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

by MM MMN

Submission date: 15-Mar-2024 10:42AM (UTC+0700)
Submission ID: 2320840193
File name: Equipaje_et_al_2017_Resilient_Design_Community_Structures.pdf (636.26K)
Word count: 5056
Character count: 28475

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

Ruth Marie I. Equipaje[1], Shirleyana[2] & Cut Yulvizar[3]

[1]University of Santo Tomas, Philippines
[2]Department of Architecture, Widya Kartika University, Indonesia
[3]Department of Biology, Syiah Kuala University, Indonesia
Email: ruth.equipaje@gmail.com; shirleyana@widyakartika.ac.id; yunda_mnz@yahoo.com

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

1

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

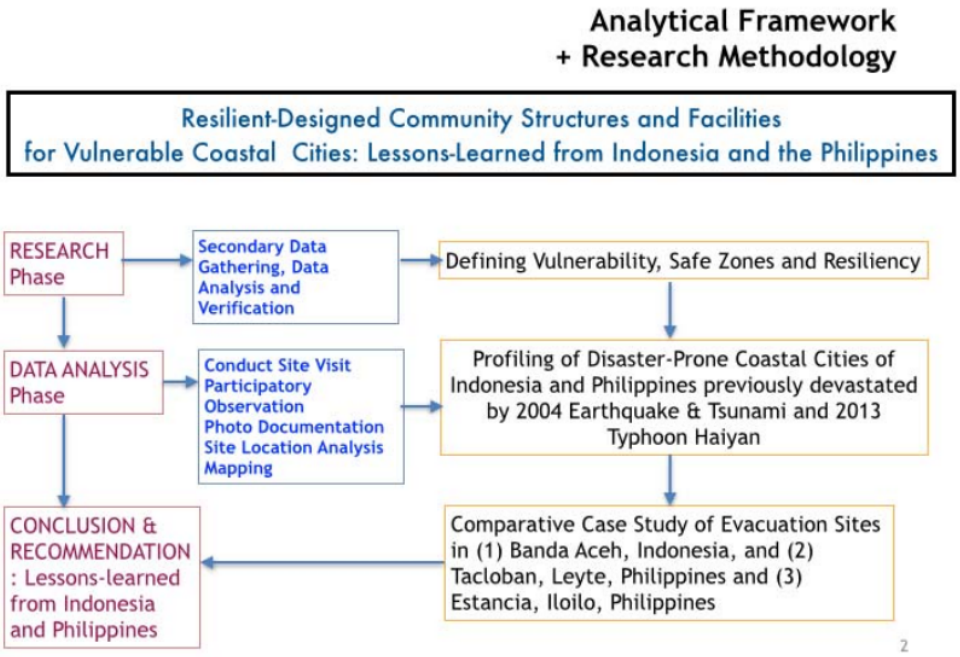

Figure 1. Research Framework
Source: Own elaboration

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 Rrights (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.

References

ADRA (2013) Rapid Needs Assessment of Iloilo and North Eastern Panay. November 23, 2013.

Badan Rekonstruksi & Rehabilitasi/ Reconstruction and Rehabilitation Agency (BRRR) & partners (2006). *Aceh and Nias. Two Years after theTsunami. 2006 Progress Report*.

ICCM (2014). Bunkhouse Assessment Report of 2014.

Dahuri, R. and Dutton, I.M., 2000. Integrated coastal and marine management enters a new era in Indonesia. *Integrated Coastal Zone Management, 1*(1), pp.1-16.

Diposaptono S (2005) Tsunami research needs to support the management integrated coastal area in Indonesia. In Sadikin A, Aprijanto, Wibawa B, Sujoko SU, Suranto, editor. Seminar Proceeding: *Research on tsunami hazard and its effects on Indonesia coastal region (2002-2003-2004).* Jogjakarta: Tsunami Research Center, BPP Teknologi dan Jakarta: BPPT-Press. pp: 207-233. [In Indonesian]

Fakhrurrazi (2010). *Reshaping Banda Aceh; Planning a better city in coping with future hazard of tsunami*. Thesis Report. Urban Climate Studio, Department of Urbanism, Faculty of Architecture, TU Delft.

Gillespie D F and C L Streeter (1987). Conceptualizing and Measuring Disaster Preparedness. International Journal of Mass Emergencies and Disasters Vol. 5 (2): 155 -176

Giddens, A. (2009). The Politics of Climate Change. UK: Polity Press.

Gonzales, M 2005, Map of Iloilo with Estancia highlighted. Available from: https://en.wikipedia.org/wiki/Estancia,_Iloilo#/media/File:Ph_locator_iloilo estancia.png [24 August 2017].

HLURB (Housing and Land Use Regulatory Board) (2008). *Revised Implementing Rules and Regulations For BP 220(with amendments).*

ICC (International Code Council) (2015). 2015 International Building Code. Retrieved from: https://codes.iccsafe.org/public/document/code/542/967724C0 [last accessed July 26, 2017]

Japan Study Support (JPSS). Lectures for Foreign Students on Disaster Control. Where to evacuate. http://www.jpss.jp/en/life/crisis/5/ [last accessed May 10, 2016].

Latief, H., Sengara, I.W. and Kusuma, S.B., 2008. Probabilistic seismic and tsunami hazard analysis model for input to tsunami warning and disaster mitigation strategies. In *International Conference for Tsunami Warning* (ICTW) Bali Indonesia.

Mercy Corps (2013). *Quick facts: What you need to know about Super Typhoon Haiyan*. Retrieved from: http://reliefweb.int/report/philippines/quick-facts-what-you-need-know-about-super-typhoon-haiyan#sthash.tn5ZwrLW.dpuf [last accessed July 26, 2017]

Panjwani, D. (2013). The Effects of Resettlement on Community Recovery: An Analysis of Post Tsunami-Aceh, Indonesia. Thesis Report. The Faculty of Graduate and Postdoctoral Studies, University of British Columbia, Vancouver.

Purbani D (2012) Tsunami Mitigation Strategies Based on the Mangrove Ecosystem Application Space Utilization Beach. Dissertation. Institut Pertanian Bogor. Bogor [In Indonesian]

Roaf, S. Crichton, D, Nicol, F. (2005). Adapting Building and Cities to Climate Change. Oxford: Elsevier.

Ruswandi (2009). Model Development Policy Coastal Region Perspective of Sustainable and Mitigation of Natural Disasters in Coastal Indramayu and Ciamis. Dissertation. Institut Pertanian Bogor. Bogor [In Indonesian]

Tacloband Hotels n.d., Location of Tacloban City, Leyte, Philippines. Available from: https://www.taclobanhotels.com/TACLOBAN-MAPS.htm [24 August 2017].

UN (United Nations) (2015). *Sendai Framework for Disaster Risk Reduction 2015 – 2030*.

UNISDR (United Nations Office for Disaster Risk Reduction UNISDR) (2005*). Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters***.** World Conference on Disaster Reduction. 18-22 January 2005, Kobe, Hyogo, Japan. A/CONF.206/6. UNISDR.

USAID (US Agency for International Development) (2014). Philippines- Typhoon Yolanda/Haiyan. Retrieved from: https://www.usaid.gov/sites/default/files/documents/1866/philippines_ty_fs22_04-21-2014.pdf [last accessed July 26, 2017]

Villar, E. 2003, Map of the Philippines showing the location of Iloilo. Available from: https://en.wikipedia.org/wiki/Iloilo#/media/File:Ph_locator_map_iloilo.png [24 August 2017]

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

ORIGINALITY REPORT

7%	6%	5%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	gsdrc.org Internet Source	1%
2	link.springer.com Internet Source	1%
3	www.gsdrc.org Internet Source	1%
4	ipsdi.org Internet Source	1%
5	architecture.brookes.ac.uk Internet Source	1%
6	outbreakwatch.blogspot.com Internet Source	<1%
7	J. M. Hills, D. Alcock, T. Higham, H. Kirkman, M. Le Tissier, C. Pagdilao, P. C. Samonte, T. F. Smith. "Capacity Building for Integrated Coastal Management in Asia-Pacific: The Case for Case Studies", Coastal Management, 2006 Publication	<1%

8	Reidar Staupe-Delgado, Bjørn Ivar Kruke. "El Niño-induced droughts in the Colombian Andes: towards a critique of contingency thinking", Disaster Prevention and Management: An International Journal, 2017 Publication	<1 %
9	bacolodcitynegrosoccidental.news.blog Internet Source	<1 %
10	jicari.repo.nii.ac.jp Internet Source	<1 %
11	Harald N. Røstvik. "Does research results have an impact? Climate change and building insulation", Advances in Building Energy Research, 2013 Publication	<1 %
12	www.rius.ac Internet Source	<1 %
13	Raju J. Das, Deepak K. Mishra. "Global Poverty", Brill, 2022 Publication	<1 %
14	www.coursehero.com Internet Source	<1 %
15	Graham Spinardi, Luke Bisby, Jose Torero. "A Review of Sociological Issues in Fire Safety Regulation", Fire Technology, 2016 Publication	<1 %

16	tjaglcs.army.mil Internet Source	<1%
17	Havidán Rodríguez, Enrico L. Quarantelli, Russell R. Dynes. "Handbook of Disaster Research", Springer Science and Business Media LLC, 2007 Publication	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		