchers because this project can hold enough gravitas to encourage the DRR programme into the government’s annual work plan for the first time since 2007, and it also has the potential to support the birth of disaster management law in Indonesia.

According to Hoffman et.al, this analysis focuses on the impact on the government institution at the ‘national government’ level covering four areas suggested by Hoffman : (1) Aid agencies, in order to improve their work, demonstrate impact and make choices between projects; (2) Donors, to choose what to fund and to develop policy; (3) Agencies and donors, to assess the impact of new approaches and innovations in programming; and (4) National governments, to guide disaster preparation, planning and response (Hofmann et al., 2004)

This study aims to explore and investigate the impact of the UKAid project in support of the Disaster Risk Reduction program in the Indonesian Government. The primary objective is to analyse the barriers and obstacles affecting the impact of UKAid at the level of national government in the optimisation of foreign assistance funds for DRR activities, and to identify and asses the lessons and good practices learnt after the DRR project in implementing sustainability programs into regular government programs. According to Miles and Huberman (1994), a conceptual framework aims to explain the main concepts of the research, its key factors, unit of analysis, its variables and its relationships, either graphically or in the narrative form (Miles and Huberman, 1994).



**Figure 2 Conceptual Framework of Research**

The conceptual framework shown in the Figure 2 demonstrate the analysis between disaster management cycles, as suggested by Warfield, and the analysis of humanitarian aid impact as recommended by Hofmann. Figure 2 describes how the research problem is embedded within the scope of this research. The unit of analysis of this study; “the impact of DFID/ UKAid grant for DRR at the level of government” is embedded through the SC-DRR project activities. It demonstrates how the impact of grants for DRR projects contribute to sustainable DRR programs in the country.

## DISCUSSION ON IDENTIFICATION RESEARCH GAPS IN MEASURING IMPACT IN SC-DRR PROJECT

### Gaps at the donors’ level

Based on the experience of a researcher in carrying out monitoring and evaluation of some project funds sourced from foreign aid in Indonesia, there are some gaps in donor levels including:

1. Donors have difficulty in obtaining initial data when trying to determine the location of the project in detail, even though it has been coordinating and consulting with local government agencies.
2. Determination of the logical framework for monitoring the appropriate implementation of the project by adjusting the conditions in the field, although some donors are using a standard instrument. This resulted in delays in output of project deliverables.

According to the researchers, it is assumed that the gaps that occur here should be of research interest, so that the results of future study will be a lesson for other donors who will contribute in the same field.

### **Gaps at the beneficiaries' level**

The gaps at the Central Government level are a point of interest for this research, particularly:

1. Chronology of planning to be adjusted each year, due to differences in priorities in the Annual Work Plan of activities related to DRR issues within the government.
2. In budgeting, particularly in the distribution portion of the budget will be allocated from the accompanying state budget for disaster risk reduction activities.
3. Implementation of quarterly monitoring and evaluation of the utilization of foreign grants in disaster risk reduction activities.

When the Government of Indonesia, through the National Development Planning Agency as the coordinating force, begin to manage foreign aid, they should have a complete and integrated instrument within all relevant ministries. This will enable the integration of any foreign aid that will support the annual work plan each year.

At the local government level, the gap is mainly a lack of understanding from the personnel and planners in the province and district, for capacity building. Especially in the management and use of foreign assistance funds, they still have a difference of perception regarding the utilisation of funds from grants, the state and local budgets. The proposed use of these funds is for the same goal, which is to increase the effectiveness of disaster risk reduction programmes.

SC-DRR was proved as the first systematic and integrated DRR project that fell in line with the government's annual work plan in Indonesia. Admirably, the project was designed to link policy work at the national level with demonstration projects in eight target provinces and one target city. Such activities included training of masons on earthquake-resistant building techniques, working with local lending programs to ensure that DRR considerations were made a prerequisite for construction loans, and using central government grant money to support disaster risk assessments. However, not all activities related to community targets can be fulfilled because some provinces included in the pilot project have a continuing deficiency of budgets related to the disaster risk reduction programme.

### **CONCLUSION**

There is now worldwide acknowledgement that efforts to reduce disaster risks must be systematically integrated into policies, plans and programmes for sustainable development and poverty reduction, and that they should be supported through bilateral, regional and international cooperation, including partnerships in private sectors. Sustainable development, poverty reduction, good governance and disaster risk reduction are mutually supportive objectives, and in order to meet the challenges ahead, accelerated efforts must be made to build the necessary capacities for the community and national levels to manage and reduce the risk.

In line with the issues above, the effect of foreign aid on Indonesia during the ongoing research has had a mostly positive impact, particularly in strengthening the core of the institutional government and in strengthening the capacity of local levels which are in disaster-prone areas.

As noted by Lessmann and Markwardt, it was also found that devolution of powers has a positive impact on growth in developing countries, but foreign aid is less effective or even harmful in decentralised economies. In highly centralised economies, however, foreign aid increases economic growth. The cases of Indonesia, the Philippines, and Uganda are in support of our cross-country results (Lessmann and Markwardt, 2012).

However, the negative effect also appears in the early stages of programme implementation and coordination among agencies both between donors and the government, and between government agencies and the public. This study is expected to make a positive contribution to the sustainability of disaster risk reduction programme implementation at the national level, regional level and in the community, especially in the implementation of policies, programmes and budgets. Also, it serves as a lesson learned for developing countries that they need to optimise the foreign assistance for sustainable development.

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## **Paper 8: Knowledge Communication in Post-Disaster Reconstruction Projects in Indonesia: the Barriers**

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### **ABSTRACT**

The construction industry is considered to be a knowledge-based industry. Activities within construction projects are based upon knowledge creation and subsequent communication of such knowledge between the project stakeholders. Successful communication of this knowledge may lead to undisturbed implementation of the activities on the project. However, there are barriers capable of hindering successful knowledge communication within a project, especially those concerned with post-disaster reconstruction (PDR) efforts. Identifying these barriers becomes important in order to have successful knowledge communication within PDR projects. The research adopted a mixed method research design, involving a combination of a questionnaire survey (143 respondents) and interviews (33 interviews) involving participants from key PDR project stakeholders: contractors, local governments, NGOs, and consultants. The findings of the research show that the main barriers to knowledge communication between the key stakeholders are 'inadequate time to seek or collect knowledge', 'limited ability and lack of prior knowledge', 'different organisational backgrounds', and 'cultural differences'. Different perspectives of the barriers from the four groups of respondents are proffered.

**Keywords:** barriers, Indonesia, knowledge communication, knowledge management, post-disaster reconstruction.

### **INTRODUCTION**

The profile of Indonesia shows that the country is very vulnerable to disasters. Indonesia is located on a 'ring of fire' of active volcanoes and tectonic plates. The population of Indonesia was more than 237.5 million in 2010, and has grown by more than 32% compared to the census taken in 1990 (BPS, 2011a). More than 80% of the area, 383 out of 471 districts and cities, are considered to be disaster prone (Hadi, 2009a). Indonesia was also ranked first in human exposure to disasters during the tsunami and landslide (Preventionweb, 2010).

According to the international database, 'The Centre for Research on the Epidemiology of Disasters (CRED)', in the last 20 years Indonesian disasters have been dominated by floods, earthquakes and landslides. Earthquakes, wildfires, and droughts are the three mayor hazards that affect Indonesian inhabitants. However, six out of ten of the most deadly disasters in last two decades have been earthquakes (EM-DAT, 2012).

The CRED database shows that earthquakes are the most prominent disasters in Indonesia. Irsyam et al., (2010) calculate that in Indonesia, in the period between 1987-2009, more than 14,000 earthquakes occurred with a magnitude of  $M > 5.0$ . Large earthquakes in the last six years consisted of the 2004 Aceh earthquake and tsunami ( $M_w = 9.2$ ), the 2005 Nias earthquake ( $M_w = 8.7$ ), the 2006 Jogjakarta earthquake ( $M_w = 6.3$ ), the 2009 Tasikmalaya earthquake ( $M_w = 7.4$ ) and the 2009 Padang earthquake ( $M_w = 7.6$ ) (Irsyam et al., 2010). Losses from these earthquakes encompassed not only human lives but also damage to housing and infrastructure. In the 2004 Aceh earthquake, 120,000 houses were damaged, with 306,234 and 13,577 houses damaged in the 2006 Yogyakarta and 2007 Bengkulu earthquakes,

respectively (Hadi, 2009b). More recently, the 2010 Padang earthquake caused 114,797 houses to be damaged.

Portrayals of the reconstruction process are often not good in the public's perception. Many articles in newspapers revealed many problems in conducting reconstruction in Indonesia. These problems are, for example, the slow progress of the reconstruction (Tobing and Muhammad, 2008), scarcity of construction materials which led to delays, rise in costs, failure in project tendering, and lack of coordination and supervision during the reconstruction (Harian Global, 2008). It is not uncommon to find cases of poor construction practices such as illegal sub-contracting and collusion and corruption of government officials and of NGOs' staff (Serambi, 2006). Also, there may be found many cases of project failure where contractors have abandoned the reconstruction project (Serambi, 2008), or questionable construction quality in the reconstruction which repeats the pre-disaster vulnerability (Media Indonesia, 2008). These examples show the challenges in post-disaster reconstruction which may affect the success of the reconstruction.

On the other hand, knowledge management (KM) has been promoted as one method of improving an organisation's performance (Quintas, 2005). In the construction industry KM has been implemented; it gives the benefit of better performance (Carrillo et al., 2000, Robinson et al., 2005, Fong and Chu, 2006) and in turn will help to achieve the project goals. However there are some obstacles to implementing KM in a construction project and this paper especially aims to highlight the barriers of knowledge communication in post-disaster reconstruction projects in Indonesia. The first section of this paper describes the importance of the post-disaster reconstruction, and continues with the review of knowledge and knowledge communication. Results from the questionnaire survey and interviews will be presented and followed by discussion and conclusions on the barriers to knowledge communication in post-disaster reconstruction project.

### **The importance of the reconstruction**

Most of the authors (e.g.:Alexander, 2002, Perera et al., 2010) identify four key stages in disaster management: response, recovery, mitigation and preparedness. Reconstruction is an activity carried out in the recovery phase and plays an important role in disaster management. Following a disaster, the restoration of livelihoods for individuals in disaster affected communities is restored by building new housing units and infrastructure. It is an opportunity to re-plan the community, beginning a new life with a new start. Previous living conditions can be restored, and often, may result in better living conditions after reconstruction.

In the disaster cycle, reconstruction is also the key for mitigation and preparedness for future disasters by the application of structural measures and non-structural measures. The quality of the housing and infrastructure constructed during the reconstruction phase will influence the vulnerability of communities to future disasters. The reconstruction phase provides an opportunity to begin again and 'do it right' to accomplish hazard reduction goals and also objectives of land planning and economic development (Boen, 2006). As in the reconstruction following the 2004 tsunami, it was conducted using the 'build back better' framework (BRR, 2005, United Nation, 2006) which aims to create better conditions following a disaster.

Considering the importance of the reconstruction stage, construction quality becomes a very important issue. From a project management perspective, completion of a reconstruction project to the specified quality is the most important criterion for project success criteria (Hidayat and Egbu, 2013). However, achieving the planned construction quality is also the most challenging aspect in post-disaster reconstruction projects (Hidayat and Egbu, 2013). The human aspect is an important factor that affects the construction quality (Abdel-Razek, 1998, Pheng and Wee, 2001, Pribadi et al., 2008). In 2011 there were more than six million construction workers in Indonesia, which represents 5.7% of the total Indonesian workforce



(BPS, 2011b). Indonesian construction workers traditionally evolved from farmers who looked for temporary work after the crop harvest. Their level of education is poor and more than half of the workers received only an elementary educational background, or less, and furthermore 1.5% of them have never received any formal education at all (Soemardi et al., 2011). Research by Joshi (2012) shows that there was a change in peoples' occupations after the tsunami in Aceh, because farms and fields were damaged by the tsunami and more people moved to work in trading or construction work which was widely available during the Aceh reconstruction project. Thus, communicating knowledge to the workers becomes one of the important aspects for helping to improve the reconstruction quality.

### **Knowledge and knowledge communication**

From a construction project perspective, a post-disaster reconstruction project is similar to construction under 'normal' conditions. However, the nature of the reconstruction is quite different, commonly with the addition of chaotic conditions, rarity of resources and with many simultaneous projects being carried out at the same time (Davidson et al., 2007, Siriwardena et al., 2009). With regards to the size of the disaster, the reconstruction project has challenges that are different to 'normal' construction project (Hidayat and Egbu, 2011).

Egbu and Robinson (2005) point out that the construction industry is a knowledge-based industry, although the industry is commonly known for its products: buildings, roads, bridges, dams and monuments. Egbu and Robinson (2005) gave an example of the construction of a new modern office complex in which 70% of production costs can be associated with knowledge-based elements.

Rennie (1999, cited in Olomolaiye, 2007) defines knowledge from five different perspectives: know-why, know-how, know-where, know-what, know-when and know-who. Know-why is the scientific knowledge of principle and laws of nature; know-what is accumulation of facts; know-how is the skill or ability to do something; know-where is the ability to find the right information; know-when is sense of timing; and know-who is the information about who knows what (Egbu and Robinson, 2005). Knowledge management becomes vital in the construction industry because the industry is continually exploring ways to increase efficiency, "*finding new ways of doing things*" (Pathirage, 2007). Also, in order to fulfil clients' demand, construction organisations should improve on past solutions, innovate, and manage change, by producing new knowledge (Egbu et al., 2003).

When knowledge is viewed as a process, knowledge management focuses on knowledge flow and the process of creation, and sharing and distribution of knowledge (Alavi and Leidner, 2001). Organisations may obtain benefits from knowledge management if knowledge is conveyed from one person to another. The process for conveying knowledge may be known in literature as knowledge sharing, knowledge transfer, knowledge diffusion, knowledge distribution, or in this paper is labelled knowledge communication. For example, knowledge transfer involves either actively communicating to others what one knows or actively consulting others in order to learn what they know (Hooff and Ridder, 2004). Liyanage et al., (2009) also suggest that knowledge transfer is the act of communication where knowledge transfer is considered to be the conveyance of knowledge from one place, person or ownership to another. Specifically, Eppler (2007) defines knowledge communication as "*(deliberate) activity of interactively conveying and co-constructing insights, assessments, experiences or skills through verbal and non-verbal means*".

In knowledge communication there are barriers which hinder the conveying process which may lead to less utilisation of knowledge in the project. The process of conveying knowledge may be fitted into the communication model created by Shannon and Weaver which consists of sender, message and recipient. The effectiveness of the communication may be affected by occurrences of noise or barriers that originated from the sender, the message, the recipient, or



the communication environment. A series of publications by Eppler (Eppler, 2006, Lurati and Eppler, 2006, Eppler, 2007) investigates problems between experts and decision makers in knowledge communication. Cohen & Levinthal (1990) suggest the importance of the absorptive capacity in knowledge communication; which is the ability to recognise, assimilate, and apply new knowledge. Another barrier is the inability or unwillingness to share knowledge, or stickiness of knowledge (Szulanski, 1996, Li and Hsieh, 2009). Riege (2005) has identified three dozens of barriers to knowledge sharing which consist of personal barriers, organisation barriers, and technological barriers.

## RESEARCH METHODOLOGY

The research employs a mixed method research approach, combining quantitative (questionnaire survey) and qualitative (semi-structured interviews) paradigms and allowing investigation from both an inductive and deductive perspective (Hesse-Biber, 2010, Jogulu and Pansiri, 2011). The respondents in the research are contractors, consultants, NGOs, and local government organisations who have had experience of the Aceh reconstruction, the Yogyakarta reconstruction, and the West Sumatra reconstruction. For the questionnaire survey, 777 postal and email questionnaires were distributed and 151 questionnaires were returned, of which, 143 questionnaires were usable. This represents a 19.4% response rate. The respondents of the questionnaire survey consisted of 47 contractors, 36 NGOs, 34 local governments, and 26 consultants. Concurrent with the questionnaire survey, 33 semi-structured interviews have also been conducted with informants from the previously mentioned four organisations.

Barriers to knowledge communication were identified from previous publications on knowledge management and the 15 most cited barriers were used in questions in the questionnaire survey in this research. The questionnaire seeks the frequency of occurrence and the influence of the barriers. Questions about the barriers were also asked in the semi-structured interviews. The questionnaire survey data was analysed using SPSS 16.0 software and the semi-structured interview data was analysed using NVivo 9.0 software.

## FINDINGS AND DISCUSSIONS

Table 1 shows the results of knowledge communication barriers in post-disaster reconstruction projects. The respondents were asked to rate the influence of the barriers to effective knowledge communication using a five Likert-like scale, from 1 for 'not influential at all' to 5 for 'very influential'. The five most significant barriers are 'too much information to be processed quickly', 'limited ability to grasp the knowledge', 'there is not enough time for collecting information or knowledge', 'poor relationship between participants, and 'inadequate infrastructure for knowledge communication'.

Examination of Table 1 shows that there are some differences in the rank of influence of barrier to effective knowledge communication. Lack of prior knowledge was ranked 1st by contractors, but was ranked 6th by NGOs and consultants. Respondents from NGOs perceived 'not enough time for collecting information or knowledge' (ranked 1st), to be the most influential barrier to knowledge communication. For respondents from government organisations, 'valuing knowledge from outside more than inside' was ranked 1st as the most influential barrier to effective knowledge communication.

When asked about the barriers to communicating knowledge, most of respondents of the interviews stated the difference in the background among post-disaster reconstruction project participants. Differences in educational background is one example where, although reconstruction projects are basically construction projects, the workers involved do not need to have had an engineering or construction education background, as mentioned by the following respondent:

*“Many people in Aceh [reconstruction] who enter reconstruction work may not have an engineering or construction background. For example, because he was good in English then he is hired by NGOs to do the work. In fact, his educational background was literacy, so he led the NGO people who at that time consisted of newly graduated engineers. It has become an obstacle.” (R22-NGO)*

One prominent barrier which emerged from the questionnaire survey and the interviews is ‘limited ability to grasp the knowledge, lack of prior knowledge’, or it can be associated with a lack of absorptive capacity. Absorptive capacity is the ability to recognise, assimilate, and apply the new knowledge (Cohen and Levinthal, 1990). Lack of absorptive capacity is one of the major barriers to internal knowledge transfer where the knowledge recipient might be unable to exploit the new knowledge (Szulanski, 1996). Zahra and George (2002) argue that there are four components to absorptive capacity: acquisition, assimilation, transformation, and exploitation; one of the components in acquisition is prior knowledge. A project manager in the interview illustrated this problem as follows:

*“The biggest obstacle is in terms of basic knowledge. Well, if we talk to [owner from] the technical departments, perhaps the solutions or the experiences we give them they maybe cannot ‘picture’ because they had never had such experiences. But in the [owner from] non-technical departments where their basic knowledge is not technical, we share our experience; they have not a clue.” (R23-CTR)*

There are various approaches to post-disaster reconstruction, from financial support only to donor-driven reconstruction (Jha et al., 2010). The implementation of the construction of houses in the reconstruction phase may be conducted by the disaster-affected community or by local contractors with technical support and supervision provided by ‘facilitators’ hired by the NGOs. In the case of Indonesia, both approaches were used by local builders (artisans, or locally known as ‘tukang’). There was some resistances from the ‘tukang’ to accepting new knowledge related to seismic safe construction, due to local habits and customs and knowledge from the facilitators, of whom the majority are fresh graduates from university, and are perceived as having little experience. Local builders need good reasons to change their construction habits, as mentioned by one of the respondents:

*“If he [‘tukang’] sees the evidence directly, he can simply change his habits. For example, previously, he builds a house with concrete and reinforced steel but if after the earthquake the house is cracked or collapsed, he will then quickly change his habits. The habit here is to use 8mm bars for concrete reinforced steel, so long as he has no experience of a collapsed house it will take a long time for him to adjust his habits (R19-NGO)”.*

In Table 1 it can also be observed that respondents from government organisations perceived ‘valued knowledge from outside more than inside organisation’ as the most influential barrier to knowledge transfer. In the reconstruction stage there is involvement of foreign staff, or experts, from other countries; and in Indonesia there is often the perception that external knowledge sources, from foreigners, are held in high esteem as indicated by Menon and Pfeffer (2003). The preference is also due to people perceiving items are more valuable when they are less available or rare (Cialdini, 2001). An example of this barrier is captured in one of the interviews with a project manager from a contracting company. The project manager proposed a structural design for a building to the supervising consultants and the project owner, but they had difficulty in accepting the proposed design. He invited a specialist, one of the few experts in earthquake engineering, to come to a meeting with the consultant and the project owner. The expert often dubbed the ‘father of earthquakes’ gave his opinion and although that opinion was very similar to that previously suggested by the project manager, the consultant and the project owner easily accepted it. This indicates the scarcity value in the number of experts in the field as indicated by Cialdini (2001).

**Table 1 Influence of knowledge communication barriers by organisation type**

Barriers	Mean Score					Rank				
	ALL (N=143)	CTR (N=47)	NGO (N=36)	GOV (N=34)	CSL (N=26)	ALL	CTR	NGO	GOV	CSL
Too much information that has to be processed quickly	3.63	3.64	3.50	3.53	3.92	1	2	3	4	1
Limited ability to grasp the knowledge, lack of prior knowledge	3.62	3.81	3.42	3.68	3.46	2	1	6	2	6
There is not enough time for collecting information or knowledge	3.57	3.30	3.78	3.53	3.81	3	11	1	3	2
Poor relationship between participants, so there is inadequate trust	3.49	3.57	3.56	3.35	3.42	4	5	2	7	7
Inadequate infrastructure (e.g. ICT) for knowledge communication	3.43	3.57	3.03	3.47	3.69	5	3	14	6	3
Refused knowledge from outside because of pride of group/organisation	3.42	3.57	3.36	3.32	3.35	6	4	8	10	9
Lack of motivation to seek or share knowledge	3.38	3.32	3.36	3.35	3.54	7	9	9	8	5
Cultural difference (e.g. language)	3.36	3.43	3.47	3.32	3.15	8	6	5	11	11
Using inappropriate channel or media for communication	3.35	3.43	3.28	3.35	3.31	9	7	11	9	10
Assuming the other participant(s) have similar understanding of an issue	3.34	3.32	3.47	3.47	3.04	10	10	4	5	13
Lack of time to share knowledge	3.32	3.23	3.39	3.29	3.42	11	13	7	12	8
Valued information/knowledge from outside more than inside organisation	3.31	3.30	3.11	3.68	3.12	12	12	12	1	12
Hierarchical organisational structure inhibiting knowledge communication	3.27	3.40	3.06	3.12	3.54	13	8	13	13	4
Refusal to share knowledge because of fear about job security	2.89	2.94	2.69	3.09	2.81	14	14	15	14	14
Using specialised language, not common language, in communication	2.88	2.70	3.33	2.88	2.58	15	15	10	15	15

The scale : 1 (Not influential at all), 2 (Less influential), 3 (Fairly influential), 4 (Influential), 5 (Very influential)

ALL = Overall, CTR = Contractors, NGO = NGOs, GOV = Governments, CSL = Consultants

## CONCLUSIONS

Post-disaster reconstruction is a strategic stage in disaster management but there are various challenges to its implementation. One of them is achieving the planned quality. Knowledge communication, if addressed well, may help to improve quality of work, spread best practices, reduce re-work and problem solving. In the same vein, knowledge communication processes have barriers that impact on their implementation which have their origin in the sender, receiver or medium and the environment of knowledge communication. This paper has discussed the various barriers to knowledge communication, three of the most influential barriers to knowledge communication are 'too much information to process', 'limited ability to grasp knowledge', and 'there is not enough time for collecting knowledge. Due to the occurrences of the barriers important knowledge (e.g. construction quality and seismic-safe structural design) may not have been conveyed to the required recipients. By identifying these barriers project managers may be helped in choosing the right knowledge communication methods. It suggested that meetings are one of important and effective methods.

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## **Paper 9: Post-Earthquake Permanent Housing Implementations and the Communities Affected: A Study on Rural Eastern Turkey**

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### **ABSTRACT**

Post-disaster permanent housing projects have been the focus of academic studies for the last few decades. They generally point the difficulties and challenges in such implementations based on single-case studies. Turkey is one of the most earthquake-prone countries; and for each experience, it has put more effort into developing better post-earthquake permanent housing implementations for its rural areas. Therefore, there is a need to assess and evaluate more systematically the approaches and the improvements in its reconstruction process over the years. To do this, with a multiple-case study design, both historical and current housing implementations in rural eastern Turkey are examined based on 'secondary resources' research and 'direct' field surveys. Three cases (the province of Erzincan, Erzurum and Van) examined in the paper are given in chronological order, to highlight the long-term, mid-term and short-term effects of the implementations.

**Keywords:** perception of rural dwellers, permanent housing implementations, post-disaster reconstruction, rural Turkey, the Eastern Anatolia Region.

### **INTRODUCTION**

When a disaster has a huge impact in extensive scale, which indicates devastations in both the physical environment and the psychological situation of the society; the capacity of the society affected to cope with the situation is often insufficient (UNISDR, 2007). Hence, an intervention from out of the local back-up resources is required to help the society affected to re-establish itself. Today, most of the countries obtained their post-disaster action guidelines or methods as a part of 'disaster preparedness'. However, planning and reconstruction of the destroyed physical environment are generally considered as 'disaster mitigation', and seen as the last component of 'preparedness'. Furthermore, the 'practice' of reconstruction after a natural disaster is also argued as a modified model of the practices in ordinary times in terms of its process and the legislations (Masurier et al. 2006; Boano & Hunter 2012). Rebuilding and providing houses to survivors, and to remain in an affordable budget are the utmost challenging issues for the countries in the post-disaster period. Reconstruction period often takes longer time than the planned, and has inevitable long-term effects on the society involved. It is more complicated than the early stages of disaster response, and requires particular aims to achieve disaster mitigation, such as reconstructing more resistant the built environment and developing better settlement plans with facilities and infrastructure where not existing previously. Notwithstanding, post-disaster reconstruction has different features in urban and rural context. While the dynamics of urban areas are more homogenised in terms of socio-cultural and economical structure, in the worldwide extent; rural areas are more customised with their unique characteristics, particularly in developing countries. Traditional construction practice, agriculture-dependent economy, strong cultural background, and

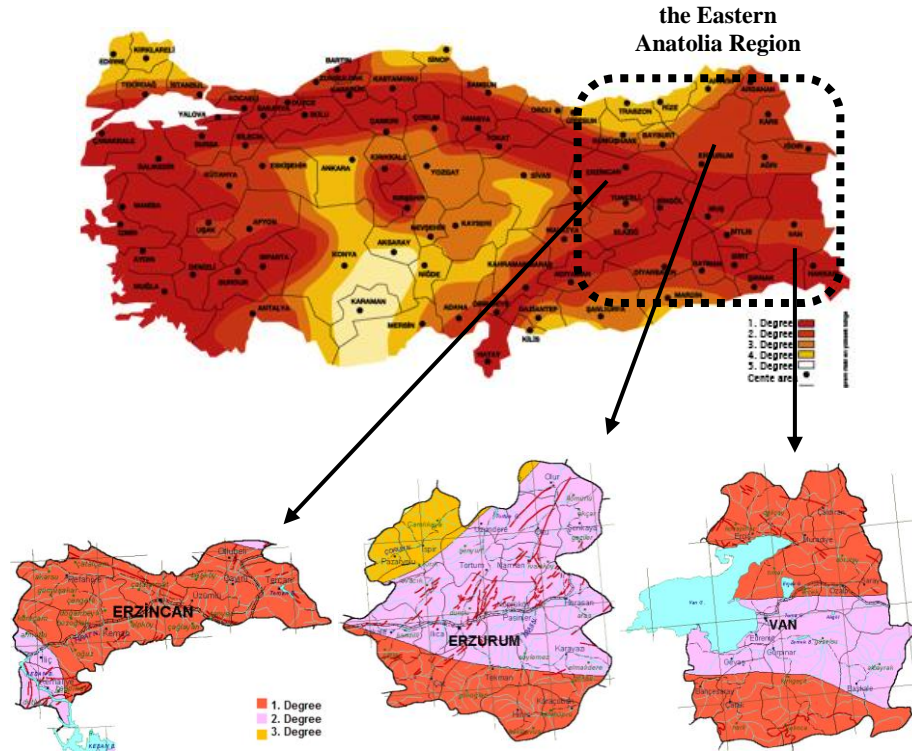
most of the time, conservative living are the leading factors that differ rural areas from urban areas, even from each other.

Between 1939 and 2011, Turkey experienced numerous earthquakes and applied different approaches of the post-disaster reconstruction depending on the location and result of the tremor. However, the implementations for the rural areas affected have been a challenge for the state authorities; and still there are gaps in the post-disaster permanent housing implementations in terms of their functional-structural-social sufficiency, which are required for the sustainability of such interventions adapted by the state. The number of the academic studies highlighting such issues on a single-case basis is relatively high enough to raise a set of discussions about the post-earthquake permanent housing implementations for the rural areas of Turkey. However, in consideration of the fact that Turkey has put more effort into developing better post-earthquake permanent housing implementations for its rural areas after each occurrence, this doctoral study aims to address the need of assessing and evaluating more systematically the improvements in the process and the adaptations of the damaged rural settlements through implementations run by the state authorities. Having this starting point in mind, this study examines the post-earthquake permanent housing implementations completed in the rural areas of Turkey within the last two decades. The target area of the study is the Eastern Anatolia Region of Turkey, which is situated on the first and the second degree of seismic risk zones of the country. When such seismically active geography overlaps with a highly vulnerable rural built environment, it often results in large numbers of death and injuries along with the heavily damaged settlements. Besides, the region has a concrete rural characteristic that have not changed over the years, and based on the indicators stressed (illiteracy, unemployment, low level of income, low level of productivity in agriculture, and quality of living standards) by various researchers it is still considered as ‘under-developed’ among the other regions of Turkey.

## THE RESEARCH METHODOLOGY

Having a qualitative approach as a fundamental research strategy, the researcher adopted the multiple-case study method by conducting ‘direct’ field expeditions in order to explore such a complex phenomenon with a holistic approach. Figure 1 illustrates the locations of the provinces with each of their seismic risk map. The data collection from each selected cases was completed through questionnaires and semi-structured interviews with the dwellers; beside, the researcher’s direct observations documented through photographs. The aim at selecting three cases is to investigate the implementations in a chronological timeline including short-term, mid-term and long-term outputs. Therefore, each of three provinces selected meets a term in the timeline, and has their own sampling groups, which are the rural settlements rebuilt after the earthquakes.

The form of this paper presents the three cases both in a way of descriptive and comparative assessment as much as possible. The paper combines a set of visual data collected through ‘secondary resources’ research and ‘direct’ field surveys to illustrate the built environment and the implementations along with a conclusion of the preliminary findings upon the dwellers’ adaptation in socio-economical and physical context. To better explain the changes of the state implementations in time, each case study starts with the past experience and continues with currently existing implementations. It should be noted that the paper aims to pave the way to understand the prospective outcomes of the study in a broader context; and thus, the findings, intentionally, does not branch into the results of in-depth analysis, which is the next path of the current study.



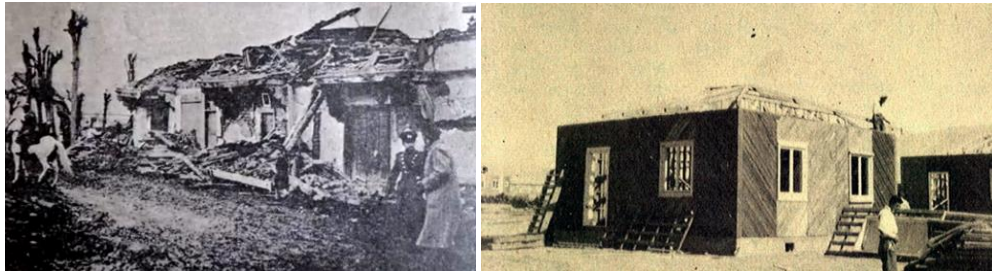
**Figure 1** The map above shows the seismic risk zones in Turkey, the bold dashed line indicates the location of the region; and below is the target provinces of the study with their seismic risk maps (DEMP Earthquake Department 1993).

## THE MULTIPLE-CASE STUDY

### Case I: the province of Erzincan (1992)

Erzincan has an area of 11.900 km<sup>2</sup> and the human settlements are mostly situated at the altitude of 1200 m while the province is surrounded by the mountains reaching up to 3000 m. As a result, it has a harsh climate with severe colds and heavy snow during winter, which lasts over 4 months per year (Williams et al. 1992). In 1939 (27th December) the most severe earthquake in the history of Turkey occurred in the midnight with a magnitude of 7,9 Mw (and with 8,2 severity on the surface) (Meguro & Nakano 1993; Fuenzalida et al. 1997). The amount of the loss was large and the devastation was widespread, and the state was unprepared to the earthquake. The reconstruction started with the financial help and material supply of foreign countries (Bozdemir 2011; Koyunoğlu, 1977) (Figure 2). In 1992 (13th March) another relatively severe earthquake took place in the evening with a magnitude of 6,8 Mw. More than 600 people died and nearly 30.000 residential units heavily damaged by the earthquake. The tremor affected adjacent 150 villages and causing devastation (Williams et al. 1992; Meguro & Nakano 1993; The Ministry of Settlements and Public Works 1993).





**Figure 2** A picture from a village heavily damaged by the earthquake (Bozdemir, 2011); a picture from the reconstruction phase of the permanent houses, which are wooden frame structures with reinforced concrete foundations (Koyunoğlu, 1977).

The reconstruction phase started a few months later and houses were delivered to survivors by the end of the year (Figure 3). Preferred material in the reconstruction was reinforced concrete and supplied by local firms. Foreign agencies donated the implementations they conducted (The Ministry of Settlements and Public Works 1993). While most of the villages were relocated after this earthquake, some relocated twice after 1939 and 1992 (Hayli 2001).



**Figure 3** A picture of a heavily damaged adobe infill-wooden frame house from the village of Altınbasak (Williams et al. 1992); the reconstruction phase in the same village (The Ministry of Settlement and Public Works of Turkey 1993).

### Findings from the direct field surveys and observations

Today, after two decades, the rural settlements reconstructed in 1992 are still standing and administered as districts under the municipalities as a part of development and investment plan of the state. As time passed, the central area of the province expanded, so the distance to the rural settlements shortened, which improve the relation between the urban and the rural (e.g. in terms of leaving the agricultural activities in the villages and increasing the employment in labour market of the urban area and higher level of literacy among the adults). Figure 4 provides the current conditions of the implementations. The first impression of the researcher during the field study was that the reconstructed settlements almost became the natural pattern in the rural built environment, since all the implementations were same in structure and plan layouts. Some of the dwellers have changed significantly both the exterior and interior of their houses. For example, the number of the dwellers who changed the door and window profiles was high, and most of them added a porch to the entrance in order to minimise the dust and cold weather coming inwards as well as to create a terrace to sit in warm weather. Particularly, in the villages quite near to the central area, the dwellers no longer have agricultural activities. Most of them stated that they gave up farming and sold the farming lands sometime after the earthquake.



**Figure 4** The exterior picture of a maintained house with a facade painted and plastic window profiles; a dweller added a porch to the entrance of the house; another dweller added an extra space to the next of the house (D G Yilmaz 2013).

Therefore, the barn units rebuilt by the state were mostly in use as storage or changed into another small residential unit for elder parents or guests. The number of elders who had pension insurance was unexpectedly high as well as the literacy rate. However, in nearly half of the population in the villages visited, the families use their house as a summerhouse, and some houses were already sold in second-hand market, which has never seen in the other cases of the study.

### **Case II: the province of Erzurum (2004)**

Erzurum has an area of 25.000 km<sup>2</sup> and the fourth largest province of Turkey. The human settlements are generally situated at the altitude of 1500 m, but the area is one of the most mountainous in the country which rises up to 4000 m. Therefore cold winters dominate the area with the temperature often below 0o C during the season (Demir & Polat 1985). The seismic activity in the area is significantly high particularly within the central line of the province (Horasan-Pasinler-Aşkale Faults) (Yarbasi & Bayraktutan 2001; Ozturk & Bayrak 2011). In 1983 (30th October) a severe earthquake shook the ground with a magnitude of 6,9 Mw, which resulted in 1147 casualties and 3350 houses to total collapse (Demir & Polat 1985). The reconstruction process was completed in one year with national funding entitled social housing. The combination of the structural system of the houses was reinforced concrete double-walls on foundation and timber rafters on top of the walls with aluminium covering (Gok 1995). Figure 5 shows the implementation for the village of Gerek and its current aerial view.

In 2004 (25th - 28th March) two earthquakes occurred repeatedly with magnitudes of 5,1 and 5,3 Mw. These tremors mostly affected the rural settlements, where 9 people died and nearly 3000 buildings damaged and collapsed in 80 villages (Dogan et al. 2004; Goksoy et al. 2004). Preferred structural system was reinforced concrete frame with masonry infill and clay roof tiles for covering. The post-earthquake permanent houses were rebuilt as single or two-storey buildings (Figure 6).



**Figure 5** A picture from the implementation for the village, which was totally relocated after the earthquake (Gok 2001); the aerial view of the village today (GoogleMaps 2013).





**Figure 6** A picture of a house collapsed; the samples of single-storey and two-storey buildings from the implementations completed by the end of 2004 (D G Yilmaz 2013).

### **Findings from the direct field surveys and observations**

Almost after a decade, only a few of the rural settlements reconstructed are administered as districts under municipalities. The most of them remained as villages not only by their physical features but also socio-economic indicators. During the field surveys, it was remarkable that the large number of dwellers adapted their houses according to their needs, which was more significant to two-storey buildings. Generally, the physical conditions of the building interiors were quite good, unlike the exteriors. Large cracks were on top and bottom of the walls and the outdoor stairs were also in poor conditions (Figure 7). The lack of structural quality of the buildings was the common complaint among the dwellers, which was considerably different between the implementations in one village to another.



**Figure 7** The pictures of the cracks at the bottom of the walls and a sample of the outdoor stair in poor condition with removed top-layer; Additions to the entrances to provide further interior space or storage under the stair (D G Yilmaz 2013).

Adding a shed to the entrance was the most common alteration due to the cold climate, and changing the roof covering from clay tiles to aluminium panels followed that. Besides, although the ground floor of two-storey buildings was designed as barn in the original plans, some transformed it into a residential unit due to the need of an extra space. In addition, most of the dwellers complained the unsuitableness of barn right under the house causing smell, humidity and noise. In socio-economical context, animal-stock based income still widely exists in the villages, but the rate of having pension insurance was quite low. The state provides ‘poverty’ financial help scheme and free sack of coal for heating in winter to the people who do not have any insurance. The literacy and education rate was low particularly among women and girls. Almost all of the dwellers are permanent inhabitants; there were only a few examples of usage as summerhouse.

### **Case III: the province of Van (2011)**

Van has a border to Iran and the total area of the province is 19.069 km<sup>2</sup>. The area covers and surrounded by the mountains reaching at 4000 m. As a result, the human settlements are situated at relatively high altitude of 1725 m and around. Existence of the large Van Lake highly affects the harsh climate over the area, reducing the differences of average summer-winter temperatures and resulting in hot summers unlike the other adjacent provinces (T.C Van Valiligi 2013). The historical records prove the frequent seismic activity of the area due to spread fault lines, particularly

between the Lake Van and the Iranian border. In 1976 (24th November) the second most severe earthquake occurred since 1939 with a magnitude of 7,2 Mw, which resulted in over 6000 death (Milliyet Archives 1976) and over 14000 buildings heavily damaged or collapsed (Shelter Projects 2009). The reconstruction process was completed by the end of November 1977, and the state preferred to rebuild the houses as reinforced concrete frame with infill materials, and the roof structure from timber rafters with aluminium panel covering. Almost after 40 years, some of these buildings are still in use by the dwellers, but most of them are in poor conditions so that during the damage assessment surveys after the earthquakes in 2011, many of them were reported as mid-damaged for retrofitting or rebuilding by the state (Figure 8).



**Figure 8** The exterior view of the housing projects for the 1976 earthquake, which are still standing but fairly in poor conditions due to the lack of maintenance; cracks around windows and visible steel reinforcing bars at the bottom of the walls due to plaster loss and an interior beam suffers from loss of section size (D G Yilmaz 2013).

In 2011 (23rd October & 9th November) two earthquakes shook the area with the magnitudes of 7,2 and 5,6 Mw, which causing 644 deaths and giving serious damages to over 15000 buildings both in urban and rural areas (Mimarlar Odasi 2012). The reconstruction process was started just one month after the earthquakes. The state intervene directly only two large villages and hired contractors for the reconstruction of the rest of the villages. Significance of the houses rebuilt directly by the state is that they were built as light-steel frame structures, while the rest were reinforced concrete structures (Figure 9).



**Figure 9** A picture from the ruins of a house in the Topaktas Village (D G Yilmaz 2013); the construction system of the implementations for the village (AFAD 2012), and the aerial view of the new settlement (Van Valiligi 2012).

### Findings from the direct field surveys and observations

During the field surveys, some of the rural dwellers living in the light-steel frame houses stated that their preference would be reinforced concrete, which they considered as 'more resistant'. In addition, some mentioned that if the houses were built with concrete, they would add another storey on top of them to create a larger space. Another common bias among the dwellers was that the light-steel frame houses would not have cost as much as the concrete buildings. Correspondingly, they mostly complained the amount of the loan state provided for these houses (75.000TL), which were quite higher than the loans given for the reinforced concrete buildings (40.000TL). On the other hand, while the direct interventions of the state were already

completed within a year, the reconstruction process was still on in the other villages even after two years. The contractor system was the most common complaint in these villages due to several issues, such as poor workmanship, lack of quality in structural and finishing materials and delivering the houses incomplete. Some dwellers stated that they would better rebuild by themselves than the contractor done, while in some cases the dwellers had to continue the reconstruction or to complete the finishing materials themselves. Nevertheless, even though the houses were delivered to the beneficiaries almost a year ago, some already applied alterations to their houses (e.g. a porch or shed to the entrance, extending the house and changing the interior materials). From a socio-economic perspective, the number of the families temporally migrated to adjacent areas was quite high, but most of them state that they no longer considered going to another place. Agricultural activities are not preferable anymore for the dwellers, as they started to work in regular jobs, such as security staff, driver and officer. The rate of literacy and university education was the highest of the other cases in this study. The dwellers currently living in the implementations are permanent inhabitants, but particularly in two villages that the state intervened there were unoccupied houses due to their owners' dissatisfaction with the houses, as their neighbours mentioned so.

## **CONCLUSIONS**

From the cases in the study, the improvement in the level of preparedness to earthquakes of Turkey is clear since the reconstruction process started in less than a month after the earthquake in Van. The study reveals that the preference of structural material for the reconstruction changed from timber to steel in years by the state. However, the perception of the rural dwellers on the material remained limited to concrete, due to the lack of knowledge about steel and the collapses of timber log buildings in previous earthquakes. Relocation of damaged settlements to a more accessible area and rebuilding the new settlement in grid-layout were often preferred by the state. However, it should be noted at this point that in such cases some dwellers mentioned their aspirations for the former settlements due to several reasons including less windy and greener location, beside their sentimental connection. The design of the houses, nearly in all cases selected, was often evaluated insufficient by the rural dwellers in terms of the size of the house, number of rooms and plan typologies. Correspondingly, most of the dwellers adapted the implementations according to their needs. The most significant finding within the socio-economic context is that the earthquakes and post-earthquake permanent housing implementations change the way people live, particularly livelihood resources. While such changes can be seen prominently in the long-run, even in the short-run dwellers tend to adapt themselves in parallel to the changes in their built environment. Add to this the fact that development and investment plans should follow the reconstruction period in the rural settlements in order to improve the quality of dwellers' lives in terms of transferring the relation between urban and rural areas to a higher level, as in the case of Erzincan.

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## **Paper 10: Disaster Risk Reduction in Bangladesh as an Adaptation Strategy for Climate Change**

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### **ABSTRACT**

Bangladesh is one of the most disaster prone countries of the world and it is predicted that its current climate variability will be made worse by future climate change. Beyond some of the limitations of implementing disaster risk reduction (DRR) in Bangladesh, residents of high risk locations and local practitioners have been coping for as long as records began with environmental hazards and disasters using their own knowledge and experiences. Although climate change adaptation (CCA) is a recent concept in institutional development terms, the country intends to mainstream both DRR and CCA in all phases of development. To better understand the meaning and implications of this combined application of big ideas to local context a study was carried out amongst disaster survivors and local level practitioners in focal regions of Bangladesh. This used a qualitative approach to understand the underpinning of a community based DRR-CCA nexus. Apart from differences between coping strategies for flood and cyclone, respondents were similarly concerned about how recovery from recent disaster losses can prepare them for similar events next time. They were also found to be using their knowledge and experience of disaster management as CCA. Academics and those in leadership in this sector also corroborated DRR as a suitable climate change adaptation strategy in this part of the world. It is suggested that Bangladesh has much to offer in demonstrating how the implementation of community based DRR can reduce disaster risk as well as be the driver of CCA.

**Keywords:** Bangladesh, CCA, community participation, DRR.

### **INTRODUCTION**

Environmental hazards and risks of disaster are considered to be highest in contexts of poverty in the developing world, where resulting losses can also be a major obstacle to development (United Nations 2000, Dilley et al. 2005, Collins 2009, UNISDR 2009a). Evidence shows that climate change can affect disaster risks in two ways; firstly through increased climatic hazards, and secondly through the vulnerability of communities to hazards, particularly resulting from ecosystem degradation, reductions in water and food availability, and changes to livelihoods (O'Brien et al. 2008, UNISDR 2009a). Apart from projected extreme climatic events of the future, many changes are already being observed due to climate variability (UNISDR 2008, 2009b).

#### **Disaster risk reduction (DRR)**

Increasing trends of environmental disasters and their threatening impacts on lives and livelihoods resulted in a paradigm shift in disaster management in many countries - from short term 'relief and response' to 'integrated disaster management' approaches addressing all phases of disasters (Wisner et al. 2004). Many countries are committed to incorporating DRR in their development projects primarily focusing on preparedness, mitigation and prevention to reduce vulnerability (Van Aalst & Helmer 2004, Burton & Van Aalst 2004, Sperling & Szekely 2005). The Hyogo Framework for Action 2005-2015 (HFA) aims to progress DRR, particularly from an institutional



point of view, in the passing of national legislation, in setting up early warning systems and in strengthening disaster preparedness and response (UNISDR 2011).

### **Climate change adaptation (CCA)**

In the context of climate change, ‘adaptation’ strategies in the developing world principally mean the processes or adjustments that people make to reduce their present vulnerability to climate risk (Burton et al. 1993, ed. Smit 1993, Smith 1997, Smithers & Smit 1997, Olmos 2001, O’Brien 2008). However, many studies show that at community level people have been adapting for centuries to climatic trends and extremes (Brokensha et al. 1980, Campbell 1990, 2006, Inglis 1993, Nunn & Britton 2001, Gaillard 2007) and that this will be a significantly increased challenge for them over the next several decades (O’Brien et al. 2006). CCA strategies aim to reduce vulnerability to expected impacts of climate change (Mercer 2010) across local and global scales from community level responses through to local, national and international government interventions (United Nations Framework Convention on Climate Change 2006). Most of the developing countries have developed their own ‘National Adaptation Programmes for Action’ (NAPA) identifying appropriate areas in which adaptation strategies are essential to mitigate against adverse climate change effects (Mercer 2010). However, to date many CCA initiatives are hypothetical in the international arena and mostly programme and project oriented in practice rather than disseminated to, embedded amongst, or driven from within groups of local people most at risk.

### **DRR – CCA nexus**

There are no shortage of analysts (ed. Glantz 1999, 2003, O’Brien et al. 2006, Warner et. al. 2009, IPCC 2012) who call for a common platform for both DRR and CCA to reduce disaster risks and adapt to climate change in the context of vulnerability reduction and wider development. This is also a very evident theme in the literature of the NGOs and UN Organisations (UNISDR 2012). Mercer (2010) stated that community based DRR could provide an entry point for CCA that would include CCA initiatives. He also added that many countries and regional co-operations have integrated DRR and CCA in their policies and practices. However, the manner in which DRR and CCA work together at community level has not been given much attention. It is therefore necessary to examine the theoretical underpinnings in the light of the knowledge and experiences of local people and communities of practice in the front line of DRR and CCA. .

### **Bangladesh: geographical focus of the study**

Bangladesh is one of the most disaster vulnerable and climate change affected countries in the world (IPCC 2007). However, it is important to note that the country has a good history of disaster management and recently, beyond its regular seasonal environmental risks, has also been taking global climate change into account (Ministry of Disaster Management and Relief, Government of Bangladesh 2012). Most development projects in the country have addressed reducing vulnerability to disasters or poverty, and it is well recorded how local people have their own well established coping capacities (Alam & Collins 2010). The government has invested around US\$10 billion for adjusting to climatic events over the last 35 years (MDMR, GoB 2012). Apart from some controversial decisions, that include its Flood Control Drainage and Irrigation projects and Flood Action Plan, the country has been working for strengthening its policy for action and institutional structures to deal with environmental disasters and climate change.

Bangladesh is incorporating DRR and CCA principles and practices into all development programmes, sectoral policies and plans including those of the NGOs

(MDMR, GoB 2012). However, apart from implementing development projects that can answer to DRR and CCA, the country has very little experience in dealing with climate change in practice.

### Objectives of the study

The study from which this paper is derived critically examines the role of DRR in CCA at community level for a disaster prone country context. In these circumstances, the question arises as to how DRR, which may be more prevalent as a natural process in Bangladesh, can incorporate CCA project implementation? What potential adjustments or recognition of existing local knowledge and practice are necessary? How local people perceive and respond to disaster events using their indigenous knowledge and practices and react to external interventions in a climate change context? The paper explicates DRR as an adaptation strategy for climate change from a community resilience point of view.

## RESEARCH METHODOLOGY

### Methods of the study

The study was designed using a qualitative data collection approach implemented through active community participation. Primarily this used in-depth interviews and focus group discussion (FGD). Eight in-depth interviews and four focus group discussions were conducted in four study villages. Local level government and NGO officials were also interviewed. The study was supplemented by the researcher's observations and notes throughout.

### Study area

Two distinct geographical locations were selected so as to provide opportunity to investigate local knowledge and practices in zones of contrasting socio-cultural contexts and differences between flood and cyclone prone areas of

Bangladesh. A further, two villages were selected from each area (Figure 1). This is because there are differences in the types of flooding event in relation to local communities for the river islands in Sirajganj district to those in the mainland adjacent to the Jamuna River in Bogra district. Impacts of cyclones Sidr and Aila on coastal communities are varied due to local socio-economic conditions. Two cyclone affected villages were selected from Barguna and Satkhira district respectively. During selection of the study villages, some further issues such as easy accessibility, local logistics and personal safety had to also be taken into consideration.



Figure 1 Four Study Areas

### ***Selection of respondents***

One respondent was selected for in-depth interview from each of eight social groups comprising farmers, fishermen, businesspersons, local leaders, senior citizens, women, NGO personnel and academics. These respondents were selected considering criteria of their age, sex, socio-economic background, and their willingness to participate in the study. Local NGO personnel assisted the researcher through introductions to the local people. In all instances engagements with respondents observed the norms of ethical practice including consent in advance of an interview and confidentiality regards participant identity within the context of the data collection.

## **RESULTS AND DISCUSSION**

### **Community perception of disasters in a climate change context**

*“Sidr cost us a lot that we never thought. Though Aila didn’t damage to such volume, we were worried and ran away to the shelter. We are afraid of the increasing frequency of cyclones.”* (A farmer aged 35, Barguna, June, 2012)

*“People’s vulnerability is increasing as the length of floods is increasing. Besides, river bank erosions are also increasing.”* (A member of local Union Council and businessman aged 38, Bogra, March, 2012)

As with the above two respondents, most people from the coast and river islands of Bangladesh believe that their local hazard calendar is changing in terms of increasing frequency, timing and magnitude of environmental events that affect their lives and livelihoods. This scenario suggests the impact of climate change as already predicted by international scientists. Though local people’s perception of climate change as an underlying cause is not clear, they have noticed the changes in their local environment in terms of their exposure to potential and actual disaster events. The respondents agreed that there is a negative relation between disaster vulnerability and coping mechanisms indicating that if their vulnerability increases, their capacity to be resilient will be eroded. Some senior citizens expressed that they were aware of underlying climatic factors, not just the river environment. They referred to the changing weight of disasters through associated economic costs.

*“I can feel temperature is increasing. I am not going to say rainfall is also increasing or decreasing but the time is changing. The numbers of early and late floods are increasing.”* (A senior citizen and landowner aged around 70, Sirajganj, January, 2013)

In addition, the local government and NGO staff claimed that they are often discussing climate change and its impacts. The participants of the FGDs also agreed that they had attended awareness building trainings and workshops on climate change. However, they added that it is difficult for them to utilise this new information in their daily lives and just lived with the uncertainty of disaster.

### **Community response to disasters and climate change**

When asked during FGDs, it was observed that participants felt more comfortable in discussing about how they coped with environmental hazards and disasters than with climate change. Though there is a distinct variation between coping strategies for cyclones and floods, the main intention is to save their lives and protect their belongings and livelihoods that are helping them to recover from previous disaster losses and to prepare for the next event (Table 1). These coping mechanisms have been transferred from one generation to the next. However, they need to readjust their

inherited coping strategies after experiencing one severe environmental event to the next.

In contrast, the respondents were confused regarding their responses and how they can adapt to climate change. It was observed that the respondents had an intention to move the discussion on CCA to their indigenous coping strategies for surviving disasters.

*“I don’t know what I should do if climate change happens; but I know how to prepare for floods. ... Our house is portable so that we can easily move it if erosion occurs. Actually we have already moved here two years ago.”* (A housewife aged around 35, Sirajganj, January, 2013)

*“I am a local person. I have been seeing from my childhood that the local people are fighting against cyclones after regular intervals and they have their own coping strategy. ... Nowadays we are hearing about climate change and its impact. But my little knowledge says that if we can protect these people from cyclones and salinity they can easily adapt to climate change.”* (A school teacher aged 56, Barguna, June, 2012)

**Table 1 Community level strategies for dealing with cyclones and floods**

Phases	Cyclones	Floods
Pre-disaster	<ul style="list-style-type: none"> <li>• Disseminating early warning</li> <li>• Packing essential goods</li> <li>• Moving to shelters</li> <li>• Protecting embankments</li> </ul>	<ul style="list-style-type: none"> <li>• Packing essentials goods</li> <li>• Preparing mobile earthen stoves</li> <li>• Inter-cropping</li> <li>• Use of short-distances and flood resistant crop varieties</li> </ul>
	<ul style="list-style-type: none"> <li>• Staying at shelters/homes</li> </ul>	<ul style="list-style-type: none"> <li>• Building high platform if flood water increases above home plinth</li> <li>• Moving to shelter or embankment</li> <li>• Looking for relief</li> <li>• reducing food quality &amp; amount</li> <li>• Selling labour in advance</li> <li>• Getting loans from neighbours/ relatives &amp; NGOs</li> </ul>
During disaster		
Post-disaster	<ul style="list-style-type: none"> <li>• Assessing damages &amp; losses</li> <li>• Looking after neighbours</li> <li>• Looking for relief</li> <li>• Recovering losses</li> <li>• Permanent/ seasonal migration</li> </ul>	<ul style="list-style-type: none"> <li>• Sowing early winter crops</li> <li>• Seasonal migration</li> <li>• Looking for relief</li> <li>• Recovering losses</li> </ul>

(Source: FGD sessions in study areas in 2011-2012)

The above two respondents’ comments suggest that individually or collectively they cope with environmental hazards and disasters rather than climate change. A local government official in Sirajganj was of the opinion that if the local people cope with the unpredictable frequency and magnitude of climate induced disasters, they will most likely adapt to climate change. However, he added that external assistance is needed for improving their existing coping mechanisms.

### Community level external interventions

When it was asked the participants of FGD sessions what types of external help they get, they mentioned several support services for disasters provided by the government,

NGOs and development partners (Table 2). The table shows that the external activities are not only involved in humanitarian response but also in reducing their disaster vulnerability and enhancing their capacity to recover disaster losses. In the case of climate change, they did not give any particular information regarding external assistance for CCA. However, local level practitioners claimed that there are many projects on CCA. It was observed in terms of project implementation that the CCA applications are primarily focused on solar energy service, eco-friendly stoves and organic fertilizers. These CCA projects could be considered to be addressing community level vulnerability reduction, and in so doing, enhancing community resilience to disaster.

**Table 2 Major assistance from external sources**

<b>Cyclones</b>	<b>Floods</b>
<ul style="list-style-type: none"> <li>• Cyclone shelters</li> <li>• Early warning system</li> <li>• Rescue operation</li> <li>• Relief works</li> <li>• Social safety net</li> <li>• Rehabilitation programmes</li> <li>• Coastal embankments</li> <li>• Trainings &amp; workshops</li> </ul>	<ul style="list-style-type: none"> <li>• Embankments and flood shelters</li> <li>• Flood forecasting system</li> <li>• Clustered village for displaced people</li> <li>• Raising home plinths</li> <li>• Asset transfer programme i.e. livestock</li> <li>• Relief works</li> <li>• Social safety net</li> <li>• Flood resilient crop varieties</li> <li>• Trainings &amp; workshops</li> </ul>

(Source: FGD sessions in study areas in 2011-2012)

### **Community based DRR as adaptation strategy in the climate change context**

*"We can combat Sidr again in future but we need proper timely help from the government."* (A fisherman aged 45, Barguna, June, 2012)

As with the fisherman from the coast, most Sidr survivors believed that they have their own capacities to cope with cyclone risk. Here he labelled 'Sidr' as a benchmark of severity of cyclone impacts on their lives and livelihoods, which they will need to again overcome in near future. However, external assistance was considered as still needed for enhancing their disaster resilience. Further he mentioned 'proper timely help' suggesting the weakness of existing DRR policy and action that needed to be addressed. Moreover, the comments from these sources also indicated the inefficiency of local level service providers in dealing with potentially new CCA applications.

*"Recently we know about climate change adaptation. To be honest, I have no clear idea about it but we are using our experiences of working at disaster management projects."* (An NGO field worker aged 38, Satkhira, July, 2012)

As with the local level practitioners, it was observed that most government and NGO staff at community level utilise their existing experiences of disaster management for implementing CCA initiatives. Further, participants of FGD sessions said that they feel comfortable in discussing their disaster vulnerability and capacity enhancement rather than climate change in training sessions and workshops provided by government departments and local NGOs. Thus, all stakeholders at community level, dealing with both DRR and CCA, interpret climate change and its potential adaptation strategies in terms of their own knowledge and experiences, as also indicated by Bangladeshi academics.



*“In Bangladesh, the impact of climate change mainly exposes the uncertainty of disasters. ... Though there is still lack of coordination of implementing DRR approaches, I think it would be the right way to implement CCA applications at community level.”* (A university professor aged 48, Dhaka, February, 2013)

The professor revisited the underpinning of how climate change exposes the country of Bangladesh as highly prone to disasters through geographical location and ‘monsoon’ climatic characteristics. He also pointed out limitations of implementing DRR approaches due to institutional weaknesses. Though he did not mention specific details it indirectly indicated that the existing institutional structure is not fully ready to execute CCA strategies. This was evident through local people’s perspectives. Moreover, though DRR is a suggested entry point for CCA applications, consideration of both present theoretical underpinnings of DRR and CCA at global level and observations of people’s vulnerability and coping mechanisms at community level were further confirming the validity of the feedback offered from study respondents.

As active community participation is undoubtedly important in boosting the output of developmental actions, community based DRR minimises external institutional weaknesses through building an internal institutional structure for implementing DRR at community level. In such a manner, it can strengthen capacity for dealing with disaster risk in climate change contexts.

## CONCLUSION

Climatic changes are accelerating community level vulnerability to disasters in Bangladesh, particularly in the most environmental disaster prone areas. Besides limitations of the existing disaster management systems of the country, DRR is a suitable strategy for addressing climate change. Community level coping mechanisms are recognisable as having been implemented and as an effective level of intervention in Bangladesh, being only partially assisted by external institutional interventions. However, further research will expose how new adaptive mechanisms for climate change can fit with existing disaster management oriented community systems. A major challenge for the country would therefore be how the government and local NGOs can negotiate with foreign countries and development partners for utilising aid, destined as climate change adaptation grants, in the implementation of enhanced DRR approaches.

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## **Paper 11: After SARS: Focus Event and Agenda Setting**

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### **ABSTRACT**

Agenda-setting plays a vital role in the entire process of policy making. It is believed wildly that major changes in public policy result from the rise of agenda. Crises, as focus events, indicate policy failures and learning opportunities, and skipping into the agenda of policy-making increases the probability of policy change in the wake of crisis. Drawing on the SARS case, this article attempts to explore the role of crises in the agenda-setting structure of the Chinese central government.

**Key Words:** agenda setting, china SARS case, crisis, focus event.

### **INTRODUCTION**

Crises, as focus events, make involved public policies to come to light and agenda of policy making, although it still remains uncertain whether crises contribute to policy changes in the wake of crisis (Birkland 1997, Boin 2007). When crises, disasters, or unscheduled events suddenly occur, it is inevitable that these kinds of events exert tremendous pressure on existing policies and organizations. Crises, as focus events, will generate framing contests to interpret events, their causes, and the responsibilities and lessons learned (Boin, 't Hart; McConnell, 2009, 81). The policy-makers and institutions that these incidents involve may run into serious legitimacy problems (Brandstrom, Kuipers, 2003, 281) or policy crises (Boin, 't Hart 2000).

The severe acute respiratory syndrome (SARS) crisis in 2003 places significant clout on public policies, government institutions and even the perception of governance in China. Spreading from local issue to national campaign, even global panic, it is conceivable that the SARS crisis dominated the agenda of Chinese central government in 2003. The basic aim of the article is to explore the general framework of agenda setting in Chinese central government, especially, the catalyst role of the crisis during SARS.

### **Theory perspective**

Crises directly challenge existing public policies, as well as organizations and public managers in charge of them, in various ways and degrees. Policy crises which crisis events lead to might provide "a window of opportunity" (Birkland 1997) for both government actors and critics. Crisis, as a focus event, plays a positive role in promoting an issue to become a pressing problem in the problem stream because it uncovers some technology and organization deviants of the system which is always unknown in the previous period. Likewise, as many crisis scholars state, crises often cast long shadows on the politics in which they occur (Boin, 't Hart & McConnell 2009). In other words, crises act as catalyst factors in the political stream because both government and opposition actors will try to escape blame for their occurrence, consolidate/strengthen their political capital, and advance/defend the policies they stand for (Boin, 't Hart & McConnell 2009) through political interpretation of crises. The government must investigate and reflect upon existing policies and also survive the political "blame games" and media "witch hunts" that tend to follow most contemporary disasters (cf. Bovens, 't Hart 1998; Hood 2002). It must also draw lessons for either improving policy or regaining credit. The framing contest will mean that

crisis provides an opportunity and a platform for policy entrepreneurs to promote their pet proposals related to the problem and the political atmosphere.

The process of fixing attention on one problem rather than another is a central part of agenda-setting. The role of crisis in the process of policy changes base on the two facts that it provides evidence of policy failure at first. Policy-makers begin to feel that lessons need to be learnt and policy needs to be adjusted. However, the exposure of problems does not necessarily lead to policy changes. As Kingdon (1984) states, focusing events, including disasters and crises, need to be accompanied by pre-existing perception with other such events. Another, political consideration places powerful impact of agenda-setting. Generally, the technical role of crisis in the problem stream and the political interpretation of crisis in the political stream push policy issues into the policy-making agenda in that moment.

Based on this dual role of crisis on agenda-setting, indicators of effects need to be clarified. The nature of the crisis and media coverage composes the main part of indicators accompanying political context. First, nature of crisis includes death, injury and range of crisis. Second, generally media coverage means domestic and foreign pressure on the crisis. The former let decision-makers know the fact that some problems explicitly exist in the system (intentional or unintentional ignore), and they have to take necessary measures to defuse the tension (regardless of symbol or substance) after crises, while the latter helps decision-makers to just make use of crisis as an opportunity to pursue their political aims, even if some policy changes have no direct correlation with the crisis itself.

### **Case, methods and data**

This research draws on SARS in 2003 in China to explore the role of crisis in the process of agenda-setting. First, as SARS was the first severe and easily transmissible new disease to emerge in the 21st century, China's new administration was seriously doubted and criticized during this crisis. The SARS crisis in 2003 had significant influence on the Chinese government and society as well. Therefore, this case can be considered as a "critical case" (George, Bennett 2005, 120) for structuring the role of crisis in the process of agenda setting. Another, this anti-SARS war in China has been totally dominated by the government. Especially the central government took a leading role in the national campaign in the later period; thus, a series of major policy changes that SARS has triggered also concentrate on the central government level out of Guangdong local or Health department sub-system.

In doing so, case study is employed to reconstruct the whole process as exactly as possible in order to determine what policy issues rose into the agenda of the Chinese central government before, during and after SARS. It is, therefore, indispensable that reliable research materials support this exploration. The main source is the media coverage. As an important source of information, at first, a great number of news reports and previous research were used to build the general framework of how the issue rose into the agenda of the Chinese central government. It is worth explaining here why I utilized a large proportion of the previous research, for a great number of excellent, in-depth researches had been carried out on SARS case as significant social issue in recent years. During this process, both the nature of the crisis and media coverage are selected as indicators. Second, a large number of media reports were collected to structure the process of agenda setting following spreading of the SARS crisis. After finding out about several turning points in the spread of SARS and the corresponding policy changes, I started to ask for help from people who are supposed to know the stories behind these changes in order to gather supplementary materials on this subject. Especially, the factor of political consideration to some extent was confirmed by interviews. I have interviewed approximately 15-20 key persons

including officials in the Health Department, scholars who are concerned about Chinese public health issues and reporters during that time. Through these various effects, the phase of agenda setting is displayed below.

### **The agenda-setting process of SARS as focus event**

From the detection of the first case on November 16, 2002, in Guangdong Province, South China, until the removal of Beijing from the SARS list of the World Health Organization (WHO) on June 24, 2003, nearly eight months witnessed the biggest fight against an infectious virus in the 21st century in China. According to China's Ministry of Health, the deadly SARS virus eventually spread to more than 24 provinces, autonomous regions and municipalities within a few months; infected 5,327 people and claimed 349 lives; and even spread worldwide to more than 32 countries and regions, posing a tremendous threat to public health and safety.

From government response perspective, the battle against SARS can be described in two phases. The first phase can be called a "black box" phase: less information can be available for the public, even for central government. No public announcement or news releases detailed on the outbreak. Even after Guangzhou (Capital of Guangdong Province) Health officials admitted to the SARS outbreak in February, the epidemic spread into other parts of China (such as Hongkong, Beijing) and overseas. The second phase can be called a "national campaign" phase. Since April 2003, especially after the SARS virus entered Beijing and gradually span out of control, new national leaders started to put emphasis on prevention and treatment work. In contrast to the taboo about the SARS epidemic in Chinese news media, national medium were full of SARS reports; a daily SARS reporting system was established; and a national campaign against SARS was officially and openly launched.

### **Black box: from secret to public**

According to the World Health Organization (WHO) report, the date of onset of first identified case in Guangdong, South of China was November 16, 2002; however, the first report was sent to World Health Organization (WHO) from the Health Ministry of China in February 11, 2003. In fact, on January 31, 2003, The Health Department of Guangzhou issued an internal emergency report "Designated Hospital for SARS Patients", which means an official start point of combating SARS in Guangdong. Nevertheless, the public can't find any information about this virus in public. All local media kept silence in that time so that all kinds of scandals emerged in the street, and the panic motion pervaded Guangdong. During this period, some online posts about SARS were deleted forcefully in China Power BBS. Until February 14, 2003, The Chinese Ministry of Health informed the World Health Organization (WHO) that the outbreak in Guangdong Province was clinically consistent with atypical pneumonia. The outbreak was said to be under control. On February 23, 2003, a team of World Health Organization (WHO) experts arrived in Beijing, but it was only granted permission to work at the central level. At a News conference that was held by Guangzhou government, Director of Health Bureau reported the death toll, infected cases and recovery cases in Guangdong. It was the first-time that the outbreak of SARS was officially announced. But it could not stop scandal from spreading in Guangdong. Local residents rushed to purchase Ban Lan Gen (BLG, a Chinese herb medicine), antibiotics, white vinegar, and even iodized salt, all of which were rumoured to be effective against SARS. In contrast, most people outside of Guangdong were convinced that the disease was mild with a minute fatality rate. As a result, no preventive measures were taken in Beijing and other Northern cities. Train travel between Guangzhou, Hong Kong and other domestic cities remained unrestricted.



After the SARS virus spread to other provinces, especially Beijing, the deliberately hidden truth continued to exist. On February 28, 2003, when the Minister of China Health Ministry met the delegates of the World Health Organization (WHO), he stated that the spread had been controlled well and that most of the infected patients had recovered. Both the local government in Guangdong and the highest health department in Beijing denied the SARS was a serious threat to public health. As the situation became more and more serious, on April 2, 2003, an executive meeting of State Council was hosted by the Premier Minister. Topics included how to prevent SARS - this being the first reported discussion about the SARS at State Council level - and Chinese government gave the World Health Organization (WHO) team permission to travel “immediately” to Guangdong. Even under the severe situation, the Health Department remained negative attitude for the public, when the Chinese Minister of Health appeared on national television to address SARS-related issues on April 3, 2003, he stated that in his name of Minister of Health, it was safe in China, and SARS was only a regional epidemic. The Beijing area was under control once again, but the central government started to emphasize the seriousness of the virus. On April 4 2003, Premier Minister Wen Jiabao and Vice Premier Yi Wu inspected the Center of Disease Control and said “high priority” should be given to SARS precautionary measures, and began daily electronically reporting, by province, SARS cases and related deaths nationwide. Although on April 10, 2003 a growing number of investigative media reports suggested that cases in Beijing military hospitals were not being truthfully reported, Vice Minister of the Health Ministry continued to express optimistic views regarding the prevention work of SARS: following his superior, he said that the total number of cases was 1290, including 1213 in Guangdong, 32 in Shanxi, 22 in Beijing. On April 12, 2003, when the mayor of Beijing met Japanese delegates, he stated that the 22 cases in Beijing had been controlled and it was not necessary to worry. On the same day, the Director of the Health Bureau was interviewed by a correspondent of China News Agency and said that Beijing was a safe city, where SARS no longer existed. In spite of this, the central level’s attitude began to gradually change.

### ***National campaign***

On April 13 2003, a nationwide working conference of SARS prevention was held by the State Council which was the first conference of State Council specifically for SARS prevention. Premier Minister Wen said that the situation of SARS remained extremely serious and emphasized the importance and urgency of efforts to prevent SARS. On April 14, 2003, Hu Jintao, the Secretary General of the Central Committee of CCP inspected the Center of Disease Control and appeared in one of the commercial streets to convey greetings to the public in Guangdong Province. Meanwhile, President Hu presided over the standing meeting of the Politics Bureau; presented a special report on SARS prevention and control measures; emphasized the reality of the cases in the reports; and advised officials not to cover up cases of SARS.

Until April 20, 2003, a series of measures were taken at national level, signaling the turning point from secret to public and the beginning of the national campaign, “One heart and one mind surmount the face of SARS crisis”. On that day, the mayor of Beijing and the Minister of Health, both of whom had downplayed the SARS threat, were removed from their Communist Party posts. Vice Premier Minister Yi Wu succeeded Minister of the Health Ministry and Wang Qishan became the mayor of Beijing. The Chinese government joined the global network of combating SARS of World Health Organization (WHO). In the days which followed, concerned national departments coordinated and collaborated to issue all kinds of measures to combat SARS, for example, transport control, medicine research, and adjustment of tour policy. Classes at school and all kinds of conferences and public festivities were also cancelled, and the accountability of officials on SARS prevention all over the country

was strengthened. After these tactics, the general situation was controlled, and the image of the government improved.

The SARS crisis seriously threatened public health and safety; posed a huge challenge for crisis management in government; and led to significant loss on social economy as well. The CCP and the new administration, however, took effective measures against SARS and finally defeated it. Zhong called “Fighting a New War with Old Weapons”, and the key question that was asked by many people after the SARS crisis subsided in China was the following: why did the system take so long both to detect and react to the new disease, thus, inducing a crisis that could have been prevented? (Zhong 2012, 27). Therefore, the crisis forced the entire nation to discuss its impact on China’s reform process and to reflect upon the lessons learned on health and disease prevention. In other words, it ignited a policy debate about the disease itself, the means of controlling it and the issue of surveillance of spreading. None of these policy issues had been at the forefront prior to the SARS crisis. This crisis challenged the new government and greatly provoked reflections on the country’s public health system, crisis management system, and ongoing public administration.

### **Exploring focusing event and agenda setting**

Besides the spread of the SARS virus described above, another reason why the SARS crisis rose into the agenda of the Chinese central government is that the latter started to feel pressure from the public and the international community after the SARS cases spread to Beijing and to other countries.

The SARS crisis made public health policy to enter the national agenda for the first time in the last several decades. Thus, there are two basic ways to make the potential agenda issues to become pressing problems. First, as the previous analysis showed, when the problem becomes more serious beyond the tolerance of superiors, turns from small scale to large scale and from secret into public, it means two different points for central government. The former mainly means the life and economic toll that the potential issue brings. The latter means that some information that was not known before was leaked to the public or the superior. Therefore, the legitimacy and the image of the party and the government were doubted. Secondly, fierce criticisms and pressure stem from the international community such as international media, international organizations, and the governments of other countries.

In the media domain, comparing to the domestic silence in the initial period, international media performed positively: according to Zhu Qin’s research (2011), she collected these reports about China during the crisis from Washington Post, New York Times, CNN, and BBC, 132 reports were negative, 69 reports were neutral, and only one report was positive. In April 2003, the failure of controlling SARS crisis resulted in public panic and international criticism. It seemed that the attitude and the policy of government began to change. The Health Minister apologized for early delays in reporting and was holding regular press conferences. The central government appeared to have issued directives that the press should not refrain from stating bad news and government officials should accept media supervision. Apparently, the Chinese government more or less had considered the negative comments from abroad: at least a series of symbolical gestures were made. Because in the Chinese political tradition, it is not necessary for the central government to immediately take measures to reduce the pressure from domestic or international actors unless the issue becomes a political focus.

Flowing along independently the problems stream is the political stream, composed of such things as public mood, pressure group campaigns, election results, partisan or ideological distributions in congress and changes of administration (Kingdon 1984,

152). In the SARS case, it is worth explaining at first that the limited capacity of dealing with the SARS crisis at once, to some extent, was due to the definition of SARS being totally different in the two periods. Initially, although the early spread of SARS did cause some panic, neither Guangdong nor Beijing perceived the matter seriously. In February and early March 2003 when SARS spread to different parts of Guangdong and Hong Kong, it was still regarded as a medical issue, not a political one. From the description above, it can be seen that the crisis was controlled as a local issue by Guangdong government at the outset of occurrence. However, with the spread of the virus into Hong Kong and later to Beijing, local government failed to do. With the rise of the number of infected and dead, the spread of the virus from a single point to the world, the same behavior occurred again in the Beijing municipal government and the Ministry of Health. It was initially regarded as a purely medical issue so that this kind of problem should be best left to local governments or relevant central bureaucratic agencies to handle. But following mounting international pressure and potential social instability, it is undeniable that the central government (especially top leaders) started to feel compelled to investigate and to take serious tactics as political issue, and began to mobilize national resources to combat the spread of the virus. In other words, the SARS issue was brought into the central government agenda within, at most five months. On the one hand, the issue had become a pressing problem and was beyond the control of sub-systems like Guangdong Province and Ministry of Health. On the other hand, the central government began to shoulder heavy pressures from the public, the media and the international community. The process of redefinition of this focus event was accompanied by its spread.

More than half of the interviewees think that political consideration places powerful effects on agenda-setting. Therefore, the next step will be displayed from the political context of China. Three core political principles have to be mentioned.

First, the sub-law “a skeleton in the cupboard” is particularly evident either private or public life in China, although the practice of the political unspoken rule is not only unique to China but also prevalent elsewhere. Furthermore, the belief “report the good news but not the bad” in the Chinese political system widely exists, especially the situation from subordinate to superior, and propaganda of party and government to the public. This situation was aggravated by two time periods. Firstly, it is noteworthy that the time when infected cases began to spread was February 2003. It was during the most important traditional “Spring Festival” that once-a-year biggest population transportation over the country occurred. It not only accelerated the spread of the virus objectively, but also made all the levels of government believe that it was a political task to keep the festival atmosphere. Another unavailable factor, once-in-ten year national leadership transition, once-in-five year government leadership transition occurred during the 10th National People's Congress (NPC) in March, 2003, and it means Hu Jintao-Wen Jiabao leadership took over the helm of the party and government formally. It's a major reason why no negative news appeared in any Chinese public media and government news.

In contrast with multiple public participants such as public opinion, public pressure, lobbies, interests groups which can form an essential component of the current policy agenda in Western countries, in China whether an event comes under the political realm or not is often shaped by the perceptions and actions of top leaders, either collectively or individually. In this case, top leaders play a dual role as policy entrepreneurs and decision makers. According to Hu's recent research, eight out of nine members of the central standing committee of the China Communist Party (CCP) during SARS did inspect on SARS event, and then the total numbers of inspect on disease prevention and control are twenty-two times from October 2002 to September 2007, and include that topic about SARS accounts 86.4% of them. Which factors

influence top leaders pick up the issue from subsystem, must be finished. Furthermore, traditionally, social stability, political order, economic development and international image are considered some of the most important references in the government decision-making system.

The important political principle “Stability Overrides Anything”, which was confirmed during Deng Xiaoping Time, is a core parameter in Chinese governance. Two sides of this principle appeared in the SARS case. On the one side, in order to reduce panic in public and maintain stability, for example, in the early stage whoever local government or national health department assured that the situation was under control, as usual, they prefer to work behind the scenes to bring SARS under control. In that case, it is also a strategy that the subsystem tried to constrain the outsider participants into policy arena. Interestingly, the same logic also is applied in the later stage when the issue is beyond the tolerance of superiors, has turned from small scale to large scale, and from secret to public, superiors (top leaders) will take it serious as their agenda from subsystem with same reason.

## CONCLUSION

Crisis, as focusing event, indeed has significant effects on agenda-setting. On the one hand, the severity of the crisis provides visible evidence for policy failure. On the other hand, political interpretation of crisis constructs an intangible force. One of my interview questions is which has more influence on agenda setting between nature of crisis and political consideration. Most respondents conclude that crisis provides a fertile soil for political interpretation and nature of crisis and political consideration play a core role in this process. However, it does not mean that crisis necessarily leads to interpretation. It also depends on the nature of policy itself. In this case, the SARS crisis as health policy is closed with daily life of citizens and technical and policy nature dominate the policy issue. Likewise, generalization, as well basing on a single case, will be questioned. Therefore, more cases might be analysed further.

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## **Paper 12: Gender Mainstreaming and Sustainable Post Disaster Reconstruction**

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### **ABSTRACT**

Gender inequalities are barriers to achieve sustainable post disaster reconstruction. Mainstreaming gender equality within post disaster reconstruction process can enhance sustainability of reconstruction. Based on a detailed literature review on post disaster reconstruction, this paper identifies pre-requisite conditions for mainstreaming gender within sustainable post disaster reconstruction as ; awareness of gender needs and concerns, a strong gender policy framework, women participation and leadership as an agent of change, gendered institutional capability, flexible and decentralised structure of gendered policy planning.

**Keywords:** gender mainstreaming, post disaster reconstruction, sustainability.

### **INTRODUCTION**

Gender mainstreaming is widely believed as one means for enhancing sustainability of reconstruction and development (Khatun, 2003; Yonder et al., 2005; Chakrabarti, 2009). Yet the integration of gender mainstreaming within sustainable post disaster reconstruction is uncommon (Walker, 1994; Morrow and Enarson, 1996; Fothergill, 1996; Fordham and Ketteridge, 1998). The common practice has been to use men's experiences as a universal category. Women's experiences and needs have been invisible (Fordham, 1998). Within this context, this study elaborates the links between gender mainstreaming and sustainable post disaster reconstruction. Pre-requisite conditions for making gender mainstreaming works within sustainable post disaster reconstruction and development are identified from gender and post disaster reconstruction policies in five affected disaster countries. Study was based on a detailed literature analysis and synthesis.

### **Gender, disaster and reconstruction**

Disaster is not only naturally constructed but also socially constructed (Pelling, 2001; McLaughlin and Dietz, 2007; Enarson, 2012). The social construction of disasters results from power inequalities in society that leads to vulnerability of women (McLaughlin & Dietz, 2007). Enarson (2012) explains that gender relations, as power relations between women and men, often place women in a subordinated position in disaster contexts. Hence, women are made more vulnerable to disasters through their socially constructed roles. Supplementing such vulnerabilities, studies have documented gender inequalities and its impacts within post disaster reconstruction (UNISDR, 2010; Enarson, 2012). Table 1 presents types of gender inequality and its impact on reconstructions.

**Table 1 Type of gender inequalities within post disaster reconstruction**

Gender inequality	Example	Impact
Shortage of women voices within planning process	Women concerns and preferences are often neglected during consultative process to design housing, water and sanitation, land titling, and local economic development activities.	Women less access and control on properties and economic resources.
Shortage of women leadership during reconstruction	Lack of women leadership within reconstruction causes women needs and concerns do not fully addressed.	Unsustainability of reconstruction may result in due to women needs and concerns are not fully accommodated.
Man bias in properties right	Women have no right on land and houses which may put them on the verge of losing livelihoods and assets after disaster.	Women lost their assets which mean they more vulnerable to be poor following reconstruction.
Man bias on access labour and credit policies	Lack of access of women on labour market and credit increases poverty following disaster.	Women poverty which indicates unsustainable development following reconstruction.
Bias of women health needs on accessing health services	Women have distinct health needs such as reproductive health and increased risk of violence. Protection risks to women are often neglected when health risks increase due to disaster.	Women poor health which indicates unsustainable reconstruction and development.
Lack of safe environment for women and girls after disaster	Public housing and sanitation fail to secure a 'female-friendly' environment with separate space for women to care for their children or sanitary facilities. As a result, women become subject to threat of harassment and sexual violence.	Lack of housing and safe space put women at high risk of violence. Unsafely community also indicate unsustainable reconstruction and development.

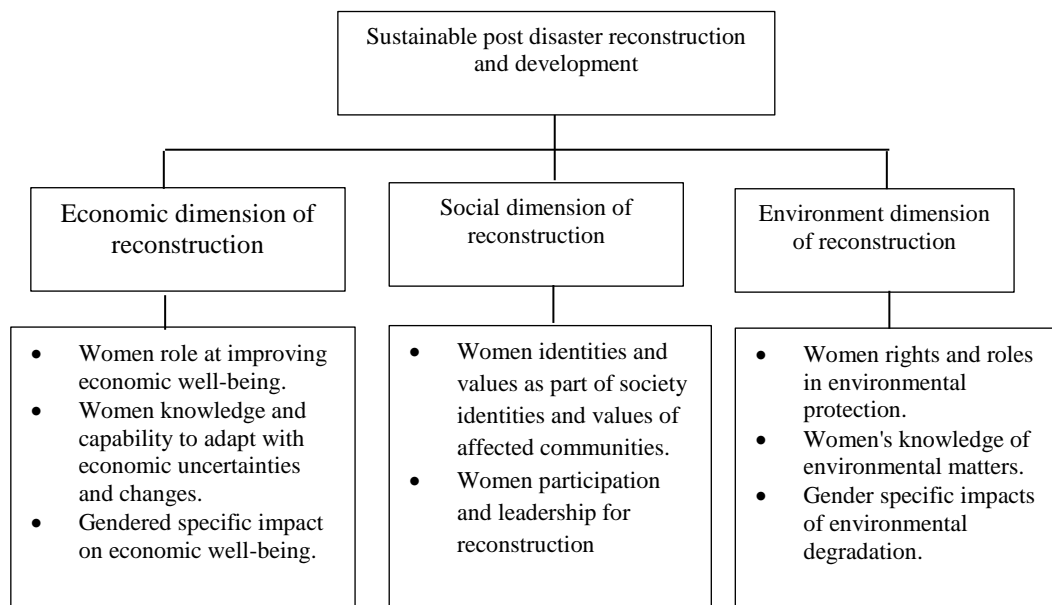
Source: UNISDR (2010); Enarson (2012)

### **Gender equality and sustainable post disaster reconstruction**

Sustainability of post disaster reconstruction is vital for ensuring that the development opportunities within reconstruction can benefit present and future community development (Mileti, 1999). Broadbent and Broadbent (2007) define sustainable post disaster reconstruction as an approach to redevelop an affected region that considers not only the present needs of communities but also contributes to future needs of community development of affected regions. Sustainable reconstruction implies that reconstruction efforts should aim to re-build, enhance, and then maintain the quality of life of members of the disaster-stricken community in the short and long term (Mileti, 1999). Post disaster reconstruction thus could be a move for achieving a sustainable development agenda as it opens various social, economic and environmental development opportunities for rebuilding better communities.

The relevance of gender equality for sustainable development has long been established in intergovernmental commitments. A growing body of research demonstrates that societies with greater gender equality experience faster economic growth, and benefit from greater agricultural productivity and improved food security. Participation, decision-making and management roles of women are also critical to sustainable development processes, where they can be effective agents of change. Women, owing to lifestyle and consumption patterns, seem to be more concerned about the environment and have a greater sense of responsibility towards achieving sustainable development. Women also tend to hold themselves more accountable as consumers, are more likely to recycle, and use public transportation more often than men (Enarson, 2012). However, women's lack of or limited access to resources, such as land, clean water and affordable energy, hinders their full participation in a green economy, and puts them at greater risk in times of natural disasters.

Figure 1 shows the links between gender equality and three dimensions of sustainable post disaster reconstruction and development.



**Figure 1 Gender equality and three dimensions of sustainable post disaster reconstruction**

(adapted from Lizarralde et al., 2009, Enarson, 2012)

None of the three dimensions of sustainable development can be achieved without long term investments in economic, social and environmental capital. Reconstruction of housing, water and sanitation should not only create healthy environments of affected communities but also should protect land and its ecosystem from disasters in the future. Environmental protection requires a solid understanding of women's relationship to environmental resources, as well as their rights and roles in resource planning and management. Acknowledgement and incorporation of women's knowledge of environment as well as an understanding of the gender specific impacts of environmental degradation matter for enhancing sustainable environment. However, the economic dimension means that reconstruction should be achieved by adaptation of economic systems to various uncertainties and changes in the environmental conditions (Jones, 2006; Lizarralde et al. 2009). Economic well-being requires gender-sensitive strategies. Women role at improving well-being is vital given the increasing of women poverty following disaster. Gendered specific impact on economic well-being will

enhance economic sustainability. Finally, social dimension 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 (Jones, 2006; Lizarralde et al. 2009). Integrating women identities and values is fundamental for maintaining society identities and values of affected communities. The participation and leadership of women is needed to identify needs and concerns of local communities during the reconstruction process. All of these need gender mainstreaming.

### **Gender mainstreaming and sustainability of post disaster reconstruction**

Gender equality can be achieved through gender mainstreaming. CEDAW (1995) defines gender mainstreaming as a strategy for making women's as well as men's concerns and experiences as an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes. Gender mainstreaming is not an end in itself but a strategy, an approach, a means to achieve the goal of gender equality. It involves ensuring that gender perspectives and attention to the goal of gender equality are central to all activities - policy development, research, advocacy or dialogue, legislation, resource allocation, and planning, implementation and monitoring of programmes and projects. Gender mainstreaming is not about adding a "woman's component" or even a "gender equality component" into an existing activity. It goes beyond increasing women's participation; it means bringing the experience, knowledge, and interests of women and men to bear on the development agenda.

The link between gender mainstreaming and sustainable post disaster reconstruction has been highlighted by several studies. Yonder et al. (2005) explain that sustainability of reconstruction will not be achieved if policies and measures do not take into account equally the experience, knowledge, and interest of both women and men within society. Table 3 shows gender mainstreaming and its impacts on sustainability of post disaster reconstruction. The integration of gender mainstreaming within planning, reconstruction and evaluation brings many benefits. Promoting women and men voices within reconstruction planning improve awareness of them which is important as stepping stone for building sustainable reconstruction. Within reconstruction process, establishing gendered institutional capacity within reconstruction process to ensure equal access, participation and control between women and men within reconstruction process. Moreover, identifying and recognising structure, procedure and culture which may hinder women and men access to reconstruction process will enhance equality within affected communities. Evaluation is an important stage within reconstruction which is useful to identify whether the reconstruction outcomes bring benefits to communities. The result of reconstruction policy evaluation is also important for policy feedback. Bringing gender mainstreaming within this process not only ensures equal economic, social and environmental benefits of reconstruction for women and men, but also provides comprehensive information about negative effects of economic, social and environmental reconstruction both for women and men within affected communities.

**Table 2 Gender mainstreaming and its impact on suitability of PDR**

Reconstruction process	gender mainstreaming	impacts on sustainable PDR
Planning	<ul style="list-style-type: none"> <li>• Ensuring gender perspective to assess reconstruction policy options.</li> <li>• Ensuring equal participation and voices between women and men within reconstruction planning.</li> <li>• Awareness of women and men needs and concerns within reconstruction planning.</li> </ul>	<ul style="list-style-type: none"> <li>• Women and men are aware with reconstruction planning. This is important as stepping stone for sustainability of reconstruction.</li> </ul>
Reconstruction	<ul style="list-style-type: none"> <li>• Establishing gendered institutional capacity within reconstruction process.</li> <li>• Ensuring equal access, participation and control between women and men within reconstruction process.</li> <li>• Identifying and reducing structure, procedure and culture which may hinders women and men access to reconstruction process.</li> </ul>	<ul style="list-style-type: none"> <li>• Reconstruction projects that address women and men rights, aimed at improving their well-being.</li> <li>• Women and men are more care with reconstruction projects.</li> </ul>
Evaluation	<ul style="list-style-type: none"> <li>• Ensuring equal economic, social and environmental benefits of reconstruction for women and men.</li> <li>• Identifying and reducing negative effects of economic, social and environmental reconstruction both for women and men.</li> </ul>	<ul style="list-style-type: none"> <li>• Improving women and men well-being.</li> <li>• Establishing reconstruction sustainability and community resilience.</li> </ul>

Sources: Khatun (2003); Yonder et al. (2005); Enarson and Chakrabarti (2009)

There is also evidence that demand-driven, participatory, inclusive approaches to reconstruction that empower women lead to more efficient and sustainable programmes (Enarson and Chakrabarti, 2009). Gender mainstreaming enhance productivity and income for families, and, more equitable access to reliable infrastructure services contributes to poverty reduction, growth, has positive impacts on health and empowerment within affected regions. These integrated approaches also increase access to markets, access to education, skills training and economic opportunities, business and other information and reduces the time required for domestic tasks (World Bank, 2007). Accordingly, the next section presents experience of mainstreaming gender within sustainable post disaster reconstruction from some disaster affected countries.

### Examples from developing countries

Studies provide evidence the benefits of mainstreaming gender for enhancing sustainability of post disaster reconstruction. Yonder et al. (2005) found how gender mainstreaming enhances social, economic and environmental sustainability of reconstruction at Marmara Turkey and Maharashtra India. In Marmara Turkey, they found that creating formal spaces where women's groups can organise to participate in reconstruction and formally allocating resources and roles to groups to involve reconstruction process is important to achieve sustainability of reconstruction. Poor women whose homes had been destroyed circulated, searching for ways to ensure the safety and survival of their families. They were looking for food, collecting usable items, talking to the press, and caring for their families and the injured. In Tent cities, women attended community meetings and interacted frequently with settlement administrators and local government representatives to obtain information and access to aid. They tried to raise money for their families, by selling handicrafts or by preparing and selling food from their tents. Women groups also formed savings and credit groups and initiated partnerships with local agencies to ensure the financial



sustainability of their centers. Tenants organised around housing cooperatives to find a solution to their housing needs. Moreover, small groups of women leaders participated in regional and international peer exchanges. These meetings gave them confidence to act as grassroots experts on microcredit schemes, housing processes, information gathering, and on the establishment and operation of centers for women and children.

In Maharashtra India, Yonder et al. (2005) show that women groups could inform, motivate, and supervise local homeowners. These groups provided hands-on leadership training with more than 1,000 village women appointed by the Mahila Mandals. Women were taught the basic construction techniques used for adapting and strengthening traditional village houses and learned how this type of construction would protect residents from future tremors. The information assistants and women groups took their responsibilities to homeowners and community groups seriously and worked to ensure that people knew how to access and use their entitlements and understood and were able to supervise the use of earthquake-safe features in construction and make use of appropriate technology and local resources. They worked, as well, to involve women in planning and designing their houses and interacted with government agencies on behalf of their communities. Since the women took the initiative to engage themselves, the government started understanding the problems better.

Krisnaraj (1997) shows how women are more active for supervising, monitoring and even undertaking construction following Latur Earthquake in India. Women go from house to house to encourage others to take up repair; monitor the subsidy provided by the government in instalments; see that the engineers who have to estimate the damage and certify construction do so; check corruption among these officers, and so on. Women participate in the construction of community buildings and model houses, in education campaigns on earthquake-resistant technology and checking erring officials. They have organised the collective purchase of materials. This has been an inspiring saga of the strength and energy of women's groups. Wherever they have worked, the rate of completion of houses has been very successful. Women also talk knowledgeably about beams, lintel, plinth, brackets, retrofitting and related technical terms. They can say whether a house has been constructed properly. They have designed their own houses with modifications-like where to put shelves, and what spaces they need. In some cases women have created their own drainage system, attaching a small pipe to a cement tank built inside the bathroom, which serves as an outlet and feeds the kitchen garden.

Study of International Federation of Red Cross and Red Crescent Societies (2007) shows the advantages of mainstreaming women into reconstruction process in Pakistan and Bangladesh. In Pakistan, enrolling women groups within reconstruction contributes to better performance and acceptance of the programme because they are more knowledgeable about local norms and beliefs. It is very important for the programme staff to have knowledge of the prevailing cultural values, traditions and the interests of the target community before designing activities to realize maximum benefits. Advocacy and strong leadership in gender-sensitive programme activities are key elements for ensuring sustainability and lasting results, since it is very common for organisations to focus on saving lives during times of emergencies and to not give gender needs and issues adequate consideration. Youth and volunteer projects endeavour to expand the female volunteer base. The youth policy addresses the inclusion of gender equity in the volunteer base. Recognising and reducing security risks incurred by women make them more willing to participate in programme activities.

In Bangladesh, setting targets and quotas and using related promotional strategies has been important to the recruitment of greater numbers of female volunteers in the reconstruction policies. This is especially significant in the context of the targeted areas because there are fewer men than women in these communities, as many have migrated elsewhere to find employment and women ultimately must play a leading role in community-level disaster preparedness and response. The approach of holding combined monthly and bi-monthly meetings with male and female volunteers and the programme officer has made it easier to concentrate on finding solutions to the problems they face in the community. The involvement of local political, community, and religious leaders has a profound impact on effective programme implementation in the community, including the acceptance of women participation. Having a significant number of women participate in disaster risk reduction efforts strengthens the overall positive outcomes for communities' reconstruction.

Tanesia (2007) studies women role within post disaster reconstruction at Meulaboh Aceh Indonesia. Women have succeeded in organising themselves to fulfil their domestic needs. For example, after the tsunami, these widows' capability to organise proved very helpful in the process of reconstruction and rehabilitation. All members of women group organisation instantly set up shelters and public kitchens, and organised aid distribution. When these groups became the door and conduit for aid, the women exercised more control in managing aid coming into villages and were able to pay attention to all of women needs. World Bank (2008) documented Women participation within reconstruction process at Bantul Indonesia. The women organised themselves and made a savings and credit organisation which provides women with business capital in order to restart their daily economy. Business groups were established and proved helpful in obtaining additional income for families. This study also shows that having a strong gender policy framework is important for achieving gender integration objectives. Promoting the participation of women in reconstruction programme, and providing quotas for community volunteers are effective ways of challenging the existing power dynamics while at the same time promoting the participation of women in decision making, thereby giving them shared access to, and control over, project resources.

From those examples, it shows that mainstreaming gender within post disaster reconstruction enhances development effectiveness and sustainability. Hence, sustainable reconstruction and development can only be achieved if the interests and needs of women and men in society are taken into account and the potential of all groups is released. Both women and men have important roles within reconstruction, but women are often marginalized. Hence, responsiveness to women' needs and concerns are the core of sustainability. However, to achieve these awareness need some pre-requisite conditions.

### **How mainstreaming gender within sustainable post disaster reconstruction?**

Lessons learned from gender and post disaster reconstruction in Marmara Turkey, Maharastra India, Pakistan, Bangladesh and Indonesia, it is identified that making gender mainstreaming works into sustainable post disaster reconstruction needs some pre-requisite conditions. Table 4 shows pre-requisite condition for mainstreaming gender into sustainable post disaster reconstruction and development. First, planning for reconstruction must be based both on women and men concerns and interests. By identifying the different women and men concerns and interests have it is possible then to translate them into planning needs by which their concerns may be satisfied. From this the requirements for gender policy and planning can be formulated, and the tools and techniques for implementing them clarified.

**Table 4 Pre-requisite condition for mainstreaming gender into sustainable post disaster reconstruction and development**

Pre-requisite conditions	details
Awareness of gender needs and concerns within reconstruction and development planning	By identifying the different interests women and men have it is possible then to translate them into planning needs.
A strong gender policy framework	A systematic and pro-active approach to gender integration applied throughout all stages of reconstruction can have many positive results and create a better balance in meeting the needs and priorities of male and female beneficiaries.
Engaging women participation	Identify the barriers to women's participation in reconstruction and community leadership positions, and form a systematic strategy for overcoming these barriers.
Involving women leadership as an agent of change	Leadership for reconstruction and development often requires principally feminine attributes such as cooperation, holistic thinking and intuitive decision-making.
Gendered institutional capability	Mainstreaming gender within sustainable post disaster reconstruction need to provide adequate funding and human resources capability to discuss gender approaches in an environment.
Flexible and decentralised structure of gendered policy planning	The design of reconstruction needs to be flexible enough to adapt to lessons learned during implementation of reconstruction

(Sources: Khrisnaraj (1997); Yonder (2005); UNISDR (2006); Enarson and Chakrabarti (2009))

Second, having a strong gender policy framework is important for achieving gender integration objectives into sustainable post disaster reconstruction. A systematic and pro-active approach to gender integration applied throughout all stages of reconstruction can have many positive results and create a better balance in meeting the needs and priorities of both male and female beneficiaries. The way in which a reconstruction programme is designed and implemented influences the degree to which women and men can actively participate and contribute. Women and men need to be fully consulted at every stage of design and implementation to ensure that the activities are responding to their needs and circumstances.

Third, there is a need to engaging women and men participation. Identify the barriers to women's participation in reconstruction and community leadership positions, and form a systematic strategy for overcoming these barriers. Create a gender-friendly environment for volunteers. This could include providing more opportunities for female staff and volunteers to participate in disaster management work in the field. The careful use of targets or quotas for participation by women and other socially excluded groups in decision-making bodies and training opportunities can be an effective way of ensuring that they do not get left out. It also needs to be recognised that this action alone will not necessarily lead to an increase in women's participation in decision-making. Supporters - including respected community leaders and members - may need to be identified to encourage a change in the way things are done. Gender sensitivity

education may need to be provided to peers, and support may need to be given to women for them to develop the skills to successfully play what may be new and challenging roles for them. Achieving equal staff numbers of men and women requires systematic and pro-active approaches to identify the socio-cultural barriers to women's participation in the formal labour force and to develop specific strategies to overcome these barriers. Gender objectives, targets and performance indicators need to be incorporated into the reconstruction log frame or other key progress and performance measurement tools and systems. The collection and analysis of gender-disaggregated data in monitoring and reporting needs to be reinforced by women leaderships, and necessary follow-up on any issues identified.

Fourth, the design of reconstruction needs to be flexible enough to adapt to lessons learned during implementation of reconstruction, such as the Bangladesh case experience of needing to change the way in which latrine construction and maintenance training was delivered to ensure that it better responded to the different roles of women and men. A gender analysis showed that local taboos and customs meant that men were predominately participating in trainings involving latrine construction and maintenance even though women were the ones primarily responsible for their cleaning and upkeep. Therefore, in its second year, the reconstruction phase plans to conduct separate training courses in latrine construction and maintenance for men and women. Once people have an increased understanding of the importance of addressing sanitation issues, combined male and female training will be more acceptable.

## CONCLUSION

Sustainability of post disaster reconstruction and development will not be achieved if policies and measures do not take into account equally the experience, knowledge, and interest of both women and men within society. By integrating a gender mainstreaming into reconstruction, policy makers have valuable information to understand the possible effects of policies and measures developed for reconstruction on gender roles, which are needed for better and more sustainable reconstruction. However, pre-requisite conditions are needed to integrate gender mainstreaming works into sustainable post disaster reconstruction. Lessons learned from the case of gender and post disaster reconstruction, this study finds pre-requisite conditions for integrating gender mainstreaming within sustainable post disaster reconstruction as: awareness of gender needs and concerns, a strong gender policy framework, women participation and leadership as an agent of change, gendered institutional capability, flexible and decentralised structure of gendered policy planning.

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## **Paper 13: Social Inequalities and Vulnerability to Natural Hazards: Case of Afghan Women in Tehran Metropolitan Area**

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### **ABSTRACT**

Tehran, the capital city of Iran, is located on one of the highest seismic zones of the world. Although the physical dimensions of earthquake hazards in Tehran has been well studied, little research examines the underlying social patterns and power relations that shape the population's differential vulnerability and resilience to seismic hazards. The need for an integrated vulnerability analysis is examined in case of the Afghan population in Iran. Macro level policies are assessed as determinants of structural vulnerability. Livelihood assets model is used as the analytical framework for progression of vulnerability to everyday hazards as well as earthquakes. Current state policies result in limited access to resources for Afghan residents in Iran. Afghan women face increased restrictions due to their “female” status. Their livelihood options result in increased social vulnerability, both in daily life as well as in case of a disaster. Community-based coping strategies are developed by Afghan residents to remedy absence of social protection measures.

**Keywords:** Afghan, earthquake hazards, everyday vulnerability, livelihoods, Tehran.

### **INTRODUCTION**

Awareness of the centrality of the social and natural phenomena in human-environment interactions is now emerging in the social sciences; however, until quite recently there has been a general failure to consider the interaction of the processes that produce hazards and disasters (Oliver-Smith 1996). This is also the case in terms of studies of disasters in Iran and its capital city, Tehran – where vulnerability to environmental hazards is viewed as separate from social or economic vulnerability.

Being on the foothills of the Alborz mountain range, Tehran is located on multiple active faults. In addition to the ever present seismic risk, additional factors such as a high population density, incohesive city planning and uncontrolled construction in the city have increased the overall vulnerability of the city's population to earthquakes (Ashtari Jafari 2010). While residents are aware of the possibility and resulting consequences of earthquakes, the general preparedness, levels of loss and damage and also means of recovery and regaining one's livelihood are not equal among all city residents. Differential disaster vulnerability is an attribute of people, not places, and is formed by processes and power relations embedded in conditions of daily life (Cutter et al. 2003; Enarson and Fordham 2001; Wisner et al. 2004). Aside from a few considerations of socioeconomic factors as relevant indicators of vulnerability to earthquake hazards, the discourse of disaster research in Iran seems to be neglecting the social vulnerability component (Amini-Hosseini et al. 2009; Lotfi and Koohsari 2009; Zebardast 2013).

The geophysical aspects of natural hazards in Tehran have been the focus of thorough research (see for example Ashtari Jafari 2010; Omidvar et al. 2012; Nateghi 2000 and Nateghi 2001, among others), however; these studies focus the risk assessment on the economic damages as a result of building and infrastructure losses. Such research has

focused on the investigation of “vulnerable urban fabric” rather than on the vulnerability of people to earthquakes. Sole focus on technical and engineering issues tends to overlook or downplay political, economic and social forces. Such human elements are important as they shape the mechanisms through which people gain access to resources and determine their entitlements and rights (Pelling 2003, p. 46; Wisner et al. 2004).

Introducing an integrated vulnerability assessment is important from multiple perspectives. Factors resulting in differential vulnerability shape people's capacity of avoiding risk as well as their resilience after the impacts of a hazard. Disaster resilience is the intrinsic capacity of a community or groups susceptible to shocks to “bounce forward” and adapt in order to survive and can be defined in terms of their primary survival values or assets – life, livelihoods and culture (Manyena et al. 2011). Finally, from an environmental justice perspective, it is important to understand conditions that facilitate or reduce people's ability to avoid environmental hazards.

### **Problem background**

The expansion of metropolises has been accompanied by increased heterogeneity of urban structures where phenomena such as social exclusion and urban marginalization are outcomes of such growth. Tehran, in addition to being a densely populated megacity with over 12 million residents (Statistical centre of Iran, 2013), is highly stratified in terms of socio-economic status. Many of the neighbourhoods that are mapped as “vulnerable urban fabric” based on their physical indicators host populations that have fewer resources and options to prepare for, and recover from, an earthquake hazard. Immigrants often constitute a share of the marginal population in such urban structures. Conditions of daily life can, in effect, create situations of marginality and powerless positions for immigrants where they commonly face restrictive legislation, participation difficulties in labour markets and civic activities as well as lack of access to basic services and formal social protection and, at times, discrimination (Wang et al. 2010). In order to better understand geographies of risk in Tehran, one needs to tackle how power relations on macro and micro levels make certain groups of people more disaster prone than others. There is need for exploring social attributes of at-risk people and groups as well as examining the way in which assets shape their livelihoods options. An important factor here is to broaden the standard conceptualization of disasters as sudden catastrophes and include determinants of everyday hazards.

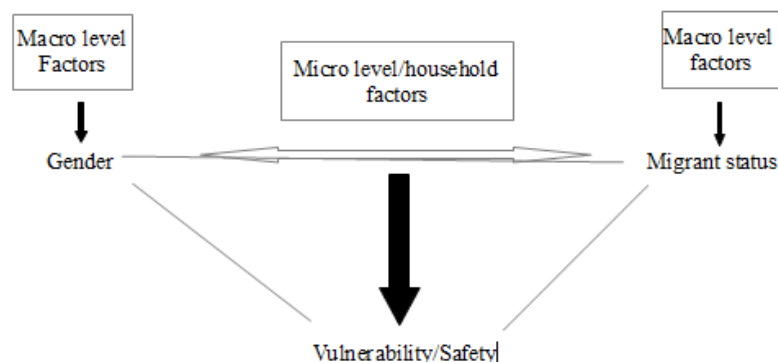
Afghan immigrants in Iran face such situations of marginalization. Sharing land borders has resulted into continuous, albeit episodic, influx of movement from Afghanistan to Iran over the past three decades. Only limited on-migration to other destinations and return to Afghanistan from Iran means that there has been a chance for a significant second generation Afghan community to develop in the country (Hugo et al. 2012; AREU 2005). Nevertheless, the majority of Afghan residents of Iran lack legal documents in forms of citizenship or refugee entitlement and a residence permit. There is no official data and statistics on the total population of Afghans in Iran. According to Iran's Bureau for Aliens and Foreign Immigrants' Affairs (BAFIA), as of 2012, there are estimates of 1 million registered and about 2 million unregistered (without a residence permit) Afghan nationals residing in the country. Women constitute 48% of the registered Afghan population (Hugo et al. 2012; Koepke 2011). Possession of a residence permit sets the line for entitlement to basic rights and services. In theory, registered refugees have enjoyed widespread social benefits, including access to free education, adult literacy training, health care, and employment. In practice, however, international agencies have admitted that, “the vast majority of Afghans lead rather precarious lives” (Hugo et al. 2012; Adelkhah and Olszewska 2007; Justice for Iran 2012).

By adopting the concept of vulnerability this paper aims to use the case of female Afghan residents of Tehran to represent the reproduction of vulnerability and potential for resilience under constraining political-economic conditions.

## THEORETICAL ANALYSIS AND DISCUSSIONS

The vulnerability approach towards natural hazards is adopted as the working paradigm of this paper. Following this concept, patterns of people's vulnerability are shaped by a multitude of elements, with the natural hazard being just one factor (Cutter et al. 2003; Hewitt 1998; Wisner et al. 2004). This view point re-introduces the concept of social vulnerability and its close attributes- marginalization, exclusion and susceptibility, to the realm of disaster studies and disaster risk reduction. Factors such as ethnicity, class, gender or migrant status are known to have a key role in understanding social processes that determine the level of access people have to resources, opportunities as well as unequal exposure to hazards (Bollin 2007; Wisner et al. 2004).

Daily life conditions of Afghan women are viewed as results of choices and decisions made within a context shaped by the dynamics and interactions between macro and micro level factors. Macro level factors include socio-economic and political structures at the institutional levels that by means of policies, rights and entitlements impact groups of people and individuals as well as social networks and movements. At the same time, on the micro level personal characteristics, social relations and power asymmetries within the household influence further decisions and activities of the individual. These are the same conditions influencing the opportunities for coping with and recovering from hazards (Pelling 2003, p.52, Wisner et al. 2004). This paper -as depicted in Figure.1 examines the synergies between two indicators of social vulnerability – gender and migrant status – and their outcome trajectory of differential vulnerability.



**Figure 1 Interplay of macro and micro level factors with variables Gender and Migrant status shaping conditions of vulnerability and safety**

Based on the definition offered by Wisner et al., vulnerability is “the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard” (2004, p.11). Examining resources or access to resources – seen through livelihoods – is the entry point for applying a sociological perspective on vulnerability to disasters.

Livelihood refers to the command an individual, family or other social group has over an income and or bundles of resources that can be used or exchanged to satisfy its needs as well as facing, resisting and recovering from hazards. Livelihoods are the final outcome of choices, available within constraints to the household or individual in

regards to uptake of income opportunities or jobs. Income opportunities available to an individual, in turn, depend on a set of qualifications such as skills, resources and even rights, such as work permits. Often times there is a direct link between the set of qualifications and payoff of a given income opportunity (Wisner et al. 2004, p.80-90). In an urban context, the livelihood asset models point towards labour, housing, possessions, tools of the trade and social networks as key resources for households in coping with vulnerability or moving out of poverty in the city (Pelling 2003, p.58). As it is the case in Iran, the majority of state policies create unequal access patterns to such resources for Afghan residents and hence reinforce the marginalization of Afghans.

### **Livelihoods assets of Afghan residents of Iran**

As a rule Afghans supply low-cost, low skilled labour in a narrow range of sectors. Policies followed by the government have effectively restricted Afghans to these low skilled occupations with lowest returns. Most Afghans are employed in the informal sector without any written contract or any type of work related benefits such as accident, unemployment and retirement insurance. There is effectively, no social protection for Afghan workers nor do they enjoy any benefits such as sick leave (Hugo et al. 2012; Wickramasekara et al. 2009). Afghan women, compared to Afghan men and also Iranian women, have a considerably lower participation in the labour market. At the same time, despite their lower participation they face higher rates of unemployment (AREU 2005).

The lack of employment authorization and exclusion from the formal sector are largely responsible for the evident lack of upward mobility in employment despite Afghans length of stay in Iran (Wickramasekara et al. 2009).

Low educational attainments are another characteristic of the Afghan population, with Afghan women constituting a higher share of the uneducated population (Wickramasekara et al. 2009). The national policies have created many obstacles regarding education for Afghans in Iran. Children of undocumented Afghans are not allowed to enrol in state-run schools. Those Afghan children whose parents possess a resident permit are required to pay a mandatory extra fee to study in Iranian schools at all levels (Justice for Iran 2012; Wickramasekara et al. 2009).

Iranian law prevents Afghan nationals who do not hold a valid passport, visa and work permit from holding governmental jobs, buying or selling land, enjoying socialized governmental healthcare, opening a bank account, registering a cell phone, or any other activity that requires official registration where a national ID card or birth certificate is required (Justice for Iran 2012). Moreover unregistered Afghans do not enjoy rights to property ownership. A 2009 survey on socio-economic status of Afghan households in Iran reveals that the majority of households (83%) live in rented houses with only 7% of the households having their own accommodation (Wickramasekara et al. 2009).

How vulnerable someone is, is determined by how weak or strong their livelihoods are, how good their access is to a range of assets that provide the basis for their livelihood strategy, or how useful different institutions are in providing social protection (Cannon et al. 2003). Macro level policies play an important role in limiting the livelihoods of Afghan residents by creating unequal access to labour market, basic services (education and health care), and rights of possession. Weak livelihoods and unequal access to resources and assets restricts Afghan's livelihood strategies and negatively impacts their coping mechanisms.



Marginalization of the Afghan population not only increases their everyday life vulnerability, but also limits their coping strategies and ability to recover in case of a catastrophic hazard. Wisner et al. (2004) introduce four generic types of coping mechanisms that can be applied to the actions of actors from individuals to the state. These mechanisms include preventative and impact minimizing strategies, diversification of production strategies, development of social support networks and post event coping strategies (as cited in Pelling 2003, p.54).

In regards to coping mechanisms, livelihood options of Afghans in Iran reduce their chances for uptake of household adjustments, diversification of livelihoods and reliance on state welfare. In fact livelihood options of Afghan residents of Iran mostly resemble conditions of every day vulnerability and hazards. Constant exposure to everyday hazards and risk gradually lowers peoples' thresholds of resilience. Those who are most vulnerable often times find it hardest to reconstruct their livelihoods following a disaster (e.g. due to lack of financial resources, insurance and credit systems, or networks of support) and this in turn makes them more vulnerable to the effects of subsequent hazard events. Moreover living in situations of daily risk and hazard can create conditions that risks becomes an acceptable and normalized part of everyday life and can have a perverse effect on people's willingness to prepare for the possibility of catastrophic disasters (Pelling 2003, p. 15).

Besides facing social inequality and marginality due to their 'migrant' status, daily lives of Afghan women are influenced by another set of power structures as a result of being 'female'. Gendered division of labour, women's domestic responsibilities, and reproductive labour and community roles are some examples of structures influencing lives of women (Enarson 1998). In the particular case of Iran, state policies have increasingly attempted to impose restricting regulations on women, targeting both the private and public sphere. These policies vary from legislative law regarding the institution of family (e.g. legal age of marriage or divorce rights) to educational and occupational restrictions for women. Such policies aim to force women out of the public sphere and restrict their role and responsibilities to the private sphere of family. Gendered segregation and exclusion of women from public spaces convert women into invisible members of the society and puts them in even more marginal conditions (Dr. S Ezazi 2013, pers. Comm., 10 June).

### **Actors agency in creation of safety**

A wide range of structural factors imposes added conditions of vulnerability in lives of the Afghan population in Iran. People however are not passive victims of the structural elements. In fact actors take up strategies that attempt to improve their livelihoods and enhance safety (Cannon 2000; Wisner et al. 2004, p.13).

While state polices provide very little social protection, Afghan residents of Iran have created their own ways of coping with conditions of daily life. These mechanisms try to make up for inequalities faced with lack of citizenship rights by relying on their social networks and relations. It is important to keep in mind that such coping strategies are part of the process of daily life, and thus, are still influenced by the social relations and power structures (Wisner 1993).

Social networks and relations play an important role in this regard serving as points of social interaction as well as networks of informal reciprocity (AREU 2005). An example is the attempt to remedy the official prohibition on property rights. Especially in border towns of Iran, where ties of kinship and relations go much deeper between Afghans and Iranians, some Afghans choose an Iranian associate to register their property in his name (AREU 2005; Adelkhah and Olszewska 2007; Hugo et al. 2012). Such activities entail certain amounts of risk and trust.

The best illustration of Afghan's agency is seen through the increasing number of self-regulated schools (*Madrese khod gardan*) for Afghans children. These schools are taught primarily by (Female) Afghans in order to make up for the educational inequality that Afghan children face in Iran. Iranian authorities on the other hand view these self-regulated schools as violation of the repatriation plans for Afghans and shut down these self-regulated schools periodically and their teachers are at risk of arrest and eviction (Adelkhah and Olszewska 2007; Hoodfar 2007; Rostami-Povey 2007).

Finally the coping mechanisms are also evident at the household level regarding rights and resource allocation. The state policies may have a reinforcing role in supporting possible patriarchal norms and values within the household, yet various women and social movements in Iran have caused attitude changes among Afghan women regarding birth control, education and gender roles (Hoodfar 2007; Piran 2004; Rostami-Povey 2007).

Coping strategies practised by the Afghan community tend to make up for lack of social protection and citizenship rights. However these achievements on their own will not suffice to counteract the structural elements that shape Afghans differential vulnerability. Agency of actors is limited to and restricted by the boundaries of structure. Moreover; while aiming to improve livelihoods, these mechanisms can give rise to added risk. Possibility of arrest for female Afghan teachers, or chances of fraud in cases of property ownership are some examples.

## CONCLUSIONS

The dominant discourse in Iran's disaster studies tends to focus on environmental vulnerability and geo-physical aspects of natural disasters. This view undermines the socio-economic and political forces that shape the mechanisms through which people gain access to resources and determine their entitlements and rights.

The case of female Afghan nationals in Tehran is used to represent multidisciplinary factors in reproduction of vulnerability and potential for resilience. Assessment of livelihood assets of Afghan residents of Iran shows how political-economic constraints influence their livelihood options. Limited income opportunities and lower income level, lack of financial security in forms of insurances or benefits, type of tenure (rented accommodation in nearly most cases) along with quality of housing and finally restricted rights to education and healthcare are some features of livelihoods of Afghan residents of Iran. Afghan women face further marginalization due to their female status.

While conditions of marginality do not increase the direct exposure of the Afghan population to an earthquake event, they in fact increase their overall vulnerability to disasters. Unequal access to assets and resources increases vulnerability of everyday life for Afghans while at the same time reduces the capacity to avoid risks. Moreover due to limited primary survival values (livelihood strategies, financial credits and support systems), Afghan residents of Iran have lower resilience. This lower level of resilience makes it more difficult to recover or 'bounce forward' after an earthquake disaster.

Moving beyond the direct risk of environmental factors and catastrophic hazards is an important requirement for gaining a holistic understanding of factors underlying earthquake vulnerability in Tehran as well as enhancing resilience and coping mechanisms. Structural factors are important determinants of daily lives and shape and restrict choices and decisions of people. As shown with the Afghan community in Tehran, agency of actors in creating coping mechanisms and enhancing livelihoods can be limited by social, economic and political conditions. Consideration of how social

structures and power relations impact people's differential vulnerability to everyday hazards and disasters is an important (and a primary) component in achieving environmental justice.

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## **Paper 14: Towards Collaborative Wildfires Management in Portugal: Context and Challenges.**

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### **ABSTRACT**

Wildfires represent the main natural risk in Portugal. Since 2003 the territory has been affected by extreme wildfires which have consumed more than 1.2 million ha. Following those events, several modifications were introduced in wildfire policies to preserve forest and increase the resilience of communities facing wildfires. These modifications suggest that the wildfire management strategies in Portugal are changing from a response based paradigm (wildfire combat capability) to a paradigm based on prevention and community collaboration. The goal of this paper is to identify this set of transformations, analysing the main features of the wildfire management program between 2003-2012 and the challenges for the implementation of a collaborative wildfire management framework. Wildfire policies and legislation created since 2003 were collected and submitted to content analyses to identify the main resolutions and strategies for wildfire management and to explore the extent of community involvement and participation. Results suggest that since 2003 many changes were implemented in the system, setting a positive context for wildfire prevention. But these measures still reveal a low potential for community participation and empowerment towards wildfire risk. New models of risk communication and information sharing with communities that increase their involvement in the decision process are needed.

**Keywords:** collaborative framework, community participation, wildfire management, wildfire policies.

### **INTRODUCTION**

Wildfires represent the main natural risk in Portugal. Since 2003 the territory has been affected by extreme wildfires which have consumed more than 1.2 million ha and destroyed many tangible and intangible resources, including human lives. These great wildfires, with catastrophic features, highlight the need for reviewing the policies of wildfire management and to develop systematic actions to preserve forest, guarantee the security and increase resilience of communities (adaptive capacity) when facing wildfires. Therefore, following a tendency common to other countries such as the United States of America or Australia, where catastrophic wildfires are common, wildfire management strategies in Portugal are changing from a response based paradigm to a more collaborative/resilience oriented framework based on prevention and community participation (Pearce, 2003). After 2003 several changes were introduced in the national system for the defence of forest against wildfires, focusing in creating more resilient and safe territories. However, recent studies indicate that wildfire risk is still very high and that there is an urgent need to work on prevention issues and with communities: individual risk behaviours continue high and the collaboration of people/communities has been identified as one of the major factors to the success of the wildfire national policies (Viegas et al, 2012; Tedim & Paton, 2012). This paper analyses the main legislative and policy context of wildfire management framework in order to understand the changes that emerged following the 2003 wildfires and analyse at what extent these measures are favourable to the new paradigm based on prevention and community participation.



## OBJECTIVES

The goal of this paper is to identify and analyse the main modifications in wildfire policies following the catastrophic wildfires of 2003. Specifically it characterizes the framework of wildfires management, from 2003-2012, identifying the main resolutions and strategies for wildfire management, and exploring the degree of community involvement and participation involved on it. Results highlight the legislative framework, its main principles and orientations, suggesting the challenges facing professionals and other stakeholders in the implementation of a more collaborative orientation within the wildfires management cycle.

## METHODS

In order to understand the main orientations of the policies following the 2003 wildfire catastrophic events legislative instruments (policies and legislation) focusing on wildfire management, between 2003 and 2012 were selected using wildfire as key-words and submitted to content analysis (Miles & Huberman, 1994). The data base of the national forestry services-ICNF (<http://www.icnf.pt/portal/icnf/legisl/lex-flor/flor-incen-agric#dfci>) which contains the majority of legislative documents connected to the Portuguese forestry sector, since 1901, was used. Seventy seven (77) legislative instruments (law, decree-law, resolution of the council of ministers and parliamentary resolution and ordinance, decree, order and legislative order) were selected on the basis of their aims and field.

## DATA ANALYSIS

The selected documents were integrally read and then submitted to content analysis (Miles & Huberman 1994) within the emergency management cycle framework (NFPA 1600) (Figure 1).

The analysis aimed to describe and characterize the main features of the wildfire management framework: core themes, strategies used within the emergency cycle, amount of attention devoted to each of the cycle phases. Categorisation system was gradually refined by two independent judges. Each judge read the legislative documents and drew up a list of categories and subcategories based on the phases of the wildfire management cycle (Figure 1). The inter-judgment agreement score (number of agreements / total number of agreements plus disagreements) was 80%; this reliability may be considered high (Miles & Huberman, 1994). A list of categories and sub-categories, which included definitions were, produced (Table 2). Then the legislative documents were classified to the (sub) categories (judges were in full agreement) (Table 3).

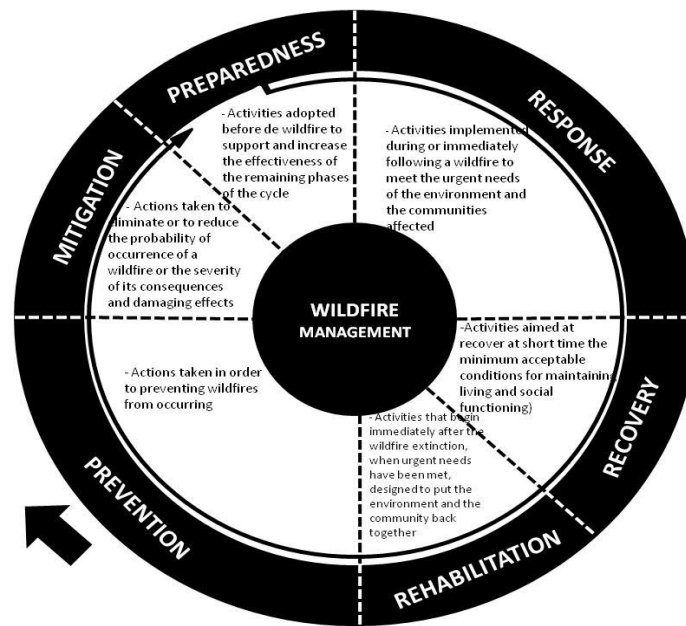


Figure 1 Wildfire Management cycle

## RESULTS

### Main topics/themes within the wildfire management cycle

Prevention /Mitigation is the most frequent topic within the Portuguese wildfire management cycle (Table 3). Forest management strategies (plans for sustainable management of wildfire hazardous areas at regional, local and operational level) are the most significant topics within this matter. Funding and support and the reinforcement of agents, organizations and human resources to work on prevention and mitigation actions were also underlined by the legislative instruments. Public education (focused on education to the correct use of fire and wildfire risk awareness) and prescribed burning are also present but are a lot less expressive.

Rehabilitation is the second most recurrent category (Table 3). Most common issues are support programs and funding to face the effects of wildfires, which emerged from a Disaster Declaration in August, 2003. Rehabilitation issues also emphasize operational/technical procedures (e.g. reforestation programs; harvest burned timber; control erosion; preserve water resources) to recover the burned areas, specially following the wildfires occurred in 2003-2006. The regulation of burned timber trade market was included but is less expressive.

**Table 2 Themes and contents of wildfire policies and legislation: categories and subcategories within the emergency cycle**

Category/	subcategory	Definition
<b><u>Prevention/Mitigation:</u></b>  Reducing the chance of occurrence and the damaging effects of wildfires.	1.1. Forest management and planning strategies	Plans for sustainable management of wildfire hazardous areas (regional, local and operational level).
	1.2. Fuel management tools	Fuel reduction techniques (e.g. prescribed burning).
	1.3. Funding and support	Financial support (from European Community and fuel taxes) for prevention and education campaigns and plantation programs
	1.4 Reinforcement of agents, organizations and human resources. (prevention specialists)	Specialized entities and committees; specialized forest brigades; and volunteers programs.
	1.5. Public education/communication	Warning systems, definition of critical risk periods, reinforcement of the legal framework.
<b><u>Response/Immediate Recovery:</u></b> meeting the urgent needs of the environment/communities affected;	2.1. Reinforcement of human resources(combat specialists)	Special fire fighters; coordination between fire-fighters and civil protections agent in combat.
	2.2.Communication systems/technology	Communication systems to improve combat and the interaction/connection between entities involved.
	2.3. Special combat/response equipment	Special funding conditions to rent forest fire combat aeroplanes.
<b><u>Rehabilitation:</u></b> putting the environment and the community back together	3.1. Support programs (financial, social and operational)	Criteria for the attribution of financial support to repair the damages; special credit lines (preservation of pine and eucalyptus timber; <i>Quercus suber</i> plantations and cork extraction).
	3.2. Reinforcement of agents, organizations and human resources (Rehabilitation specialists)	Agents and procedures and to cope with wildfire consequences and recovery of burned areas (reforestation programs; harvest burned timber; control erosion; preserve water resources).
	3.3 Regulation of burned timber trade market	Creation and establishment of burned timber points.
<b><u>System for forest defence against wildfires:</u></b> setting the frame	4.1. General framework	Interventions related to the prevention and defence of forest against wildfires accomplished by the public entities and private agents (public education and awareness, conservancy and land use planning, forestry, surveillance, detection, combat and aftermath of wildfires).

Response/Immediate recovery is the third category (Table 3). Most frequent issue within this topic is the reinforcement of organizational and human resources involved in combat. It centres on the coordination between national forestry services, the national civil protection services and the law forces in combat scenarios and in the specialization of professionals to work on the field (fire-fighters, law forces, forest workers and fire specialists). The allocation of special services, like combat aeroplanes and the acquisition of communication systems are also contemplated.

System for forest defence (general framework) is the fourth general category (Table 3). It contains documents related to the definition, implementation and adjustment of a National Wildfires Defence System, which were publicized in the immediate sequence of the great wildfires (years 2004, 2005, 2006).

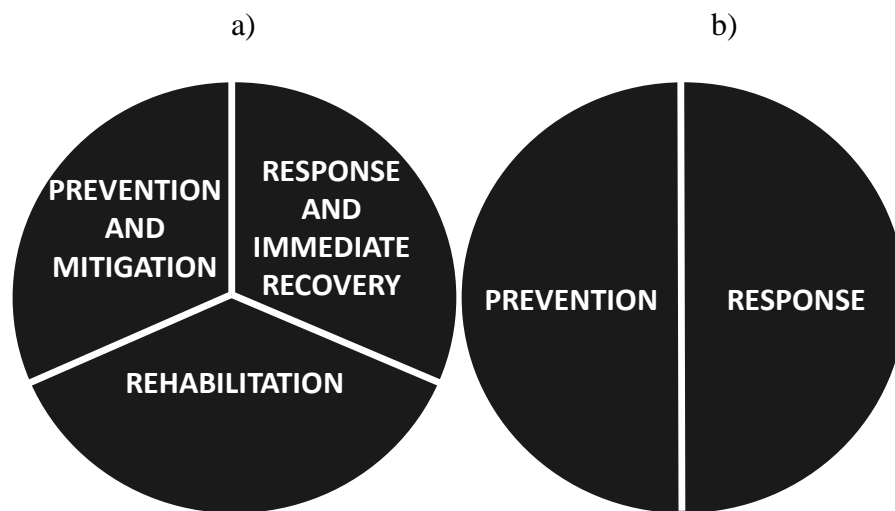
**Table 3 - Classification of the fire policies and legislation on the themes (categories and subcategories) between 2003 - 2012**

Categories/subcategories	%
<b>1.Prevention/ Mitigation</b>	66,2
1.1. Forest management and planning strategies	22,1
1.2. Fuel management tools	2,6
1.3. Funding and support	15,6
1.4 Reinforcement of agents, organizations and human resources. (prevention specialized)	15,6
1.5. Public education/communication	10,4
<b>2. Response/Immediate recovery</b>	9,1
2.1. Reinforcement of human resources(combat specialists)	5,2
2.2. Communication systems/technology	1,3
2.3. Special combat/response equipment	2,6
<b>3.Rehabilitation</b>	19,5
3.1 Support programs (financial, social and operational)	11,7
3.2. Reinforcement of agents, organizations and human resources (Rehabilitation specialists)	5,2
3.3 Regulation of burned timber trade market	2,6
<b>4. System for forest defence against wildfires (general framework)</b>	5,2
Total	100

## DISCUSSION

### General framework of the wildfire management (context)

The results of this study suggest the embracing of two major topics for wildfire management in Portugal: prevention /mitigation and rehabilitation. Together both areas integrate nearly 85% of all legislative publication, mostly issued between 2003 and 2009. This seems to point out to a turning point on the wildfire management framework, towards a more preventive/resilience orientation. However recent data evidence that funding and financial support continue to reinforce response and combat over prevention. Decision makers centre the discussion on prevention vs. response, dismissing other phases of the emergency management cycle, namely preparedness (Fig. 2). Moreover, nonetheless the results suggest that public policies put an emphasis on rehabilitation the guidelines of the legislative instruments are not being successfully imported and transferred to those who implement recovery actions on the field.



**Figure 2 Features of the wildfire management framework: a) legislative frame: b) perspective of decision makers.**

Therefore, recent studies and reports continue to point out to a deficit on prevention, structural problems connected to individual property and land use (large areas of abandoned or unattended lands with unmanaged or inadequately managed flammable vegetation), individual risk behaviours (high number of human-caused ignitions) and to the need to persist on community involvement and participation (Tedim & Paton 2012; Viegas et al. 2012).

### Community involvement and collaboration (challenges)

Content analysis suggests that the degree of community involvement and collaboration provided by Portuguese policies for wildfire management is still low. The contents analysed referred mainly to education and risk communication based on the diffusion of general information (e.g. pamphlets, media advertisements) and to the increase of the legal framework as an instrument of regulation (define what to do and how to do in a top-down orientation).

These measures represent passive forms of communication that fail to address the diversity of needs and expectations within a community and also fail to engage people in ways that facilitate their ability to make decisions (Prior & Paton, 2008). They share the assumption that providing the public with information on wildfires and the

protective measures to prevent it will automatically translate into preventive behaviours, which is a wrong assumption (Paton 2003). Behaviour change in wildfire risk situations demands for the active engagement of community members within the risk communication process and the use of interactive risk communication procedures. Professionals and agencies connected to wildfire management should act as facilitators or consultants to communities rather than directing the change process in a top down manner. One possible approach would involve invite representatives of community groups and stakeholders to review wildfire scenarios in regard to the potential challenges, opportunities and threats they could pose for each group.

Another important dimension of participation is related to the sharing and construction of knowledge between people and specialists (Callon, Lascoumes & Barthe 2001). Results suggest that the framework gives a great emphasis to the specialization of human resources (creating specialists) but less to the acknowledgment and integration of local knowledge. Within these circumstances people tend to rely on the action of the specialists, placing the responsibility of change on their shoulders and disconnecting from the field (Patrão 2010). This is important because such an orientation has the potential to increase the sense of conflict, rivalry and distrust that historically has been characterizing the relationship between the state and the communities within the forest management (Soares e Oliveira 2006; Mendes & Tavares 2009). Community participation requires the use of strategies to promote the articulation between the scientific community, the political actors, professionals and the citizens (Mendes & Tavares 2009). The New England Workshop on Science and Social Change (Taylor, 2011) is an innovative intervention in this subject.

## CONCLUSIONS

Since 2003, Portugal has implemented many (and mainly positive) changes in its wildfire management program. However, the framework for action includes only three (3) of the six (6) steps of the emergency management cycle, developing in a triadic structure around mitigation/prevention-response-rehabilitation, mainly in a mandatory and directive orientation (top-down). Moreover giving their structural features, many of these changes are still maturing and may take several years to bear fruit. This is special relevant in the process of community collaboration.

The framework is in a period of transformation and transition between paradigms: the system aims at a more collaborative stance but remains trapped in a top-down orientation. It demands new forms of communication, networking and deliberation to foster learning, transform values and cultivate new identities among the communities, the fire professionals and specialists (Goldstein & Butler 2012). It is necessary to develop a culture that embraces the value of empowering communities.

This exploratory study highlighted the legislative framework of the wildfire management in Portugal, its main principles and orientations, summarising some of the obstacles professionals and other stakeholders are facing in the implementation of a more collaborative wildfire management framework.. Future studies are needed to study people (communities) and fire professionals' attitudes towards different risk communication techniques and to deepen the knowledge about collaborative processes in wildfire management, namely through action research methodology.

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## **Paper 15: The Lightweight W Panels: An Option to Build Sustainable Housing Post-Disaster**

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### **ABSTRACT**

In recent decades natural catastrophes have had a major impact on countries throughout the world and have left behind an engineering challenge; how to build resilient and sustainable housing quickly and cheaply. This challenge offers the opportunity to test materials, techniques, and procedures for construction that have been developed in the last 30 years. Consequently, a prototype dwelling of 45.5 square metres, using W Panels (WPs) and the labour of affected people under the supervision of construction professionals, is proposed to switch toward a new construction system immediately after overcoming the emergency phase post-disasters. A theoretical approach was carried out to analyse the substitution of traditional building materials by WPs as well as the skilled labour by unskilled people from communities affected. A literature review was also carried out around housing programs used to build recovery housing after the Tsunami occurred in the Indian Ocean in 2004. The findings of the analysis suggest the WPs as an alternative for housing recovery, since using them can save up to 45% of the total cost compared to traditional construction materials. It was also found that community participation plays an important role, and participation is fundamental to saving time and money post-disasters.

**Keywords:** community participation, recovery housing, resilient, sustainability, w panels.

### **INTRODUCTION**

The time and cost for housing recovery depend on the correct management of the reconstruction after a natural catastrophe. Management of the Construction Project (MCP) should be implemented by professionals, in coordination with governments and Non-Governmental Organizations (NGOs) to guarantee sustainable and resilient homes for the affected people. After the Indian Ocean Tsunami occurred in 2004, several construction approaches were used to rebuild affected zones in Indonesia. However, a large number of problems which affected housing recovery were presented, such as the shortage of transport and construction materials (Chang, Wilkinson et al. 2011), coupled with problems of NGOs due to their lack of experience in housing construction (Chang, Wilkinson et al. 2011). Therefore, there is a possibility to contribute to housing rebuild, if a construction system is created using a holistic approach that involves W Panels and community participation to reduce the cost and time of housing recovery post-disaster, which can be ready in advance of a disaster occurring.

The WPs were seen as an alternative for building housing among lightweight panels. A quantitative and qualitative analysis was carried out to research theoretically how WPs panels can embrace the sustainability concept post disaster to contribute to housing rebuild, as an example to fill the gap created by the lack of construction materials in areas hit by disasters. The findings suggest that WPs are 45% less expensive than traditional construction materials. An interview was also conducted with the manufacturer of WPs using open structured questions and the transcript was treated as qualitative and quantitative data by pattern matching to find similar data between literature review and interview. The questions in the interview consisted of four subjects: features, availability, international prices and capacity to supply WPs and technical support in areas hit by natural disasters. Recovery programmes were analysed, in which community participation was found fundamental to help with recovery housing post disasters. The recovery programmes which used members from the communities were more able to build recovery housing in comparison with those recovery programmes managed without community participation.

### Background

One of the countries more damaged in housing by the Tsunami in 2004 was Indonesia. This catastrophe offered the opportunity to research the approaches used to build recovery housing and to analyse the participation of community members and construction materials. The Indonesian earthquake, which occurred on Sunday, December 26th, 2004 at 07:58:53 (UTC) Coordinated Universal Time, was of magnitude 9.1 at 30 km depth off the West coast of Northern Sumatra in Indonesia. This was felt by 14 countries in the Asiatic Continent and the African Continent. The Indonesia earthquake originated in the seafloor which caused giant waves, simultaneously affecting Indonesia, Sri Lanka, India, Thailand, Malaysia Bangladesh, Myanmar and the Maldives in the Southeast of Asia, as well as Somalia, Kenya, Tanzania, South Africa and Madagascar in East Africa (USGS 2004); it generated waves over 20 meters high which caused extensive floods (Pilapitiya, Vidanaarachchi et al. 2006).

The Indian Ocean Tsunami severely damaged housing and left hundreds of thousands of homeless people. Table 1 shows the number of dwellings affected in Indonesia 2004. The housing damage in Banda Aceh and Nias in Indonesia, caused by the earthquake of 24th, December 2004, was increased by the earthquake that occurred on March 28th, 2005 in the same place.

**Table 1 Housing damage in Indonesia 2004**

HOUSING	ACEH	NIAS
TOTAL DAMAGED	88,000	13,000
PARTIALLY DAMAGED	71,000	24,000
TOTAL	159,000	37,000

(Steinberg 2007)

After the tsunami and earthquake the Indonesian government had a considerable challenge to rebuild housing, facilities, infrastructures and livelihoods. The Agency for National Development Planning (BAPPENAS) and the Ministry of Public Works (MPW) were responsible for overseeing the rehabilitation and reconstruction of Banda and Nias in Indonesia. However, Rehabilitation and Reconstruction (BRR) was the organisation that continued the challenging task to facilitate recovery in Banda Aceh and Nias, and coordinated 120 NGOs and disaster management, which were supported by international donors (Steinberg 2007). Due to the magnitude of the catastrophe and the lack of preparedness and plans to rebuild damaged housing, the BRR in the first stage adopted the idea of prefabricated houses to solve the problem, but that idea did not prosper and existing housing programs from the World Bank were implemented through the Multi-Donor Fund (MDF) (Steinberg 2007).

The literature review indicated that the first program used was the Kecamatan Development Program (KDP), a program developed in 1997 by the World Bank to alleviate poverty in Indonesia (Guggenheim 2004). This programme works closely with the community, who actively participate in projects to improve the education, health and opportunity generation of employment in rural communities. Hence KDP was used after the earthquake occurred to build housing through cash grants, under the regulation of BBR (The World Bank 2005). Nevertheless, due to the magnitude of destruction and the NGOs participation KDP was not able to overcome the situation and the Urban Poverty Program (UPP) was used simultaneously under a community-based approach. This led to the Rekompak project, which was widely supported by the MPW and BBR who provided economic and technical aid to community members to build their houses and livelihoods (Multi Donor Found 2012).

The community-based approach places trust in the community and individuals, in order that they can build their homes rather than mere dwellings. They are supported and trained by facilitators to manage economic funds, construction methods, and accountability and for taking decisions. However, Rekompak faced its first challenge when the experts in different fields rejected the idea of involving unskilled people from the community to rebuild Banda Aceh and Nias; hence, facilitators were made responsible for training groups and individuals. Another challenge presented to Rekompak was the reconstruction on a large scale; the facilitators were fundamental for overcoming the challenge. Community-based reconstruction was successful because there was a clear understanding between government and communities which was induced by the facilitators. The facilitators were trained by experts in the different fields to transmit knowledge to groups and individuals and absorb lessons learned during the pilot program carried out before starting large scale recovery (Multi Donor Found 2012).

Other programmes used in Banda Aceh and Nias were donor-driven reconstruction (DDR) and owner-driven reconstruction (ODR), both are 40 years old and they have experience in dwellings construction to alleviate poverty, although ODR has only 10 years of experience in housing construction on a large scale (Lyons 2010). Donor-driven reconstruction housing was carried out by NGOs. The NGOs were responsible for looking for builders to build

damaged housing and they implemented their own projects; however, being donor-driven, it encountered a large number of problems that adversely affected housing recovery; the problems that occurred are listed below (Chang, Wilkinson Suzanne et al. 2011).

1. Competition among NGOs for economic resources and participation.
2. The shortage of transport and construction materials (Chang, Wilkinson Suzanne et al. 2011) (Chemonics 2008)
3. The inability of builders to satisfy the standards (Chang, Wilkinson Suzanne et al. 2011).
4. The lack of community involvement (Chang, Wilkinson et al. 2011)
5. Political problems (Gaillard, Elsa et al. 2008)

The agencies were free to design housing by themselves and they could choose between DDR and ODR for rebuilding the area affected. However, the Urban Development Authority (UDA) in Sri Lanka and India, other countries affected by the Indian Tsunami, established a minimal standard to design the houses, which was focused on size and backyard, hence the dwellings were built with different kinds of construction materials and construction processes (Shaw 2010).

Figure 1 shows a dwelling built by DDR of 45.5 m<sup>2</sup> which included two bedrooms, a living room, kitchen and bathroom with latrine. “The minimum room dimensions were: bedroom 8 m<sup>2</sup>; kitchen 5 m<sup>2</sup>; store 2.5 m<sup>2</sup>, lavatory 1.36 m<sup>2</sup> to 1.62 m<sup>2</sup>” with a minimum room height of 2.8 m<sup>2</sup> in the bedrooms, lounge, kitchen and 2.20 m<sup>2</sup> in the bathroom, lavatory, patio, balcony and terrace. The patio was dimensioned in relation to storeys; for one-two storey houses: 1m<sup>2</sup> in front and 2.3 m<sup>2</sup> patio and for three storey houses 1m in front and 3m patio (Shaw 2010). The designs used by agencies faced some problems mainly due to the characteristics of communities affected.



**Figure 1 Housing of 45.5 m<sup>2</sup>**



**Figure 2 Kitchen**



**Figure 3 Foundation cracked**

Figure 1, 2 and 3 are source from (Shaw 2010)

Figure 2 show a kitchen problem, since these was designed without open spaces, which Indonesian people require due to using a bio-fuel cooker. Another problem with the design implemented in DDR was the lack of participation of displaced people; as a result, the builders built the minimum size housing without previous knowledge of dwellers' needs (Shaw 2010). Figure 3 shows a cracked foundation built by constructors in Indonesia. This problem resulted from the soil conditions together with bad construction processes. The DDR and ODR used concrete floor slabs up to 10 cm in depth, although sometimes the displaced people looked for extra funds and they made the foundation over 15 cm in depth. The walls were built from timber, masonry,



clay blocks and concrete. The roofs played an important role; since asbestos roofs were banned, they were made of clay tiles on a timber frame, concrete and timber rafters. However the clay tiles presented problems with sealing, since they allowed the passage of water (Shaw 2010).

### W Panels

Given that construction materials used to build houses in Indonesia presented problems, the WPs could be an option to build houses after natural disasters: the Panel W Company is an enterprise established in Mexico since 1975, which manufactures polystyrene panels able to bear loads caused by natural disasters; The Panel W Company distributes WPs for making structural walls, semi-structural and roofs in Mexico and Latin America; this has been recommended by the UN, because the polystyrene used in the panels does not harm the environment. The WPs have also obtained a certificate issued by the Florida Approval FL10614 due to the quality of the walls; the WPs have been tested by the Architectural Testing under conditions of wind up to 320 km/h (W 2012). In addition these panels are manufactured in countries such as China, India, Spain and the USA among others (Escrow 2012).

The WPs are lightweight and among their qualities can be identified their fast installation in the construction, as well as their low cost and high performance, in as much as they generate minimal waste of material. The WPs have high thermal conductivity which reaches R-value of 2.47 m<sup>2</sup> K/W, which is higher than insulation with fibreglass (1.73 m<sup>2</sup> K/W). In addition to that they can reduce by 20% the air passing through them compared with wood panels (Medina, King et al. 2008). The cores of the WPs are made from the sheets of polyurethane and polygonal bars of polystyrene (Hollaway and Head 2000). Figure 4 shows the WPs composed of cores of sheet and bars as well as grids of galvanized steel.



**Figure 4 W Panels (core and sheets (5), bars (1, 2, 3, and 4) and grid**  
(Source: <http://www.panelw.com/english/index.html>)

The WPs obtained rigidity and greater resistance to shear forces, due to the characteristics and position of the wires that form the grids of the structure of the panels. The wires of galvanized steel, which are 3.5 mm in diameter, are obtained by a cold rolling method under regulations of the American Society for Testing and Materials ASTM A82. Such wires are placed in a three-dimensional grid, forming a welded wire fabric with a resistance to stress of 520 mega Pascal (MPa). These wires are more resistant than a steel bar of 10 mm diameter which has a value of 470 MPa (Rezaifar 2007). The WPs achieve total resistance when these are connected with steel meshes and tied with annealed wires which have a resistance to stress of 570 MPa (Rezaifar 2007) and are covered with a layer of water-cement-sand mix on both sides to ensure the structural integrity, since these allow the structure to work monolithically as a piece of reinforced concrete.

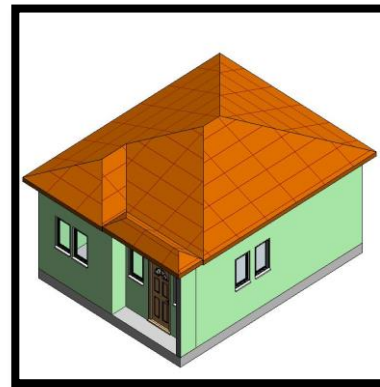
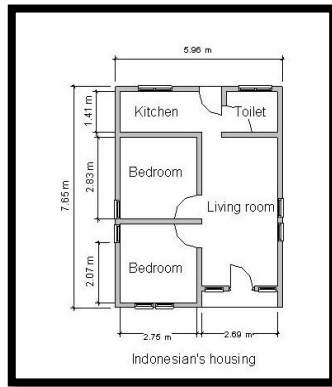


## RESEARCH METHODOLOGY

A comparative-descriptive research study was conducted using a holistic approach in order to research the possibility of switching toward a new construction system immediately after overcoming the emergency phase post-disasters, thus saving time and money. Literature review was conducted in the databases of Scopus, Science Direct and official websites and analysed in Nvivo 9 software to identify similar patterns in recovery housing programs, traditional building materials and WPs. An interview was also carried out with W Panels Company which was held using seventeen open questions by telephone with the representative from the W Panels Company and the transcript was treated as qualitative and quantitative data by pattern matching to find similar data between literature review and interview. The questions of the interview consisted of four subjects: features, availability, international prices and capacity to supply WPs and technical support in areas hit by natural disasters. The data collected was taken with the consent of the W Panels Company and validated by comparison with the literature and a search of construction materials in the database of the Mexican Institute of Cost Engineering. The literature review around housing recovery programmes was focused on the programmes used in Indonesia, since two regions were strongly damaged and several approaches were used to build recovery housing. A quantitative and qualitative analysis was carried out to research theoretically how WPs panels can embrace the sustainability concept post disaster to contribute to housing rebuild as an example to fill the gap created by the lack of construction materials in areas hit by disasters. Firstly, the analysis consisted of calculating of the total cost of a dwelling of 45.5 m<sup>2</sup>, which was used in Indonesia after 2004 for housing recovery, with traditional construction materials. Secondly, the total cost of the same dwelling with WPs was calculated. Finally, a comparison between the two calculations was carried out. The total cost of 45.5 m<sup>2</sup> was estimated by the method of a floor area which includes materials, equipment, tool and labour. This method takes into account the total cost (TC) of the structure multiply by the surface area (S) of the floor with the average cost per square meter built (P) (Pettang et al., 1997)

### Analytic framework

The economic analysis of Indonesian's housing corresponds to the construction of a housing unit of 5.95m x 7.65m. The economic estimation consists of the following concepts: preliminary, foundation, walls, roof, windows and doors, bathroom (tiles on floor and walls), hydraulic and sanitary and electric installations. This does not include the cost of land, given that the government was responsible for regulating the land tenure under guidelines of the BBR. Neither was the economic inversion estimated, since the housing was built with international donations from several countries (Wegelin 2006). It was considered that electric, sanitary and hydraulic facilities were developed parallel to recovery housing, since programs and budgets to build these were launched by BBR (Chemonics 2008). Figure 5 shows the architectural distribution and figure 6 shows the 3D view of the housing used after the tsunami of 2004 in Indonesia.

**Figure 5 Indonesian's plan housing.****Figure 6 Indonesian's 3D housing**

To estimate the total cost of construction of housing the method was used of a floor area (m<sup>2</sup>) 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 et al., 1997). Construction concepts are composed of a breakdown of activities, materials, labour equipment and tools, which gives the average cost per square meter built on floor area. The prices used to calculate the average cost were obtained from the database of the Mexican Institute of Cost Engineering, because this database is composed of a wide range and diversity of building materials and the prices of many suppliers and manufacturers of building materials, and the cost of labour for construction. Table 2 shows the cost per square meter of the surface housing designed with traditional construction materials described above which were used in Indonesia 2004. The cost per square meter of the surface housing resulted in £199.98 per square meter. It can also be observed that the total cost is £9,099.10, which corresponds to 45.5 square meters.

**Table 2 Cost per m2 of Indonesian's housing with construction materials used after Indonesia Tsunami 2004**

CONCEPTS	AMOUNT	UNIT	UNIT PRICE	SUBTOTAL
The cost per square meter of the surface housing with traditional building materials	45.5	m2	£199.98	£9,099.10
<b>TOTAL</b>				<b>£9,099.10</b>

Table 3 shows the total cost of the proposal to build Indonesian's housing with WPs, including materials, equipment and tools. It can also be observed the total cost is £6,279.14 which corresponds to 45.5 square meters. The comparative analysis conducted between traditional materials used to build recovery housing and WPs shows a decrease of £61.98 per square metre, namely, £1,816.23 per house built.

**Table 3 Cost per m2 of Indonesian's housing with W Panels**

CONCEPT	AMOUNT	UNIT	UNIT PRICE	SUBTOTAL
The cost per square meter of the surface housing with WPs	45.5	m2	£138.00	£6,279.14
<b>TOTAL</b>				<b>£6,279.14</b>

## **FINDINGS**

The tsunami that occurred in 2004 left 120,000 housing units completely damaged, which were rebuilt by NGOs supported by international donors. The NGOs suffered from a lack of knowledge in construction and this contributed to slow recovery. The Indonesian government lacked recovery plans to rehabilitate housing, facilitates, super structures and livelihoods. Community participation was found fundamental to help with recovery housing post disasters. The recovery programmes which used members from the communities were more able to build recovery housing in comparison with those recovery programmes managed without community participation. The WPs were found as an alternative for building affordable and resistant housing, since they are resistant to earthquakes and tornados up to 320 km/h, have high thermal conductivity, and produce minimal waste. The polystyrene used to produce the WPs does not harm the environment. The interview findings allow the conclusion that the W Panel Company is able to supply WPs in areas affected by natural disasters by road, train or ship two weeks after they have taken the purchase order, that the base price of WPs is not incremented, but there is an extra cost of transportation. The W Panel Company is able to give technical support to construction professionals and unskilled people. The W Panel Company also offers franchises, which are strongly supported by the company and skilled people. Theoretically, the economic comparison suggests that WPs are 45 % cheaper than traditional construction materials.

## **DISCUSSION**

Advance measures should be considered to rebuild areas affected by earthquakes, tsunamis, tornadoes and floods, to save time and money. The substitution of traditional building materials by WPs, as well as the skilled labour by unskilled people from communities affected is proposed as a measure in advance to switch toward a new construction system immediately after overcoming the emergency phase post-disasters. Traditional building materials can be substituted by WPs, since these are capable of withstanding earthquakes and tornadoes, because they work as structural elements of reinforced concrete when the panels are connected with steel meshes and covered with mortar to achieve that the structure works monolithically. The WPs are also 45% less expensive than traditional construction materials and they are available in several countries and can be acquired by franchises, which can be operated by groups or individuals from communities. On the other hand, the recovery housing programs used in Indonesia after the Indian Ocean Tsunami in 2004 show that a community-based approach offers the possibility of training community members in new construction systems to build homes rather than housing.

## **CONCLUSIONS**

The rehabilitation and rebuilding of areas damaged by natural events are a major challenge for governments, NGOs and populations that do not have recovery plans to withstand the onslaught of natural forces. After the Indian Ocean tsunami occurred in 2004 Indonesia had to use programmes created to alleviate and to improve poverty from the Word Bank. Indonesia received

economic aid from several countries for overcoming the unprecedented damage left by the Tsunami. However, the presence of 120 NGOs complicated the recovery of the area, mainly due to the strong competition among NGOs. The community-based approach was successful, because this involved individuals and groups from the community to build homes. The training of facilitators was the key to the success of this approach, because they were trained by professionals of different fields. Thus, WPs and community members can contribute for developing a systematic framework to switch toward a new construction system before a natural event occurs. WPs are an option to replace traditional construction materials, because they are cheap, lightweight, thermal and resistant, thus building sustainable housing. There are, undeniably, many areas that need further detailed examination, especially to develop a logistic operational plan to make accessible the construction system to the affected countries.

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