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Recovery after extreme events
Lessons learned and remaining challenges in Disaster Risk Reduction

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EDITION NOTICE

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Foreword

Disasters such as the Indian Ocean Tsunami 2004, but also other extreme events such as cyclones, earthquakes and tsunami substantially affect the lives of many thousands of people - they are events radically and abruptly changing local circumstances and needs. At the same time they can significantly reshape global paradigms of Disaster Risk Reduction (DRR). Such events also bring to light the challenges in coordinating assistance from the "global community" with all the intended and un-intended effects. Two of the most pressing questions therefore are whether the different actors have learned from the disaster and whether processes of DRR and livelihood improvements have been implemented successfully.

This volume gathers selected papers addressing the following key questions:

- Lessons learned: Which lessons have been learned in a way that a difference can be seen today for the livelihoods and resilience of local people in the regions affected?
- Lessons to be Learned: Despite the body of knowledge created and reflected in a good number of lessons learned studies – what is still unsolved or needs to be emphasized?
- Monitoring and evaluation: Which DRR measures have been perpetuated and how can they be monitored and evaluated scientifically?
- Resilience effects and (unintended) side-effects: Which coping, recovery and adaptation measures are supported by the resilience paradigm and which other areas are side-lined, neglected or even contrary to the intended effects?
- Dynamics in risk: In which cases has resilience building taken place? In which cases have vulnerabilities been shifted internally or new vulnerabilities been created?
- Relocation/resettlement: How did the relocation/resettlement process of displaced people take place and what are its long-term effects?
- Urban-rural divide: How have DRR measures in urban vs. rural areas differed and which linkages but also rifts in rehabilitation and reconstruction initiatives can be observed between the two?
- Early warning: What is the future of Early Warning and how can important top-down information chains benefit from or be balanced with bottom-up feedback of users and affected people?

It appears that extreme disaster events spark a plethora of actions in academia, civil society, media, policy, private sector and other organisations. Tragic, as such disasters are, they offer incentives for learning, locally and globally. Lately, disaster impacts have in many cases been detracted through the application of knowledge and experience gained from previous events. However, there are still a number of challenges with regards to learning from past disasters:

The outcomes of the German Academic Exchange Service (DAAD) Alumni Seminar 2016 „11 Years After the Indian Ocean Tsunami 2004 – Lessons of Disaster Recovery, Rehabilitation and Resilience", conducted by TH Köln - University of Applied Sciences, United Nations University - Institute for Environment and Human Security (UNU-EHS) and the Social Policy Analysis and Research Centre (SPARC) of the Faculty of Arts, University of Colombo and this volume that is one result of the seminar tie in with the Sendai Framework for Disaster Risk Reduction (SFDRR9 endorsed in 2015, specifically regarding priority 1: *understanding disaster risk* better through the documentation and critical reflection of lessons learned a decade after the tsunami in the Indian Ocean, but also which other recovery processes of other events it later influenced. This volume also addresses priority 2: *strengthening disaster risk governance to manage disaster risk* by analysing which institutions have been created after such extreme events, which ‚master plans' have been set and what

knowledge management and communication challenges remain. Priority 3, *investing in DRR for resilience*, is covered by investigating the successfulness and sustainability of investments immediately after extreme events with a midterm perspective. Priority 4 of the SFDRR finally, is fully covered by the papers scrutinising the lessons learned about ‚Building Back' and how to advance our knowledge to *‚Build Back Better'. In recovery, rehabilitation and reconstruction.*

We thank the authors of this volume for their efforts and willingness to share their insights on lessons learned and remaining challenges in Disaster Risk Reduction. Moreover we thank the reviewers Arinafril Arinafril, Hananto Kurnio und Vicente Sandoval for their constructive comments.

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Planning and development following disaster events

Economic Revitalization of the Tsunami Victim Community in Aceh Province, Indonesia

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Introduction

The earthquake and tsunami in Aceh on December 26, 2004 destroyed most of the west coast of Aceh and its surrounding areas, including Banda Aceh, Aceh province's capital. Based on data from the Disaster Management Agency of Aceh province, the tsunami caused approximately 236,116 deaths and 74,000 missing people. Moreover, the tsunami destroyed most of the community activity centers around the coastal areas.

There are some alternative possibilities to help develop economic activity in disaster affected areas, including supporting small and medium enterprises, encouraging the establishment of new businesses, attracting foreign investment (domestic and international), investing in the physical infrastructure, investing in soft infrastructure (including human resources, institutional reinforcement and policy issues), supporting the growth of specific business groups, targeting the growth of spatial targets, and targeting the growth of some disadvantaged groups (World Bank, 2001)

Revitalization is an effort to enliven an area that had originally been thriving but then suffered a decline. The process of revitalization includes improving the physical, economic and social aspects of an area (Danisworo, 2002). Revitalization is not only used to improve the physical characteristics of a place, but also must improve the local economy and cultural recognition. The revitalization process requires community involvement. However, the community should not just support the formal aspects of the project, but people also really need to engage in all processes of the development (Laretna, 2002). Lee (2004) explains that in order to retain long-term economic improvements and optimize potential resources, great efforts are needed to improve the infrastructure and facilities in the community. Economic revitalization is one aspect of revitalization that should be reviewed now that eleven years have passed since the tsunami. One specific area needs revitalization when its lack of economic growth or the economy will begin to deteriorate. This occurs because of the loss of economic competitiveness.

Eleven years after the tsunami, Aceh continues to rise from adversity. This began with the rehabilitation and reconstruction process initiated by BRR (Rehabilitation and Reconstruction Body of Aceh and Nias) from 2005 to 2009, and was completed with various physical and non-physical assistances provided by local and international non-governmental organizations (NGO). Afterwards, the development process was conducted by the Acehnese government. In this period, the government created many projects to improve community life, focusing on the economic empowerment of community assets. However, the recent conditions of the community have indicated that the development process has not shown the expected results. Most of the tsunami-affected communities in the coastal areas are still in poor condition. The major problems faced by the tsunami victims are the loss of property, lack of capital and infrastructure problems. This required an analysis of the economic revitalization eleven years after the tsunami. To study the economic revitalization of

the disaster region, we identified the economic conditions of the disaster communities as well as their future expectations for their economic conditions. This study conducted in tsunami-affected areas in Banda Aceh and Aceh Besar District, Aceh Province. The villages determined by the level of damaged they had. The villages were Meunasah Keude, Lampulo, Blang Krueng, Lampaseh, Lampisang and Lamlhom. This study explained about the development program implemented in the affected area after Tsunami. This result has been presented in National Seminar of Indonesian Higher Agricultural Education Communication Forum (FKPTPI) in Yogyakarta, Indonesia in November 2016.

Economic Empowerment Program for Affected Community

Recovery of economic activities was one of the main focuses of donors during the rehabilitation and reconstruction period (2005-2008). Thus, many things were done to make people able to support themselves and their families able to rise from adversity. The loss of family, property and businesses caused resignation by affected people so they only expected support from other parties. In economics, number of family, property and land are all production inputs, so that if one of them does not exist or is lost, it will obstruct the production process. Through the economic recovery activities, donors created a variety of programs that aimed to increase people's access to economic assets, such as allocating capital, equipment and training to improve people's creativity in the economic sector. In this period, many foreign donors were involved in the economic recovery process. The donors included Oxfam, International Relief and Development (IRD), Islamic Relief, UNICEF, United Nation Development Programme (UNDP), Mercy Corps, Asian Development Bank (ADB). The only government agency which was engaged in the rehabilitation processes was The Rehabilitation and Reconstruction Body (BRR) for Aceh and Nias. BRR was an Indonesian government agency which coordinated and jointly implemented the recovery program following the 2004 Indian Ocean Tsunami and the 2005 Nias Earthquake. This institute has run many disaster recovery projects in Aceh from 2005 to 2009, so this period is known as the rehabilitation and reconstruction period. The institutions which engaged in the rehabilitation and reconstruction period were mostly international aid agencies. They were focused on the ownership of economic assets and production facilities to increase the community's ability to generate income. Some assistances given by donor in this period are business capital, fish processing equipment, training of producing Aceh craft, sewing equipment, training of catfish production, procurement of catfish germ, revitalisation brick factories, procurement of boat and fishing gear, procurement of tricycles, training of producing shredded fish, cool box procurement to preserve the fresh fish and training of fish processing to fishermen.

After 2009, the aid was more focused on sustainability and equitable distribution of economic activities. In this period, some aid programs were still supported by the government through related agencies, such as the Industry and Trade Department, the Marine and Fisheries Department, the Social Welfare Department, etc. While during the rehabilitation and reconstruction period the type of aid was mostly physical assistance, in the next period the aid was more focused on non-physical assistances in the form of business development training.

However, people's lives ten years after the tsunami were still below the standard of living, including low income levels and poor quality of life. Moreover, focus group discussions have shown that there are some aspects that are ignored in the distribution of aid to the community. One case was that people were not involved in determining the economic assets needed.

In an effective empowerment program, the community should be involved in the process of planning, actuating, results utilization and project evaluation. However, due to time constraints in implementing aid programs, there was incompatibility between the type of assistances provided with the capacity and skills of the community based on their economic activity before the tsunami. In order to give a quick response, the donors formulated quick policies in accordance with disaster locations and the amount of funds available.

In addition, the absence of monitoring and evaluation from funders in every provision made donors only focus on the fulfilment of tasks of institutions to provide assistance in a precise time, sometimes regardless of people's basic needs. The people were also not involved in any of the decision making processes, showing that these actions only want to show the existence of donors without requiring the community to participate actively. Moreover, in the rehabilitation and reconstruction period, the affected community also noticed aid that was overlapping between donors. This condition happened because one type of goods was considered more important compared to other types of assistances. This situation left some kinds of help ignored and not used.

We realise that many assistances made people move on from their sadness and improve their lives again. But in economic assistance, the huge amount of assistance has had a negative impact on people's daily attitude. One of the problems is that the beneficiaries have become apathetic and always rely on donors for their livelihood. This happened because the economic resources were not developed as a whole. Donors seemed to put a lot of attention on the type of aid. However, we also need to consider the readiness of the community to take advantage of the aid. Readiness of the society includes not only economic aspects (which means skills in using a given asset), but also the readiness and commitment of the community to use the aid in accordance with the purpose of granting such aid. In some cases it was found that people often used cash capital or other aid for private purposes because they needed to fulfil their primary needs, so their businesses remained undeveloped.

People's desire to meet their primary needs quickly also caused other problems in the efforts to accelerate economic growth. Generally, people choose to do business that could increase revenues in a relatively short time and that had a certain market. So many trainings on product innovation were not implemented by the community. It showed that Acehnese people focused more on fulfilling their family needs by using the assistance or working as before tsunami because they don't want to take a risk to try something new to fail and loose income for their family. Therefore, after the various assistance programs from NGOs and BRR were completed in 2009, the economic life of the people affected by the earthquake and the tsunami did not experience significant development.

Eleven years after the earthquake and tsunami, Aceh's economic conditions have begun to improve. Most people have been forced to change their jobs because of the loss and destruction of business areas, but some others are still doing their previous efforts. People in coastal areas are generally still running the same businesses, such as fishermen and fish processors. Likewise, people in the Lampisang and Blang Krueng village are also still running the same business such as traditional cake production. Lampisang village has been known as a producer of reliable traditional Acehnese cakes since before the tsunami. Along the streets of Banda Aceh-Meulaboh we can see many traditional pastry shops. In contrast, in Blang Krueng village, people sell only on a small scale at the coffee shops around the village and the Darussalam area.

For the farmers in the region of Lamlhom village, Aceh Besar, some have had to switch jobs and become as traders or construction workers as their fields are still covered in mud from the tsunami. However, some people are still trying to work as they did before the tsunami as farmers and traders. Recently, we can see

most of the people affected by the tsunami have received higher revenues, especially the fish processors, the traditional cake makers and some farmers. But some traders have experienced a lower income as a result of the increase in competition. This competition happened because a greater number of shops were built throughout Aceh since the rehabilitation and reconstruction period.

From group discussion we can see some constraints faced by the community, such as the limitations in marketing channels and the rise of the unemployment rate. This was caused by people's dependency on aid and the high level of wages during the reconstruction and rehabilitation period. It made people engage with the wage system, and they did not want to work at a lower wage. So they were willing to be unemployed rather than accept low wages.

From some of these constraints, some of the expectations of the tsunami victims are higher access to venture capital and an independent economic society. Some cases in the coastal regions of Aceh Besar showed that the number of requirements and guarantees from the official financial institutions caused a lack of community access to capital and made people not want to borrow capital from official institutions. So they were willing to borrow capital from moneylenders who did not require any collateral. But people had to pay interest on loans which had higher rates than the official financial institutions. By the adequacy of capital, people are expecting an independent economic society.

Lesson Learned from Economic Revitalization Efforts

Many programs of donors were able to empower tsunami victims in Aceh. However, the study on the economic revitalisation of affected communities by the disaster showed the importance of comprehensive planning for various emergency response programs. The government should have a blueprint for disaster response that can be used by all agencies which are involved in the emergency response in the future. Cooperation between the various institutions will help to improve aid distribution and minimize the occurrence of overlapping types of assistance in the same areas. A blueprint for emergency response must contain a mapping of the conditions in affected areas including demographic information, the data for rural households (such as poverty rate, livelihoods, business scales and main assets owned) as well as data on supporting institutions that are located in the disaster area. Policies, economic decisions and mitigation activities should be supported by long-term, accurate data and assessments (Barredo, 2009). Ease of access to data will increase the effectiveness of the assistances provided to the community, both in terms of the type and amount of aid that is distributed to the community.

Another thing that is needed to accelerate the economic revitalization of affected people is to create policies that reduce the loss of community economic assets after the disaster. In this case, the government should have a master plan for disaster risk reduction within the next 10 years to ensure that economic assets can be protected, for example by improving community access to banking institutions and the expansion of insurance, especially for vulnerable people who were exposed to the earthquake and tsunami.

Conclusions

The earthquake and tsunami in Aceh have eliminated many productive assets of community, a result of the lack of economic activities in the community level. In the process of economic activity revitalisation, there are several projects that have been implemented by donors, such as the distribution of production inputs, the rehabilitation of land and the training for small and medium businesses in the community. However, there are problems in the process of economic revitalisation about the incompatibility of the types of aid and the overlapping types of aid. This formed gaps in economic empowerment, and moreover made several aid

opportunities be abandoned because they could not be used in certain areas due to a lack of land capacity. In addition, top-down planning and aid provisions made people feel unsatisfied with the assistance provided because it was not in accordance with the needs and characteristics of rural areas. In this case, the integrated efforts of all institutions which are involved in the rehabilitation processes and reconstruction is needed. This can be realized through a blueprint of emergency response and disaster risk reduction master plan that can become a reference for the actions of all donors involved. Thus, the efforts of the emergency response in the future will be well integrated and will maximize the accelerated development of disaster victims.

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Planning For Safe Public Open Space in Reconstruction Sites after Large-scale Disasters: Comparing Indonesia and Japan

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Introduction

Disasters caused by natural hazards are occurring more often, and the impacts become more severe and costly. While the impacts on developing countries are mostly on the high number of deaths and total people affected, the impacts on developed nations are on the associated damages on the built-environment. Hence it is important that countries, rich or poor, need to start reducing disaster risks and strengthening communities' resilience. When disasters strike, it is important to minimize the disturbances caused to the affected communities.

This study aims at reviewing the importance of providing Safe Public Open Space (SPOS) in relocation sites for reconstruction after vast and complex disasters. Reconsideration of SPOS is important as an efficient response when a disaster happened, and for providing community common ground for rehabilitation and reconstruction in post-disaster phase. Furthermore, as proposed by UN Habitat (2015) share of open spaces is also an indicator in providing safe, resilient, and sustainable human settlements.

This study is based on desk research literature review. Two case studies were selected from different resettlement sites: one from Indonesia and one from Japan. Japan and Indonesia are the two countries that are very vulnerable to geophysical disasters. Both countries have experienced large-scale disasters caused by earthquake and tsunami and conducted extensive rehabilitation and reconstructions following those disasters. The study results are expected to be the tool for post-disaster reconstruction, to consider public open space as a place to be provided to the community for reconstructing their lives.

This paper is structured as follow. Section 1 presents the aim, rationale, and methods of study. Section 2 outlines results of the literature review on the role of SPOS after disasters. Section 3 compares Indonesia and Japan. Section 4 gives the conclusion and recommendations for future studies.

The Role of Safe Public Open Space (SPOS) in Disaster

This section outlines results of the literature review on definitions of the concept of open space and the importance of providing safety from disasters, immediately following disasters as well as in the long term. The discussion examines definitions and characterisations from general to specific, from open space to safe open space, and finally Safe Public Open Space (SPOS).

Public Open Space

The definition of public open space varies. Several researchers put open space in general as open areas, contrasting open space to built areas. According to Swanick et al. (2003), open space can be defined as green spaces which include park and greenways. There are many purposes of providing open space, e.g. the usage for diverse activities such as walking, talking and sitting and explicitly private activities in gardens and courtyards (Wolley 2003, Swanick et al. 2003.

Public open space, however, is the part of open space areas that is public. Carmona et al (2006) defined public open space as space open to public for free access. According to UN Habitat (2015), public open space is defined as the area of cities allocated for streets, boulevards, including walkways, sidewalks, and bicycle lanes as well as the area allocated for public parks, squares, green areas, public playground and open areas of public facilities. A public open space does not include open spaces which are privately owned. In this study, public open space refers to open areas for free public access, including e.g. parks, green areas and playgrounds.

In terms of function, public open space serves as cultural space, education space, and community focus activities (Woolley 2003), and offers a social learning opportunity (Shaftoe 2008). The need of being together to help and support each other has been recognized as an important role that public open space should provide. Public open space should be safe for people to meet, stay together, and give help to others (Pizzo 2013). In terms of disaster response, there is increasing attention to the role of public open space for disaster reconstruction purposes. Public open space becomes a refuge place, a temporary home to affected people who need to adapt to their new environment (Hossain 2014, Allan 2010). Hence, public open space creates a strong boundary for the community. It has a significant role in the community, especially its role for social interaction. Consequently, many diverse activities can happen in public open space, thus provoke the social gathering and social network within the community.

Safe Public Open Space (SPOS) after Disaster

For countries prone to earthquake disasters, it is important to learn how these types of disaster would affect the built environment especially in public open spaces for people. The element of safety is also commonly disregarded in the planning process for public open space. Safety is important since in most cases the availability of public open space does not take all users into consideration. Planning for open space should be carefully considered, especially when people are relocated to resettlement area.

Manandhar and Joshi (2015) recognized the role of open space in the phase of pre-disaster and post-disaster recovery. In the pre-disaster phase, public open space gives social value and interaction, as well as community identity. For the post-disaster recovery phase, public open space functions as a place for temporary shelter where aid can be distributed. In the case of a major earthquake, public open space operates as a safe public place for refuge, temporary homes before people can adapt to their new environment, a place for gathering and shelter and for the distribution of goods and services (McGregor 1998, Middleton 2007 in Allan & Bryant 2010). Pizzo (2013) also emphasized the importance of open place as a first place for people to run to, amid the flocks of running people, where after that first aid help can be distributed, and they can stay together. It acts as a response to a disaster event and a common ground for reconstructing the affected community's living environment in the post-disaster phase.

The community social network is primarily needed especially for disaster resilience. Therefore, in context of disaster reconstruction it is important for urban planning to plan for public open space that assists in rebuilding the community after such catastrophes. Public open space has a significant role before and after the catastrophe, e.g. to gather the communities and distribution of information. Before disaster happen, public open space has a social value by offering places for people to meet, to gather, to interact with the community, or to have a social life. Immediately after disasters they function as a space for people to run to, to get first aid and to be offered temporary shelter (Manandhar & Joshi 2015).

After a disaster, people are relocated into a temporary shelter or relocation sites. Problems occur where people are reluctant to move to places where they lose social contact with their neighbours. Open space is one component of the urban system which could facilitate recovery after a disaster (Moehle 2009 in Hossain 2014). Thus it is necessary to provide a safe public open place for the community to rebuild their community network.

In public spaces escape and rescue routes need to be ensured in two routes as one route may be impassable in an emergency case (Senda 2015).

There are examples of how spaces have been used in context of disasters from many cities around the world. Some examples in Japan (Bryant & Allan 2011) showed the rehabilitation of open space to increase the quality of life in a traditional neighbourhood and give safety to its residents. The community in Kobe, after the Kobe earthquake in 1995, rehabilitated their alleys with signs of safety and developed several parks, especially pocket parks as networks. Parks were rehabilitated as community space to prepare for the next disaster. Each park has a unique design and is equipped with a water pump, a seat, some flat space, and tree planting for shelter.

Figure 1: Pocket parks as networks for disaster mitigation in Japan
Source: Allan (2010)

The awareness of the importance of public open space in disaster response is rising. In Chile, after the earthquake and tsunami in 2010, open space has also become an important aspect in the emergency response. The affected people occupied all available open space as their refuge place. Here, a potential of public open space as an asset for urban resilience was realized as it helped to absorb shocks and respond to changes after the disaster (Fuentes & Tastes 2015).

After the earthquake in Nepal 2015, planning for public open space has also become a priority. Every open space is regarded valuable after a major earthquake as portals for delivering aids. The public open space can be used for the humanitarian response, e.g. camps for displaced persons, logistics centres and distribution centres (Flagship 2 of the NRRC 2015). People acknowledged that the availability of these open spaces provided them immediate safety (Manandhar & Joshi 2015).

Research Design and Methods

The United Nations 3rd World Conference in Sendai in 2015 adopted the Sendai Framework for Disaster Risk Reduction 2015-2030. The framework aims to achieve the substantial reduction of disaster risk in relation to physical, social, cultural, economic and environmental assets. The framework tries to prevent new and reduce disaster risk and thus increase preparedness for response and recovery. The goal to prevent and reduce

disaster risk comes with four priorities: (1) Understanding disaster risk, (2) Strengthening disaster risk governance to manage disaster risk, (3) Investing in disaster risk reduction for resilience, (4) Enhancing disaster preparedness for effective response and to "Build Back Better" in recovering, rehabilitation, and reconstruction (UN 2015). Focusing on the priority of enhancing disaster preparedness and to build back better, this study intends to evaluate the public open space in relocation sites regarding the safety remarks. This is important to help to build back better in context of future planning for public open space in disaster reconstruction. Thus planners are provided a guideline to plan the required space.

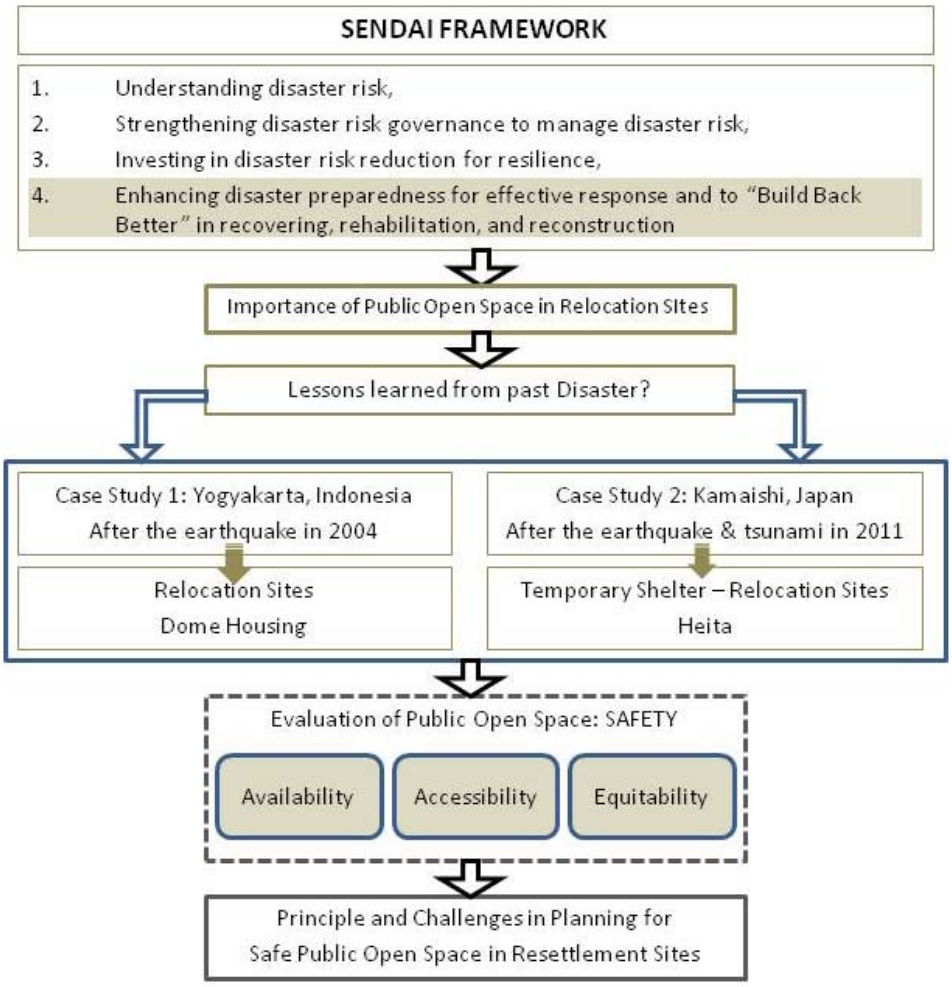

Figure 2: Conceptual Research Framework of the study
Source: own illustration

This research is designed as qualitative research, using a descriptive study that compares case studies in order to evaluate the existing plan for public open space and to further recommend guidelines in planning for safe public open space in relocation sites. This study collects data from various sources of the literature study and selects two case studies to evaluate existing public open space in relocation sites, one case from Indonesia and one from Japan. The compared case studies used are relocation sites after the earthquake in Yogyakarta in 2006 and after the earthquake and tsunami in Tohoku region, Japan in 2011. This study uses evaluation criteria focusing on disaster reconstruction as proposed by the Aceh Rehabilitation and Reconstruction Appraisal (ARRA). ARRA uses rapid appraisal and suggests evaluating space and services based on availability, accessibility, and equity and involvement. Availability focuses on available services and public awareness. Accessibility focuses on how the public accesses the space and the service. Equity and involvement focus on community involvement without discrimination.

Case Study of Indonesia and Japan

This section compares the implementation of Safe Public Open Space (SPOS) after large-scale disasters in Indonesia and Japan. Both countries have suffered continuous impacts from earthquakes and tsunami and have progressed extensively in their efforts to build resilience.

Dome Housing, Yogyakarta, Indonesia

Yogyakarta, a city in Central Java Indonesia (Figure 3), was hit by an earthquake on Saturday, 27 May 2006. The earthquake in circa 6.3 magnitudes killed over 5,000 people and injured thousands. More than 100,000 homes were destroyed and around 200,000 were damaged (Suryandono & Wong 2012).

Figure 3: Location of Yogyakarta
Source: WorldAtlas (2015)

An NGO from the USA – DTWF (Dome for the World Foundation) donated for Ngelepen around 80 new buildings in a dome shape called Dome Housing project. Ngelepen is a village in Yogyakarta and had to be relocated because of landslides caused by the earthquake. The new resettlement site is called New Ngelepen which is one km away from the original village (Figure 4). Future residents participated in the housing constructions, but not in the design and plans. The dome houses consist of eleven or twelve blocks of houses that share electricity, public toilets, and pathways. The diameter of the house is seven meters, two stories, with the total area of 38 square meters. Public facilities available are a mosque, playground, kindergarten, health clinic and a cemetery. However, facilities for community activities are lacking. This is because the planners assumed in the construction process that public facilities were nearby. The children playground area is too small and located beside the cemetery. Most community activities happen on the streets.

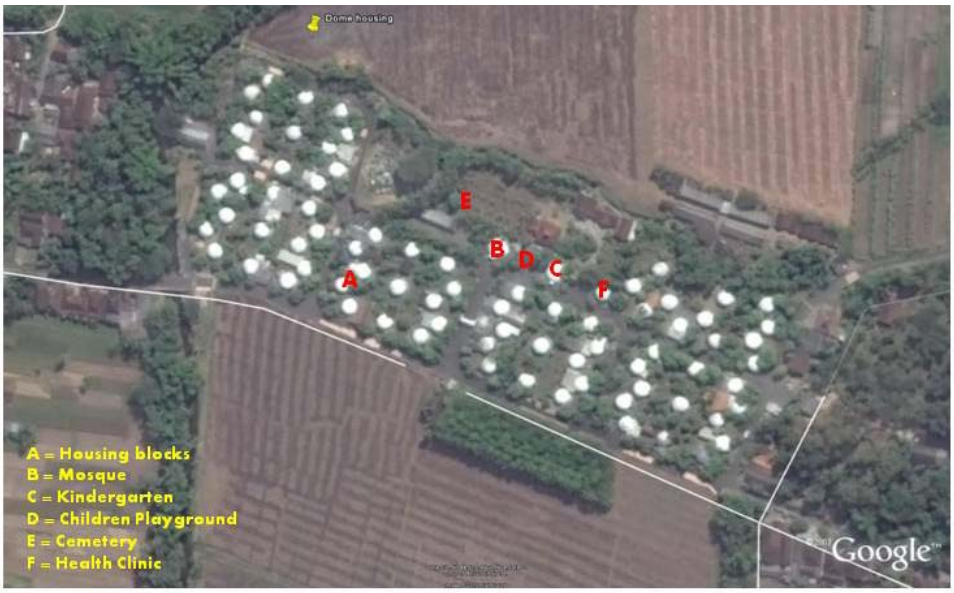

Figure 4: Dome Housing plan in New Ngelepen
Source: "Dome Yogyakarta". 7°48'49.79"S and 110°30'12.58"E. Modified from Google Earth. 24 June 2015. September 18, 2015.

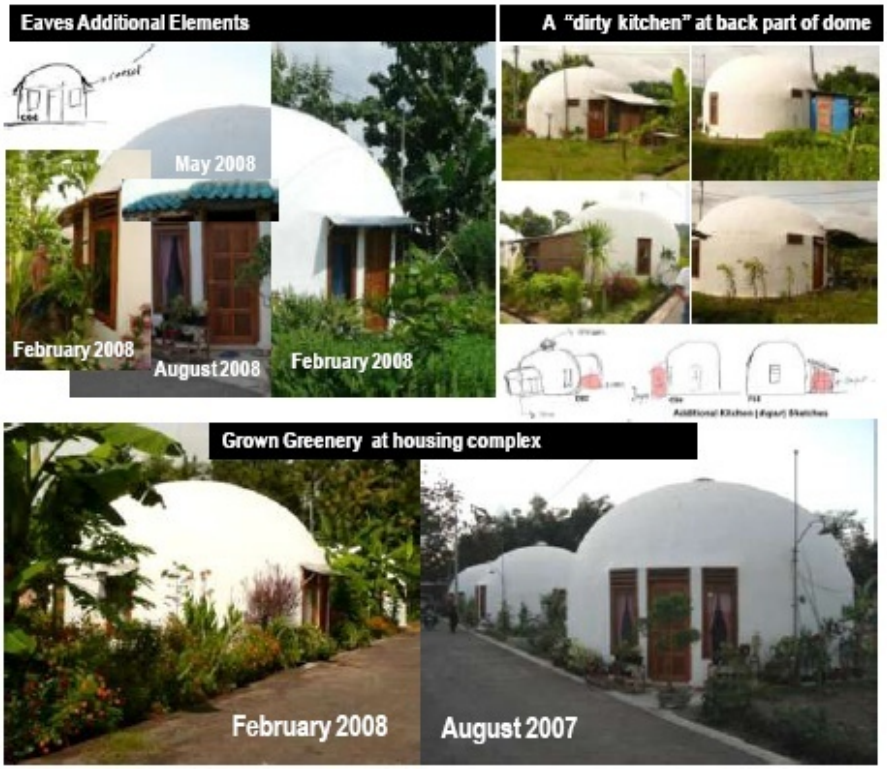

Figure 5: Changes made by inhabitants of Dome Housing
Source: UGM & IRM (2009)

According to Saraswati (2007), after one-year occupancy, people liked to stay in the dome houses since they felt safe from the earthquake. However, the dome housing was perceived as not suitable for the Indonesian tropical climate. Therefore, many residents eventually made additional changes to the dome, such as additional eaves, canopy, and other functions (Saraswati 2007).

Marcillia and Ohno (2012) investigated the influence of social interaction between residents within three years occupancy. 34 residents out of 51 residents were interviewed. The results indicated that 57% wanted private approach pathways, 61% had not enough yards in the house for social gathering. The available terrace in front of the house should be altered as a guest room, but the limited space made this not possible

(Marcillia & Ohno 2012). Based on this investigation, the outdoor space was not enough for large gathering space. The only flat open space available was used for a cemetery. The inflexible design of the dome houses made the residents to use open space outside the houses for better social interaction. Housewives chat and children playing were found in the streets activities. The main street was even painted for a badminton court. Here, the function of social gathering that used to be available in the original place, was taking place on the street, though it was considerably dangerous. The discrepancies from the intended usages in the original plan and actual usages showed the insensitivity to the cultural needs (Marcillia & Ohno 2012).

Temporary houses, Heita, Kamaishi, Japan

The Great Eastern Japan Earthquake and Tohoku Tsunami have led to the loss of approximately 108,000 residencies. The Japanese Government quickly responded to this with multiple offers for transitional shelter according to the affected location (Shiozaki, et al. 2013).

Figure 6: Location of Kamaishi Japan
Source: The Economist (2015)

The Great East Japan Earthquake devastated Kamaishi City in Iwate Prefecture in Tohoku Region (Figure 6). The temporary housing in Kamaishi is located near Heita Athletic Park and its design is similar to the destroyed houses (Figure 7). According to a report of the Japan International Cooperation Agency (JICA) on the reconstruction processes from large-scale disasters (2013), there are 240 housing units and a temporary shopping district to support the inhabitants, comparable to a small town with functions to provide the residents services for daily lives, places for work, and places for offering physical and mental support (JICA 2013).

Figure 7: Heita Temporary Houses in Kamaishi Japan
Source: "Heita Kamaishi". 39°14'3.88"N and 141°53'11.27"E. Modified from Google Earth. 01 June 2015. September 26, 2015.

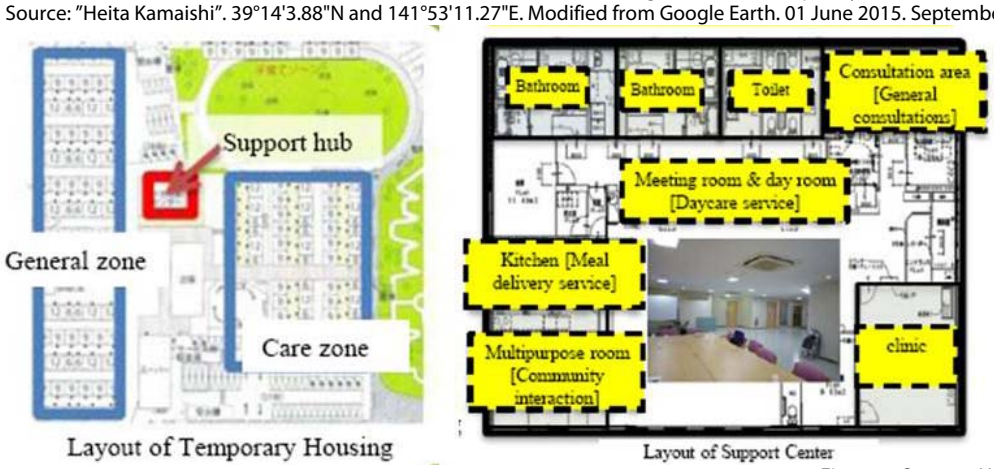

Figure 8: Support Hub location
Source: Examples of Initiatives Aimed at Reconstruction (2013)

There are two types of temporary houses, one with a wooden deck and one without (Ohno 2011). A support hub facility is given to prevent residents from isolation and to promote interaction between the elderly and the other members of the community (Figure 8). To make the optimum use of spaces, the temporary houses also have porches made of wooden decks so that the residents can sit in front of the houses and interact. Neighbours can meet each other in front of their houses and thus have a social relation. Besides the support hub as a welcome place, there is also a community place called "home for all", where the community can gather at night (Figure 9) (Worrall 2013). Here, the community participated in the design and construction process. There are also large outdoor spaces around the community centre which can be used as a children playground area.

Figure 9: Types of temporary housing (left, centre), Home for All (right)
Source: Ohno (2011) (left, centre); Sumner (2013) (right)

Discussion

Based on the two case studies above, this study compares the public open spaces available regarding the criteria of availability, accessibility and equity.

Availability

From the two case studies, the relocation sites are mostly in areas away from the possibility of danger. This makes the community feel safe. In both cases, meeting places are needed. In Japan, the community centre serves as a welcome place, support hub, and even for elderly. In Indonesia, public spaces and facilities available are a playground, mosque, and health clinic. This is related to different cultures and locations in Indonesia and Japan. The location of the community centre in Japan case is in the centre to ease access of the inhabitants.

In Yogyakarta, no space is allocated for community activities. There is no large public open space for gathering space. Thus, the social interaction happens on the streets. The children playground is considered too small and therefore children prefer to play on the streets. Furthermore, the need for social place, either in an outdoor or indoor community centre is important and has not been noticed by the local government. For the case of Heita in Japan, the community made porches between the shelters as shared space to meet their neighbours. Besides, they have a support hub as a welcome place and a different community centre. The outdoor area is also large enough for children playing.

The existence of public open space is, therefore, necessary, since it is a place for the community activities, and it is indeed a primary social need of the community. The disaster took not only their physical belonging but also their social, economic life they had before the disaster.

Disasters have a great impact on the social relation of the society. The availability of community centres can help to reduce the loss. This is why social ties are important in relocation sites. The social relations or social ties improve community resilience. Besides building construction the reconstruction of new place should consider social behaviour.

Shared space for the community can be recommended in two ways: an indoor community centre and outdoor public open space for the community. The indoor community centre should serve as a place for social activities, a health centre and needs to consider the elderly as the most emotionally and physically affected. Outdoor public open space is needed as an assembly point, a refuge for the community during the disaster and for temporary spaces for relocation.

Accessibility

Public facilities for the community in Yogyakarta are available nearby. Hence, they are easily accessible for all residents. However, the roads as an accessible place to all have taken over the need for real public open space. For instance, children use streets as a place to play badminton. In the case of Japan, the relocation site is surrounded by a large park and has big open spaces. The community centre is located in the middle to ease the access of people.

Public open space facilities should have an inclusive design to be accessible to everyone, since its importance in pre-disaster or post-disaster reconstruction. This also means to consider various stakeholders who will benefit from the new relocation sites, from children, youth, adults, elderly, even considering disabled people, which are often not mentioned in many cases for emergency escape ways.

The community awareness regarding safety routes and escape ways during disasters is also important, but often lacking in places that do not realize the earthquake and tsunami hazards. The survivors of the Indian

Ocean Tsunami 2004 mentioned that eye orientation regarding high buildings, sign, hill, etc. made them to react faster, to run away from the water, to go to a higher place, and follow the lock of people. Therefore, the escape routes need to be clear and visible to everyone (Fakhrurrazi 2010)

Equity

The community involvement is important as part of the reconstruction process. In Yogyakarta, the community participated in construction, but not in the housing plans. As a result, there is some incompatible design to the local culture and condition. Local residents therefore made some adjustment and use roads as an open area for community activities. This is in contrasting situation with the case study of Japan, where community participated in the planning process to ensure the social value between the residents.

To sustain a new area, it is suggested to support a community participation that helps to enhance self-belonging feelings. The community can also maintain the communal space. Since the case studies also shows cultural changes in relocation sites, thus it is important to provide the community an adaptable function of place, for example, public open place which can serve as sport facilities, a place for community gathering and even as a refuge place. This may end up in the open ended and flexible design by the community.

Conclusion

Enhancing disaster preparedness for effective response and to "Build Back Better" in recovering, rehabilitation, and reconstruction is one of the goals in Sendai Framework. The findings from the two case studies allow to draw the conclusion that the public open space is an important part in planning for relocation sites. It is one important element to build better new relocation sites for disaster risk mitigation, recovery, rehabilitation, and reconstruction. It needs to be easily accessible and to provide options for social activities of various users, like children, youth, adults, elderly, and disabled people. The more adaptable communal spaces are, the better can people use them concerning their needs. Since the beginning of planning regarding the scape`s function and location, the affected community needs to be involved by the planners. This is necessary to ensure sustainability of the space and also increase community awareness for the availability and importance of this space. Social ties also help to build community resilience in the pre- and post- disaster phase. Therefore, every planning for macro scale of settlement in disaster prone area should take this matter into account.

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Resilient-Designed Community Structures and Facilities for Vulnerable Coastal Cities: Lessons Learned from Indonesia and the Philippines

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Abstract

Twenty-first century cities are home to more than fifty percent of the world population. Coastal cities and towns that are highly exposed to sea level rising, have high risk and vulnerability particularly during the occurrence of disasters such as: earthquakes, tsunamis, typhoons, and storm surges. Countries, such as Indonesia and the Philippines, are geographically located along the sphere of climatic hazards and have high vulnerability to these natural disasters.

The coastal area is indicated as vulnerable to natural disasters. This study puts a focus on the discussions of disaster preparedness and mitigation measures through identifying safe zones. The analysis presents findings to create concepts of resilient-designed community structures and facilities to help create safer zones and better human security in the highly-dense disaster-prone urban cities and coastal towns of Indonesia and the Philippines.

Keywords: safe, community, structures, facilities, disaster, resilience, vulnerability, climate change adaptation

Introduction

Great disasters such as earthquakes and tsunami often strike coastal areas (Purbani, 2012; Diposaptono, 2005). Some countries are prone due to the fact that large parts of their territory are made of coastal areas. In Indonesia, some cities are close to the fault line of active tectonic plate that is constantly moving. This means that it is highly prone to volcanic eruption, earthquake and even tsunami. There are 290 cities located at the coastal line. Therefore, countermeasures to protect the coastal cities from tsunami are needed (Fakhrurrazi, 2010).

Indonesia as the biggest state archipelago has huge natural coastal resources and high natural disaster potential. The present population of the region is approximately 210 million, with approximately140 million living within 60 km of the coasts. The coastal area is indicated as one of the areas that are vulnerable to natural disasters such as earthquakes and tsunami. One of the disasters was the earthquake and the following tsunami that devastated Banda Aceh, Indonesia on December 26th in 2004. It has caused remarkable problems such as social, economic and environmental aspects in Banda Aceh. Although this region of Indonesia is extremely vulnerable to natural disasters and due to its location exposition to danger is unavoidable, disaster risk still could be reduced. The government must consider this in making policy and development strategy to be more suitable for disaster mitigation (Ruswandi, 2009).

The Philippine archipelago is frequently visited by strong typhoons, while on a yearly basis of the average of 20 typhoons develop and about eight to ten make a landfall. Being an archipelago of 7,100 islands, it is

predominantly surrounded by water and geographically located within the "Ring of Fire" and directly adjacent eastward to the Pacific Ocean. With the constant experience of typhoons, the Filipinos have been resilient to the impact of typhoons and flooding. However, Typhoon Haiyan, taught the most cruel first-hand experience on the destructive effect of storm surge which has been recorded to happen once in 50 years.

Typhoon Haiyan (2013) is historically recorded to be one of the super typhoons that traversed the Philippines with a wind speed of 195 miles per hour and built a strong gust of wind of 235 miles per hour at landfall. According to the data gathered by United States Agency for International Development from the Government of the Philippines (GPH) National Disaster Risk Reduction and Management Council (NDRRMC) as of April 17, 2014 Typhoon Haiyan affected 16 million people, displaced 4.1 million people, caused 6,300 recorded deaths, damaged and destroyed about 1.1 million houses (USAID, 2014).

Planning for disaster-prone towns and cities should be strategic and focus a more concrete sustainability and resiliency solutions that are adaptable and comprehensive. Safe places to function as evacuation space should be managed and planned prior to its occurrence as to minimize the impact of such disasters to the physical environment of cities, to prepare the community for the disaster and most importantly to save lives of the people. The problem is people react faster, run away from water or follow the lock of people instead of following escape routes (Fakhrurrazi, 2010). Besides escape routes, they need to be familiar with the evacuation space or space of refuge, which usually are community facilities.

Too little literatures was written about "space of refuge", but the closest definition is related to the "area of refuge" that is defined and identified in building codes and fire safety standards. Area of refuge is a fire-resistive indoor space inside the building where people run to for safety during the occurrence of fire which is equipped with necessary tool to clear the air from smoke and any hazardous gas (ICC, 2015). Space of refuge is an area in a public open space that is unobstructed and with the significant role of providing a free, safe place for people to go during the peak of climate-related disasters and immediately right after it has passed.

Considering the need for community facilities which have a multi-functional purpose and can be convertible to evacuation area in times of disasters, it is necessary to have a resilient design community structure and facilities for these prone cities.

Disaster preparedness

Coastal communities are full of false myths associated with disasters. Community members living in disaster-prone areas become victims because of the lack of preparation and false myths about the disaster (Dahuri et al., 1996). After disasters occur, people often lose control and are afraid and anxious. Disaster preparedness reduces these feelings and helps communities to know where to take refuge and how to care regarding domestic purposes.

Disasters are inevitable, unpredictable and significantly impact communities and their economy. Therefore, it is important for disaster preparedness to minimize the threat. Planning, warnings, evacuations and search and rescue are processes designed to minimize the deleterious effects of disasters on populations (Gillespie & Streeter, 1987). Disaster preparedness can be in form of rescue facilities such as disaster warning sirens, evacuation routes and evacuation area for disaster victims. In an earthquake rehabilitation period, a warning from the sound of sirens can make people to run to disaster and evacuation sites that have been provided in accordance with instructions or knowledge at the time of counselling, socialization and practical simulations.

Evacuation space as a safe zone

Evacuation shelters are areas that can be used for emergency evacuation directly after the occurrence of a natural disaster. The Japan Study Support (JPSS) categorises evacuation space into three categories: (1) Temporary evacuation sites (Temporary assembly point) (usually the nearest spacious places such as local park, schoolyard); (2) Open evacuation area (e.g. larger park or an open space); (3) Evacuation shelters (places for evacuees to live temporarily e.g. public schools).

Based on the categories the City of Hiroshima in Japan differentiates the evacuation shelters in (1) immediate shelter, (2) neighbourhood and daily life designated evacuation shelters and (3) wide-area evacuation shelters. The immediate shelter is a pre-selected evacuation area, e.g. public parks, open fields, or empty spaces near to homes or work places. The neighbourhood and daily life evacuation shelter provides lodging and shelter for persons whose residences are destroyed. The wide-area evacuation shelters are used when the neighbourhood evacuation shelter can no longer be used.

Resilient design of community structures and facilities

According to the Hyogo Framework for Action (UNISDR, 2005), disaster resilience is determined by the degree to which individuals, communities and public and private organisations are capable of organising themselves to learn from past disasters and reduce their risks to future ones at international, regional, national and local levels.

Buildings and structures protect people from negative effects of extreme-weather conditions and impacts of climate change. Therefore, we should design structures that are climate-adaptive and enable better health and chances of survival during climate-related disasters (Roaf et.al, 2005). Another important point is the multi-functional aspect of community structures and facilities. Schools, churches, and community halls become evacuation centres and people often run to these buildings to seek shelter during typhoons and other emergencies and disasters. It is therefore important to consider a multi-functional and multi-hazard approach in the design and planning of community structures and facilities.

Most community structures and facilities in developing countries are initiated by donor agencies, politicians, religious groups or people's organizations. Most of these facilities have limited budget also affecting the design and material specifications of the respective buildings. The aspiration of designing climate-adaptive structures that can withstand extreme weather events lacks realization and implementation.

Research design and method

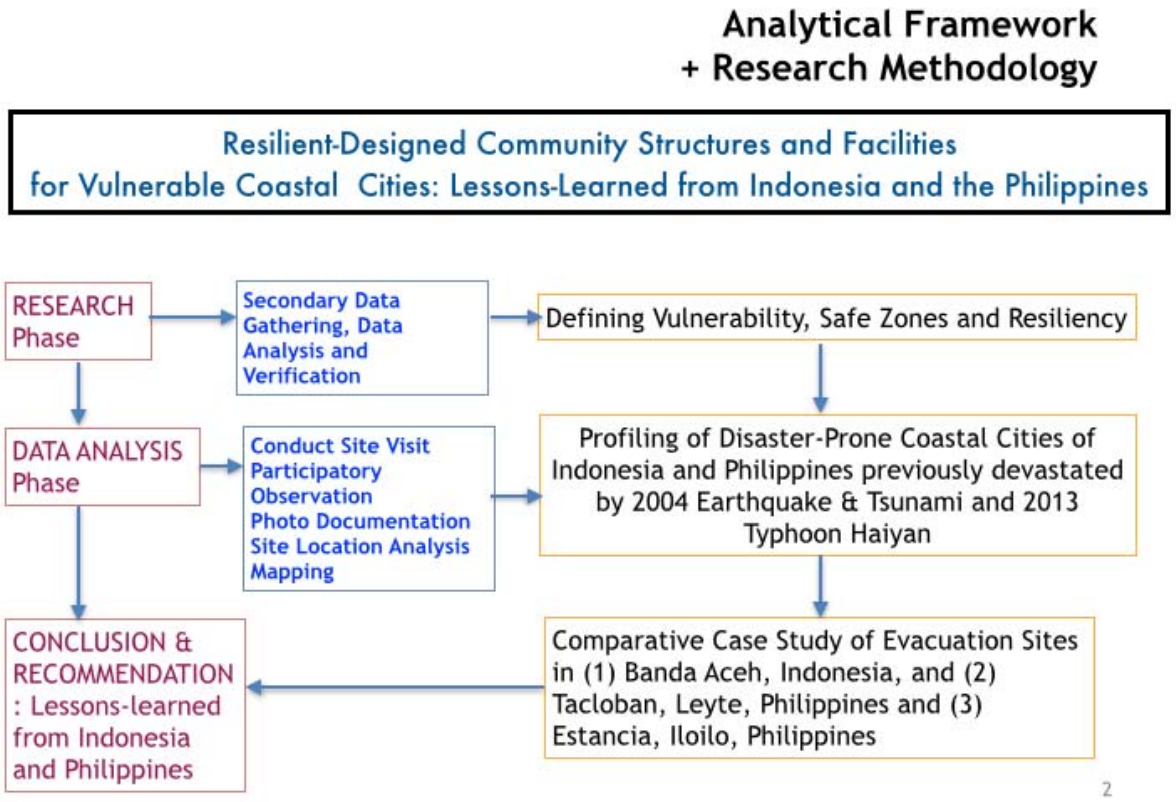

Figure 1. Research Framework
Source: Own elaboration

This study adapts a qualitative research method using the following research tools to assess the needs and gap on implementing disaster preparedness measures on the case study coastal towns: (a) data gathering and analysis of secondary data on tsunami, storms, disaster preparedness and resiliency, (b) participative observation, (c) walking/ foot survey, (d) wind-shield survey, (e) photo documentation, (f) key informant interviews, (g) focus group discussions and (h) comparative case study method comparing evacuation sites of coastal towns in Banda Aceh, Indonesia, and Leyte and Iloilo, Philippines.

This approach is in line with the support of the Sendai Framework adopted at the United Nations 3rd World Conference in Sendai (UN, 2015). The Sendai Framework priority number four includes "Enhancing disaster preparedness for effective response and to "Build Back Better" in recovering, rehabilitation, and reconstruction" (UN, 2015). It is, therefore, necessary to identify safe zones, significantly conducted in the early stage of the planning of cities and way before mega-disasters hit the vulnerable coastal towns of disaster-prone countries. These evacuation facilities should be designed by adapting resilient principles and serve as spaces of refuge during disasters.

The aim of this study is to draw lessons learned on designing and building more resilient community structures and evacuation sites based on Indonesia's experience in context of the Indian Ocean Tsunami 2004 and the Philippines' experience from the devastation of Typhoon Haiyan in 2013.

Profiling of case studies

Case 1 Aceh, Indonesia – Gampong Neheun Banda Aceh

Nanggroe Aceh Darussalam (Aceh) Province, in Indonesia (Figure 2) was devastated after the Indian Ocean Tsunami on December, 26th, 2004 (BRR & partners, 2006). Banda Aceh suffered great loss after the disaster. About 130,000 people died, 37,000 were missing, and 500,000 were displaced. An entire coastline of 800 kilometres was devastated and obliterated. Since the inhabitants of the coastline's communities had no experience with tsunami, they were unaware of the upcoming wave and its devastation.

Figure 2. Location of Banda Aceh Indonesia
Source: Colorado Coalition for Human Rights (2005)

Resettlement sites in Banda Aceh are either in original villages or new locations. One of the relocated resettlement sites is Gampong Neheun within the Subdistrict of Mesjid Raya, Aceh Besar District. This village was affected by the Tsunami 2004 which destroyed some houses of the residents in Neuheun. Gampong Neuheun is divided into two parts, the original settlement and the relocation or resettlement village. The original settlement of Gampong Neuheun is located on low-lying lands vulnerable to coastal hazards (unsafe are), but the resettlement site is located on a hill (safe areas). The site is located 15 kilometres away from Banda Aceh city centre on a mountainous land and elevated from the coastline (Figure 3).

The population of in Gampong Neheun in 2011 comprised approximately 300 families with 1000 people. The Gampong Neuheun community has currently a highly poverty level. Most of the settlers work as fishermen, fish sellers, builders, or cycle rickshaw drivers. They have to travel ten kilometres to the city for employment, causing them certain costs. Many would eventually sell the house and return back to the city (Panjwani, 2013). The village population is heterogeneous with different cultural, educational, social, and economic backgrounds. Public facilities available are a mosque at the base of the hill and used as a meeting place for men, a health clinic, marketplace, village office, and three school buildings. The marketplace was abandoned since there was no competition and enough population to serve (Figure 4-5). Based on a preliminary survey, there are 50 houses constructed from wall and 210 houses constructed from wood. Therefore, this area has a highly poverty level.

Figure 3. Neheun Compound and the houses located on steep site
Source: own photograph by Yulvizar (2006)-left / Panjwani (2013)-right

Figure 4. Shelter initiated by women (left) and unused market place in Neheun Compound
Source: Panjwani (2013)

Neuheun Village has already equipped with escape routes and evacuation facilities for disaster victims. The province of Aceh provides a new technology for tsunami warning systems. However, not all communities like Neuheun village are familiar and connected to the means of modern technology used to convey an earthquake and tsunami warning. Therefore, the dissemination of information about tsunami threats often cannot reach the people in vulnerable and far-off region.

Figure 5. Masjid and Village office in Neuheun Village
Source: own photograph by Yulvizar (2016)

According to Latief et al. (2008) a weather warning system (early warning) is an effort to give warning signs that the possibility of a disaster is imminent and thus, an early warning must be accessible, immediate, resolute, coherent and official.

For communities living in low-land areas, they will soon relocate to the hill and follow evacuation routes. The escape routes including respective instructions have been provided in Acehnese language (Figure 6). These instructions give clear indication of evacuation routes to the resettlement area on the hill. This is supposed to be an effective way to make the community understand where to run to in the evacuation process. But through times, some of the signs were covered with trees. In addition to the effort in increasing community resilience, many NGOs have supported in counselling, socialization and practical simulations related to disaster risk reduction.

In Aceh, there are eight tsunami evacuation or escape buildings (TEB) that loom over the coastal landscape. These TEB were introduced after the 2004 earthquake and tsunami and are temporary shelters for evacuation during a tsunami. It must be located close to public spaces and accessible via roads and transportation systems. One escape building in Banda Aceh is the Tsunami and Disaster Mitigation Research Centre, and another is the imposing Tsunami Museum. Nevertheless, these buildings are far away (25 km) from Gampong Neuheun.

Figure 6. Signs of Escape Routes in Neuheun Village
Source: own photograph by Yulvizar (2016)

Case 2 Tacloban City, Leyte and Estancia, Iloilo, Philippines, during the Typhoon Haiyan (local name "Yolanda") in November, 2013

Tacloban City, Leyte which is part of Region XIII of the Philippines, is a progressive coastal town lying along the eastern part of the Visayas group of islands. The Typhoon Haiyan and the massive storm surge of about 13 feet (Reliefweb, 2013) or approximately 4 meters high at sea level during the peak of the storm, has completely wiped off a big portion of its coastal towns as the hardest impact of the typhoon hit the provinces of Leyte, Samar, Northern Iloilo and Palawan. One of the first temporary housing facilities constructed for the families affected by Haiyan was financed and constructed by the Department of Public Works and Highways (DPWH) and the Department of Social Welfare and Development (DSWD) and of the Philippine government. These "bunk houses" received many criticisms and complaints for the 'substandard' materials used.

Figure 7. Location of Tacloban City, Leyte, Philippines
Source: Tacloban Hotels (n.d.)

According to the 2014 Bunkhouse Assessment Report of Camp Coordination and Camp Management (CCCM) Philippines, seven from the total 20 sites selected to construct these temporary housing are located on low-lying and flood-prone areas and two sites are directly adjacent to the highway which poses a threat to the safety of children if sites are not fenced. With regards to having proper drainage systems, only five out of the 20 sites have installed drainage water that is capable of receiving the amount of excess rainwater to be channelled off-site. Although twelve sites from the total 20 sites have sufficient space for solid waste management, none of them have installed sewerage disposal systems for non-solid wastes. Most of the sites have cleared access ways for vehicles and pedestrians but most need a better site development in terms of levelling and grading of roads. Concrete and gravel path walks were provided but did not include provision for accessibility of persons with disabilities (PWDs). With regards to security, only two of the 20 sites were provided with fences creating an insecurity issue among the other sites of these temporary housing. Some additional construction deficiencies were reported by CCCM (2014): (1) about five sites have stairs with no railings, (2) No provision of required basic communal facilities such as laundry and washing area, child-friendly spaces and recreation facilities, spaces for women and mothers, and multi-purpose halls.

Figure 8. Location of Estancia, Iloilo, Philippines
Source: Gonzales (2005); Villar (2003)

The report has no or very limited information about the structural stability, liveability aspect of the site of the temporary housing and the condition or space design of each individual housing unit. Though it was mentioned that one single housing unit has an average area of 8.64 square meters per family which is below the standard of about 50% less than the required average standard size of a liveable space of a minimum floor area of 18 square meters for socialized housing, row-house type (HLURB, 2008).

In the case of the Municipality of Estancia, located at the Northern part of Iloilo (Figure 8), the researcher conducted a post-disaster assessment with United Architects of the Philippines- Emergency Architects (UAP-EA) in December 2013. One of the sites for temporary housing facilities is around three kilometres north of the town centre located in Barangay Gogo (ADRA, 2013) and another is in a Public High School grounds within the town of Estancia.

Figure 9 & 10: Lack of provision for drainage (left) and Water Supply System (right) at the Evacuation and Temporary Housing for the displaced families of the oil spill and the devastaton brought upon by Typhoon Haiyan in Estancia, Iloilo, Philippines
Source: own photograph by Equipaje (2014)

In most camps visited, the provision of water is not sufficient for the needs of the displaced families. On some temporary housing and evacuation sites, water is stored in fire trucks and channelled to water pump sites. Insufficient access to potable, clean water exposes the Internally Displaced Persons (IDPs) to health threats and the lack of water to clean and bathe and a proper drainage facilities may threatened the sanitation of the whole site. Toilet facilities are of poor flushing system so foul odour is not controlled and the use of these facilities is not a pleasant experience, thus, discouraging some to access the facilities or abandon the evacuation sites. What is commendable in the Estancia temporary housing sites are its consideration to provide an open space allotted for recreation of the IDPs, particularly the children of the camps. This creates an opportunity for the people to interact as most of them came from different coastal neighbourhoods, and thus, created a venue for communication and interaction. An indoor mobile play area and a small library are provided by UNICEF for psychosocial therapy of young toddlers and children.

Figure 11. An open space for recreation at the Evacuation and Temporary Housing for the displaced families in Estancia, Iloilo, Philippines
Source: own photograph by Equipaje (2014)

Analysis and discussion

Both case studies are reactive and take corresponding actions on disaster preparedness and mitigation only after the disaster already occurred. The case of Neheun in Aceh is a resettlement village, while the case in Tacloban is an example of temporary housing that serves as a temporary shelter for Typhoon Haiyan disaster victims. In terms of location, the evacuation sites or relocation sites should be in safe area, far away from possibilities to be affected by continuing disaster. However, since there were many considerations like ease for livelihood, the location of temporary or relocation sites could still be within the radius of danger zones . In the case of Neuheun, the resettlement area is on a hillside and can be considered to lie on a safe area since it is far from the coastline. In contrary, the Bunkhouse temporary shelter in Tacloban is still located in low-lying and flood prone areas. The temporary housing in Estancia, is not far from town centre, and the open public ground such as public school ground was selected for the temporary shelter location.

Evacuation plans or way-finding signage of the “escape routes” are installed and made available in Neuheun Village, Aceh, written in the local language. This made the evacuation plan easier to understand, thereby facilitating a better participation among the residents during evacuation procedures. The escape routes showed directions going to the hill. As observed, some of the signs are covered with tree branches and made the signs less visible to the public. This shows that the maintenance of escape routes signs has also be considered, otherwise, the signs will not be visible when needed. In the case of Tacloban and Estancia, since both were temporary shelter case, there were no signs of escape routes.

With regards to community facilities, in Neheun Village there were a mosque which also serves as a meeting place, a health clinic, a market place, vaillage office, and three school buildings. In the case of Bunkhouse in Tacloban, there were no communal facilities reported. The community needs child-friendly spaces, recreation facilities, spaces for women, and multipurpose hall. These functions are necessary to create opportunity for people to interact. In the case of Estancia, UNICEF helped to facilitate communal facilities such as setting-up an indoor mobile play area and a small library. Furthermore, a large open space was

allotted for recreation of the evacuees, which became venue for sports activities and play area for the children. This public open space encouraged interaction among the people, though they came from different neighbourhoods.

The evacuation buildings were designed and prepared but the location is also important. In the case of Neheun Village, the escape buildings available are 25 kilometres away. The existing eight Tsunami Escape Buildings (TEB) were located in the city, focused around the coastal area. For the two cases in the Philippines, no further information about evacuation buildings in the temporary sites was provided. The temporary shelters already had a large open area functions as an assembly point, but consequently an evacuation plan is needed, if a disaster occurs again.

	Case Study 1: Neheun Village Aceh - Indonesia	**Case Study 2: Bunkhouses, Tacloban, Leyte, The Philippines**	**Case Study 3: Temporary Housing, Estancia, Ilollo, The Philippines**
Type of disaster happened	Earthquake & tsunami	Typhoon & flood	Typhoon & flood
Type of housing	Resettlement/relocation Housing	Temporary housing	Temporary housing
Location	On the hill, safe area	Low-lying & flood prone areas	3km from the town centre & public school grounds within town.
Escape routes	Available in local language, some signs are covered with trees. NGO supported in counselling, socialization, and simulation for the disaster risk reduction.	No sign of escape routes	No sign of escape routes
Evacuation building	The local Government plan the escape buildings for Aceh, the nearest from the settlement is 25 km away. The near available evacuation place is mosque and…	Since it is prepared as temporary shelter, no evacuation place planned.	Since it is prepared as temporary shelter, no evacuation place planned.
Community facilities	Mosque, also serve as a meeting place, health clinic, market place, village office, school buildings.	No communal facilities were reported.	Open space allotted for children, NGO provided indoor play area and small library. However, less access to potable water supply is found.

Table 1. Comparison of the Case Studies in Providing Evacuation Space and Community Facilities
Source: own elaboration

Conclusion and recommendation

Coastal towns and cities have high a risk and vulnerability to climate-related disasters as they are geographically exposed to the effects of strong typhoons, tsunamis and storm surge and other hazards. There is a need for thorough risk assessment studies to determine the geological characteristics of these disaster-prone towns and cities, from below and above sea-level, in order to identify weak points or threats and lay out necessary strategies to reduce its vulnerability to tsunamis, storm surges and the impact of typhoons and other disasters.

Identifying safe zones on these coastal towns and cities is a challenge by itself as its location and exposure to the open sea and adjacency to rivers is by itself a factor contributing to vulnerability. Identification of safe zones should be done by experts and should be adapted in the land use plans of cities as safe and secured zones for climate change adaptation and disaster risk reduction and management mitigation purposes.

On adapting resilient community structures and facilities, evacuation sites should consider planning for a multi-functional and multi-hazard approach in building these community centres and allow flexibility to enable conversion to evacuation centres to protect the people during extreme-weather events. These should have pre-allocated spaces in identified safe zones of cities and should be structurally sound and apt to adapt flexibly before, during, and after events. But most importantly, it should save live as a resilient evacuation centres during typhoon, storm surge, tsunamis, earthquakes and other hazardous events. Ideally, these safe zones should be within a running distance or in close proximity of most of the permanent residences of the town residents.

Evacuation routes have to be prepared and introduced to the people in a socio-culturally sensitive way. The signs can use local language for people to easily understand. As often it is community facilities which are being utilized as evacuation centres, it is important to consider allotting climate-adaptive and resilient community structures and facilities and plot a higher budget to make the structures safer and stronger to withstand the high impact of extreme weather events, thereby preventing disasters to destroy the city and lose its people.

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What about the development of a framework for coastal smart cities?

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Abstract

The post Tsunami 2004 phase has witnessed significant enhancement in the planning of mitigation measures against extreme coastal natural hazards. However, a safe and quick recovery management in real events even after an early warning is still a critical challenge that is not yet successfully realized. Recently, the Indian government has announced setting up about 100–smart-cities of which, about 50 smart-cities would be along the coast of Indian peninsula; including smart islands for tourism and recreation to come up within the coastal areas. However, developing a town or a city along a coastline is a very different process from that of regular city development within the mainland. The present paper discusses the need to consider the different aspects in city development, among them technical social aspects as well as psychological aspects of the residents. The paper provides insights into these aspects and addresses the question how they could serve as the basis for developing a conceptual framework for building tsunami and cyclone-resilient new coastal smart-cities, in cooperation with different national, international, public and private stake-holders.

Introduction

Over a decade after the tsunami in the Indian Ocean, coastal cities across the world have given great importance to planning, design and to proactively taking steps to counter the growing number of natural disasters such as cyclones, heat and water stress caused by the rapidly changing global climate. Countries such as Japan, Indonesia, Malaysia, Singapore and other South-east Asian countries across the Indian Ocean have enabled the city metropolitan governments to take pre-emptive steps and provide guidance in planning and recovery measures to various stakeholders including citizens, businesses, communities and rescue emergency support services, such as fire brigades, ambulances, TV and radio channels, utility and transportation companies, etc.

In India, after the 2004 tsunami, there has been significant work on enhancing tsunami and earthquake prediction mechanisms. However, even with enhanced early-warning mechanisms and disaster recovery solutions for tsunami, cyclones and storm-surges, there is still considerably long duration between disaster detection and recovery actions like reliable information transmission to the concerned individuals or group, evacuation, protection of critical assets of individuals, etc. A safe and quick recovery management even after early warning is still a critical challenge that is not yet successfully realized; a prime example being - Cyclone Hudhud in Vishakapatnam, AP, India in October 2014 (a city also affected by tsunami in December 2004), that caused humongous damage to the city. Significantly, it is predicted that by 2030, more than 40% of Indian population and 60% of population in south-east Asia will live in towns/cities (Sankhe et al. 2010; United Nations Centre for Human Settlement n.d.). Recently, the Indian government announced the setting up of 100+ smart-cities while around 50 of them including smart islands for tourism and recreation will come up in

coastal areas. However, building a city around coastline is very different from building a regular city. A major question therefore arises - how to build a smart-city that will ensure strong resilience from different water-based natural calamities and provide an intelligent ecosystem-adaptive way of living, protecting both residents and industries. Herein, it should be noted that although India has a vast coastline of over 7,000 km with more than 200 ports (comprising 13 major and about 190 minor ports) that carry more than 90% of India's total trade volume, the coastline is highly underutilized and has significant potential for improvement and development (Ministry of Finance n.d.). A comprehensive analysis of India's domestic and port traffic movement indicates the need to improve the transport infrastructure and inter-modal linkages to achieve optimal modal mix for port evacuation (Holman Fenwick Willan n.d.).

In this regard, it is important to note that in the context of coastal smart cities, the Government of India, in the 2nd half of 2014, has initiated a concept for developing an institutional framework for water-based project called 'Sagarmala' (Ministry of Shipping (Government of India) 2014). There are different objectives set under project 'Sagarmala' which include:

- Port based development
- Infrastructure to transport goods quickly, efficiently and using low-cost technique
- Develop water-based access to new development regions with inter-transport modes
- Development of tourism and recreational activities across different islands
- Efficient evacuation in islands in case of emergencies such as cyclones, Tsunamis, etc.

It is important to note that such a large scale development of world-class coastal regions require a deeper understanding of many aspects:

- Knowledge of the local region and the challenges therein
- Different scenarios that need to be tackled
- Examples across the world where such scenarios have occurred and the engineering principles, especially surface and ocean engineering concepts that they have investigated and applied
- The implementation of such projects and the challenges in terms of both engineering and collaborating with other public agencies and private stake-holders,
- The know-how for technologies and usage and deployment of ICT for development of coastal regions

The motivation of this work is to investigate the need for a conceptual framework that will serve as the platform for developing new coastal-smart-cities in India and South-East Asia that would be smart enough to avoid the insurmountable losses and other dangerous consequences arising from natural coastal hazards like cyclones and tsunami. The goal of this work is to devise innovative solutions and models right from the planning, design and development of coastal smart-cities, particularly in terms of partnerships with city, state and the central government, different national agencies, private players and other stakeholders such as hospitals, police stations, monitoring rooms, etc. Notably, using technologies such as Internet of Things (IoT) and Machine to Machine (M2M) communication, hundreds of thousands of sensors and other electronic devices can be connected together to form an intelligent network in the design of a coastal smart-city. Further, there are numerous other engineering aspects along with social and cultural aspects that need to be considered in human resettlement and also aspects of current and historical activities in any coastal area that need to be investigated.

This paper initially describes different real-world scenarios for water-based transportation along with an example in Indian and South Asian environment; along with a relevant example of how an intelligent use of

water medium is used for efficient transportation in Germany. This is followed by a discussion on developing a coastal island and its surface/ocean engineering requirements to be considered before going for self-sufficient and regional development. Thirdly, the sociological aspects in the rehabilitation of people and activities in the coastal areas are considered. Subsequently, the different aspects to be considered in an integrated framework for coastal smart cities are discussed and a series of conclusions is drawn.

Intelligent use of water medium for efficient transportation

In order to understand how an intelligent transportation system can be built, it is imperative to understand that there are many places where a major river flows between the land areas. Over the years, in many places, an example is Mumbai which was originally a combination of seven islands, the lands separated by water bodies have been joined by closing the water body through sand, mud, etc. However, a major and a dangerous drawback of such methods is the destruction of ecology. At the same time, with rapid advancements in 21st century, it is imperative that an efficient connectivity is provided to people across islands and water bodies. In this regard, there are several places in India where people are still using water bodies to travel from one place to another, albeit in a very crude manner. For instance, in the city of Guwahati, the capital of Assam, IIT Guwahati and Guwahati city are separated by river Brahmaputra, as shown in Figure 1.

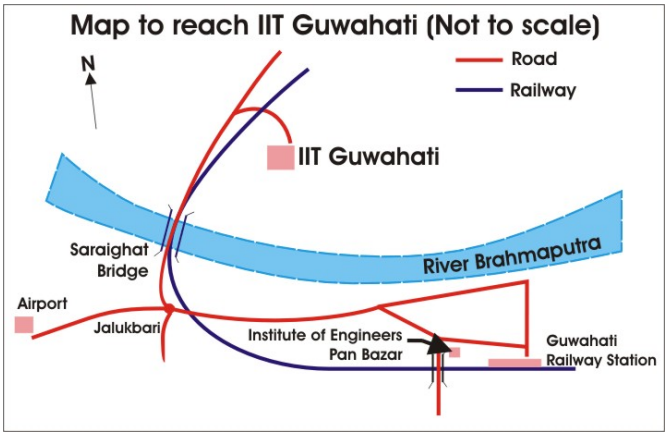

Figure.1: River Brahmaputra between IIT Guwahati and the city of Guwahati
Source: Transportation Map in Guwahati and IIT Guwahati (n.d.)

The residents of IIT Guwahati have to take a circuitous route to reach the city of Guwahati through the road (Transportation Map in Guwahati and IIT Guwahati n.d.). However, as Figure 1 shows, a shorter water-based route exists which the people of that region use (through a small boat) to travel from IIT Guwahati to the city. This boat carries people and small vehicles like bicycles. An important question is if this concept can be scaled up such that everybody uses this water medium to travel from one place to another, thereby avoiding the long circuitous route?

Figure 2: River Weser separating Bremen Vegesack port and the Land on Other Side
Source: Google Maps (2017)

A similar problem existed in the state of Bremen, Germany, at the small port of Bremen Vegesack (Figure 2). The small port at Bremen Vegesack has a long creek where people can take a walk for a distance of about one kilometre. At the same time, there is land across a distance of a half kilometre of water body. Also, due to very brittle ecological condition, the Government of Bremen decided not to construct a flyover across the water body and a medium sized designed ferry that travelled between both sides of the port is used instead. This ferry has the capability to not only carry pedestrians and bicyclers, but also cars and small trucks. In ten minutes the ferry travels to other side of the port and returns to the original side in 30 minutes. This procedure is repeated twice in a period of one hour. Given that a ferry can take around ten cars at a time, it was observed that even during the peak times, the vehicles can be easily ferried without causing traffic congestion. The example of Bremen could be recreated not only at Guwahati but also across other places in India, typically in the state of Orissa, Andhra Pradesh and Tamil Nadu where several similar coastal rural areas exist.

In this regard, the authors would like to point out another positive example for a connection of two lands separated by a water body. If one travels from Germany to Denmark by train, one would realize that the two countries are separated by a small distance by Baltic Sea at Puttgraden, as can be observed in Figure 3a. Again, to reach Copenhagen in an economical way from Hamburg in Germany, there was a need to come up with an efficient transportation model.

Figure 3a: The German and part of the Danish railway line
Source: Bienick (2007)

Again, the engineering principle used was to have a combination of train and ferry as shown in Figure 3b. For travelling from Germany to Denmark the procedure is the following:

a) The train enters the bottom deck of the ferry (there are tracks), along with other vehicles.
b) Passengers exit the train and go two floors up to the ferry decks for the 45 minute journey.
c) When the ferry nears the port, passengers board the train again.
d) The train exits the holding area of the ferry and continues onward in Denmark.

Figure 3.b: Way to Ferry at Puttgarden
Source: Möller (2005)

The entry and exit from the ferry is designed such that trains and cars are loaded by the lower ramp while cars are loaded only by the upper ramp (Möller 2005). It is not only an effective and ecological way of transportation, but also a tourism-friendly that offers options for coffee breaks during the train journey. It is important to note that this procedure requires intense coordination among different agencies –the rail network in Germany, the rail network in Denmark, the shipping company, the port management and most importantly, the customers and the immigration office.

This example underlines that an integrative approach, suited to suit the people's needs along with care for surface and ecological protection, can help to solve major transportation problems in coastal regions, even if it is spread across multiple states.

Developing a coastal island for self-sufficient and regional development

This situation is getting more and more importance in the coming years, especially in the Indian Peninsula (Ministry of Shipping (Government of India) 2014). The Government of India has identified ten coastal economic zones (CEZs) or clusters around the Indian Peninsula which they would like to develop over the coming years. Notably, the government has shown a lot of interest in developing the towns and small cities in these ten CEZs; and making many of these towns and the islands in this peninsula as tourist and recreational hubs. Figure 4 shows the ten CEZs planned across the Indian Peninsula (marked as red circles). It can be observed that the Indian Peninsula covers a region of 7,000 kilometres, spreads across several major cities with lots of industries and tech-parks.

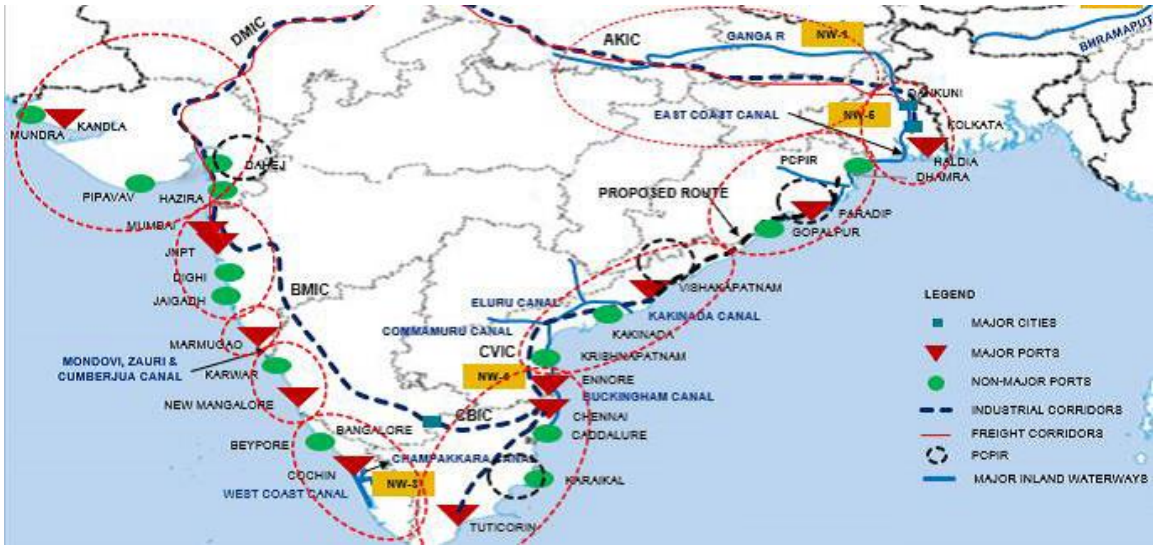

Figure 4: Concept of 10 Coastal economic zones (CEZs) planned across Indian Peninsula (Ministry of Shipping
Source: Government of India (2014)

So, this offers a lot of opportunities for development across this region. The coastal smart cities and recreational areas can be developed at appropriate locations, based on the available coastal features and sediment transport that plays a key role in any type of coastal development. But there are several challenges in building and protecting the coastal areas. This could be done by using coastal structures like groins, offshore breakwaters and submerged reefs and designed in the form of hard and soft measures in protecting the coast/reclaiming the land and energy barriers for recreational purposes, based on the requirements. Typical case studies focusing on different surface engineering aspects using the above mentioned structures are detailed below. These include:

Groin field

The land reclamation for these coastal islands using groin fields can be done in the coastal area with a predominant alongshore sediment transport. This has to be done with proper care in order to eliminate possible errors. A typical coastal protection measure in the Indian scenario by utilising the existing out crop with proper design has yielded fruitful results with the formation of beach at Simon Colony is shown in Fig. 5. The Groin field functions well in trapping the long shore sediment. The beach of about 100m wide in between the groin filed gets formed and has got stabilised. The groin field serves not only as coastal protections measure for the coast but also acts as mini fishing harbours. Similar, protection measure with short groins has been utilised to protect most of the coastal lands and islands to act as a buffer in protecting the coast during extreme events are in practice in most of the developed countries. During the tsunami of 2004, the beaches formed due to the present groin field acted as buffers due to which the inundation distance and run-up heights had reduced leading to almost nil damage. The tsunami had exhibited its might on the villages adjoining the study area.

Figure. 5: Groin at Simon Colony (designed so that the natural outcrop acts as a head)
Source: Sundar & Sundaravedivelu (2007)

Submerged reefs

Submerged reefs are man-made underwater structures which have been submerged into natural environment. These reefs are used due to their advantages such as reduction of wave energy reaching the shore in shallow water, providing marine habitat and enhancement of recreational benefits (diving, fishing and surfing). Geometry and design of the submerged reefs vary depending on the main function of the structure and materials used. All kinds of materials such as concrete objects, steel structures, old wrecked cars, airplanes, military tanks, junked appliances, docks, old boats, ballistic missiles, decommissioned ships and obsolete oil rigs gets sunk and get designated as submerged reefs. Reef units with different shapes and constructive characteristics can be used to produce submerged reefs. Reef units are made up of steel, reinforced or pre-stressed concrete, fibre glass or a variety of composite materials. Reef units are usually fabricated on land according to particular design specifications. Strength, stability of reef materials and construction are the physical principles involving factors such as material science, civil engineering and physical oceanography. There have been various variations in the shape, size and complexity of reef units used in submerged reefs throughout the world.

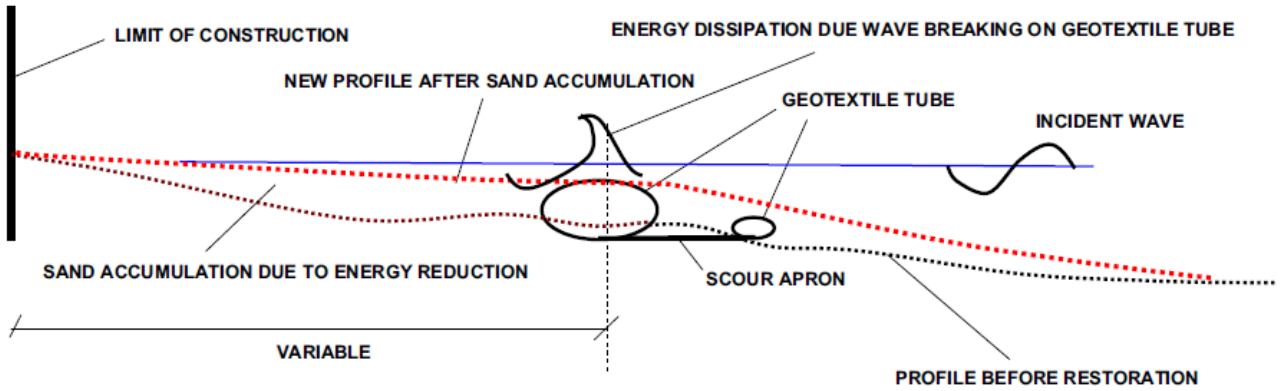

Figure 6: Schematic section of wave energy reduction
Source: Alvarez, Rubio & Ricalde (2007)

Alvarez, Rubio and Ricalde (2007) adopted a technical solution of using geo-textile tubes, as low-crested structures which reduce the incident wave energy on the beach, by controlling the wave breaking process, to the required level that maintains the dynamic balance on the shoreline as shown in Figure 6. The Narrowneck

Artificial Reef is located on the Gold Coast of Queensland, Australia, approximately two kilometres north of Surfers Paradise and was implemented by Gold Coast City Council (GCCC). The design dimensions are 400metres long (cross-shore), 175m wide (longshore), with the base of the reef positioned approximately 150metres offshore (B/S ratio = 1.16). A view of the submerged reef as a coastal protection measure near San Juan is shown in Figure 7.

Figure 7 An aerial view showing the submerged reef as a coastal protection measure
Source: own photograph by Sundar (2007)

Sociological aspects - relocation and rehabilitation of people

Involuntary or voluntary relocation and rehabilitation of people need to be adopted as a vulnerability reduction strategy to reduce poverty of those living in underserved settlements in cities. On one hand, the main intention has been to improve the living conditions of the down-trodden people; by providing them not only housing in alternate locations but also a medium or platform for more and better job opportunities. On the other hand, at many places, the intention of the government is to make use of those locations to build planned cities, townships, industries, recreational activities, etc. For instace, the Government of Sri Lanka adopted an involuntary resettlement policy in 2001 to address issues of relocation of people affected by donor funded development projects. This was expedited because of the 2004 Tsunami, wherein a great amount of people, especially fishermen and other people living in coastal areas were displaced away from their homes closer to coast line to other locations. However, many of these fishermen and boatmen were not in a position to take up other job opportunities; simply because they were moved several kilometres away from their original place of job (fishermen from coast, farmers from agricultural land, etc.) and most importantly, did not have the skill to pursue some other career (Fernando 2012; Fernando & Punchihewa 2013).

Hence, it is extremely important to have a relocation policy as well as a widely accepted implementation mechanism for the sustainable relocation of displaced people due to development related activities. In this context, it is vital to list some of the areas that the implementers, politicians and planners need to consider when displaced communities are relocated and rehabilitated. In this regard, there need to be a certain policy for a proper rehabilitation of people. This includes:

1) *Well-conceived People Programs*: Efficient processes should be evolved in pertaining to utilizing local resources to manage displacement and temporary internal migration. Affected people need to be relocated preferably close to the location of their original settlement so that the affected people will continue to have access to social networks, to services and common property resources which would minimize the adversity of impact to their way of life.
2) *Compensating Affected Communities:* It is essential to assist the affected people to submit their claims for compensation due to acquisition of their land, structures, perennial crops and their economic losses. This can be implemented either by an implementing agency or with the assistance of non-governmental organizations. It is also important to assist the displaced people to manage their compensation.
3) *Infrastructure*: If people are relocated into a donor built settlement it is essential to obtain consent for housing structures, construction materials, common infrastructure facilities (access roads, street lights, community centres, religious places etc.) and additional facilities (bridges, transportation, garbage disposal, postal services etc.). Consent should be obtained irrespective of whether houses are built by donors or by the affected families themselves using monetary compensation they receive from the organization.

Aspects to be considered in a framework for coastal towns/coastal smart cities

For a framework for costal smart-cities it is imperative to consider information and communications technology (ICT), aspects of surface/ocean engineering and other sociological and society-based aspects.

ICT aspects

The two most important aspects in the maintenance of a coastal smart city are

- A highly reliable telecommunication system
- An extremely secure heterogeneous and multi-modal physical transportation network.

Highly Reliable Telecommunication System

In this regard, the framework should consider the following:

a) An ecosystem based adaptation especially during weather and climate-based natural calamities
b) A secure communication network that would work efficiently during disaster management.

Herein, the planning and design of the telecommunication system should involve multiple mobile service providers, TV and cable operators, underground wiring providers, etc. The mobile networks would connect all stakeholders, including police, hospital and thermal, electric and nuclear plants. Further, they would be configured to connect to a wide range of sensors and combined with different types of observation systems and global satellite systems, in order to monitor land and ocean changes, and accurately measure crucial parameters, such as wind speed, waves, radiation and salinity and feed it to communication network.

Extremely Secure Transportation Network

In this regard, the framework should consider the following:

a) A provision for a variety of land, water and interlinked transportation options for safe and swift movement
b) A creation of pedestrian-based societies along the waterfront for easy access and exit; with provision for easy evacuation and airlifting if and when required.

The framework should have a pre-planned blueprint of the transportation network so that not only people's movement will be least affected, but there will be also a smooth, non-congested passage for people to move from one location to another in the case of calamity. This will be realized using a mix of pedestrian, road, rail and water-based transportation to form a co-operative intelligent and adaptive transportation system. The framework should detail out a sensor-based algorithm-driven route planning and design that will adapt to any water-based natural disaster/calamity.

Surface/ocean engineering aspects

Notably, in the design of the intelligent transportation network, significant importance should be given to the fact that the coastal protection structures such as groins can be integrated with proper consideration to serve as a mini boat landing facility which can be used as transportation network, especially in case of emergency. It should be noted that this will yield a good result by protecting the eroding coast along with providing an additional facility for the society. A typical groin field serving for the above said purposes has been projected in Figure 8a and 8b. The aerial view above area shows very clearly the multipurpose usage of groin filed as boat landing facility (Sundar & Sundaravedivelu 2007).

Figure 8.a: Groin serving as a coastal protection measure as well as boat landing facility
Source: Sundar & Sundaravedivelu (2007)

Figure 8.b: Clear view of groin filed serves as boat landing facility
Source: Sundar & Sundaravedivelu (2007)

The sediment cells demarcation would form as the main technical aspects to be considered in the Frame work for coastal cities and recreational places. This sediment cell concept has been proposed by Van Rijn (1997; 2011). In this regard, a sediment cell is defined as a stretch of coastline and its near-shore area within which the movement of coarse sediments is largely self-contained. In other words, these are distinct areas of coastline separated from other areas by well-defined boundaries, such as headlands and stretches of deep water. Interruption to the movement of sediments within a cell would be considered not to have any major effect on the adjacent cells. The cell boundaries are usually defined as locations where there is a discontinuity in the transport rate or change of direction. These boundaries always need not be of natural origin, for example jetties, breakwaters, long groins etc. Apart from this, the ecological nature of the coast of interest (hard or soft) needs to be considered in deciding the method of solution.

Sociological/ rehabilitation aspects

In the framework, there should be significant importance given to sociological and rehabilitation aspects along with further job and growth opportunities and integration to the new smart-city environment. The framework should include the two assessment reports Social Impact Assessment (SIA) and Environment

Impact Assessment (EIA) which should be regularly examined by experts of a multi-disciplinary group. The identification of different levels of vulnerable families (from most vulnerable to average to least) by conducting a vulnerability assessment (considering not only inherent factors such as ethnicity, gender, caste, income generation etc. but also other socioeconomic, demographic and environmental factors) among the affected families should be a pre-requisite for further improvements of the coastal smart-city. Further, the framework for coastal smart cities should compulsorily include the following five aspects:

1) *Information:* Prospective re-settlers should be informed about the development projects and processes from the beginning in a language that they easily understand. This would enhance the overall outcome of the projects. Full recovery from stress and risks generated as a result of relocation is a right of the affected person. The framework should outline the duty of the project implementer in terms of assisting the rehabilitated people in completely recovering from the exchange of money or finance for their property and improve their quality life. Further, the government should provide relevant information to the prospective relocates and the general public about vulnerabilities and opportunities for future development and have continuous consultation so that public concerns are lobbied at respective levels.
2) *Land Titles:* The framework should consider that the loss of land should be replaced by new land of comparable value. The framework should outline that deeds are granted promptly for new land. Also, in the absence of land, cash compensation should be paid to all affected persons. It should ensure that compensation for all other lost assets (movable and immovable) are based on full replacement cost and paid promptly. Notably, the framework should ensure that the project execution agencies bear the cost of compensation. Further, it should ensure that the families who do not have a secure land title receive fair and just treatment.
3) *Infrastructure Standardization:* The framework should be designed such that national and international accepted standards are adopted when constructing temporary, transitional and permanent shelters. At the same time, the availability of resources such as material, land, labour depending on the location are flexible and allow practically sound implementation of relocation programmes and processes.
4) *Adequate Funding:* The framework should ensure that there is a proper financing since under-financed relocation processes will adversely affect the re-settler. There should be not only a strong political will and backup; but also a more humanitarian approach through which the resources will be mobilized and put to better use. Although money alone would not solve all relocation related problems the absence of adequate financial compensation would cause failed relocation.
5) *Restoration of Livelihood:* The framework should make sure that disruptions of families and individual income opportunities due to redevelopment of the place, in addition to increased family expenses like (transportation, electricity and gas, are considered adequately. In order to achieve this, local employment mobilization programmes to enhance family income should be implemented. Therefore, a resource database is to be established that facilitates efficient relocation processes with minimum harm to the concerned people, natural resources and budgetary concerns. This database should include a skill pool with focal points on the coordination of stakeholders and access to natural and physical resources.

These assessments will assist the implementer's understanding of who should be given more attention and assistance. Further, it will ensure the success of the relocation process without making the re-settler's feel

further marginalized and more vulnerable after the relocation; which in-turn would enable not only a faster but much smoother development of any planned industrial or residential township or coastal smart city.

Conclusion

This paper discusses the three different aspects - technology (i.e., communication system, intelligent transportation system), surface and ocean engineering and social/rehabilitation - a framework for developing a coastal smart city should include. A major consideration in the development of a smart city is to use different ICT based techniques for efficient maintenance, connectivity and ease of transportation of the people, for all residents, industries, tourists, etc. Further, there is a need to have a closer cooperation between different stakeholders of the society like hotels and residential colonies, industries, hospital, police, insurance, for quick and correct transmission of information and people when required. However, even before planning a smart city along a coast there are two very significant aspects that need to be considered – the first aspect is the suitability of the coastal line/land for building a smart city. In order to do that, the first exercise is to prepare a coastal vulnerability map using satellite imageries wherein the identified locations would be categorised depending on the degree and nature of vulnerability. The second exercise would be to identify locations that are affected badly only during extreme events like storm surge, tsunami which need to be treated in special manner as regard to the mitigation measure. This has to be followed up with the preparation of a shoreline management plan that would clearly indicate, apart from the vulnerable locations, fishing grounds, fishing harbours, ports, tourism, coastal corridors for efficient transport, etc. The second aspect to be considered is the current status of the location, the nature of the people's work, their strength and weakness and how would the relocation affect them. For a better growth of society, it is extremely essential that these people are involved at every stage in the development of a city; so that they are not only not left out; but also feel proud to be part of the new township or smart city. Finally, the consideration of these aspects in the framework would help not only to develop a coastal smart coastal city but also to make it a rebellion free and long-term sustaining smart city.

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Learning processes triggered - from individual stakeholders to countries

Tribal indigenous knowledge of tsunamic hazard prone areas in reducing disaster risk with focus on Simeuleu Island Aceh and other islands offshore west of Sumatra

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Abstract

Besides other types of knowledge indigenous knowledge (IK) was accessed after the Tsunami 2004. In indigenous communities it was possible to reduce deaths and injuries, due to the knowledge of processes in the physical world related to a tsunami.

In Simeuleu Island – Aceh Province north of Sumatra, IK saved a lot of local residences from the catastrophic consequences of the tsunami hazard that hit Aceh and North Sumatra in 2004. At the island the number of victims was only 7 people out of the 78,000 total population of the island, compared to Aceh at the mainland of Northern Sumatra where the number of victims reached 200,000.

The type of IK that saved most Simeuleuan people was related to the traditional culture inherited from their ancestors in facing tsunami hazards. Indigenous knowledge on the tsunami hazard was built up in the form of the *smong* story. *Smong* being the word for tsunami in local language since 1907's tsunami event, the *smong* story became an early warning system on the island.

Smong culture tends to be forgotten by the young generation due to the influence of mass media and mobile phones that takes lots of people´s attention and time. Education for children at school is the key to preserve *smong* stories and it could be improved by accompanying it in TV programs, movies and books. In Aceh and Sumatra stories and messages about tsunami that had occurred in the past could be found in some oral histories, poems and songs. The conclusion is drawn that utilizing IK is a powerful tool for disaster risk reduction (DRR); the recognition of the high value of IK by local communities could even improve future human security.

Key words: Indigenous Knowledge, tsunami hazard and Disaster Risk Reduction (DRR)

Introduction

The term indigenous knowledge (IK) generally refers to knowledge systems embedded in the cultural traditions of communities. These include traditional and local knowledge. Indigenous knowledge is sourced from indigenous peoples and their societies (Dunn, 2014). The United Nations estimates that more than 370 million indigenous people live spread across at least 70 countries. This figure allows the argument that problems will occur if the knowledge systems that characterize them are generalized and simplified. The problem increases when we realize that indigenous societies often live in remote and isolated places, and that their identities vary strongly. Indigenous knowledge is acquired in a much more empirical way compared to modern knowledge in the process of finding out the world (Dunn, 2014). First-hand experience is considered the best and the only way to properly learn. Sense perception and language are used to understand something and to experience it. This is the way many indigenous societies approach knowledge.

Processes of gaining knowledge involve the strong bonds between the people and the place in which indigenous people live (Dunn, 2014). To describe how strongly people are related to their living place, an illustration was given by a member of the US Indian Navajo tribe who defended in court his people being forcibly removed from their ancestral land by a mining company in the 1980s: "The land is sacred to us, we cannot practice our religion elsewhere, only on the land where we are known. It is like your family. You could not leave your relatives if they were sick – it is in this way that we must stay with this land, our relative" (Manybeads et al., 1989, pp.228, 230)

Indigenous knowledge can be believed to be stored in the land itself, any relocation means dislocation from everything that defines indigenous people. They transfer knowledge to younger individuals by telling stories. The stories allow their listeners to relate to the objects of the story, and empathize with them; It can be reflected how it is like to be the animals in the story and experience the world from their perspective.

There are many different ways for passing stories and knowledge. In Australia aborigines traditionally transform information about the landscape into songs, which are then passed down from generation to generation. Those who know the songs can get from one place to another and can navigate through the harsh environment of the Australian bush. The verses of the song are taught to aborigine children by their mothers from a very early age on while children are carried around on their mothers´ backs. As a result, grown up aborigines have a combined imagination, artistic ability and navigational skill. In the South African San society, important skills for survival are delivered in the ceremony of the great dance.

There are two implications of passing on knowledge using the methods mentioned above; firstly, it requires the use of imagination by the listeners to develop a thoughtful bond with their living environment and the way to live successfully in the environment; secondly, the story telling, song learning and ritual dance help to strengthen community bonds and build respect in the society.

The adaptation of indigenous knowledge to the modern western world is sometimes considered as outdated, static and ill-adapted. Not well-adapted does not mean that they are not very good at adapting to change and facing challenges. A society which could operate effectively within its environment should be considered very well adapted (Dunn, 2014).

Indigenous knowledge in Indonesia was becoming well-known after the disastrous tsunami 2004 event which fortunately only took few lives of Simeuleuan peoples. This can be seen as an evidence of the power of Indigenous Knowledge in reducing disaster risk. For its role in disaster risk reduction, there are four main views (UNISDR, 2008):

1) Various indigenous knowledge practices and strategies against natural hazards can be transferred and adapted to other communities with similar conditions.
2) Participation of the affected community is needed when there is an incorporation of indigenous knowledge in existing practices and policies, in order to encourage and empower its members to take the leading role in all disaster risk reduction activities.
3) Project implementation will also be improved because information contained in indigenous knowledge provides valuable information about the local context.
4) Dissemination of indigenous knowledge in non-formal ways provides a successful model for education on disaster risk reduction.

Objective of the study

It is a fact that mostly in tsunamic hazard prone coastal areas of Indonesia, awareness of this hazard was not realized by most local people until the catastrophic event hit Aceh in 2004. It took 230,000 to 280,000 lives and left more people missing that lived in the coastal areas of Aceh – Northern Sumatra Indonesia as well as other countries surrounding the Indian Ocean such as Sri Lanka and Thailand. On the other hand, the death toll in Simeuleu Island west of Aceh was much less, only seven people from 78,000 total population of the island. It is argued that the comparably lower number of deaths was a result of indigenous knowledge (IK) present on the island that has been inherited from generation to generation. It contains information on how to react when a big earthquake occurs which is followed by a dropping sea level at the coast, which is a process preceding a tsunami. The objective of this study is to identify those characteristics of indigenous knowledge which reduced the number of people vulnerable to tsunami hazards on Simeuleu Island Aceh and other islands offshore west of Sumatra, and examine local geomorphological characteristics that support their escape route to higher grounds.

Disasters in Indonesia

Indonesian territories are prone to either natural or man-induced disasters. The list of disasters contains terror or sabotage, flood, flood and landslide, high wave and abrasion, earthquake, forest and land fire, transportation accidents, volcano eruption, small tropical cyclone and landslide (BNPB, 2016). In 2016, a total number of 1,928 events resulted in 478 people dead or missing, 2,421,619 affected or evacuated and 30,763 houses destroyed (Figure 1).

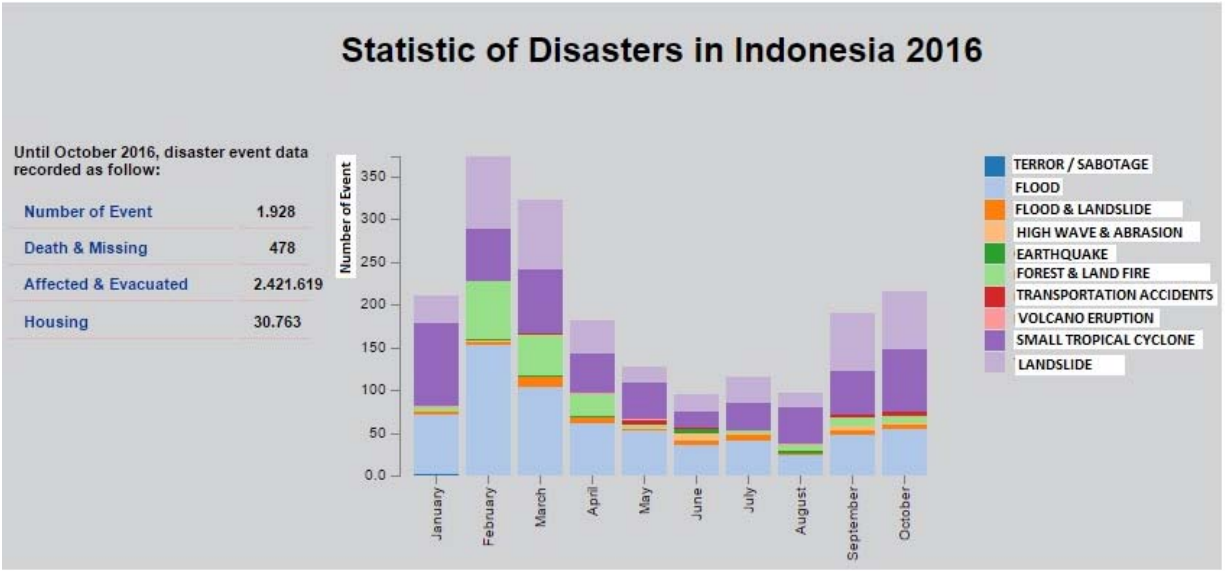

Figure 1: Disaster statistic of Indonesia 2016
Source: BNPB (2016)

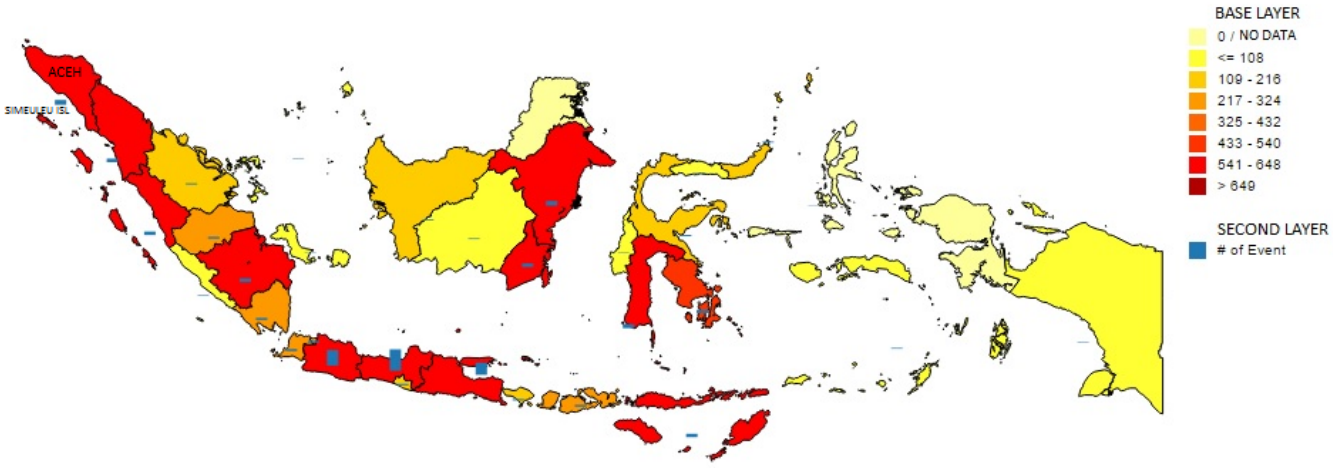

Figure 2: Number of disasters per province in 2016 (until October)
Source: BNPB (2016)

Disaster Type	Number of Event	Victims (people)			Damage (unit)						
		Death & Missing	Injured	Affected & Evacuated	House				Health Facilities	Worship Facilities	Education Facilites
					Heavily Damage	Moderate Damage	Lightly Damage	Inundated			
TERROR / SABOTAGE	1	7	20	0	0	0	0	0	0	0	0
FLOOD	639	134	104	2.210.114	2.071	1.018	5.242	214.079	16	199	277
FLOOD & LANDSLIDE	53	46	7	77.552	382	1.552	1.262	15.526	11	19	17
HIGH WAVE & ABRASION	20	0	0	631	32	13	17	589	0	0	1
EARTHQUAKE	10	2	42	972	390	1.036	3.036	0	3	5	10
FOREST & LAND FIRE	178	2	1	4	0	0	0	0	0	0	0
TRANSPORTATION ACCIDENTS	17	103	61	0	0	0	0	0	0	0	0
VOLCANO ERUPTION	7	7	2	86.654	0	0	0	0	0	0	0
SMALL TROPICAL CYCLONE	536	17	138	9.610	1.448	1.629	8.977	0	4	32	51
LANDSLIDE	464	160	82	35.625	955	865	838	303	9	24	27
TOTAL	**1.925**	**478**	**457**	**2.421.162**	**5.278**	**6.113**	**19.372**	**230.497**	**43**	**279**	**383**

Table 1: Details of the disaster types, their victims and impact until October 2016
Source: BNPB (2016)

Figure 2 shows the distribution of disasters per province on a map of Indonesia for the first ten months of 2016, showing that Aceh Province and Simeuleu Island belong to high risk disaster areas. Details on the events are presented in Table 1.

Concerning the total number of events, flood has the most frequent occurrence in Indonesia with up to 150 events in February together with heavy rains. Flooding is followed by landslides which at the same month had an occurrence of approximately 75 events. This is possibly related to over saturation of soils with rain water that increases the weight of soils and can cause landslides. Earthquake events in 2016 can be neglected as only few occurred: ten events with two deaths and missing. Property loss due to earthquake resulted in 390 houses heavily damaged, 1,036 moderately damaged and 3,036 lightly damaged. No tsunami event was recorded in 2016.

Indigenous knowledge (IK)

Natural disasters are not easy to predict, but indigenous knowledge (IK) could anticipate them in advance before they occur. Example of such knowledge exists in island communities of Simeuleu Aceh and other

islands offshore the West coast of Sumatra (Figure 3). This IK was firstly recognized after the Aceh's tsunami disaster 2004.

Figure 3: The location of Simeuleu Island offshore west of Aceh Province
Source: archi pelago fastfact (2012)

Indigenous knowledge can be a powerful tool for Disaster Risk Reduction, as long as it is recognized and utilized. Without this, it is merely a part of common things in community. Empowering local communities to recognize the high values of Indigenous Knowledge for DRR can improve the future of human security.
Indigenous Knowledge originates within the community (Sartini, 2004), which contrasts from scientific knowledge that is often influenced by many outside sources unrelated to the local culture or environment. Indigenous Knowledge can be easily adopted and used by the community (Marfai, 2012).

Community response to earthquake and tsunami hazard

Simeuleu Island

Living in a region of seismic activity, Simeuleu's people are familiar with earthquakes and tsunamis. This condition has influenced their culture to adjust to such hazards. Their adjustment to tsunami hazard was stimulated in 1907 when a 7.8 M earthquake occurred in the Indian Ocean causing the death of seventy per cent of the Simeuleu population. The survivors shared their experiences and knowledge through the oral story of *Smong*. The story explains the tsunami disaster phenomenon where a big earthquake is followed by low tide of sea water in the beach before a giant wave sweeps through the land. This IK showed its power during the disastrous events on December 26th, 2004 and March 28th, 2005.
On the other hand, within Aceh ethnic group living in coastal areas of northern Sumatra, the messages and story of tsunami that happened in the past were implied in some traditional songs and oral histories. In Bahasa Indonesia, the songs and oral histories are called *hikaya*t or *syair*. Unfortunately, this valuable IK was not recognized. Unrecognized IK could not be used as disaster risk reduction tool. This is evidence from more victim numbers in Aceh main land (Syafwina, 2014). Furthermore, adaptation of one successful practice of IK in one place to another place needs modification (Syafwina, 2014). The modification shall meet the culture based on the new location and community.
Simeuleu Island has an excellent road network surrounding the island, as shown in figure 4. The roads run parallel to the coastline on the whole island. These roads connect its Regency Capital City Sinabang located in the Southeast of the island with other places along the coastal zone. The highest place is Gunung (Gg) Sibau or Sibau Mountain (625 m above sea level) and Ayerpinang (530 above sea level) which are both

located northwest of Sinabang. These mountains are located at the coastal zone, creating high relief morphology in its northeast facing coasts around Ujung Tinggi village (Figure 4).

Figure 4: Simeuleu Island
Source: SumatraEcoTourism (n.d.)

Mentawai Island

Mentawai Island belongs to the same island belt with Simeuleu and is located offshore of West Sumatra. The island itself geologically was formed dominantly by folded and faulted marine sediments controlled by the active Mentawai Fault. Mentawai Fault runs through the island belt offshore West Sumatra. Due to its hazard prone area, Mentawai tribe disposes of Indigenous Knowledge related to the selection for residence areas. People choose residence locations far from the coastline. They select areas close to mangrove forests which in the past acted as a natural protection against incoming large waves from the sea (Zuriyani, 2016). There also exists Indigenous Knowledge concerning the building of houses, which are constructed approximately two metres above soil ground which allows to adapt to temporally rising sea levels during (Figure 5).

Figure 5: An Uma, the traditional communal house of the Mentawai
Source: Lapuerta (2004)

Each household also has small boats which serve as evacuation tools in case of sea waves (Romana, 2010 in Zuriyani, 2016). This local wisdom has been inherited from people´s ancestors who were aware of geological hazards and their effects on their residential areas. IK of Mentawai people is listed in Table 2.

Type of indigenous knowledge	**Implied values**	**Conservation implications**	**Its role on adaptation and hazard mitigation**
Traditional houses are built approximately two metres above the ground in Mentawai Islands	Adaptation effort using low and precise technology as well as saving energy suitable with local natural conditions	-	Efforts to mitigate sea water flood and high tide wave
Sabulungan wisdom means no separation between human and nature	Principle of balance between nature and humans as well as respect for the surrounding nature	To preserve flora and fauna diversities in the forest	Protecting biodiversity is one effort to store carbon in anticipation of climate change impact
Respect to the sea or water as the source for human life but also as potential danger, local Mentawai's name : *Tai Leubagat Koat*	Respect to the surrounding nature that creates harmony between humans and nature	The community realize that they are part of the nature, this creates respect and awareness on the need to maintain biodiversity	Carbon reserve storage and climate change anticipation
Selection of residential areas far from coastline for members in Mentawai communities	Adaptation capability using precise low technology and energy saving suitable to local natural conditions	To keep environment capabilities, through adaptation of residential location with local condition	As a form of anticipation for large wave hazard (tsunami) or to minimize the impact of tsunami

Table 2: Conservation principle and hazard mitigation in local wisdom
Source: Analysed based on conservation principles of local wisdoms by Nababan (1995)

Conclusions

Indigenous knowledge is a powerful tool in Disaster Risk Reduction as evidence from its application by Simeuleu and Mentawai people in the islands offshore west of Sumatra Island shows. During the Tsunami 2004, it is reported that the victims were only seven people from 78,000 total population of Simeuleu Island. The traditional culture that had been inherited was re-established after a tsunami event in 1907 when almost 70 percent of Simeuleu people died. Survivors taught the lessons learned to their children and grandchildren and they are remembered until the present day. The culture took the form of a story they called *smong* which means tsunami in local language.

The regional geological conditions in the area made local residents aware of the tsunami hazard and has given the opportunity to adapt. Culture in harmony with nature is an Indigenous Knowledge that possibly can be used by modern societies in understanding better how nature works.

While IK is a powerful tool, it is necessary to that local community recognise the high value of it for future human security.

Much research has to be carried out on Indigenous Knowledge especially concerning the relationship of people with their physical living environment. Physical characteristics especially those that relate to the geomorphology of tsunami prone coastal areas need to be examined further. Pressing questions are e.g. how far the distance of higher hinterland as evacuation zones have to be from people's residences , in what type

of coastal geomorphology human settlements are safer and especially whether embayment or headland coasts can protect better against tsunami hazards:.

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Lessons learned from Syiah Kuala University in surviving and recovering from the 2004 Indian Ocean Tsunami

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Abstract

The 2004 Indian Ocean Tsunami resulted in huge damages in nearly the entire coast of Aceh Province, Indonesia. Besides the loss of human lives, this mega-disaster caused the collapse of many sectors at the provincial and affected districts level, including the functioning of their governments. In the early times after the tsunami, the provincial and local governments were paralyzed and could hardly contribute to a long-term recovery planning for several reasons. Among others, they had to focus on immediate response, they lacked competent human resources in post-disaster recovery and they had never experienced such a massive disaster and thus, were unprepared regarding an overall strategy with specific planning and actions measures. During post-tsunami recovery, Aceh Province was fortunate that the largest public university in Aceh, the Syiah Kuala University (SKU) played important and strategic roles in supporting the governments and stakeholders during the recovery process. This article captures how SKU responded to the 2004 Tsunami, and also how the university was involved in the recovery process from the aftermath until recent days. It also emphasizes the university's initiatives and activities during the recovery process, in particular on the role of SKU for the reconstruction of Aceh. Relevant experiences from other universities in disaster-affected countries are also presented.

Introduction

As defined by Noji (1997), a disaster is what results in damage, disturbance or loss in terms of habitat, life, and health on a scale that attracts responses from communities outside the affected area. Any disaster would generate adverse effects on all life aspects of affected people. One of the most destructive disasters that devastated Aceh Province of Indonesia and left unforgettable experience to its people is the2004 Indian Ocean Tsunami on December 26th. It resulted in huge damages in the region, as reported by Affan et al. (2015), JICA (2005), Rizal (2015), Steinberg (2007), Srinivas and Nakagawa (2008), and Griffin et al. (2013) in Table 1.

Infrastructures	Remarks
House	139,195 houses destroyed
Road	2,618 kilometers of road destroyed
Bridge	119 bridges destroyed
Ports	22 ports destroyed
Fishing Boats	13,828 fishing boats destroyed
Religious Facilities	1,089 religious facilities destroyed
Farmlands	73,869-hectare farmlands ruined
Government Buildings	669 govt. buildings destroyed
Schools	3,415 schools destroyed

Medical Care	517 health facilities destroyed
Airports	8 airports/airstrips destroyed
Shoreline	More than 800km shoreline was devastated
SMEs	104,500 SMEs destroyed

Table 1: Summary of major damages in the 2004 Indian Ocean Tsunami in Aceh
Source: own elaboration

Concerning human casualties in Aceh province 635,384 people were displaced, 127,720 people were killed, 93,285 people were missing and 10,000 individuals experienced injuries and severe traumas (Rizal, 2015; Steinberg, 2007).

Role of universities in disaster management

According to Seville, Hawker und Lyttle (2011), Seville, Hawker und Lyttle (2012) and FEMA (2003), universities could play an essential role in strategic efforts, such as a the long-term disaster recovery process. This role could be further extended to other phases of disaster management, i.e. emergency response, mitigation, and preparedness. Most importantly, universities situated in the disaster affected area should strengthen their knowledge capacity in dealing with disasters. Relying merely on the government is a risky choice because, during a large-scale disaster, the functioning of governmental services mostly collapses. As a formal and higher education institution, a university should also pay attention to developing disaster knowledge and passing it to a wider community as well as future generations.

Besides, a university could be regarded as a centre for coordination and recovery planning as it has human resources with a variety of knowledge, the widest network of alumni, including the availability of equipment for disaster management. In the following, the paper describes the role of Syiah Kuala University in Aceh, Indonesia in responding to the 2004 Tsunami. In addition, it briefly presents relevant experiences from universities in the Philippines and Japan.

Response of SKU to the 2004 Tsunami

Syiah Kuala University (SKU) is the oldest public university in Aceh and was established on September 2nd, 1961. The university is located in the capital of Aceh Province with the main campus situated in Darussalam. SKU has 12 faculties and a postgraduate program. In the 2004 Indian Ocean Tsunami, SKU was also greatly affected (Figure 1). As reported by Rizal (2015), the following figures show the scale of damages faced by the university.

- 247 faculty and staff members were dead or missing
- 5,000 out of 18,000 students were dead or missing
- More than 200 children of faculty and staff members were dead or missing
- More than 250 homes of faculty and staff members were destroyed
- One-third of the buildings and equipment on campus were destroyed or badly damaged

Due to these damages academic activities were disrupted and, therefore closed for one semester. It is important to note that before 2004, both the government and the universities in Aceh were much unprepared for such a large-scale disaster because it did not have what is necessary for such a disaster such as human resource and supporting facilities. In addition, systemic efforts to reduce disaster risk had not yet been established. Also, Aceh was in political instability over most of the last 150 years.

Besides its adverse effects on the human lives and environment, the 2004 Tsunami paralyzed the local government activities and functions in many aspects. In the aftermath of the tsunami, the province was hardly functioning because many government buildings were destroyed and many government officials were severely affected. Most importantly, this post-disaster chaotic situation left the affected government pointless in formulating the long-term recovery efforts.

Although SKU was also much unprepared in facing such a mega disaster, the situation was much different from that of the government. The head of SKU took the initiative to start formulating the university's response to the tsunami disaster considering available resources. Since the beginning, the university had taken a role merely on long-term recovery issues, leaving the immediate response to the local government. SKU put more efforts in recovery planning and composing a master plan for Aceh's rehabilitation and reconstruction. In short, SKU took the immediate response by imposing a quick decision process and the bureaucracy line, which has always been long in Indonesia, was shortened.

Figure 1. Affected Building at Syiah Kuala University (SKU) after the Tsunami
Source: own photograph

Listed below are the main activities of SKU in the disaster response and early recovery phases.

Trauma healing and medical response

Immediately following the tsunami, SKU established the Trauma Healing and Medical Response (THMR). This unit helped students and faculty survivors to recover from tsunami traumata. This unit also provided services to students and lecturers who were injured during the tsunami.

Temporary tent for students and lecturer

SKU Area is one of the few areas in Banda Aceh for tsunami survivors. Students, faculty and the community who lost their homes were allowed to make the campus area as a temporary shelter using the tents that were obtained from donors.

Media centre

SKU also set up a media centre to provide information to various stakeholders regarding the actual situation in Aceh. The unit was given access to the internet network facilitated by JICA and Keio University.

GIS centre

Furthermore, SKU also set up a GIS Centre which served to prepare and analyse spatial data for emergency responses. This centre involved students and professors who survived the disaster. The centre supported

some organizations working in Aceh who were in need for maps, satellite images, and others spatial data related to damages, IDP concentrations, and logistics for refugees. The centre also worked in the field to identify the level of damages to support the SKU for Aceh Reconstruction (UAR) in preparing Aceh Blue Print.

SKU for Aceh Reconstruction (UAR)

The most significant effort by Syiah Kuala University was to initiate a task force to facilitate the coordination and collaboration regarding the reconstruction and rehabilitation of Aceh, called SKU for Aceh Reconstruction (UAR). This task force was established on January 2nd, 2005. UAR comprised eleven working groups, i.e. (1) spatial plan & land affairs, (2) environment and natural resources, (3) public infrastructure, (4) economy and manpower matter, (5) institutional affiliation, (6) health, social, culture and human resources, (7) law, (8) orderliness, security and reconciliation, (9) accountability and governance, (10) funding/financing, and (11) Islamic law. Each working group consisted of three members with related expertise.

Through UAR, the university was able to work with the National Development Planning Agency BAPPENAS and Aceh Local Government under a Memorandum of Understanding to formulate plans for Aceh reconstruction and rehabilitation. The parties agreed to provide inputs for need assessment, development of database required for rehabilitation and reconstruction, efforts to improve stakeholder participation, analysis related to the development of the community, their economy and livelihood, and the strengthening of local government capacity.

In this collaboration, UAR played vital roles. It has functions to (a) compile data and survey, (b) accommodate, coordinate, and evaluate opinions, ideas and plans, (c) design work method and networking model, (d) collaborate with external experts, (d) establish working groups experts and formulate detailed proposal, (e) evaluate sectoral program and need assessment, (f) prioritize implementation programs, (g) formulate the draft of blueprint for rehabilitation and reconstruction. This collaboration was extended further to an initiative for the establishment of peer group networking which involved donor agencies and other Indonesian leading universities and to mediate these agencies with government and the local community to compose a blueprint for Aceh reconstruction (Figure 2). The blueprint was then used by the central government to initiate the establishment of BRR (Rehabilitation and Reconstruction Board) in April 2005.

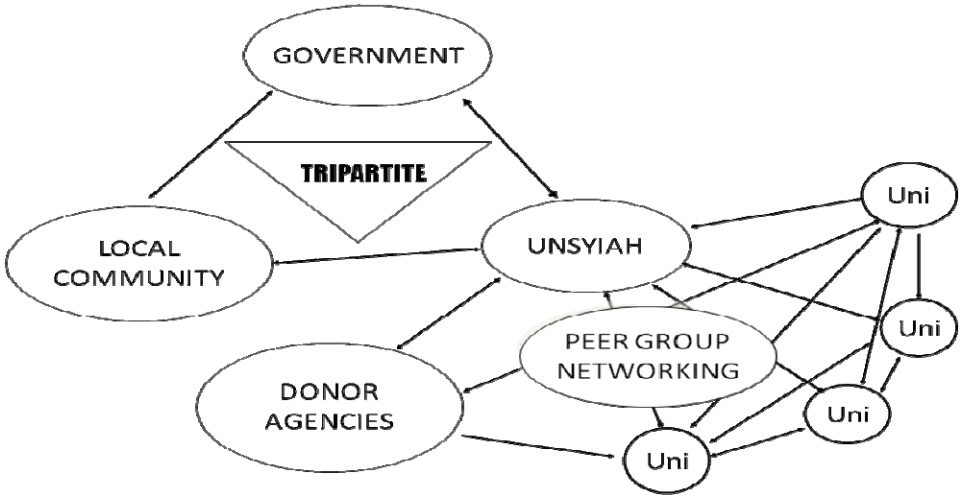

Figure 2. UAR network during the preparation of Aceh Blueprint.
Source: own elaboration

Response of universities in the Philippines

The Philippines is a country with a high frequency of disaster occurrence. Floods and typhoons are the most common disasters that strike the country each year. The key roles of universities in the Philippines in disaster management are spanning from pre-disaster, during the disaster, and post-disaster (Sharma, 2012). During the disaster, universities mobilize their experts to the affected region to support emergency efforts and gather data from the devastated areas. Activities provided by the experts include for example providing medical care and sanitation and identifying victim's bodies. For post-disaster activities, the universities provide inputs to the government for a better recovery process. Regarding disaster management efforts in the pre-disaster context, universities in the Philippines utilize information from alumni and academia to make efforts to reduce disaster risk, including encouraging politicians and government officials to make immediate and necessary moves in disaster risk reduction.

De Vera (2012) reported that in the immediate aftermath of the Tropical Storm Sendong in 2011, universities in the area mobilized their expert staff members to provide immediate aid and relief to victims and to collect data which could benefit victims and volunteers in the affected areas. This effort was a severe and urgent action because, in the aftermath of a disaster, affected people were not ready or unable to share valuable information with the volunteers and at the same time the volunteers were not familiar with their working environment. Experts from universities with their skills and competencies were very crucial for designing plans based on the collected data to prepare for well-managed post-disaster recovery. In this catastrophic situation, following the bureaucracy risks resources and lives.

However, although immediate and straightforward processes are urgently required, necessary procedures must not be violated, especially those regulated by law. Considering this fact, only experts in universities can carry out plans without breaking the law. Post-disaster management, which is very much related to infrastructure reconstruction, uses data and plans prepared by expert staff members from universities. This information is a crucial requirement when donating countries and international volunteers are about to take part in post-disaster recovery. Finally, emergency actions and reconstruction plans by universities in the Philippines comprise well-documented data, which can help in preparing similar actions when handling potential disasters in the future.

Response of universities in Japan

Japan is one of the advanced countries in dealing with disasters, mostly earthquake, and tsunami. Not only is Japan well prepared for facing the disasters, but it also pays much attention in accumulating disaster knowledge of each event. Most of the disaster-related policies are based on the evident and scientific findings. The Ministry of Land, Infrastructure, Transport and Tourism (2015) stated that Japan has proven its readiness to deal with disasters. Procedures for early warning system and regular exercise have formed the attitude of the government, businesses, and communities in the face of disaster. Therefore, the universities in Japan have been known to have a broad range of knowledge and skills that can be quickly mobilized in case of a disaster to any affected places (Aoki & Ito, 2014). Universities are capable of providing a significant contribution to all phases of disaster management because of their comprehensive knowledge. Universities are capable of assessing a large number of professionals, volunteers, and influencing government officials who were able to make even the most difficult move, and who had access to sophisticated technology, technical skills, and bleeding edge equipment and facilities. The following shows how Japanese universities responded to March 2011 earthquake followed by the tsunami: Tohoku University, which is the largest

university in the Tohoku area, conducted several actions to deal with post-disaster activities (Aoki & Ito, 2014). One year after the disaster, Tohoku University established the research institute "International Research Institute of Disaster Science" to deal with more comprehensive and wider access to international institutions to support the reconstruction of the affected areas and also to strengthen the research activities (IRIDeS, 2015). The organisation "Iwate University Headquarters for Promotion of Sanriku Region Recovery" was established for a long-term support for the reconstruction of the disaster-afflicted areas. Iwate University set up a crisis management headquarter to confirm the safety of students and faculty members and to identify the damage to campus buildings (Matsuoka, 2015).

Conclusions

In facing a disaster, a university requires a strong leadership so that it is capable of inviting other national and international institutions to partner in disaster risk reduction and disaster management. To ensure that the administration procedure does not hinder the partnership, which leads to the delayed response, a decision should be taken immediately. The normal academic culture requiring deliberation and consensus building might not be appropriate during a disaster. The case at Syiah Kuala University revealed that tactical and strategic responses are two key aspects in dealing with a disaster so that any actions necessary can be taken immediately. Academicians at affected universities should play important roles in initiating actions for disaster risk reduction, post-disaster reconstruction, and rehabilitation. It is therefore strongly recommended that knowledge access to disaster is widely opened to them.

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A review of the civil protection system development in Peru and recent risk governance challenges with focus on the disaster risk management in the region of Ica after the 1997-1998 El Niño

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Abstract

Peru is a country prone to disasters, mainly because of the Pacific Ring of Fire, region of high seismicity, and impacts of El Niño. Recent civil protection in Peru has been formed according to such natural hazards, for example, after a major earthquake in Ancash in 1970. In this article, the development of the civil protection in Peru is reviewed with emphasis on the last years, including the changes that followed international guidelines for disaster risk management (DRM). The review focuses on the department of Ica in the South of Peru. In 1998, the city of Ica was flooded due to heavy rainfall caused by El Niño. In 2007, a major earthquake devastated three provinces in the department and in 2017 El Niño hit the urban periphery of the city. This work reviews which institutions have been created relating to the extreme events in Peru and in particular which plans and measures have been introduced in the department of Ica since the disaster caused by El Niño in 1997-1998.

Keywords: Civil protection, disaster risk management, vulnerability, risk governance, El Niño, Peru, Ica

Introduction

Peru is a country prone to earthquakes, tsunamis, floods, droughts and landslides, being part of the Pacific Ring of Fire, as well as being under the impact of El Niño in the equatorial Pacific. According to the future climate change scenarios of the Intergovernmental Panel on Climate Change, an intensification of the El Niño Southern Oscillation (ENSO) is expected (IPCC, 2007). Further, Peru is considered to have 'four of the five geographical areas most vulnerable to climate change' (The Guardian, 2013).

Peru has undergone major disasters in its history. The earthquake and tsunami of 1746 in Lima, the capital city, and El Callao, the main harbour in Peru, killed around 1,200 of the estimated population of 60,000 at that time (Oliver-Smith, 1997). In the last century, the earthquake of magnitude 7.8 Richter in 1970 in the department of Ancash, and the following avalanche buried the towns of Yungay and Ranrahirca (Kuroiwa, 2010). In this century, an earthquake of 8.0 Mw and tsunami affected the department of Arequipa in 2001. Similarly, an earthquake of 7.9 Mw and tsunami impacted the department of Ica in 2007 (Tavera, 2008).

Concerning El Niño, Kuroiwa (2002) says that in the 19th and 20th centuries, four 'mega' El Niño events have taken place in Peru in 1891, 1925, 1983 and 1998. About 'mega' El Niño events in the history of Peru, Rocha (2007, p. 11) warns about repeating the same mistakes: 'Looking back at the last five centuries [...] each Meganiño [...] that caused extensive damage, was considered [...] unusual and not expected to occur again. That is why same mistakes are made again.'

Furthermore, human action adds to the high probability of the occurrence of disasters in Peru. Urbanization with poor planning and management is an important factor in disaster vulnerability (UN-Habitat, 2012). Cities

have grown and still grow in Peru with limited or poor planning (Diario Gestión, 2016). Nowadays, 74% of the 28,220,764 people in Peru live in cities, according to the latest census of 2007 (INEI, 2008). According to a United Nations Mission report about the implementation of the disaster risk management in Peru, poverty, poor control and regulation of land use, weakness of social organisations, limited capacity to manage emergencies and disaster are those factors that make Peru a country of high vulnerability (Naciones Unidas, 2014).

The present paper focuses on disaster risk management (DRM) in the department of Ica after the 1997-1998 El Niño. This case of a major disaster and recent events of El Niño allow the assessment of the development of the DRM within the civil protection system at regional scale. Measures and projects in reaction to El Niño disasters are presented. For a deeper understanding of the DRM in Ica, the civil protection system development at national scale is summarized, regarding DRM public policies, institutions and plans.

The main research question is how the development of disaster risk management in civil protection is interlinked with significant disaster events and the specific context in Peru.

The following sub-questions are to analyse this according to selected aspects:

- Which institutions have been created, changed and shaped by the disaster events?
- Which management plans and measures have been implemented?
- How effective are these implementations in terms of the reduction of vulnerability and the acceptance of the local population?

The present work is based on the review of documents such as public policies, national and regional government plans concerning DRM, in particular, in the department of Ica. The paper is a descriptive overview, extracting key phases of institutional development in the field of disaster risk management. Expert interviews and qualitative local media sources complement a descriptive assessment of recent changes in DRM. The expert interviews mainly served the purpose to identify challenges inside the DRM system of Peru today. The expert interviews did not follow a standardised scientific methodology, were mostly explorative, and contain internal knowledge. Therefore, sources to individual statements are undocumented and names are not provided, also for reasons of preserving anonymity. While these sources are therefore not scientifically valid, for the context of this working paper they shall mainly serve as to assist in explaining the hitherto largely undocumented history of the civil protection development in Peru.

Section 2 starts with a general overview of the development of civil protection institutions in Peru at national level. Section 3 provides an overview on DRM in Ica and specifies environmental and human-made factors contributing to risks and impacts due to El Niño in 1997-1998. Section 4 analyses changes introduced in the disaster risk management in Ica. The discussion summarises relevant aspects of the disaster risk management in the department of Ica within the context of Peru.

Development of the civil protection system in Peru

This section outlines the development of the civil protection system since the 1970s. This development follows significant disaster events, is intertwined with the political changes in Peru and influenced by international frameworks for disaster risk management at UN level (Naciones Unidas, 2014).

In Peru, the establishment of the first agency to attend the population in a disaster situation is linked to the major earthquake that occurred in 1970 in the department of Ancash. After the disaster, the military government (1968-1975) created the National Civil Defence System (*Sistema Nacional de Defensa Civil* - SINADECI) in 1972 by the Law Nr. 19338 (the use in Peruvian Spanish is 'civil defence' instead of 'civil

protection'). With the cited law, the National Institute of Civil Defense (*Instituto Nacional de Defensa Civil* - INDECI) was created in 1972.

After the 1972-1973 El Niño with heavy rainfall, landslides and floods (INDECI, 2002), the Program for the Regional Study of El Niño Phenomenon (*Programa para el Estudio Regional del Fenómeno El Niño* - ERFEN), that involves Chile, Colombia, Ecuador and Peru, was created in 1974. Following this, the Multisectoral Committee in charge of the National Study of El Niño Phenomenon (*Comité Multisectorial encargado del Estudio Nacional del Fenómeno El Niño* - ENFEN) was created in Peru in 1977.

The 1982-1983 El Niño caused losses that amounted to more than one billion dollars due to the flooding in the north and the drought in the south of Peru (INDECI, 2002). The catastrophe added to the political crisis due to a breakout of terrorist activities with the Communist Party of Peru-Shining Path within the recently installed democracy (since 1980). The political and economic crisis deepened in Peru, ending with an average annual inflation of 7481.7% in 1990 (BCR, 2016).

In 1986, the Peruvian Japanese Centre for Earthquake Engineering Research and Disaster Mitigation (*Centro Peruano Japonés de Investigaciones Sísmicas y Mitigación de Desastres* – CISMID) was created with funding of the Japanese International Cooperation Agency (JICA). To cope with the effects of El Niño, the CISMID includes the Institute of Mitigation of the Effects of El Niño Phenomenon (*Instituto de Mitigación de los Efectos del Fenómeno El Niño* - IMEFEN). In 1992, the president in office carried out an 'auto' coup-d'etat and established a dictatorship (CVR, 2003).

The 1997-1998 El Niño resulted to be 'one of the most catastrophic in history', because it affected about 41 countries and left in Peru losses of 1,800 million dollars approximately (INDECI, 2002). In Peru, the disaster happened in the dictatorial regime, when corruption and the armed conflict with the Shining Path had weakened the social structure and the public institutions (CVR, 2003).

After a democratic regime was re-established in Peru (2001), the new government, the political forces and the civil society signed a National Agreement in 2002 'to set a course for the sustainable development and to assert the democratic governance' (Acuerdo Nacional, 2002).

In June 2001, an earthquake and tsunami in the department of Arequipa hit also the departments of Moguegua and Tacna in the south of Peru. The disaster raised losses about 310 million dollars (INDECI, 2002).

In the following years, taking into account the evolution about 'disaster' and 'risk' towards a vision according to the Development Agenda, in 2010 the National Agreement approved public policies in Disaster Risk Management (Policy Nr. 32) and Land Use and Management (Policy Nr. 34). Both were set within the framework of the Andean Strategy for Disaster Prevention and Attention (*Estrategia Andina para la Prevención y Atención de Desastres*), the Millennium Development Goals and the priorities set in the Hyogo Framework for Action 2005-2015 (Naciones Unidas, 2014).

In 2011, the Law Nr. 29664 created the National System for Disaster Risk Management (*Sistema Nacional de Gestión del Riesgo de Desastres* - SINAGERD) (Congreso de la República, 2011). The law set the National Policy of Disaster Risk Management (*Política Nacional de Gestión del Riesgo de Desastres*) and the National Plan for Disaster Risk Management (*Plan Nacional de Gestión del Riesgo de Desastres* – PLANAGERD), on the basis of the prospective, corrective and reactive management by means of the risk estimation, prevention, reduction, preparedness, response, rehabilitation and reconstruction. The law also installed the National Centre of Disaster Risk Estimation, Prevention and Reduction (*Centro Nacional de Estimación, Prevención y Reducción del Riesgo de Desastres* – CENEPRED). Hence, CENEPRED and INDECI are the national executing agencies, while the regional and local governments are in charge of executing disaster risk management actions. In March

2015, Peru attended the III UN World Conference on Disaster Risk Reduction in Sendai, Japan, where the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted. In 2016 the latest civil protection decree was issued that covers aspects of modernisation of institutions and stresses a national disaster risk plan (Defensa 2016).

Hazards and risk context

El Niño Southern Oscillation (ENSO) in Peru

Peru lies in the geographic zone of influence and impact of El Niño, which occurs in the equatorial Pacific Ocean that is mainly the north of Peru. 'El Niño' is the Spanish expression for 'The Child' which refers to the Christmas child. It is known that fishermen in northern Peru use 'El Niño' to refer to the warm water current in the equatorial Pacific and the resulting intense rainfall that lead to flooding at the coast of Peru. Such an episode reaches full intensity towards December. Though still often referred to as a rare 'phenomenon', nowadays El Niño is no more described by scientists as an 'unusual' event but 'a recurring climate pattern', that is the warm phase of El Niño-Southern Oscillation (ENSO), while La Niña is the cool phase across the tropical Pacific (NOAA, 2016). El Niño is characterized by the sea surface temperature (SST) anomalies in El Niño 3.4 region (see figure 1).

In Peru, ENFEN defines El Niño event in the coastal region of Peru (also known as 'Coastal El Niño') as the period in which the El Niño Coastal Index (in Spanish: ICEN, *Índice Costero El Niño*) reaches the category of 'warm conditions'. ICEN is characterized by a three-month running mean of SST anomalies in the Niño 1+2 region (see figure 1). The 'warm conditions' category, which depends on the ICEN, can be of the magnitude: 'weak', 'moderate', 'strong' or 'extraordinary' (ENFEN, 2012). Based on this definition, ENFEN classifies El Niño of 1997-1998 as 'extraordinary', taking into account the period of 1950-2011 data as the reference (ENFEN, 2012).

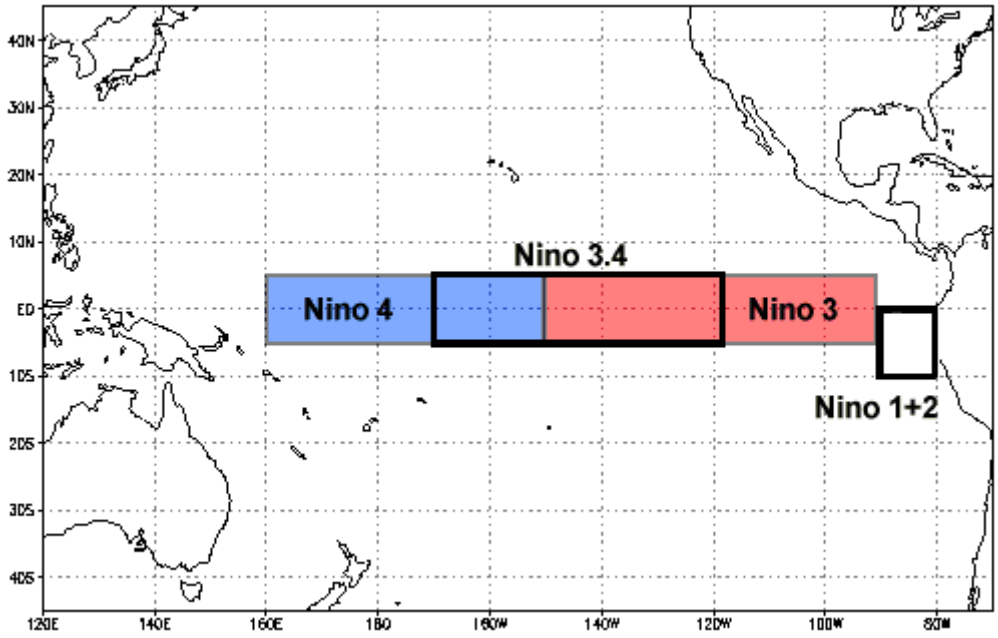

Figure 1: El Niño Regions
Source: National Centers for Environmental Information (2016)

Demography, topography and hydrography as risk factors in Ica

Ica is one of the 25 departments of Peru. It is located about 300 km south of the capital Lima. Various factors have determined the rapid growth of the city and the periphery in the last decades. In the 1980s and 1990s, the violence of the Shining Path among other factors (such as employment opportunities, health care and education) caused internal migration in Peru. Ica received ca. 80% of the 195,000 people who left the departments of Apurimac, Ayacucho and Huancavelica in the period of 1988-1993, fleeing from the violence (INEI, 1995). Further, since the 1990s, the neoliberal model introduced by the government allowed the rapid growth of export agriculture in the valley and people came to Ica looking for work in the field.

In Ica, the water resources come from the seasonal rainwater in the Andes, the exploitation of the groundwater and the water transfer from the Choclococha lagoon. Ica River runs ca. 220 km downstream towards the Pacific Ocean. The river tributaries are mainly from the left bank, while the area of the right bank is known for its extreme aridity (see figure 2).

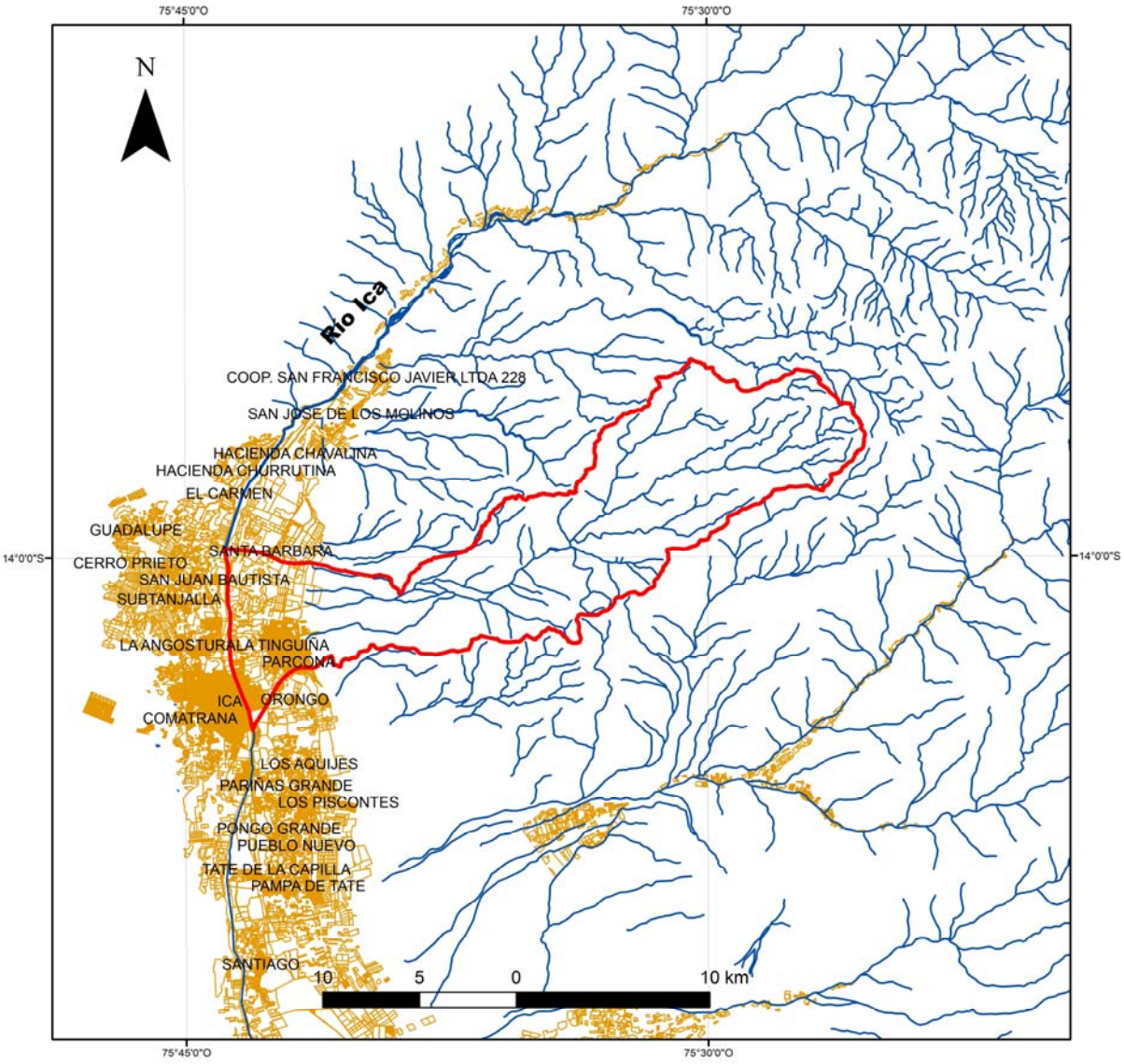

Figure 2: Ica River, La Tinguiña, Parcona, Ica (among other districts) and Cansas (in red)
Source: prepared with ArcGIS (ArcMap 10.2.2, WGS_1984_UTM_Zone_18S: EPSG Projection) with data from: Descarga de informacion espacial del MED (2015, October 29) with the assistance of Ivan Vilcahuaman

The tributary gullies on the left river bank are of steep slope with alluvial soil, gravel and rocks. These gullies, such as the Cansas gully (see figure 2), produce under extraordinary rainfall abundant runoff heavily laden with sediment, even huge rocks.

The 1997-1998 El Niño affected a large area of the department of Ica, including the districts of Ica, La Tinguiña, Parcona, San José de Los Molinos, Los Aquijes, Santiago and Yauca del Rosario, i.e. ca. 45% of the province of about 7,800 km^2 (INDECI-PNUD, 2007).

Despite the flood due to El Niño in January 1998, the riversides nearby the city and the periphery are nowadays densely inhabited (see figure 3). The urban population in the districts of Ica, La Tinguiña and Parcona, downstream Cansas, has even increased since the disaster in 1998 (see table 1).

Figure 2: Ica River, view downstream the Grau Bridge
Source: Dominguez (2013)

District	La Tinguiña		Parcona		Ica	
Census	urban	rural	urban	rural	urban	rural
1993	18,264	3,916	39,345	938	103,797	2,584
2007	27,723	3,179	49,090	1,259	124,789	400

Table 1: Population development in the districts downstream Cansas
Source: INEI (1993; 2007)

Otherwise, human activities also increase the risk of flooding. People throw domestic and industrial waste into the river, which reduces the river capacity of discharge and increases the risk of overflow. This human-made aggravation of the flood risk takes place in an environment contributing to this risk. As a coupled social-ecological system, it is important to understand not just the societal share of risk, but also the environmental interaction with this human system (Berkes & Folke 1998, Folke et al. 2007, Djalante et al. 2011).

The 1997-1998 El Niño disaster in Ica

The first forecast for the 1997-1998 El Niño dates to June 1997. The weather forecasting warned that an episode similar to the 1982-1983 El Niño, with floods in the north and extreme drought in the south of Peru, would occur. It failed however, because the 1997-1998 El Niño affected the north as well as down to Ica in the south of Peru (INDECI, 1998). The extraordinary rainfall due to El Niño left the city of Ica under mud and stones on January 29, 1998. The 1998 El Niño flood in Ica is regarded as 'the most catastrophic in its history for its balance of 120,000 victims and losses of hundreds of millions of dollars' (INDECI- PNUD, 2007).

After the flooding, several programs and plans were started. The Executive Committee for the Reconstruction of El Niño (*Comité Ejecutivo de Reconstrucción de El Niño* - CEREN) and the United Nations Development Program (UNDP) launched the Sustainable Cities Program (*Programa Ciudades Sostenible* - PCS) in October 1998 as a response to the emergency. In this framework, hazard maps of Ica were produced (INDECI, 2001). The Special Project Tambo Ccaracocha (*Proyecto Especial Tambo Ccaracocha* – PETACC) joined the 'Support Program to the Emergency of the Phenomenon El Niño' (*Programa de Apoyo a la Emergencia del Fenómeno El Niño*). In August 2000, a contract with the Technical Advisors Associates and SWECO International was signed to develop the definitive study 'Project for control of the Ica River floods and the Cansas Chanchajalla gully' (*Proyecto para el control de inundaciones del río Ica y quebrada Cansas Chanchajalla*). Among the technical alternatives for disaster risk reduction, there were weirs, drainage canals, retention ponds, etc. At that time it was decided for the regulation ponds that still have not been realised. More information about the disaster of 1998 can be found in INDECI-PNUD (2007) and INDECI (2012).

The 'Regional Plan for the Prevention and Attention to Disasters Ica Region' of 2005 to 2008 (*Plan Regional de Prevención y Atención de Desastres Región Ica – 2005-2008*), prepared by the civil protection system in the department of Ica focused on 'prevention and attendance of emergencies or disasters to protect the people and the patrimony of the department' (Defensa Civil, 2005).

Almost ten years later, the earthquake of 7.9 Mw (Tavera, 2008) in 2007 killed about 600 people and damaged more than 60,000 buildings. The earthquake´s epicentre was close to Pisco and impacted the neighbouring provinces of Chincha and Ica. Both have still not recovered from this disaster (Diario El Comercio, 2015).

In 2009, the regional government of Ica and the regional civil protection (GORE Ica y SINADECI, 2009) presented the 'Regional Plan for the Prevention and Attendance to Disasters - Ica Region 2009-2019' (*Plan Regional de Prevención y Atención de Desastres – Región Ica 2009-2019*), that also considered, in addition to extraordinary floods, river overflow scenarios with smaller and more frequent amounts of discharge flow. Regarding the implementation of the Regional Plan for the Prevention and Attention to Disasters - Ica Region 2009-2019, an INDECI official states (anonymous, interview on August 13, 2015): it 'almost has not been followed', only 'in some aspects, for example, capacity building of emergency brigades'.

The 2015-2016 El Niño forecast

In July 2015, ENFEN reported 'consistent conditions' for a 'strong' El Niño (ENFEN, 2015a). The forecast in September 2015 was that a 'strong' or an 'extraordinary' Niño at the Pacific coast –similar to El Niño in 1982-1983 and El Niño in 1997-1998– had 55% of probability to happen (ENFEN, 2015b). However, already in January 2016 the coastal Niño had only a 20% chance to be 'strong' or 'extraordinary' (ENFEN, 2016a). Indeed, the 2015-2016 El Niño happened to be 'strong' in January, but with the trend to reduce its intensity to 'moderate' in the following months (ENFEN, 2016b).

With the forecast of a 'strong' El Niño, in July 2015 the government declared the 'state of emergency' in the departments under influence, including Ica, `[...] in order to achieve the implementation of immediate and necessary response actions aimed at reducing the very high existing risk and the rehabilitation of areas that may be affected' (PCM, 2015a, 2015b).

Then, the Ministry of Agriculture and Irrigation (*Ministerio de Agricultura y Riego* - MINAGRI) announced in September of that year that as a measure to prevent and mitigate the effects of El Niño 2015-2016 'rain gauges and early warning systems [were] going to be installed in 132 vulnerable stream basins in the 14 departments under the state of emergency´ (Radio Nacional, 2015). Rain gauges were going to be installed in the upper stream basins, while the early warning systems (consisting in loudspeakers, sirens and evacuation routes) would activate to evacuate the people, when the gauges registered the rising of water, which might cause the fall of *huaicos* (local term for landslide).

According to the Regional Director of the National Service of Meteorology and Hydrology (*Servicio Nacional de Meteorología e Hidrología* – SENAMHI), Ica had an Early Warning System (EWS) in place starting from December 2010 (Dominguez, 2014). However, INDECI direction in Ica introduced the flood Early Warning System (*Sistema de Alerta Temprana* – SAT) in the districts of Ica, La Tinguiña, Parcona and San José de Los Molinos not before September 2015. Concerning the SAT in 2015, GIZ (German International Cooperation) participated in the implementation within its project *Adaptación al cambio climático en Ica y Huancavelica* (ACCIH). A personal e-mail from a GIZ staff member on 14th April 2016 reported that the protocol of 2015 (*Protocolo Operativo del Sistema de Alerta Temprana ante Inundaciones del Río Ica*) prepared by the technical team of the EWS –also integrated by INDECI– was put into practice through simulations, where weaknesses were identified, in particular in the response of local people, because people refused to evacuate or because they were not willing to participate in training.

The 2016-2017 *El Niño Costero*

In 2016 and 2017, *El Niño Costero* (the Coastal El Niño) impacted mainly the north of the country, affecting thousands of families (Canal N, 2017). In the case of Ica, the districts of La Tinguiña (see figure 4) and Parcona, downstream the Cansas gully, were flooded on 26th January 2017 (Diario Correo.pe, 2017).

Figure 4: El Niño affected area in La Tinguiña
Source: Ministerio de Defensa del Perú (2017) (creative commons)

Assessment of changes introduced in the disaster risk management in Ica

The following section addresses specific recent changes in the DRM in Ica by drawing from an expert interview and local media. Official documents and literature do not exist yet, since the process is very recent. It is therefore an opportunity to describe and assess adaptations of governance to recent conditions, specifically to a recent El Niño.

A new DRM concept

In an interview with an INDECI official about disaster risk management in Ica, the interviewed engineer said that 'in recent years [...] the concept of disaster risk management has been reformulated' (interview on August 13, 2015) in Peru. Accordingly, seven processes are nowadays described as crucial parts of disaster risk management: (1) risk assessment, (2) prevention, (3) reduction of risk, (4) preparation, (5) response, (6) rehabilitation and (7) reconstruction. CENEPRED is in charge of the estimation, prevention, reduction and reconstruction, while INDECI manages the preparedness, response and rehabilitation.

The official noted that 'we have used other terminology and concepts before the new law, now we are correcting our use'. He remarked that work had been done only in risk reduction but not in prevention, which would require 'long-term work' including for example land use planning.

Ica river banks

Ica river flows through the city of Ica in a length of about 5 km. Along the 'urban' river, the banks are densely populated, although the Regulations of the Water Resources Law Nr. 29338 (MINAG, 2010) points out that 'it is forbidden to use the river banks for purposes of human settlement, agricultural or other activity that affects them'. Furthermore it states: The National Water Authority (*Autoridad Nacional del Agua* – ANA) in coordination with local governments and the Civil Defence promote mechanisms of relocating people from the river banks. However, in Ica people have settled on the banks of the river, where they live under high risk. Within the framework of the GIZ project '*Adaptación al cambio climático en Ica y Huancavelica* – ACCIH', a German specialist in risk management and climate change said about the causes of the flood disasters in Ica: 'there are many causes, but I focus on three: weak planning for cities, poor management of land use and risk mismanagement in inhabited areas' (Diario La Voz de Ica, 2013)

Early Warning System

According to local media in Ica (Icaenlinea.pe, 2015), as part of the Early Warning System (EWS) introduced in 2015, signs have been installed for evacuation routes, meeting points and safe areas. As part of the new system, training workshops and alert simulations have been carried out. The EWS has four components: (1) knowledge of risk, (2) monitoring and alerting, (3) dissemination and communication, and (4) ability to respond. The technical team of the EWS has established a protocol which determines how the process begins and ends with the attendance (INDECI official interview on August 13, 2015). However, the protocol has not been distributed to other stakeholders and the local population. In the interview mentioned above, the INDECI official pointed towards the difficult task of successfully integrating local people into formalized procedures of disaster risk management.

Conclusion and recommendations

Peru has introduced changes in its policy of disaster risk management, following the integrated approach according to international guidelines. In this context, an important milestone is the new National System for Disaster Risk Management (SINAGERD, for its acronym in Spanish), founded in 2011. This this paradigm shift

might have happened recently because since the 1970 disaster, Peru has undergone periods of dictatorship or unstable democracy that resulted in weak institutions and social organisations.

After the disaster in Ica due to El Niño in 1997-1998, a series of studies and hazard maps to correct existing conditions and to plan ahead were produced. However, these efforts were not coordinated. Its incidence and effectiveness have been limited in practice, which means loss of credibility among the population. Regarding the river management to prevent and reduce overflow and flooding, it is necessary to correct and order the use of land as well as to assess impacts of human intervention on the river. There is the need to relocate people, infrastructure and crops that occupy the floodplains of the river.

There is still the need to increase awareness of the people in Ica and understanding that prevention and risk reduction can significantly reduce the magnitude of disasters. Regarding the early warning systems (EWS) for floods, it is necessary to standardise concepts and criteria. While it is necessary to be realistic about the capacities and resources available locally, it is also necessary to ensure that systems can operate effectively. The EWS should empower the community to cope with natural hazards.

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Disaster Risk Management in Myanmar - practical insights in context of the Indian Ocean Tsunami 2004, Cyclone Nargis 2008 and recent events

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Abstract

This perspective note discusses insights on the damage extent as well as the response measures in Myanmar in context of the Indian Ocean Tsunami 2004 and the Cyclone Nargis 2008 and aims to derive lessons learned for effective Disaster Risk Reduction. It focusses on public communication strategies and institutional measures on the local and national level and calls for the integration of Disaster Risk Management (DRM) in public rehabilitation efforts. The findings include damage extents, response measures and lessons learned that unfolded during and after the two selected disaster events. This paper also looks into how certain aspects such as natural resource management, agriculture and urban infrastructure continue to be in interplay with hazard impacts but also are means to dampen the risk.

Introduction

The Republic of the Union of Myanmar with a total population of about 53 million is located within South-eastern Asia, bordering the Andaman Sea and the Bay of Bengal at the southwest and the south, between Bangladesh and Thailand (CIA, 2017; World Bank, 2017). Myanmar's climate is influenced by tropical monsoon circulation and its west coast is subject to frequent tropical storms and cyclones during October to December with a secondary peak in April to May. Myanmar is exposed to multiple natural hazards including cyclone, earthquake, floods and fire. The major disasters events in Myanmar in the past decade were, as follows (Post-Nargis Joint Assessment, 2008; UN Office for the Coordination of Humanitarian Affairs, 2017):

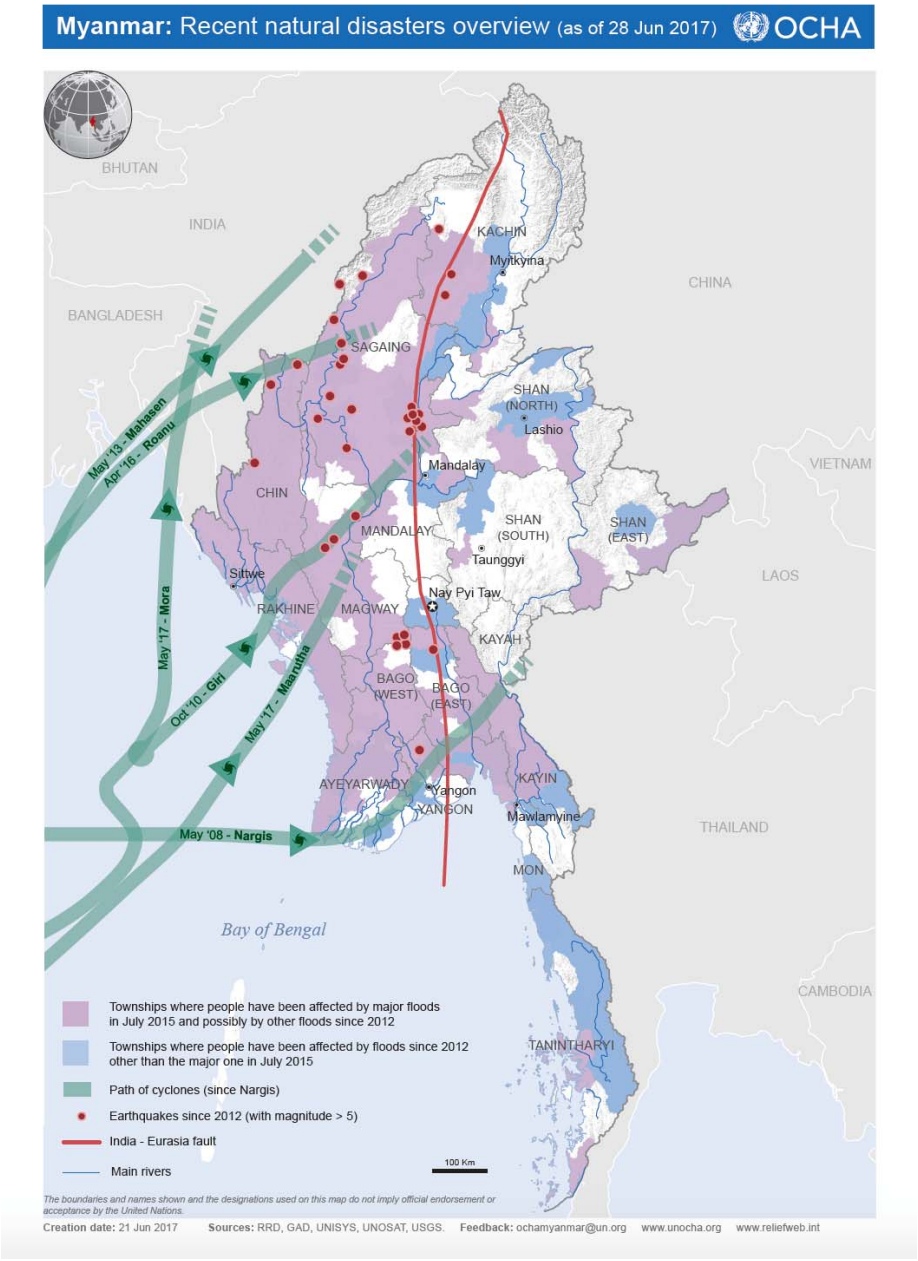

Figure 1: Overview of recent natural disasters in Myanmar
Source: UN Office for the Coordination of Humanitarian Affairs (2017)

1) Floods and landslides in July and August, 2015, June 2017, July 2017 which resulted in a significant expansion of monsoonal flood waters in 12 region / states, with Ayeyarwady, Sagaing, Magway, Bago, Rakhine, Yangon and Chin resulting in the highest number of people internally displaced and impacted regarding agriculture and livelihoods in Myanmar,
2) Cyclone Nargis in 2008 which led to the loss of 84,537 human lives, 53,836 persons missing and damage to property to the tune of approximately 4.1 billion USD,
3) Cyclone Mala in 2006 led to loss of 37 lives,
4) Indian Ocean Tsunami in 2004 claimed 61 lives and
5) Taungdwingyi Earthquake (M: 6.8 RS) in 2003 led to loss of 7 lives

This perspective note focusses on the 2004 Indian Ocean Tsunami and the 2008 Cyclone Nargis and aims to discuss the respective damage extent as well as response measures in order to derive lessons learned for effective and sustainable rehabilitation efforts. The presented insights are mainly built upon the practical experiences of the lead author Moe Moe as a national technical specialist for the environment, vulnerability and climate change sector of the National Action Plan for Poverty Alleviation and Rural Development (NAPA) Project funded by the Livelihoods and Food Security Trust Fund (LIFT).

2004 Indian Ocean Tsunami and 2008 Cyclone Nargis

2004 Indian Ocean Tsunami

The 2004 Tsunami moved strongly towards the east and west, but weakly to the north. The arrival time of the tsunami wave towards Myanmar was about three hours and the epicentre was at a distance of about 1,000 kilometres away. The calculated speed of propagation towards the coast was 160 km/hr.

Damage extent

In comparison to other tsunami affected countries there was less damage in Myanmar. The tsunami caused moderate damage in some parts of the Myanmar Coast, for example Pyinsalu sub-township, Laputta Township, Myaung Mya District and the Ayeyarwaddy Delta. Impacts included the death of 25 people, the destruction of 289 homes and 123 fishing boats. Reasons of the rather in comparison to other countries limited damage extent were the existence of a seismic gap, direction of the waves and the topographic feature of seabed level. The tsunami impacted upon unspoiled mangrove forests and existences of hundreds of uninhabited islands in Myeik Archipelago.

Response measures

There were two key tsunami rehabilitation objectives to provide support to fishing communities in replacing fishing gear and boats and supporting the replacement of equipment for agriculture. Immediately following the Tsunami, all agencies (including NGOs, government and private sector) pulled together with the communities to support the emergency and rehabilitation efforts.

Lessons Learned

The lessons learned during rehabilitation were the importance of transparency (the right to information), the constitution of committees and accountability, the use of local materials, gender sensitization, the use of a holistic approach that emphasizes horizontal and vertical as well as a "forward backward" linking.

The constraints faced during rehabilitation efforts were the large scale of the damage, much impact on subsistence fishers, the weak capacity of implementing agencies, the inadequate infrastructure, and the lack of availability of materials, understanding of socio-economic and traditional practices, alternative technologies, awareness and a time lag in gearing up the response.

Other broad issues considered important to implementation of recovery measures included: commitment to implementation in a time bound manner; coordination, need based approaches, environmental issues, sustainability, gender, value adding, transparency and accountability, credit, quality assurance and sea safety. The programme monitoring mechanisms were outlined with civil society and NGOs should take a major role for effectiveness.

Myanmar identified valuable lessons for the future which include mangrove reconstruction, appropriate location and construction of buildings, improved communication systems, the development of effective early warning and response systems and the need for relief planning.

2008 Cyclone Nargis

Cyclone Nargis caused severe flooding and shifting of sands, which resulted in extensive damage to lives and livelihoods in May 2008. An estimated 84,537 people died, 53,836 remain missing (assumed dead) and 33,754 people were injured. Nearly 18,000 fisheries workers died and 10,000 went missing. Assessment data reveals that of the estimated population of 7.35 million living in affected townships, some 2.4 million individuals were severely affected (Post-Nargis Joint Assessment, 2008). The assessment also indicates that more women and children died than men, which has distorted social structures. Approximately 800,000 people were displaced, of whom 260,000 sought shelter in camps and settlements throughout the delta. The reports indicated that a significant number of displaced persons were traumatized. These people also suffered the total loss of their livelihood (land, housing, tools, equipment and other assets) and may not return to their places of origin, depending, at least for the near future, on their host communities. There had been widespread devastation, with the near-total destruction of fields and shelter in areas that were directly hit by the cyclone. In all, 37 townships were significantly affected in Ayeyarwady and Yangon Divisions, with widespread destruction to homes and critical infrastructure, such as roads, jetties, water and sanitation systems, fuel supplies and electricity.

Damage extent with focus on the agriculture sector

Major damages and losses in the agriculture sector after Nargis included 63 percent of paddy fields submerged; stored paddy and milled rice destroyed; seed stocks lost; some power tillers and thousands of tilling equipment lost; widespread damage to public and private agricultural infrastructure and buildings; orchard crops and backyard gardening destroyed; draught animals (buffaloes and cattle) lost in the eleven most affected townships; many other animals like pigs, ducks, goats and chickens died; marine fishing vessels, small inland fishing boats and gear were lost; some acres of fish and shrimp ponds were destroyed; severe damage to 14 000 hectares of natural mangrove forest (out of 56 000 hectares, already fragile and weakened by years of over-exploitation); and serious damage to 21 000 hectares of the 63 000 hectares of redeveloped mangrove plantations.

Disaster impact on private sector (including households)			
Assets	**Damage**	**Losses**	**Total**
Field crops	65 336	159 929 - 283 000	225 265 - 348 336
Farm equipment	24 046	n/a	24 046
Plantations	22 043	65 209	87 252
Livestock	45 190	30 775	75 965
Capture fisheries	22 609	99 932	125 541
Fish farms	4 120	29 394	33 514
Total	**186 344**	**571 583 - 694 654**	**571 583 - 694 654**

Table 1: Estimates of damage and losses in the agriculture sector (currency Kyat million)
Source: Post-Nargis Joint Assessment (2008)

Response measures

The government and the international community mobilized significant resources to address the immediate needs of populations affected by Cyclone Nargis. The achievements have been notable despite the various logistical constraints and other impediments during the process. International partners faced difficulties and limitations in accessing the affected areas, which also influenced the type and scale of assistance that could be provided.

The agriculture sector is the mainstay of the economy in the cyclone-affected areas. Post-Nargis rehabilitation efforts, particularly in terms of agriculture, were done based on the results of rapid need assessment by different Local and International NGOs after emergency responses. The institutions that serve and govern the agriculture subsectors (i.e. crops, livestock, fisheries/aquaculture and forestry) were also necessary to rehabilitate.

Understanding and restoring institutions and production systems are a prerequisite to rehabilitating livelihoods in a sustainable way with a view to build back better and to improve the resilience of vulnerable populations. Further, Disaster Risk Management (DRM) issues also need to be an integral part of effective and sustainable rehabilitation efforts. This is particularly important in the context of climate change and the specific risks and vulnerability of livelihood systems in Nargis-affected areas.

A holistic programme approach was established, which streamlines DRM and institutional capacity building in rehabilitation plans. At national level, the National Committee on Disaster Prevention and Management was founded in January, 2005 chaired by Prime Minister and members from ministers of 16 different ministries and by the secretary from the Deputy Minister for Home Affairs. There are Central Committee and 10 Sub-committees on Disaster Prevention Management Central Working Committee and they coordinate the roles and strategy for the whole country. At community level, some Local and International NGOs try to implement responses and preparedness on Disaster Risk after the Cyclone Nargis and communities are also included. For example, World Vision Myanmar (WVM) implemented the Myanmar Disaster Risks Reduction (MDRR) Project in its areas. It was conducted to increase awareness, understandings and practices of the target communities on Disaster Risk Reduction (DRR) by means of increasing awareness, understandings and practices of the target communities mainly through the trainings and seminars and information, education, and communication materials of the Disaster Management Committees (DMCs). Quality of DMCs and interests and attitudes of local authority on DRR activities were also one of the important factors in achieving DRR. The communities have already identified and located the safer places to evacuate for their community members in the case of the next disasters to happen.

Nowadays communities in the Ayeyarwaddy delta hit by the 2004 Tsunami and Cyclone Nagis are aware of those risks. The communities are listening to news of cyclone and weather reports from radio and transfer the weather news to each other. The communities identified and constructed evacuation places in each village and built a cyclone shelter house for 5-10 villages for common use. The numbers of shelter are not enough for the communities still, because of limited financial support. Worries about the next disaster and loss of lives exist. Some villagers, who faced the tsunami and the cyclone experienced shock and trauma due to loss of many lives and all properties. Communities hold myths that they did something wrong and received punishment by the sea through the Tsunami.

Lessons Learned

After Cyclone Nargis, the government is aware that it is necessary to prepare, for example, through cyclone warning and alert to native people. This did not happen during the cyclone and it was evident that when the next cyclone in Rakhine occurred, even when it had the same strength, it did not reach the same death toll. Fewer people were affected and the government recognized that it is necessary to protect from disasters, also related to climate change.

The communities in delta areas affected by the Cyclone Nargis could not forget that sort of disaster and recognize that it was more severe because of no existence of windbreak trees like mangrove forest. Some villages were less affected due to bamboo plantation around their compound. Lives were saved because bamboo trees were not uprooted when the cyclone hit.

Persisting current disaster risks

During a fact finding mission of TH Köln in August 2016, we could observe some of the natural and man-made conditions in Myanmar that play a role in the construction of natural disaster risk.

In the south of Myanmar, Myeik, mangrove forests are still intact along large areas along the coast (Figure 2). However, in the future, the area might be under development for increasing tourism and also, plantation of cash crops such as palm oil production, which might result in conflict with natural resource management and protection from cyclones and tsunami.

Figure 2. Intact mangrove forest along the coast in the southof Myanmar, close to Myeik
Source: own photograph by Fekete (2016)

In the south, but also on the field trip to areas around Nay Pyi Taw and Yezin in the country centre, traces of landslides and erosion within dense vegetation could be observed, typical for rainfall-triggered gravitational mass movements, but of course also due to a range of other factors such as farming and cutting of vegetation (Figure 3). Agricultural lands are on the one hand exposed to erosion, but practices of farming are at the same time in interplay with creating or aggravating certain risks for landslides.

Figure 3. Traces of vegetation cover loss probably related to gravitational mass movements in the south of Myanmar, close to Myeik
Source: own photograph by Fekete (2016)

Natural hazards are not an issue of rural areas in Myanmar only, also cities are facing impacts of weather events such as intensive rain falls or flash floods (Figure 4). In Yangon (formerly Rangoon), the largest city in Myanmar with around 7 million inhabitants, traffic increases and cars are rapidly replacing former means of transportation such as scooters or bicycles. Next to traffic jams as a daily burden, impacts of meteorological events such as rain or storm or floods are likely to increase interruptions of transportation and logistics. While urban infrastructure is exposed to meteorological hazards, it is also how such infrastructure is technically constructed but moreover, how it is used or even used beyond planned capacity that contributes to risk of interruption in daily life as well as in a severe disaster situation.

Figure 4. Intensive rain falls submerging roads in Yangon
Source: own photograph by Fekete (2016)

Conclusion

According to the insights presented all stakeholders and authorities have to have a master plan for Disaster Risk Management. There is a continuing need for community awareness on conservation of natural resources and systematic Disaster Risk Management to mitigate disasters related to climate change in Myanmar. Until now, in Myanmar, practice is applied when disaster strikes. In the future, it will be also necessary to act before disaster risk turns into disaster damages. It is necessary to cooperate and study Disaster Risk Reduction in Myanmar by interested institutions from inland and outside of the country.

Regarding the validity of the arguments and findings presented here please note that they are mainly based on the lead author's working experience as a national technical specialist for the environment, vulnerability and climate change sector of the National Action Plan for Poverty Alleviation and Rural Development (NAPA) Project funded by the Livelihoods and Food Security Trust Fund (LIFT) and need further empirical research in order to derive general conclusions.

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Evaluation of efforts: perceptions of satisfaction and long-term effects

Studying extreme events from the perspective of the disaster relief workers involved in 2013 floods in Germany

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Introduction

In 2013, floods affected several regions of Germany and caused billions of euros in damage (Center for Disaster Management and Risk Reduction Technology 2013). These devastating floods in Central Europe have become a strong reminder of the impact such calamities can have on all groups of society. To prevent further damage, save lives and support the affected people, about 100,000 disaster relief personnel from different organizations were sent on mission (Federal Office of Civil Protection and Disaster Assistance 2013). The German disaster relief system is mainly comprised of voluntary members who conduct training programmes and different operations besides their normal occupation, their family commitments and other hobbies. There is no fixed monetary contract between these volunteers and their respective organizations. Therefore, it is not possible to oblige members to go on a rescue mission — they need to be motivated. The German disaster relief system is generally based on the principle of high motivation, which can be influenced in a positive or negative way through different parameters (Francis & Jones 2012, and Figure 1), such as a mission of an enormous dimension. Since the German disaster system needs a great number of volunteers, these forces need to be highly motivated. However, during and after the floods there were both positive and negative voices regarding various organizational issues and the effectiveness of the deployed relief forces. Therefore, this 'lessons learned' study analyses the satisfaction of the disaster relief personnel with the mission during the flood disaster in Germany in 2013, as well as the implications for further commitment to the disaster relief system. Furthermore, the study aims to increase awareness of the topic of 'personal satisfaction of relief forces' in civil protection.

Figure 1. Factors potentially influencing satisfaction of relief workers
Source: own elaboration

The survey

In order to analyse the satisfaction of the disaster relief forces and to identify important criteria of this satisfaction, a questionnaire was formulated. This questionnaire is based on hypotheses developed based on literature research and exploratory peer-group discussions (Baumgartner & Bentler 2014b) To obtain significant and detailed results, it was necessary to reach disaster relief forces affiliated to different organizations across Germany. Therefore, an online questionnaire was made available over a period of six months, and the information was spread by email and social media. The results of this study are based on 3,377 completed and analysable datasets (Baumgartner & Bentler 2014a). These datasets show that most of the relief forces were at least satisfied with the flood mission (Figure 2) and the motivation for further mission has increased (Table 1). Moreover, the study identifies some important points of satisfaction related to missions such as information management or alerting and advanced information (Tables 1 & 2). The cooperation between the disaster relief forces and positive behaviour of the residents are mentioned as additional main criteria. The study also shows criteria that affected the satisfaction in a negative way such as problems with coordination or a long standby time (Baumgarten & Bentler 2014b).

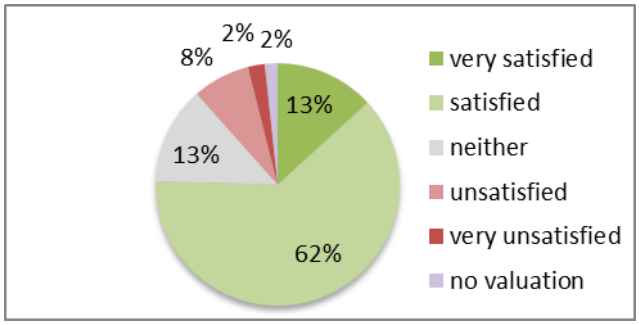

Figure 2. Personal satisfaction of disaster relief forces during the flood mission in 2013 (N=3377)
Source: Baumgarten & Bentler (2014b)

The overall picture of personal satisfaction of the relief workers after the flood mission in 2013 can be further broken down to several factors contributing to it, as displayed below in Tables 1 and 2.

Criterion	**Categories**	**Responses N = 3377**
Leadership level and training		
	Group commander (Verbandführer) or higher (highest degree of leadership)	11%
	Platoon leader (Zugführer)	15%
	Group leader (Gruppenführer)	26%
	Squad leader (Truppführer)	20%
	other training	11%
	none	17%
Personal motivation change due to operation		
	Yes, my motivation increased	53%
	No influence of operation on my motivation	42%

	My motivation decreased	5%
Age group (in years)		
	< 25	26%
	25-30	34%
	36-45	22%
	46-60	17%
	> 60	1%
Gender		
	Female	10%
	Male	90%

Table 1. Selected questions and responses from the survey regarding relief workers' satisfaction with the operation
Source: own elaboration

Table 1 shows that regarding leadership level and training, all ranks participated in the survey. Overall, motivation has increased or remained, and only few (5%) reported decreased motivation after this event. A relatively high degree of younger persons participated in the survey, which may be due to familiarity with online surveys and media, but also represents the amount of persons active in such organisations. 90% male participants can also be expected in a still heavily male dominated field.

Criterion	**Categories**	**Responses N = 3377**
Information provision		
	Very good	13%
	Good	32%
	Fair	32%
	Bad	16%
	Very bad	6%
	No judgment	1%
Alarm and information beforehand		
	Very good	16%
	Good	36%
	Fair	28%
	Bad	13%
	Very bad	7%
	No judgment	0,5%
Operation recapitulation		
	Very good	18%
	Good	37%
	Fair	23%
	Bad	11%
	Very bad	5%

	No judgment	8%
General cooperation		
	Very good	48%
	Good	40%
	Fair	9%
	Bad	1%
	Very bad	0,2%
	No judgment	2%

Table 2. Selected questions and responses from the survey regarding relief workers' satisfaction with the operation
Source: own elaboration

Regarding factors such as 'information provision' in general, the majority voted for positive to fair supply with information. Also, in the specific question after the factor 'alarm and information beforehand' this picture does not change. It appears as if information supply and quality was not a factor triggering lack of satisfaction on average. Still, it can be interpreted also in the other direction: there is still a share of relief workers that was not satisfied and this might indicate areas for improvement. 'Operation recapitulation' after the mission was also overall satisfactory. 'General cooperation' between relief workers was however, rated even better, 97% voted for very good, good and fair. Only in comparison to those numbers, the previous numbers can directly be seen to offer rooms for improvement, still.

Conclusion

The relief forces were highly satisfied and the motivation increased following the flood disaster. This is an interesting finding, as it agrees with common studies on motivations of relief workers. However, it is also interesting, since during and after the flood operations, some complaints from individual relief workers on belated alarming or having to return without being able to help were heard in personal conversations (observations amongst students and civil protection experts by Fekete). This survey however, helps to shed light on certain factors negative, but also and mostly, on positive aspects of motivation. Overall, despite some critique that was also mentioned in over 900 text field entries (see Baumgartner & Bentler 2014b), it seems that the operation was satisfactory for most survey participants. This small survey also showed by the unexpectedly high ratio of participation the need for addressing topics such as relief workers satisfaction. There appears to be a gap in the science-practitioner-policy interface that is important to complement understanding about extreme events management.

The criteria of satisfaction and the reasons for a changing motivation can provide a great input for a better motivation of relief forces, thereby leading to higher efficiency of a disaster mission. The disaster relief forces can adapt their instructions and trainings for all kinds of further missions. This, in turn, can pave the way for a greater number of voluntary relief personnel and strengthen the overall system. The flood disaster of 2013 has shown several ways of possible improvement and an increase in efficiency. Some points have already been implemented, but the improvement of the German disaster relief system is a continuous process. In modern companies the goal to have satisfied and motivated employees is becoming increasingly relevant, and this study leads the way to transferring this trend to voluntary relief forces. The main idea of enhancing the satisfaction of employees and the efficiency of a company is also practicable for disaster relief organizations or systems. Furthermore, the 'lessons learned' study reveals points of satisfaction in detail

which have to be enhanced during further missions from the relief forces' point of view. The results help organizations to reflect on the satisfaction of disaster relief forces, concentrate on the main points and enhance the structure where needed. On the whole, the policy and executives of aid organizations can contribute to the improvement of the German disaster relief system while transferring the knowledge of the satisfaction to future natural disaster operations.

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Ankokkawala - a post-tsunami village project, its implementation and a ten-years review

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Introductory note

A disaster like the Indian Ocean Tsunami on December 26, 2004, has never before in history hit Sri Lanka so seriously. Besides the loss of lives of some 40,000 people, around one million people lost their houses and got homeless. Expressing huge international solidarity with Sri Lanka, extensive international aid has tremendously flushed into the country, both by many governments abroad as well as by countless foreign non-governmental organisations. Among the NGOs from abroad there was also the German charity organization 'Sri Lanka Children-in-Need Campaign'. Under its supervision and financial support a small post-tsunami village of ten housing units was constructed for homeless, Tsunami-struk families.

This paper aims

- to investigate the procedure of implementing the village,
- to review the ten-year development of the village, and
- to describe the settlers' satisfaction about their allocated new village.

The tsunami catastrophe

On December 26, 2004, Sri Lanka was most seriously hit by a 'tsunami' and several 'killer waves' associated with it that moved across the Indian Ocean to the shores of the island and devastating the coast and coastal hinterland. A peaceful and relaxing 'poya' holiday, expected on that particular day, was turned into a bloddy and 'black' poya day for Sri Lanka and the Srilankans. The catastrophe hit the island at a time when people were neither ready for a tsunami nor knowing about a tsunami at all. Even the name 'tsunami' was a foreign word, unknown to the people. Moreover, also the many international tourists on the island bound for a Happy Christmas vacation were not at all aware of the calamitous nature of a tsunami.

The tsunami catastrophe afflicted about three quarters of the total shorelines of Sri Lanka, many parts of them having been heavily populated mostly by fishermen who run a flourishing industry. Not only some 40,000 people lost their lives, but also hundreds of thousands Srilankans lost their houses and their employment. The fishing industry was approaching a complete standstill as an uncountable number of fishing boats was wrecked. More than any other labour community, the fishing folk were paralysed by the heavy devastation resulting from the tsunami 'killer waves'.

The vast extent of damage cannot truly be described in words. The most desperate comments of the affected people were often to be heard after the catastrophe in the following way:

'We have not only lost our houses, but even more our homes.'

It means that, besides the losses of physical structures of houses, also - and even worse - the hearts and souls of the affected people have been seriously wounded.

Homelessness may even be regarded the worst consequence of the tsunami catastrophe affecting people psychologically and mentally.

Evidently to note, many people also became traumatized and have tremendously suffered from feeling socially marginalized. Mental sickness was another burden to the people they had to overcome.
For the first time, people living along the coastal strip of land and experiencing their helplessness against the power of nature, had to experience the serious fragility and vulnerability of their living space.

Urgent need for accommodation to affected people

Though immediate help, in whatever possible way, had been officially provided to the tsunami-afflicted homeless people by the Sri Lanka government and other countries (by provisional and/or semi-permanent tents and water and sanitation units), the need for adequate, permanent shelter and housing was serious. Obviously, the Sri Lanka government had been heavily overburdened due to the huge extent of devastation to the country.
Hence, promptly after the tsunami catastrophe, many housin projects were been carried out by friendly foreign governments and foreign NGOs. Most commonly, housing units had been constructed with a standard living space of 45 to 50 square meters for a family including one living room and two bedrooms supplemented by a kitchen and a bathroom with toilet and finally by a veranda. Most houses were single units built in a bungalow style. Solid houses were generally built of stones and bricks with tile roofs; they were provided with water and electricity and containing septic tanks for waste water and toilet flush. Normally open lands for the settlers' own use as fruit and/or vegetable gardens were surrounding the houses.
Houses in most village projects were envisaged as so-called low-cost houses with a standard fitting in order to limit the construction expenses per housing unit. Total cost for construction of a 45 to 50 square meters low cost house amounted to some 4,000 to 5,000 Euro.

German-Srilankan partnership and conceptual ideas for a tsunami village

Urgent need for housing and permanent shelter to the tsunami-afflicted people was hence strongly demanded once the immeasurable extent of damage was known. Among countless NGOs, also the German non-governmental charity organisation called 'Sri Lanka Children-in-Need Campaign' (SLCNC) was founded. The SLCNC fiercely focused its relief measures on an immediate support to homeless families by organizing and financing the construction of a small village with ten housing units.
In correspondence with other similar projects, each housing unit was envisaged with a living space of some 45 to 50 square meters. Beneficial families entitled to be settled in the new village, were preferably fishing families who had got homeless by the tsunami.
Decision on the village project and its implementation had unanimously been voted by the members and friends of the SLCNC, being aware that the project implementation would fully depend on incoming charity donations and funds. As a NGO, SLCNC was completely dependent upon donations by individuals while any government support could not be expected.
For constructing the envisaged 10 houses-village a total amount of around 50,000 Euro had been budgeted.

Donation campaign for the housing project

After the unanimous vote that had been given for constructing a small village for ten tsunami-affected families, SLCNC immediately started a donation campaign inviting her members and friends for their voluntary support in order to cover the required construction funds totalling to around 50,000 Euro.

Beyond any expectation by the Board members of the SLCNC, the requested full amount of funds had been substituted - within a couple of weeks only - from a huge number of individual donors in Germany. Hence, the required complete budget for the village construction was available soon after the unanimous vote for the village project had been given.

Initial stages of the project implementation

As soon as the funding campaign for the project was successfully completed and the required budget was available for a 10-houses-village, SLCNC had to follow up the necessary 'bureaucratic' initiatives and steps for the project implementation, such as:

- Where and how to acquire the required land for the project?
- How to find a contractor who would reliably carry out the construction work?
- How to recruit an architect?
- Additionally: what additional legal steps must not to be forgotten for the project implementation?
- ...

Fortunately, all these points were no major barrier against conducting the project. From the very beginning, many fruitful discussions have paved the way to a close collaboration between the SLCNC and the Government of Sri Lanka, represented by a Government Agent (GA). Beyond any discussion, the SLCNC which acted as financial donor indispensably insisted on her sole leadership and fullest responsibility for the project implementation which was agreed upon by the GA. The required outline for the village had been - even complimentarily - released by the GA providing a sufficiently large plot of Government land for the village, located in the hinterland of the town of Galle, some seven to eight kilometres off the town. The total village ground measured around 10,000 square meters.

The land provided by the Government was part of a village named Ankkokawala.

Government land for the village project was part of an abandoned, uneconomic state rubber plantation on hilly land, interspersed with many granite rocks and boulders.

Land had been provided lease-free. However neither the SLCNC nor the settlers were allowed to sell the land. The legal proprietor of the land continued to be the Government through the GA.

In addition, also a qualified architect as well as an experienced contractor was found, both recommended as reliable and professional personalities with strong expertise gained in similar relief projects.

Finally, the SLCNC has agreed for the Sri Lanka Methodist Relief and Development Services to act as local project partner in Sri Lanka. This organisation had already gained successful expertise in similar re-settlement schemes.

Selection of the beneficial families in Ankkokawala village was exclusively done by the GA, solely with regard to their need, respectively to the state of emergency, and irrespective of ethnicity and religion. The GA however thoroughly checked whether the settlers' previous houses had really been destroyed by the tsunami and whether the homes of the settlers had been at coastal sites.

The legal conditions obligatory to the settlers were also clearly released and had to be fully accepted by the settlers. They were granted to live without any rent in their respective houses which they could more or less consider as their own properties, yet they had to cover their electricity and water bills on their own. In no instance, settlers had the right to sell their houses or to rent them. Settlers were obliged to take care of an adequate maintenance of their properties.

To substantially improve the quality of living conditions to the settlers in the village, a proper piece of land around each house was also given for the garden. Each family was free to use the garden space for whatever purpose, planting vegetables, fruit trees - including bananas and coconut trees - and/or kitchen herbs for the daily cooking needs. The garden offered each family the opportunity of creating its own green environment and providing a more homely feeling and atmosphere. Additionally, an own garden may also contribute towards an ornamental beautification of the environment, by flower plants. In total, the settlers could themselves create a feeling to live in harmony with nature.

Preparatory steps towards initiating the project work

With joining hands from the SLCNC to all project partners and associates, a quick project implementation was strongly desired in order to help the homeless families.

As a first step an architectural layout of the village and the location of the houses was drafted.

Construction drawing of the houses aimed to satisfy the requirements of appropriate space and sufficient rooms for families with two children. As such, each unit was conceptualized in a one-storey bungalow-style, a solid house with a tiled roof containing two bedrooms, a sitting room with a veranda in front, a kitchen and a toilet. In all houses electric light was installed, while kitchen and toilet were equipped with running water. The total space of each unit was around 45 square meters.

The budgetary limit per house was fixed at 5,000 Euro, including landscaping of the property, but excluding plant material for the garden. Any furniture was excluded from the construction cost per house. Cost for it had to be covered by the settlers themselves.

Scheme implementation

As the initial step towards the construction work of the village, land preparation and clearing had to be done transforming the rocky rubber tree plantation land into suitable land for the housing construction. Rubber trees had to be felled, yet the hardest work was to crush and to remove the granite rocks.

- After finishing the land preparation, construction of houses had promptly started. However, the progress of work was often rather weak - for several reasons
- Heavy rainfall, resulting from the unstable monsoon, often slowed down or even fully interrupted the work,
- The number of labourers was often reduced due to sickness,
- Supply of construction material, such as sand, cement, bricks, timber, was often unreliable and slowed down the process of work.

Finally, however, house construction of the ten houses was readily completed after nearly one year.

Village inauguration

The ten settling families in Ankokkawala village, with totally fifty persons, as chosen by the GA irrespective of their ethnicity and religion, were with no exception of the Singhalese race and their predominant religion was Buddhism (seven families) while other three families belonged to the Christian faith. By their profession, nine families belonged to the fishing folk. The families originated from different parts of Southern Province and they were not related to each other and not knowing each other.

During the construction process of the houses, the settlers chosen for the village were already nervously awaiting the completion of the ten-house construction and the formal opening of 'their' village.

Finally, the happy day of the inauguration ceremony was to come on 13 August, 2008 (he present author was fortunately able also to attend the opening ceremony of Ankokkawala village. Some of his personal impressions are given above). The settlers enthusiastically applauded when the ribbon was cut to signal the official hand-over of the houses to them. Happy wishes were expressed by several personalities, including religious dignitaries and public service representatives when the settlers proudly took over their new houses. Lucky faces of the people, both of parents and children, were to be seen as their desperate homelessness had come to an end. The settlers were hardly able to express in words how fortunate and thankful they were about their new houses. They seemed to understand that they could start a new life and to look with confidence towards a safe and happy future. Hopefully the houses of the villagers would soon change into their homes. Remembering the sad saying among the tsunami-afflicted people:

"*We have lost not only our houses, but even more our homes*."

Improvement of housing conditions

In the years to come after the opening of Ankkokawala village, several improvements were carried out in order to create better living and housing conditions to the villagers. Funded by the SLCNC, the following measures were carried out:

- tiling of the veranda floor
- tiling in the kitchen and bathroom/toilet,
- digging of a well for safe supplementary water besides the public running water system,
- building of a drainage system to prevent the sloppy terrain in the village from erosion after heavy rainfall,
- providing seeds and plants to the settlers for developing their gardens.

The government provided a new tarred road from a nearby village to Ankokkawala passing through the remaining rubber plantation. On this road a regular public bus service was also introduced that connected Ankokkowala village with Galle town.

All the additional improvements were happily welcomed by the settlers in Ankokkawala village.

… a decade under review

Reviewing the past nearly ten years, the focal questions arise:

- Were the tremendous efforts - including the high amount of money, respectively funds, involved in the village project - worth or not?
- What were the benefits of the project? What were deficits?
- What about the villagers satisfaction, respectively dissatisfaction?

It seems important that the SLCNC has regularly, year by year, paid inspection visits to Ankkokawala village aiming:

- to meet the villagers,
- to look into their well-being,
- to note the progress of the village development and the societal process of harmonisation among the settlers
- and to note the settlers' satisfaction, respectively dissatisfaction.

The following achievements at Ankokkawala village can be stated:

- the village has obtained a well-functioning infrastructure by transport as well as electricity and water,
- all ten families who live in the village have meanwhile become a community with a highly developed spirit for communal responsibility. People do meet, they come together, sit together, talk together
- settlers have also well developed a good taste of a reliable neighbourhood and even close friendship and understanding,
- people trust each other and are good partners,
- people pay much attention to their gardens by planting fruit trees and vegetables. People love their gardens and most of them are paying proud attention to them. Bananas and other fruit trees, like papaya and passion tree, are thriving well and bearing rich fruits. Meanwhile, even coconut trees have grown up and have become adult for rich harvests. Year by year, it has been possible to observe to which extent gardening was successfully intensified and developed,
- most villagers have even planted ornamental flower plants, including flower pots and orchids in baskets in front of the verandas,
- it is highly encouraging to observe to which extent the settlers have put all their efforts to make their homes and homestead gardens as nice as possible,
- the village is moving forward to become a 'green village', rich and prosperous in nature's blessings under tropical skies.

Yet, there must also be recognized some deficits at Ankokkawala village and to the settlers:

- the location of the village is obviously in the hinterland and hence off the main road as well as off the sea,
- the fishermen are quite far away from their fishing sites and they must travel every day some seven to eight kilometres to the sea as well home to Ankokkawala village,
- it is most important to maintain the access road to Ankokkawala village in good condition in order to continue a regular bus service,
- there is no shop or store as part of the village because it may be too small for same. Shopping even of the daily need must therefore be done in a village some kilometres away from Ankokkawala,
- there is no playground for the kids and also no sports field for the youth.
- life has obviously been changed; the open ocean and sea is no longer part of the family life.

Considering all the deficits, they are comparably small compared with the achievements.

Comparing both, the achievements and the deficits, it can be followed that Ankokkawala represents a village worth all the efforts that have been put in during the past ten years.

Summary

Considering the achievements of Ankokkawala village over the past decade, it can be followed that the village has developed towards a true village with a strong communal responsibility among the settlers. It can also be noted that happiness and satisfaction is around among all the people in the village.

It can hence be strongly stated that houses have meanwhile successfully turned into homes to the tsunami-afflicted people where to live happily with confidence and faith.

The happy faces of the settlers are expressing the best evidence of the successful village implementation and village development so far.

It must be appreciated as a sign of happiness to the Ankokkawala villagers that no family who settled down at the opening of the village a decade ago has left the place. All the 'pioneer' families still live in Ankokkawala.

The SLCNC must pay further continuous attention to the development of Ankokkawala village and to assist the villagers, as far as possible, in their needs for a pleasant and prosperous future.

Bring back the lessons learned to the beneficiaries!

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Introduction

In the aftermath of the 2004 Indian Ocean Tsunami, about 70'000 people were relocated in Sri Lanka, most of them due to the implementation of a Buffer Zone by the government, which prohibited the reconstruction of permanent housing along the coastline. Relocation of such a huge number of people was made possible through the involvement and financial support of International Aid Organisations. In this paper we first want to highlight the difficulties and long term impacts of (forced) relocation, asking why former lessons learned have not been sufficiently and sustainably incorporated in project planning and implementation, and second, why Aid Organisations did not accept weaknesses and directly attend to upcoming shortcomings. Finally, we show that they even were not ready to revive their projects and repair back better after evaluations/impact studies proved that beneficiaries and local governments suffer from long-term consequences of aid interventions.

Inexcusable errors

Qualitative, multidisciplinary and action research over a time period of almost 10 years resulted in a scientific PhD thesis[1] and a journalistic documentary film[2] on the one hand analysing, on the other hand documenting shortages and failures of how aid has being done and which sustainable and long-lasting impact it has on the lives of aid recipients in post-tsunami Sri Lanka. With the help of qualitative interviews (170) of aid recipients but also with local government authority, politicians and international/national aid workers (35) we visited more than 20 relocation villages and – to compare – about 10 places with in situ reconstruction. Finally we worked out oral and visualized histories from 6 relocation localities (South and East Sri Lanka) that were donor-driven managed by international but also national donors. All these examples clearly show weaknesses in project planning and implementation as well as too early withdrawal of donors. Fact is: 10 years post-tsunami we see a majority of relocation projects facing huge social, economic and technical difficulties.

One of the best researched examples of post-tsunami relocation failure is German Haritha Gama in Southern Sri Lanka: 90 houses co-financed and planned through a German Emergency Aid Organisation with the vision to create an eco-friendly and autarkic model village, built by a contractor, up to 18 kilometres away from the beneficiaries' former homes. Until today the village has no proper water supply, no decent access road and public transport; the remoteness hampers social and economic development. Half of the houses are abandoned and many of the others only temporarily used. Just 12 houses are permanently inhabited, and even those not all by the first recipients. The planned bakery has been alienated and is today the temple of a Buddhist monk and the kindergarten, the doctor's room and the market place have never served their purposes.

[1]Hollenbach, 2014: The Paradox of Good Intensions: private-giving in post-tsunami Sri Lanka
[2]Neuhaus, G. and Scudeletti, A. 2014: Buffer Zone. Sri Lanka – 10 years after the Tsunami, Documentary Film

This unacceptable situation is not a singular case but is found in various locations in Sri Lanka as well as in post-tsunami Aceh and Tamil Nadu (Barenstein & Pittet 2007; Duyner Barenstein 2015; Daly & Feener 2016; Jha et al 2010). Research shows that similar problems, in combination of other socio-economic and structural problems occur, in other post disaster relocation projects e.g. in Haiti or New Orleans (Chamlee-Wright & Storr 2010).

Left alone

The community of German Haritha Gama tried very hard to solve the problems after the implementing NGO closed their 3 years commitment in 2009. Villagers called attention for their non-liveable situation on different levels: they wrote letters to local politicians and administration, the NGO headquarter, private donors and even organised public protests in front of the Galle District Secretariat. Unfortunately without success! Even an enquiry of a private donor, who co-funded the project and is engaged in the village till today, to re-establish technical and financial support solving the water problem created by the project, received a negative answer from the organisation's headquarter in Germany. And long term strategies to stay involved creating a sustainable community, proposed by a former project manager, have also been rejected. The organisation's main argument for its non-reaction was that they wanted to avoid long term aid dependency of the beneficiaries and that humanitarian assistance would have a limited time frame – after which the local government needs to take over the long term responsibilities of development. A similar answer was given to the film team, requesting a comment to the outcome and obvious failures of the project.

In the end, all activities to bring back support to the people of German Haritha Gama remained unattended, although current studies prove that existing problems – mainly the lack of water and infrastructure - exceed the technical and financial capabilities of the housing beneficiaries as well as of the local government.

We find such devastating situations island wide, where implementing organisations refuse to face their mistakes and to repair back better.

No learning

Although several pre-Indian Ocean Tsunami studies emphasize the specific difficulties and complexities of post-disaster and development induced relocation (Cernea 1999; Fernando et al 2010), there was and there still is obviously no learning of lessons learned. We ask: Why not?

Although it was known that relocation projects need more time than in-situ reconstruction, Aid Organisations withdrew in most cases after maximum 3 years, after the houses were built. Their engagement did not take sufficiently into account the socio-economic development and integration of a decent livelihood in the new places.

Based on our experiences, we state that the majority of stakeholders in the Aid Industry are not willing to look at long term developments of projects once they have been handed over. They are even less ready to openly accept failures and mistakes and to change their implementing habits. In our opinion, one of the driving reasons is the competitiveness of the Aid Business: The donors' priority is to sustainably generate funds to keep their business going. Therefore, they put in front their own visibility and interests in Public Relation instead of prioritising the beneficiaries' needs and demands.

Furthermore international organisations tend to ignore or in cooperate local knowledge and expertise, especially in the identification, planning and developing phase of projects. They come in with their own standardised methods and products and devalue the importance of the socio-political, economic and

cultural context. The assumption is – even in complex relocation situations – that handing-over houses is a sufficient base to form a community. Therefor donors often phase out and hand over projects too quickly and most critically without sufficient knowledge-transfer into the responsibilities of local governments and beneficiaries. Given time constrains highlight that a truly participatory and integrated process is not possible, and even so-called owner-driven projects become a farce, as the owner is mainly driven by the donor's vision. In fact flexibility and adjusting to unforeseen circumstances is categorically denied as all decisions are subordinated to the so-called «goal-oriented process planning». Or as Ramlingam (2013) notes "…organizations spend all their time looking for the single right answer rather than diverse solutions; people spend more time trying to do things right than doing the right things; there is much more focus on knowledge transfer than on *knowledge creation*…" (26, emphasis added).

Need for change

What needs to be changed to overcome the existing rigid structures in the Aid Business? – The main problem: Aid Organisations are driven by own interests rather than the actual demands of beneficiaries. As a result, reconstruction projects targeting Disaster Risk Reduction often sustain the everyday disasters of the beneficiaries in the long run. To really fulfil their claim improving the lives of those in need – «to build back better» – Aid agencies and NGOs need to give up their resistance to honest self-development and self-reflection. If they are really ready to learn their lessons from existing findings, the first logical step would be, to give the profit of these learnings back to the former beneficiaries: Aid Organisations need to go back into their old fields of interventions and make justice to their failures. It is important to admit that there is no blueprint solution to post-disaster reconstruction. Real partnership therefor means that new contextualized knowledge needs to be created by local experts, governments and the recipients, together with their donors. We strongly urge to bring back the so-called beneficiaries back into the driver's seats of post-disaster reconstruction. This needs time and multidisciplinary skills, including intercultural communication, social science, transparency and project planning that allow agility in any project phase.

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Lessons on relief and recovery after disastrous events – Perception and satisfaction of relief workers

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Abstract

The perception and satisfaction of relief helpers and managers engaged in different forms of domestic and foreign aid concerning disastrous events is a crucial aspect in evaluating disaster relief actions and deriving lessons learned for future projects. This article firstly summarizes findings on the perception and satisfaction of relief workers presented in grey and scientific literature and highlights the literature's focus on recovery efforts concerning housing, logistics and planning as well as on the different stakeholders involved. Secondly, these findings from the literature are supported by insights from a survey carried out amongst different actors involved in disaster relief in several countries and cases. The results underline time constraints and information management as central aspects for limiting relief enablement. Moreover, contrary to other observations, certain key documents regarding Disaster Risk Reduction (DRR), especially the Sendai and Hyogo Frameworks are well known and also, at least to 61% evaluated as general useful by relief workers. This paper serves as a starting point for in-depth research on the satisfaction with disaster relief activities as one important part of effective DRR that includes immediate response but also long-term effectiveness of recovery measures and thus makes disaster relief not an isolated activity but integrated into DRR and development aspects.

Introduction

Disasters such as the Indian Ocean Tsunami in 2004, the earthquake in Haiti 2010, the Nepal Earthquake 2015,or many other so-called natural hazards (also cyclones, floods etc.) do not only attract global attention but also domestic as well as foreign aid in different forms. A few months or years after a disaster however this attention and aid decreases, as the mandates of humanitarian organizations end and media attention switches to other places or topics.

This article based on a survey generates an overview to which extent these different forms of domestic and foreign aid interventions were satisfying from the point of view of those persons who helped.

Help and aid can come in different forms to a disaster stricken community; search and rescue teams, people organising the logistics from abroad or, crowd sourced even from their home office. Consultants of NGOs, government, private sector and individuals, affected or not affected all belong to a world-wide community of people involved in aid and recovery after severe events such as a tsunami, cyclone or earthquake. Goods and services offered to improve immediate situations can vary strongly and the length of the recovery phase can be extended up to decades. Small-scale provision of food and water, but also large-scale housing projects or hazard barriers, just as less physically tangible services like knowledge or donations in form of money all belong to disaster aid and recovery.

While quite a number of lessons learned studies exists that address the time immediately after an event, as in the case of the 2004 Indian Ocean Tsunami, the number of studies published to reflect long-term learning

decreases significantly over the years after an event. In order to foster long-term learning and share experience on which recovery effects were effective and which were not sustainable, we carried out two activities; an expert seminar and a survey.

Background and motivation: Alumni Seminar

In context of the DAAD Alumni Seminar on the topic "11 Years After the Indian Ocean Tsunami 2004 – Lessons of Disaster Recovery, Rehabilitation and Resilience", carried out by TH Köln - University of Applied Sciences, Institute of Rescue Engineering and Civil Protection, the United Nations University - Institute for Environment and Human Security (UNU-EHS) and the Social Policy Analysis and Research Centre, University of Colombo (SPARC), 20 international participants from Asia, Latin America and Africa and various German and international experts in the field of Disaster Risk Management and Humanitarian Aid discussed topics of social resilience, buffer capacities of certain ecosystems to tsunami waves and the challenges of donation management and long-term ownership and responsibility for relief activities.

Especially two pressing questions were put into focus:

1. Have the different actors learned from the disaster and
2. Have processes of Disaster Risk Reduction (DRR) and livelihood improvement been implemented successfully and in a sustainable manner?

In discussing these questions, the satisfaction of helpers and managers who were engaged in providing different forms of domestic and foreign aid was highlighted - especially the need to evaluate these processes, thereby deriving certain lessons on how to improve them for future projects. The outcome of the seminar is documented by several scientific papers in this volume and in articles published in other journals (e.g. Stephan, Norf & Fekete, 2017).

The aim of this paper is to add empirical evidence to the main questions; answering which are different actors or stakeholder groups and investigating learning that takes place when critically reviewing and evaluating specific processes that take place during the recovery phase. Success and constraint factors for DRR are analysed, mainly regarding long-term learning and transfer lessons learned on DRR to other future events. In order to achieve these objectives, this short paper firstly looks into a selected body of literature and secondly adds some insights from a broadly designed survey carried out amongst different actors involved in disaster relief in several countries and cases.

Literature review on recovery efforts related to disasters

In order to provide a background for the specific research questions that will be addressed in the subsequent chapter, firstly it is relevant to describe the thematic frame of this paper. The literature review is limited in scope and depth, since the main intention is to identify key themes already existing, before future research will look into specific aspects in more depth.

Method of literature review

Literature review was conducted in January 2017 using the search engines Google Scholar and Google and analysing each 100 first hits regarding specified search terms such as „Satisfaction of Disaster Relief Helpers". One search process has been conducted in Google (not Google Scholar) with identical search words in order to analyse the differences in hits. The results showed that in regular Google search only few additional valuable scientific journal articles were found, however, substantially more surveys and grey literature

reports. While there is a breadth of reports from NGOs and others, such reports have not been included in this review, since it would exceed the scope of this overview paper.

The first 100 search hits were analysed regarding their relevance with regard to the scope of our paper. All abstracts have been analysed, stored and their key conclusions excerpted. Most articles were fully accessible through various university platforms, but not all, hence abstracts allowed for a comparable text source. However, relevant articles were also stored and analysed regarding full text. The selection of 'relevance' of course is highly subjective but is mainly an indication for the readers, which articles conduct research in a domain similar to our research direction in this paper. It should not be misunderstood as a general judgement on usability or quality. In order to remain consistent, search terms were used consistently, even if grammatically slightly incorrect or incomplete in certain variations such as 'satisfaction of disaster relief'. Each paper appears only once in the resulting selection, even when it would fit to several search term combinations (see table below). Only the search term combinations as shown in table 1 were used, no synonyms or British English equivalents such as 'organisations' – therefore, these articles might be missing. The literature review focuses on scientific journal articles and includes some edited books, monographies and different types of grey literature. Using only one specific search term such as "satisfaction" is limiting, other synonyms for satisfaction would be contentment, or gratification, for example. However, they were found even less frequent than satisfaction and therefore excluded in order to obtain a first consistent overview.

Search words	**Search engine**	**Papers analysed in depth and finally selected for this chapter**
SATISFACTION OF DISASTER RELIEF HELPERS	Google Scholar	3 out of 17
SATISFACTION OF DISASTER RELIEF SURVEY	Google Scholar	4 out of 13
SATISFACTION OF DISASTER RELIEF	Google Scholar	3 out of 12
SATISFACTION OF EMERGENCY ORGANIZATIONS IN DISASTER	Google Scholar	4 out of 9
SATISFACTION WITH THE HELP OF AID ORGANIZATIONS AFTER DISASTER	Google Scholar	1 out of 5
SATISFACTION OF DISASTER RELIEF SURVEY	Google	2 out of 11

Table 1. Search term combinations used to identify the publication basis for the literature review
Source: own elaboration

The sample is clearly too small to make statistically viable statements. Mainly, the preselection helps to separate papers more relevant to this literature review.

Results of literature review

The topic of satisfaction related to disaster relief is widely described in the literature as the brief literature search reveals. It is observed that disasters of recent times are analysed by various types of governmental and non-governmental organisations. Various aspects of disasters are analysed in the selected number of articles

(see Table 1). Many of them give overall summary descriptions of hazardous events, their processes, damages and counter measures. However, there also exists literature dealing not just with the disaster description or process analysis, but present reflections on how the event was handled and, identifying at the same time relevant gaps and future priority areas. As an example, the report entitled "Weaving Hopes after Disasters" (Xavier 2015) discusses long-term impact and beneficiary satisfaction of relief, rehabilitation and development programmes in India. The author realises that organisations need to introspect periodically how effective their interventions are in terms of reducing the adverse effects of disasters and the underlying social and economic inequalities, defining priorities and facilitating people's access to rights and entitlements by government. In order to accomplish this, there is a need to access systematic feedback by beneficiaries on their perception and appreciation of these activities. The report aims to attain this objective as it mainly intends to obtain a critical scientific analysis of the impact of different relief, rehabilitation and development activities within the Indian post-emergency rehabilitation programmes, focusing on the beneficiaries' perceptions and satisfaction. It further aims at recommending priorities in the combination of different intervention strategies in future post-disaster programmes.

Critical evaluation of recovery efforts – housing, logistics and planning

A critical review of temporary housing as a typical means of rapid relief for residents losing homes identifies as critical the issues of suitability (costs and environmental issues) and user-needs (cultural sensitivity) (Félix, Branco & Feio 2013). This is widely in line with a range of other studies showing that temporary housing projects, although designed by donors with good intentions, often lack the necessary sensitivity for local contexts and therefore does not consider user-needs adequately; other problems are lack of maintenance, proper integration with infrastructure and poor living conditions (Geipel 1982; Fernando 2012).

While logistics are a key resource for effective recovery, constraints in this area can be a lack of cooperation between logistics companies and users as well as a lack of transparency, trust, awareness of cultural specifics but also conflicts arising from relief capacities, role and interests of the companies (Schulz & Blecken 2010). The dependence of disaster relief logistics on the process chain and 'business continuity' in situations where disasters can also hamper the (critical) infrastructure and services themselves seems to be lacking awareness (Bozorgi-Amiri et al. 2012). Lifeline reconstruction as well as business reconstruction however, are key topics identified in a number of studies and reports (Brown et al. 2015; Giovinazzi et al. 2016; Seville et al. 2014, Suppasri et al. 2015).

Local differences concerning the measures applied also play an important role as to how effective or satisfactory relief processes are perceived. As an example, satisfaction with disaster relief after floods varied significantly between two affected communities in Kansas in 1998. A study showed that residents in Augusta were less satisfied than those in Arkansas City due to shorter lead-time for warnings issued by city officials (Paul 2002). Local differences and different contexts are a general major aspect to observed not only in disaster-relief activities but also in cases of long-term recovery and planning. For example, application of measures after the Indian Ocean Tsunami in 2004 such as buffer and risk zonation levels vary in locations and countries affected by the Tsunami (Fernando 2012**,** Suppasri et al. 2015). Planning and land use management are however just one part of issues next to internal conflicts and education, this study finds.

Different stakeholders under analysis

Quite a number of studies focus on the perceptions of and satisfaction with disaster relief and recovery from the perspectives of victims or people affected. For example, studies elaborated after the earthquake in Nepal

2015 have analysed household's perceptions about disaster relief. One study finds dissatisfaction with recognition of communities, role of government and NGOs, information, recovery progress but also concerning distribution fairness and inclusion of women (Accountability **l**ab 201**6**). This study combines often used demographic factors with vulnerability/resilience factors, which are the prevailing concepts used in Disaster Risk Reduction today.

While a many papers in our selection analyse perspectives of affected people, some papers focus on distinct groups. A study carried out after the Wenchaun earthquake in China in 2008 analyses the perspectives of local officials and social protection organisations regarding relief effort and reconstruction coordination (Salazar et al. 2011). Resilience mechanisms identified for officials are

> *"flexible leadership structures, high corps solidarity, personal commitment because many officials were victims of the disaster as well, a very concentrated surge in the use of existing resources, a well organised central government response that provided both resources and administrative back-up, and a very streamlined and simple structure of early assistance that did not tax the already exhausted administrative resources"* (Salazar et al. 2011, p 2).

Relief workers are another stakeholder group analysed. Challenges for these workers were documented to be psychological stress, personal and institutional constraints, but also issues such as cultural differences, attitudes, coordination and participation as well as a range of other factors (Soliman, Lingle & Raymond 1998) One study discussing the experiences of volunteer relief workers highlights aspects such as "shock, fatigue, anger and grief as well as sleep disturbances; frustration with leadership; and life-changing personal transformation" (Clukey 2010). However, also health impacts are observed such as respiratory diseases following relief after the Bam earthquake, for example (Ardalan et al. 2015). Increasingly, attention is paid to the mental well-being of people involved in disasters, of disaster victims as well as relief helpers. Investigations cover the ability to monitor mental well-being and detect psychological distress during real disaster relief missions (van der Auwera, Debacker & Hubloue 2012).

In surveys carried out amongst relief workers and volunteers after major river-floods of national importance in Germany, questions of success and satisfaction were however found not much addressed in specific regions and cases so far and answers of respondents were sometimes contrary to expectations. For instance, a surprisingly high number of respondents in one survey illustrated the need for such assessments addressing the relief workers themselves in the aftermath of the event. While some factors for improvement could be discerned from over 3000 responses, overall satisfaction with the relief work was given (Bentler, Baumgarten, Fekete – in this volume). In another survey, volunteers were asked for motivational factors and, contrary to expectations, the fun factor not always seems to be the dominant factor for motivation (Fathi et al. 2015)**.**

Survey on Satisfaction of Disaster Relief helpers and Managers

The literature review revealed several topics and issues relevant for the satisfaction of different actor groups with disaster recovery. In this article, we have selected the topic of satisfaction perceptions by relief workers as we consider it a highly relevant topic that needs to be addressed in disaster research. Previous studies carried out at our institute as well as other scientific studies allow the formulation of the hypothesis that the motivation of volunteer or professional relief workers to be ready to support disaster situations in the future is influenced strongly by the satisfaction and experience with past relief activities. As effective DRR depends on motivated staff that engages in immediate relief activities in disaster situations and this can influence

even subsequent long-term recovery processes it is relevant to address questions of satisfaction of relief workers. Thereby, this paper puts a starting point to investigate a highly relevant topic in disaster risk science, which is not covered much by other studies yet in our context in Germany.

In order to analyse the satisfaction of disaster relief helpers and managers we conducted an anonymous web-based survey in 2016. The 25 closed questions cover relevant background information such as gender and age as well as questions about the application of specific policy statements and frameworks in practical work. However, the main emphasis was given to the satisfaction of disaster relief helpers and managers concerning the event in which help was provided and possible reasons fostering or hindering satisfaction. The survey was first published online on May 18th 2016 and was active for two months until July 18th 2016. 40 helpers and managers gave answers about their satisfaction concerning their involvement in aid and recovery after extreme events. Even though advertisement was broad, only few answers were given, but reasons for such low participation are not known.

40 persons who had been working in aid and recovery projects participated in this survey, 37 of them indicated their gender, 57% (N=21) of them male and 43% (N=16) female and the majority is between 40 and 59 years old. The professional backgrounds of the survey participants vary, for instance some work in rather technically focussed professions such as civil or coastal engineering, others in the field of political geography or social work. This overview will show three examples of the outcomes, while the whole survey and the results will be published in a full article at a later point in time.

During the operation of relief work carried out immediately after the disaster event, the main constraints hindering effectiveness of the survey respondents´ work is shown in the following chart (figure 1). Time constraints and uncertainty provoked by a lack of information and guidance seem to have been the most important constraints for any type of major disaster event. Obligations with their main job is next, however, family obligations seem to be important to a much lesser extent. Psychological and emotional stress is mentioned by a third of the participants, and even physical or mental violence seem to be factors impairing working conditions.

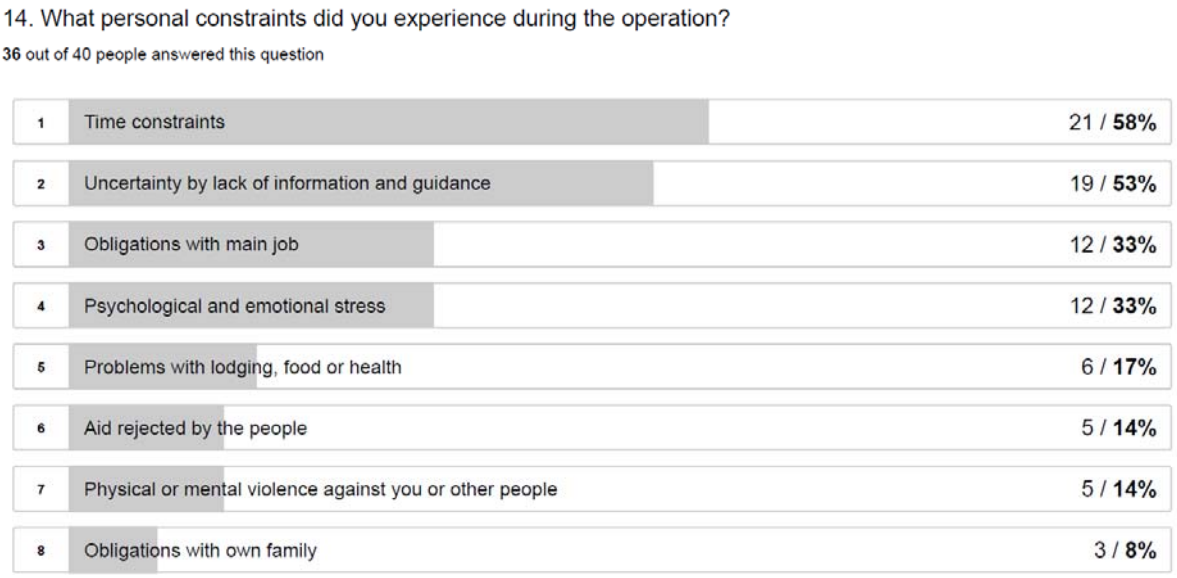

Figure 1. Personal constraints experienced during the operation
Source: own elaboration

We were also interested to investigate how international guidelines and framework documents were influential, since they are strongly promoted at international level. The following questions should help to find out how this promotion is perceived by the aid workers and managers themselves.

Looking at the general relevance of policy statements and frameworks in aid operations, the survey found that 68% are aware of the "Sendai Framework for Disaster Risk Reduction 2015-2030" adopted by the UN General Assembly in 2015 (United Nations 2015) and 63% of the predecessor from 2005, the "Hyogo Framework for Action" (United Nations/ISDR 2005). However, 21% have not heard about at least one of them and only 50% of the interviewees who know either one or both frameworks do not know operations where they are or were used (figure 2 and figure 3). The other 50% who know operations in which the frameworks were applied, rate the general usefulness of them with 61% and 17% assigned them a key role in their aid operations (figure 4). These results underline the need to communicate those frameworks and their usefulness for aid operations more effectively so their application increases. However, it has to be mentioned here that even though a framework name may not be known to staff members this does allow simple assumptions that the principles of these documents are not put into practice through the organisation. Therefore, scientific analysis of the translation of general framework documents and guidelines into practical action in relief and recovery has to be carried out in a detailed manner in upcoming studies.

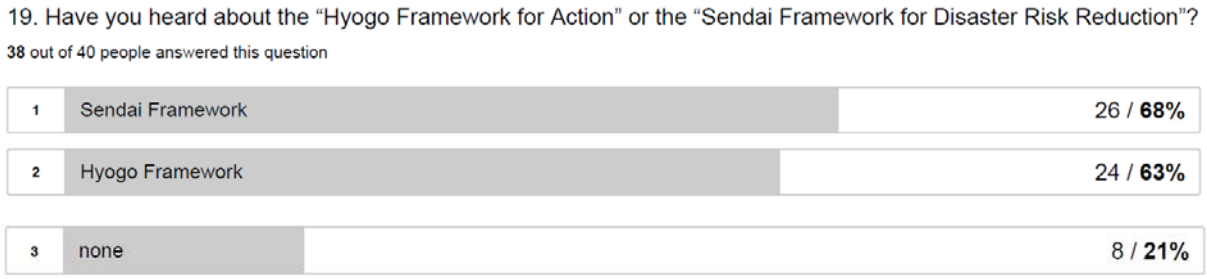

Figure 2. Knowledge about the „Hyogo Framework for Action" or „Sendai Framework for Disaster Risk Reduction
Source: own elaboration

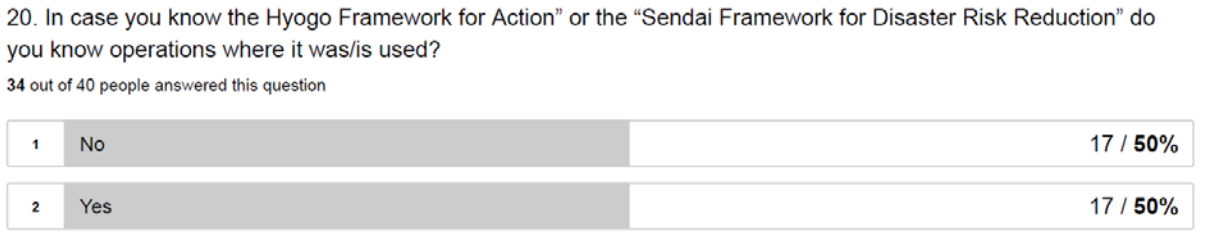

Figure 3. Knowledge about operations where programs was/is used
Source: own elaboration

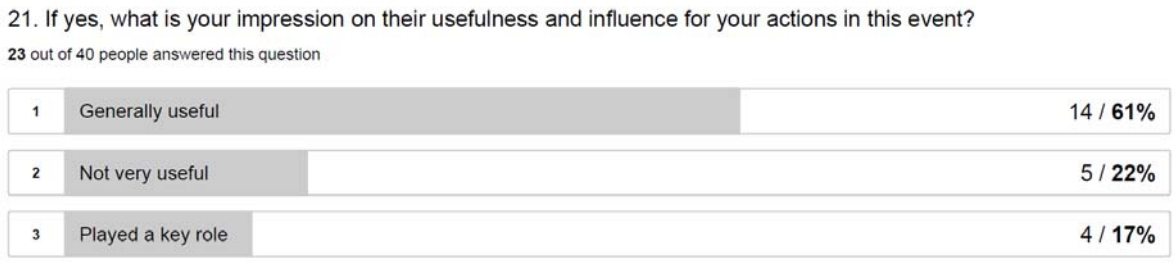

Figure 4: Usefulness and influence of these programs
Source: own elaboration

Moreover, we were interested to find out which type of document was helpful for disaster relief helpers – were it guidelines, maps or lately very prominent communication tools such as social media? Most respondents found practical guidelines related to crisis management, emergencies, risks, as well as safety and security, helpful. 29% evaluated the contribution of academic publications helpful, 19% maps of risk

areas and 5% other maps. Social media and travel guides were not mentioned which might indicate a less relevant role in the past aid operations.

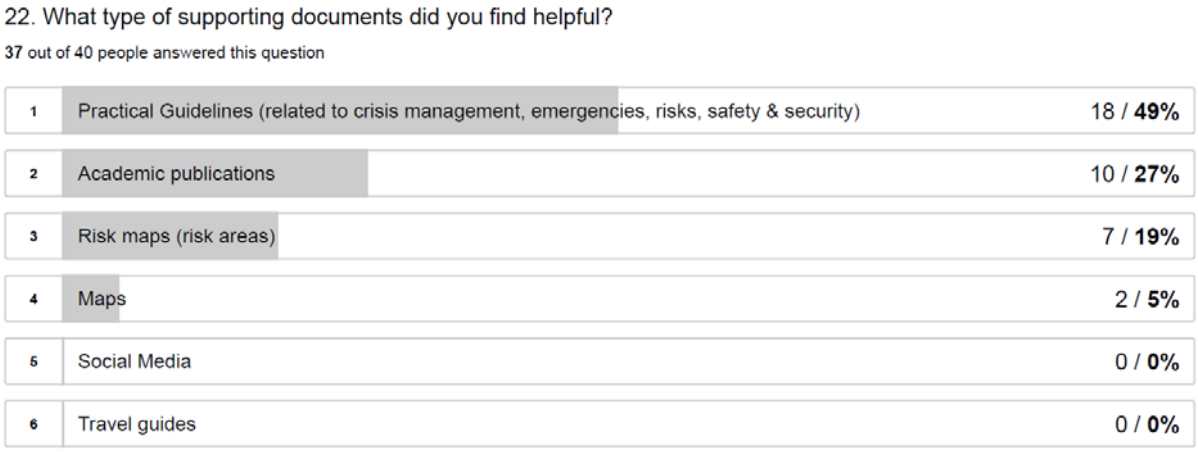

Figure 5. Type of helpful documents
Source: own elaboration

Conclusion

This short paper aimed at revealing how those actors involved in a disaster experienced relief activities and their short- or long-term effects. The paper mainly focused on relief workers, less on people affected.

In many respects, this article is limited in scope and transferability, however, some insights seem to match with other studies. Personal constraints mentioned in our survey (Figure 1) show similar outcomes compared to similar studies in our literature review. Time constraints and information management appear to be key aspects for limiting relief enablement.

Another interest was finding out how certain documents regarded as guiding documents are known and perceived by relief workers as those being one group of often envisioned 'end-users'. Interestingly, and contrary to observations at national context in other workshops we have conducted, the Sendai and Hyogo Frameworks are quite well known (Figure 2) and also, at least to 50% also being used (Figure 3).

This survey highlights only a tip of the iceberg of topics to be covered to better understand which recovery efforts were effective and which were not, when comparing to the breadth of topics illustrated in our brief literature review. 40 respondents in our survey also do not allow for any type of generalisation or transfer of the results shown. However, we found also in another survey carried out after a major flood event in Germany that there exists a need to ask the relief workers themselves how they perceived their role and what they know about the sustainability of their actions (Baumgarten, Bentler, Fekete, in this volume). More studies such as these seem necessary, but also the long-term monitoring not only of the hazards, and risks, but also of the recovery processes and lessons learned in the direct aftermath.

Even though the empirical scope of this paper is not wide, the survey can be seen as a starting point for more intense research on the satisfaction with disaster relief activities. This is one important part of contributing to effective DRR, including immediate response but also long-term effectiveness of recovery measures and making disaster relief not an isolated activity but integrated into DRR and development aspects.

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Annex: Full survey results

1) How often did you receive a similar survey request (in the last 5 years)?
40 out of 40 people answered this question

1	never	21 / **53%**
2	more than 5 times	8 / **20%**
3	2-5 times	7 / **18%**
4	once	4 / **10%**

2) In which event did you provide help (on the spot or from outside)?
28 out of 40 people answered this question

1	Indian Ocean Tsunami 2004	18 / **64%**
2	Nepal Earthquake 2015	10 / **36%**
3	Haiti Earthquake 2010	9 / **32%**

3) Thinking about your enrolment in the operation from today´s perspective: What is your overall satisfaction with your operation?
38 out of 40 people answered this question

1	Satisfied	21 / **55%**
2	Not satisfied	9 / **24%**
3	Very satisfied	7 / **18%**
4	Very unsatisfied	1 / **3%**

4) In what time (after the disaster event happened) did you start your activity?
38 out of 40 people answered this question

1	Directly (After 1-6 days)	20 / **53%**
2	After 1-3 weeks	6 / **16%**
3	After 1-2 months	5 / **13%**
4	After more than 12 months	5 / **13%**
5	After 3-6 months	1 / **3%**
6	After 7-12 months	1 / **3%**

5) How long did you work in the operation?
38 out of 40 people answered this question

1	Up to one month	13 / **33%**
2	1-6 months	9 / **23%**
3	1-3 years	8 / **21%**
4	Up to one week	5 / **13%**
5	7-12 months	2 / **5%**
6	More than 3 years	2 / **5%**

6) What role did you have in the aid operation?
39 out of 40 people answered this question

1	Professional (more than 3 years of experience)	21 / **54%**
2	Young Professional (1-3 years of experience)	7 / **18%**
3	Trained volunteer	4 / **10%**
4	Self-organized helper with experience (from the country)	3 / **8%**

5	Untrained volunteer	3 / **8%**
6	Untrained and self-organized helper (from the country)	1 / **3%**

7) Were you mainly working alone or in a group of helpers?
38 out of 40 people answered this question

1	Larger group or organisation	30 / **79%**
2	2-3 People	5 / **13%**
3	4-6	5 / **13%**
4	Alone	2 / **5%**

8) In what type of organizational structure had you been working within this operation?
39 out of 40 people answered this question

1	Non Governmental organisation	17 / **44%**
2	Governmental institution	16 / **41%**
3	Other	3 / **8%**
4	Private	3 / **8%**

9) What kind of work did you do in this operation?
39 out of 40 people answered this question

1	Desktop work (planning, analysis, decision-making)	23 / **59%**
2	Social Work	8 / **21%**
3	Physical work (for example, construction, transport).	5 / **13%**
4	Medical aid and treatments	2 / **5%**
5	Administrative	1 / **3%**

10) Have you been working in a similar operation again?
39 out of 40 people answered this question

1	Yes	28 / **72%**
2	No	11 / **28%**

11) Would you be willing to work in a similar operation in the future?
39 out of 40 people answered this question

1	Yes	39 / **100%**
2	No	0 / **0%**

12) What personal constraints did you experience during the operation?
36 out of 40 people answered this question

1	Time constraints	21 / **58%**
2	Uncertainty by lack of information and guidance	19 / **53%**

3	Obligations with main job	12 / **33%**
4	Psychological and emotional stress	12 / **33%**
5	Problems with lodging, food or health	6 / **17%**
6	Aid rejected by the people	5 / **14%**
7	Physical or mental violence against you or other people	5 / **14%**
8	Obligations with own family	3 / **8%**

13) From which sources did you receive information about your operation area after your help?
38 out of 40 people answered this question

1	Colleagues	21 / **55%**
2	Public media	18 / **47%**
3	Public/ private Officials	18 / **47%**
4	Your funding agency/ operation leader	17 / **45%**
5	Friends or family	5 / **13%**

14) Did you find this information sufficient and the way it was provided satisfying?
37 out of 40 people answered this question

1	yes	24 / **65%**
2	partly	10 / **27%**
3	no	3 / **8%**

15) Have you heard about the "Hyogo Framework for Action" or the "Sendai Framework for Disaster Risk Reduction"?
38 out of 40 people answered this question

1	Sendai Framework	26 / **68%**
2	Hyogo Framework	24 / **63%**

16) In case you know the Hyogo Framework for Action" or the "Sendai Framework for Disaster Risk Reduction" do you know operations where it was/is used?
34 out of 40 people answered this question

1	No	17 / **50%**
2	Yes	17 / **50%**

17) If yes, what is your impression on their usefulness and influence for your actions in this event?
23 out of 40 people answered this question

1	Generally useful	14 / **61%**
2	Not very useful	5 / **22%**
3	Played a key role	4 / **17%**

18) What type of supporting documents did you find helpful?
37 out of 40 people answered this question

1	Practical Guidelines (related to crisis management, emergencies, risks, safety & security)	18 / **49%**
2	Academic publications	10 / **27%**
3	Risk maps (risk areas)	7 / **19%**
4	Maps	2 / **5%**
5	Social Media	0 / **0%**
6	Travel guides	0 / **0%**

19) What is your age?
36 out of 40 people answered this question

1	50-59	11 / **31%**
2	40-49	10 / **28%**
3	30-39	8 / **22%**
5	20-29	2 / **6%**
6	1-19	1 / **3%**
7	70-79	0 / **0%**
8	80 up	0 / **0%**

20) Gender
37 out of 40 people answered this question

1	Male	21 / **57%**
2	Female	16 / **43%**
3	Other	0 / **0%**

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Volume 1/2017 Norf, C, Stephan C & Fekete, A (Eds.) 2017 Interdisziplinäre Perspektiven des Risiko- und Krisenmanagements - Beiträge aus Wissenschaft und Praxis im Rahmen der Veranstaltungsreihe „Risky Monday". In: Integrative Risk and Security Research, 1/2017, Cologne.

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