

Empowering Three High-Risk Communities of Iligan City, Philippines in the Creation of Barangay Disaster Risk-Sensitive Shelter Plans

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ABSTRACT

Barangays Hinaplanon, San Roque, and Santiago of Iligan City, Philippines, experienced the harsh tropical storm Washi, which claimed more than a thousand lives and rendered the people homeless. The three barangays were chosen to implement the Barangay Disaster Risk-Sensitive Shelter Plan (BDR-SSP) based on their exposure to hazards and a discernable significant number of high-risk households that needed priority interventions. Community volunteers did a participatory situational analysis on the area's physical, cultural, environmental and socio-economic conditions. Findings showed that the households from the three high-risk barangays live in danger zones, which are vulnerable to disasters. They are living on unsecured land and in unsafe house structures. In addressing their shelter needs, livelihood needs, and basic needs, the three barangays prepared their disaster risk-sensitive shelter plans with support from their respective barangay councils. These councils endorsed their shelter plans for inclusion in the Annual Investment Program of Iligan City. At present, about 70% of households are relocated to safe settlements with access to livelihood opportunities and essential services. Some projects are still on-going. Local governments must adopt the BDR-SSP approach of empowering the poor by giving them a voice in planning for recovery from disasters for poverty reduction and sustainable development.

KEYWORDS: disaster risk-sensitive shelter plan; participatory action research; participatory situational analysis; Tropical Storm Washi; San Roque; Santiago; Hinaplanon; Iligan City, Philippines

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1. Introduction

This interventional study of the Community Extension and Social Development Services, Inc. (ICES Dev) of Iligan Medical Center College in partnership with Alternative Planning Initiatives, Inc. (ALTERPLAN), a technical service non-governmental organization (NGO) for housing development, and the Danish International Human Settlement Service (DIB) empowered three high-risk communities to create their own disaster risk-sensitive shelter plans. The three

barangays (smallest political unit) of Hinaplanon, San Roque, and Santiago of Iligan City, Philippines, were the most hit by tropical storm Washi (local name: Sendong) when it caused a river tsunami in December 2011. Barangay San Roque, located upstream of Mandulog River, lost about 200 lives [1]. Hinaplanon, situated midstream to the downstream of the river, lost about 700 lives [2]. Santiago, located where the downstream river meets the sea, lost about 300 lives [3]. The Iligan City Disaster Risk Management Council recorded 1,272 deaths (identified bodies), of which 566 are still missing, and estimated Ph 3,47,643,000.00 as initial damage cost, which is about US\$81.4 million [4]. The Council also reported that at least 7,911 houses were destroyed and 14,874 were partially destroyed [5].

The destruction in Iligan City is worse than the devastation in Cagayan de Oro, and comparable to the destruction in Guinsaugon, Southern Leyte in 2006. It was observed that when the 250-350 mm of rain was dumped into the 50 km-long Mandulog River, it produced a tsunami-like surge that cut a bridge and killed everyone on its path [4]. The tsunami-like wave of Mandulog River was described as follows:

based on the assessment of the UP Institute of Geological Science, the stream network from the upland to the lowland generated floodwaters 7 to 10 meters high that carried tons of trees and eroded debris that cascaded toward the river communities and wiped-out villages with incomprehensible force" (Rappler, Perfect Mix for Disaster) [6].

The Global Climate Risk Index (CRI) 2013 ranked the Philippines as the 5th most-affected country exposed to extreme weather events for the year 2011 [7].

Iligan City, the study site, is a highly urbanized city in Northern Mindanao, Philippines. It is geographically located in the province of Lanao del Norte. It has a total land area of 813.37 km². It has 44 barangays with a total population of 342,618 [8,9]. It is bounded on the north by the three municipalities of Misamis Oriental, to the south by Lanao del Norte and Lanao del Sur, to the north-east by Cagayan de Oro City, to the east by Bukidnon, and to the west by Iligan Bay.

1.1 BDR-SSP Project Conception

The BDR-SSP project was conceptualized in 2015, almost four years after tropical storm Washi (local name: Sendong) had come and gone. The study was done for a year, from March 2015 to February 2016. It was introduced by the ALTERPLAN, a technical service NGO for housing development, with the DIB, also a non-government organization as its partner. ALTERPLAN and DIB piloted the BDR-SSP in Legaspi City in 2013, involving nine high-risk communities of the city, and was found to be successful [10].

The Iligan Medical Center College ICES Dev was looking for partners in giving interventions to the tropical storm Washi (local name: Sendong) survivors when ALTERPLAN and DIB offered to work with them. The high-risk barangays of Hinaplanon, San Roque, and Santiago of Iligan City, Philippines, were chosen as the study beneficiaries.

A consultative meeting was held involving the officials of the local governments of Hinaplanon, San Roque, and Santiago, the Head of the Iligan City Housing Board, the Head of the City Planning and Development Office, and the Head of the Iligan City Disaster Risk Reduction and Management Office with the President of Iligan Medical Center College and representatives from ALTERPLAN and DIB to discuss the feasibility of the project. These stakeholders expressed their interest in supporting the project and be actively involved in it. The project's goal is to relocate households from the three high-risk barangays to safe settlements to accessible locations, where they could have opportunities for livelihood and essential services. A Memorandum of Agreement specifying each stakeholder's roles was drawn, and the BDR-SSP project was formally launched on March 15, 2015.

As embodied in the Local Government Code of 1991 [11] and the Urban Development and Housing Act of 1992 (Republic Act 7279) [12], it is the primary responsibility of the Local Government Units (LGU) to implement shelter planning for its people who are underprivileged and homeless. The shelter planning guidelines are found in the Local Shelter Planning Manual of the Housing and Urban Development Coordinating Council of the Philippines [13].

The BDR-SSP project is in line with Republic Act 10121, otherwise known as the "Philippine Disaster and Risk Reduction Management Act of 2010," which adopted universal norms of humanitarian assistance for people who are displaced by disasters [14]. The law supports the integration of disaster risk reduction into local development plans, programs, and budgets for poverty reduction and sustainable development.

The City Ordinance of Iligan Number 13-6125 entitled "An Ordinance Institutionalizing and Strengthening the Iligan City Disaster Risk Reduction and Management System Pursuant to and in accordance with RA 10121 and providing funds thereof" mandates the organization of disaster risk reduction and management committees to facilitate disaster management programs and support contingency planning activities at the local level and provide budgets for disaster mitigation and poverty reduction [15].

In guiding the flow of this research project, ALTERPLAN mentored the 15 participants of the study and the researchers through a series of learning visits that were held every month. Each visit was a three- to five-day skills development and capacity building on Participatory Situational Analysis activities, including data gathering, data processing, and decision-support activities.

Several scholarly publications and applied research reports were explored to determine the authors' approaches to attaining the study's objectives. Several researchers described how the high-risk communities from nine barangays in Legaspi City prepared their Disaster Risk-Sensitive Shelter Plans (DR-SSP) [16]. The BDR-SSP project's main goal was to promote disaster risk responsive safe settlements for government shelter programs and policies. The BDR-SSP approach was pilot tested in the nine high-risk coastal barangays of Legazpi City. The community participants of the study were involved in the whole process of research using the Participatory Situational Analysis (PSA) approach.

The International Federation of Operational Research Studies (IFORS) congregated in Barcelona, Spain, in 2014, and two of ALTERPLAN's members presented their study. It was argued that the development of analytical methods and systematic procedures through the participatory situational analysis was central to the success of the Disaster Risk-Sensitive Shelter Planning project that was piloted in nine high-risk barangays of Legaspi City, Philippines [10]. The data gathering, information processing, and decision-support system employed several qualitative and quantitative tools that include: Participatory Socio-Economic Survey, Physical Data Gathering with Global Positioning System (GPS), Creation of Community Resource and Barangay Profiles, Composite Mapping of Hazards and Interventions, Structural Analysis and Risk Assessment, and Strategy Formulation and Advocacy Matrix.

A proactive approach to disaster management through risk-sensitive land use planning and zoning must be considered a high priority [17]. Geo-hazard information shown in hazard and vulnerability maps informs people on locating settlements that are not hazardous [17]. Serote, the author in the study, created the Rationalized Local Planning System (RLPS) for the Department of Interior and Local Government (DILG). The author's concept on land use planning and zoning was adopted by ALTERPLAN in DR-SSP and voluntary compliance to land use and building codes are among the policies observed by the communities concerned in shelter planning. Similarly, disaster risk-reduction through emergency response, mitigation, resilience, and preparedness must be consciously and deliberately fused into community planning so that people will voluntarily protect the environment and themselves and seek voluntary compliance to building codes in building their shelters, to assure them of safety in times of disasters [18].

Beard examined the capacity of community-based planning to address two aspects of poverty in informal settlements in Southeast Asia (Chiang Mai, Thailand, Phnom Penh, Cambodia, and Yogyakarta, Indonesia) [19]. First, she looked into household poverty manifestations such as inadequate housing and lack of access to infrastructure and services, and second, the structures and forces that create and sustain poverty. Findings revealed that communities could use collective action to address their material deprivation effectively, but not the broader social, political, and economic forces that create and sustain poverty. She commented that when solutions are local and short-term, the larger structural factors that cause and perpetuate poverty remain unchallenged. These structural factors include the state, private developers, corporations, and other economic elites whose interests are served by the commodification of urban space, and who have the power to shape social and economic opportunities.

A study that engaged volunteers from 22 river communities living along Cagayan de Oro River was conducted to investigate their concerns, using the participatory situational analysis framework [20]. Findings revealed that these river communities' problems were related to livelihood, environmental education, literacy, peace and order situation, and infrastructure. An action plan was developed based on the needs of these river communities. The stakeholders composed of the local government units where these river communities belong, the Safer River, Life Saver Club, and Liceo de Cagayan University Community Extension, may collaborate to improve the quality of life of the

river communities. It was not mentioned in the study what tools were used in the conduct of PSA.

The publications authored by members of ALTERPLAN gave direction in the implementation of the current research project. The work of Petal et al. supports the idea that disaster risk reduction management must be consciously and deliberately fused into community planning [16]. Beard's paper is an eye-opener in the idea of community-based planning in addressing poverty [19]. While the community may address their needs through community planning, they cannot handle the larger structural factors that cause and perpetuate poverty. These structural factors include the state, private developers, and corporations who have the power to shape social and economic opportunities by putting their interests above the interests of the poor. Labis and Huerbana made use of PSA activities in finding out the needs of 22 river communities of Cagayan de Oro City [20]. Still, it was not mentioned what PSA tools were used by the community in identifying their needs.

1.2 Problem Statement

Barangays Hinaplanon, San Roque, and Santiago of Iligan City are survivors of the harsh tropical storm Washi that hit Iligan City, Philippines, in 2011. More than three years have passed since the disaster, but these communities continue living in areas that are vulnerable to disasters because they do not have the means to help themselves. This study aims to empower these three high-risk communities to acquire disaster risk-sensitive shelters in various accessible locations, where they could access livelihood and essential services.

1.3 Purpose of the Study

This research study described how the three high-risk communities of Hinaplanon, San Roque, and Santiago of Iligan City, Philippines came up with their BDR-SSPs with access for livelihood and essential services for inclusion to the Comprehensive Land Use Plan and the Annual Investment Plan of the City of Iligan. In doing so, these communities are relocated to safer places with climate-resilient houses and livelihood opportunities. Several specific objectives were developed. First, the study sought to determine the geological, climatological, and human-induced hazards that pose risks to the lives and properties of the three high-risk barangays of Iligan City. Second, it sought to determine the people's socio-economic and housing needs in the three high-risk barangays. Finally, it sought to know the priority projects and mitigating interventions in shelter planning. The three high-risk barangays proposed to the city of Iligan to mitigate their vulnerabilities to hazards and alleviate poverty.

2. Materials and Methods

The Participatory Action Research (PAR) method was used in this disaster risk-sensitive shelter planning study. The Institute for Developmental Studies defines PAR as a research method which involves researchers and participants in working together

to understand a problematic situation and change it for the better [21]. This happens through a process of participatory data-gathering, collective analysis, and finding solutions and interventions that are relevant, appropriate, and inclusive. The study employed a mixed method of qualitative and quantitative methodologies.

In involving the community to participate in the research process, the three high-risk barangays formally organized themselves into the Barangay Hinaplanon Urban Poor Association (BHUPA), San Roque Urban Poor Organization (SARUPA), and Santiago Village Urban Poor Organization (SAVUPA). The people chose five participants per organization to join the researchers in working together for the common good. These organizations were later registered with SEC and were accredited with DOLE and PCUP to enable them to have a legitimate voice in the decision-making process of shelter-planning.

2.1 Disaster Risk Sensitive Shelter Plan (DR-SSP)

DR-SSP is a concept of ALTERPLAN, which is based on the RLPS created by University of the Philippines Professor Ernesto M. Serote for the Department of Interior and Local Government [17]. Its main goal is to promote disaster risk responsive safe settlements for government shelter programs and policies. This bottom-up approach in planning gave a voice to the poor and marginalized people.

2.2 Research Design

PSA was used to gather data, analyze problems, and find solutions to the issues. The United Nations High Commissioner for Refugees (UNHCR) defines situation analysis as the process of identifying the main problem and needs of a particular population, analyzing the information gathered, identifying strategies to overcome the problem and provide information necessary to create a strategic and systematic plan [22]. PSA uses a mixed-methods approach that braided together qualitative and quantitative methodologies. In using the PSA in gathering data, the following qualitative and quantitative tools and techniques were used:

2.2.1 Participatory Socio-Economic Survey [10]

PSA activity directed the research participants to conduct a socio-economic survey through a survey questionnaire and interview. Data gathered included income, source of livelihood, tenure and housing situation, available community facilities, and their access to these facilities.

2.2.2 Physical Data Gathering with Global Positioning System [10]

The PSA activity directed the participants to use the Global Positioning System to gather data on their barangays' physical conditions. They also used qualitative methods of participant-observation and interviews to look into households' geographical data, dwelling conditions, landmarks, and hazards that the communities have experienced.

The participants were provided with GPS equipment after a skills development training from ALTERPLAN.

2.2.3 Composite Mapping of Hazards [10]

In creating the composite maps of hazards of each barangay, the "Map Overlay Process" was used by the participants. This was done by overlaying the hazard maps showing the barangay boundaries and the land classification maps provided by the Mines and Geoscience Bureau (MGB) of the Department of Environment and Natural Resources (DENR), Project Climate Twin Phoenix, and the Office of the Civil Defense, onto the barangay base maps. These hazard maps for Iligan City were made possible through the United Nations Development Programme [10]. The socio-economic and structural data were also transferred into the map. As they created the maps, they analyzed the hazards that they have been exposed to. A root-cause analysis was conducted through focus group discussion to understand the cause-and-effect relationships underlying the hazards that threaten their lives and properties. They discussed how these hazards are to be prevented from recurring and what interventions should be prioritized.

2.2.4 Structural Analysis and Risk Assessment [10]

The PSA activity directed the participants to assess their houses' structures and the land tenure where their homes are built. They assigned a risk category and a corresponding household strategy for each dwelling. The households are then clustered according to geographical location and common risks experienced.

2.2.5 Creation of Community Resource and Barangay Profile [10]

In the creation of the community resource and barangay profile, the participants gathered secondary data on the demographic profile, socio-economic status, location, and information on the presence of informal settlers the City Social Welfare Development Office (CSWD), the Housing and Resettlement Office, and from the City Planning and Development Office. These data were aggregated and combined with the socio-economic survey and geographical information to build the socio-economic profile. The profile summarized information on population density, household size, age-groups, informal settlers, poverty level, employment-income levels, sources of income, location of livelihood, household expenditures, housing-land tenure, house type, structure condition, roof construction, wall material, floor area, length of stay, and hazards/calamities experienced. After analyzing the data, the participants identified and prioritized their needs through group discussions.

2.2.6 Strategy Formulation and Advocacy Matrix [10]

In doing the Strategy Formulation and Advocacy Matrix, the PSA activity asked the participants to identify their shelter needs, livelihood needs, and basic needs and place these into a table. The table must show each cluster's specific concern, the

mitigating strategies, the possible hindrances, and the proposed interventions in terms of services, program/project, and policy, with timeframe and budget for each program or project.

2.3 Research Setting

Barangays Hinaplanon, San Roque, and Santiago are high-risk communities living along the Mandulog River. Barangay Hinaplanon has a population of 12,346 with 3,553 households residing in 23 puroks located along with the upstream of the river, which is 23.9 ft above sea level [23].

Barangay San Roque has a population of 4,740, with 1,270 households living in 11 puroks located along the river's midstream, 15.4 ft above sea level [24].

Barangay Santiago has a population of 8,814, with 1,494 households living in 21 puroks located along with the river's downstream to the sea [25]. The three communities have a combined total population of 25,900, with 6,317 households living in 55 puroks.

In the BDR-SSP undertaking, the entire contiguous barangays of Hinaplanon, San Roque, and Santiago is considered as the planning area or site of the study. The combined total population of these river communities is 31,784 with a total household population of 7,530, living in 56 puroks, with 793.46 ha. Due to limited funds, sampling was done through geo-tagging.

2.4 Sampling

Research sampling was done by subjecting the three high-risk communities to geo-tagging to determine households with the highest exposures to hazard risks. A total of 723 households, broken down to 356 households from Barangay Hinaplanon, 154 households from Barangay San Roque, and 213 households from Barangay Santiago, were identified. The 723 households represent 10.41% of the entire household population of 7,530 of the three barangays.

2.5 Duration of the Study

This BDR-SSP project was conducted for one year, from March 2015 to February 2016.

2.6 Ethical Consideration

Before starting the project, ICES Dev communicated with ALTERPLAN regarding the possibility of holding an intervention project for survivors of tropical storm Washi (local name: Sendong). ALTERPLAN contacted DIB for partnership in the project. When the DIB affirmed its collaboration as a funding agency, ALTERPLAN contacted ICES Dev and presented the disaster risk-sensitive shelter plan project. ICES Dev identified the three high-risk barangays to be the beneficiaries of this study. The group agreed to meet with the local government officials of Hinaplanon, San Roque, and Santiago, and representatives of each barangay to present the plan. Having been

convinced of the benefits of shelter planning, the three Local Government Units with the barangay representatives expressed in writing their interest in the project. A Memorandum of Agreement was then drawn among the stakeholders.

Each barangay was asked to organize themselves into people's organizations formally, and a core group of 15 leaders (five per barangay) was asked to volunteer as participants of the study. The project was explained to them, including their role in the research project, and they willingly signed letters of informed consent.

3. Results and Discussion

3.1 Geological, Climatological, and Human-Made Hazards

The geological, climatological, and human-induced hazards that pose risks to the lives and properties of the three high-risk barangays of Iligan City are shown through the Barangay Composite Map of Hazards the research participants created. The composite map of Barangay Hinaplanon shows the geological, climatological, and human-induced hazards experienced by the community (Figure 1).

As shown on the map, the high-risk households are grouped into four clusters, showing the four types of hazards that threaten their lives and properties:

H1-flood due to overflowing of the Mandulog River aggravated by siltation, erosion, mining, and logging activities in the hinterlands; H2- flood due to heavy rainfall aggravated by the presence of garbage and debris; H3- flood due to creek overflow due to massive obstruction of plastics and other non-degradable materials; and H4- fire due to houses that were close together and were built with light materials.

The occurrence of floods was predicted by Project NOAH (Nationwide Operational Assessment of Hazards) of the Department of Science and Technology to occur every 25 years, but this prediction is no longer accurate [10]. It has been observed that hazards arise more often, and this can be attributed to climate change. Aside from threats of natural and human-induced hazards, these informal settlers are exposed to eviction threats by landowners and the government, who are presently creating flood-control projects in the area.

Barangay San Roque's composite map shows the geological, climatological, and human-induced hazards experienced by the high-risk households (Figure 2). The high-risk households are group into three clusters: C1, C2, and C3. These household clusters experienced eight types of hazards, which are: flood due to the overflow of the Mandulog River aggravated by siltation, erosion, mining, and illegal logging in the hinterland (H1); flood due to heavy rainfall disturbed by the presence of garbage (H2); displacement due to government flood-control project and insecurity of land tenure (H3); fire due to heavy concentration of houses with non-implementation of the local zoning ordinance (H4); landslide due to deforestation (H5); the existence of unsafe structures and dangerous slopes of the Echavez Elementary School evacuation center (H6); unsafe and hazardous slopes of San Roque road going to Barangays Bonbonon,

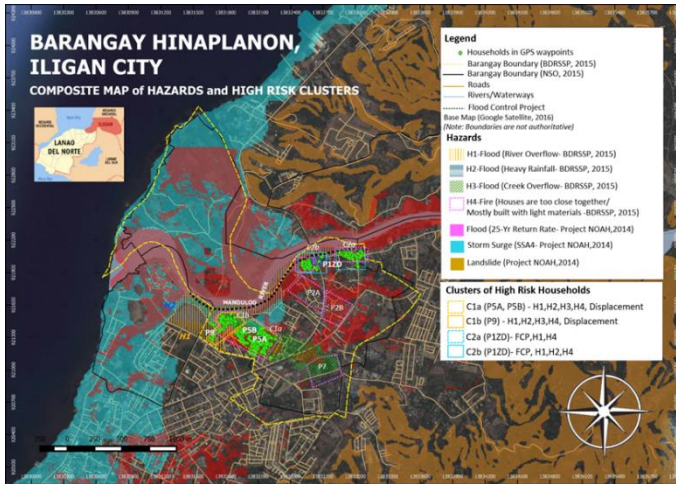


Figure 1. Composite map of hazards and high-risk clusters of Barangay Hinaplanon.

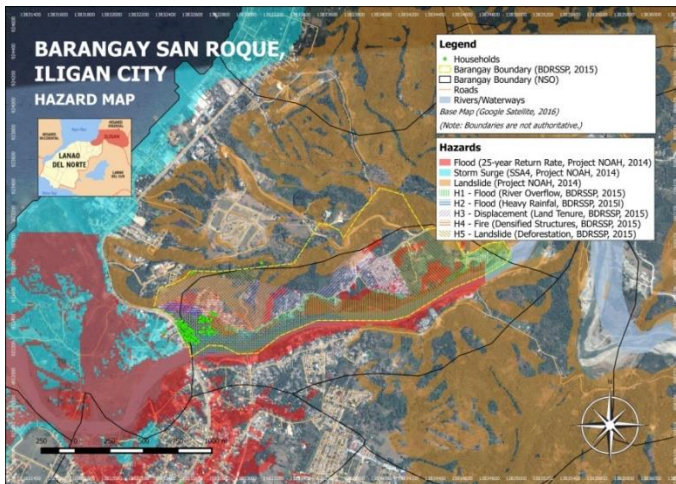


Figure 2. Composite map of hazards and high-risk clusters of Barangay San Roque.

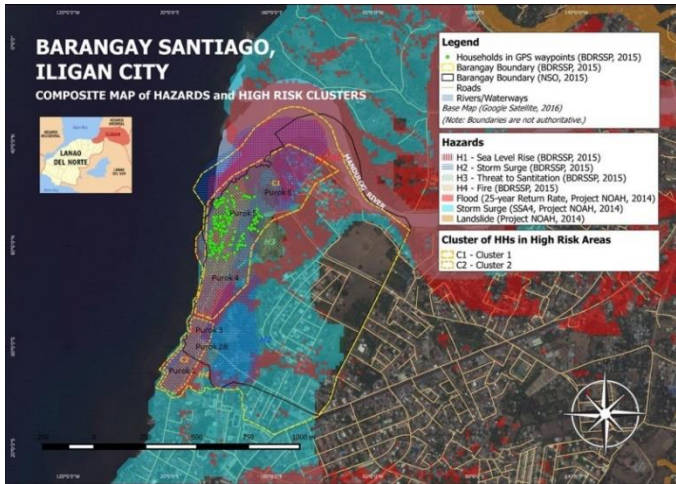


Figure 3. Composite map of hazards and high-risk clusters of Barangay Santiago.

Digkilaan and Rogongon (H7); and unfinished dike causing entrapment of inland floodwaters endangering four puroks (H8). A vast majority of the people living in San Roque are informal settlers. Aside from threats of natural and human-induced hazards, these informal settlers are exposed to eviction threats by landowners.

The composite map of Barangay Santiago shows the geological, climatological, and human-induced hazards experienced by the high-risk households (Figure 3). The high-risk households are grouped into two clusters: C1 and C2. These clusters are exposed to four types of natural and human-induced hazards such as sea-level rise (H1); storm surge (H2); threat to sanitation due to garbage dumped (H3); and fire due to the heavy concentration of houses with non-implementation of the local zoning ordinance (H4). During the Typhoon Washi occurrence, many people were carried by floodwaters of Mandulog River down to the sea of Iligan Bay, and the sea level rose to a storm surge. Many people were rescued in the sea, and dead bodies were also retrieved there.

3.2 Socio-Economic and Housing Needs

Aggregating data from the socio-economic survey identified the three high-risk barangays' socio-economic and housing needs, the housing structure and land tenure survey, combined with demographic and geographical information. In 2015, the Philippine Statistics Authority has determined PhP 9,064 as the average HH monthly income of a family of five to meet basic needs.

In the research area, out of the 723 households from the three high-risk barangays combined, 446 or 62.11% are below the poverty threshold, while 277 or 37.89% are above the poverty threshold (Table 1). The average monthly income is PhP 9,918.10, the average monthly expenditure is PhP 8,483.06, and the average monthly savings is PhP 1,341.30. The houses in these three high-risk barangays had unsecured status.

Table 1. Summary of household (HH) monthly income, expenditure, and savings.

Barangay	Geotagged HH	HH Income Below the Poverty Line (f, %)	HH Income Above the Poverty Line (f, %)	Average Monthly Income (PhP)	Average Monthly Expenditure	Average Monthly Savings
Hinaplanon	356	208, 58.42	148, 41.58	11,032.00	8,578.80	2,453.20
San Roque	154	90, 58.44	64, 41.56	9,754.11	8,687.00	1,067.11
Santiago	213	148, 69.48	65, 30.52	8,968.19	8,183.39	503.61
Mean	723, 100%	446, 62.11	277, 37.89	9,918.10	8,483.06	1,341.30

Table 2. Summary of houses with unsecured status.

Barangay	Unsafe House Structure		House Tenure of Houses with Unsafe Structure		
	Number of Houses Located in a High-Risk Area	Number of Houses with Unsafe Structure	Built on Private Land	Built on Government Land	Rented House
Hinaplanon	356	356	135	125	56
San Roque	154	154	60	54	40
Santiago	213	213	97	78	38
Total	723	723	292	257	134

Table 2 shows the houses that are hazard-prone, with no access to tenured land. The table also shows that 100% or all of the research area houses are exposed to various high-risk hazards (river or sea inland flooding, landslides, soil erosion, and fire) and other forms of vulnerabilities. Barangay Santiago used to be the city's garbage dumpsite. The dumpsite caused pollution to the residents, threatening their health and their lives. When typhoon Washi occurred, the garbage entered the homes of people. The houses in the three high-risk barangays were found to be structurally unsafe. All of the households living in the three high-risk barangays are also exposed to eviction threats from both landowners and the government.

The government declares the area they are occupying as "no-build zones" and many government flood-control projects are on-going. There is an urgency that these people should be relocated, but another problem facing the government is that there are no available land resettlement purposes.

During the flood, these people were evacuated to temporary shelters such as school buildings, barangay halls, and gymnasiums. When they were advised to vacate these buildings, they were forced to return from where they came from and built new shelters.

Table 3 shows that all the 723 households in the three high-risk barangays were advised to be relocated because their houses were structurally unsafe and living in geologically hazardous areas. Out of this number, sixteen (16) households, or 2.22%, opted to stay in their barangay, and 707 or 97.78% were interested in relocating. The reasons why the 16 households opted to stay are that they could not afford the monthly payment for housing loan, and they also are afraid that they might lose their means of livelihood if they are relocated. Those who opted to stay needed major repair of their houses. These households are advised to remain proactive in monitoring any signs of

Table 3. Summary of HHs that are recommended for relocation and HHs that opted to stay.

Barangay	Total Number of Geotagged HH	Total Number of HH to be Relocated	Percentage	Total Number of HH that Opted to Stay	Percentage
Hinaplanon	356	340 (+162)	95.5%	16	4.5%
San Roque	154	154 (+ 66)	100%	0	0
Santiago	213	213	100%	0	0
Total	723	707	97.78%	16	2.22%

Table 4. Profile of relocatees capacity to pay and qualifications to government housing programs based on income and savings.

Barangay	Above Poverty Threshold >=PhP 9,064	Below Poverty Threshold <=PhP 9,064	Based on Monthly Savings and Amortization >PhP 1,725.49	1st to 3rd Income Decile < PhP 14,061	Based on 12.6% Monthly Expenditure	Number of HH Geotagged to be Relocated
Hinaplanon	122	206	176	259	83	502
San Roque	64	90	45	121	0	220
Santiago	50	163	0	0	0	213
Total	236	458	222	380	83	935

Table 5. Loan terms, potential monthly amortization, and the available housing package per income group.

	Housing Program Per Income Group					
	1st	2nd	3rd	4th	5th	6th
	Potential Capital Cost For Housing					
Monthly Amortization (PhP)	240	600	1,500	2,500	4,200	5,400
Annually (PhP)	2,880	7,200	18,000	30,000	50,400	64,800
	Loan Terms					
Interest Rate	6%	6%	6%	6%	6%	6%
Repayment Period (Years)	30	30	30	30	30	30
	Affordable Housing Loan					
Amount of Loan (PhP)	39,643.20	99,108	247,770	412,950	693,756	891,972
Home Lot Package (m ²)	40	54	60	72	90	110

risks present or may occur in the future and evacuate to safer places within the barangay whenever disasters occur. There were 162 who are not within the research area who expressed interest in joining the housing program and were found to qualify, making 502 households for Hinaplanon. San Roque also requested an additional slot

of 66 households who were found to be eligible for the housing program. The total number for San Roque was adjusted to 220 households.

Table 4 shows the assessment for the capacity to pay the government housing program of 935 households of the three high-risk barangays that were evaluated for relocation. Based on these 937 households' monthly income, 236 or 25% were found to be above the P9,064 poverty threshold, and 458 or 49% were found to be below the poverty threshold. These households were given a choice of the housing package to take, based on their capacity to pay.

In line with RA 7279, the households that will be relocated shall be financed through the National Home Mortgage Finance Corporation's community mortgage program under the concept of socialized housing [26].

3.3 Priority Projects and Mitigating Interventions

The three high-risk barangays identified their priority projects and mitigating interventions in shelter planning that they proposed to the City of Iligan for inclusion in the City's Annual Development Plan. The disaster risk-sensitive shelter plans were supported with barangay resolutions and were submitted to the Sangguniang Panglungsod of Iligan for inclusion to the annual investment plan of the city. These priority projects are shown in three tables: Table 6 shows the shelter needs expressed in projects of the three high-risk barangays proposed to the City of Iligan for funding; Table 7 shows the proposed livelihood projects of the three high-risk barangays, and Table 8 shows the needs for basic services reflected in projects.

The high-risk barangays requested their local government units to relocate them near areas where employment opportunities are accessible. These households also planned to have community livelihood projects to augment their family income as soon as they are relocated. Hinaplanon proposed four community bakeshops as the livelihood project of the Barangay Hinaplanon Urban Poor Association. The estimated cost of the bakery is PhP 325,000.00 (Table 7). Both barangays San Roque and Santiago proposed four community sari-sari stores each, in cooperation with the Cooperative Development and Livelihood Office. The estimated cost of each project is PhP 70,000.00. The livelihood projects are intended for poverty alleviation. Target beneficiaries are the research population of the three-high risk barangays.

Section 21 of RA 7279, entitled: Provision for Basic Services, stated that:

Socialized housing or resettlement areas shall be provided by the local government unit or the National Housing Authority in cooperation with the private developers and concerned agencies with the following essential services and facilities: (a) Potable water; (b) Power and electricity and an adequate power distribution system; (c) Sewerage facilities and an efficient and adequate solid waste disposal system; and (d) Access to primary roads and transportation facilities. Other essential services and facilities such as health, education, communications, security, recreation, relief, and welfare shall be planned. They shall be given priority for implementation by the local government unit and concerned agencies in cooperation with the private sector and the beneficiaries themselves.

Table 6. Shelter needs of the three high-risk barangays as reflected in DR-SSP.

Barangay	Project	Justification	Target Beneficiaries	Estimated Cost (million PhP)
Hinaplanon	Purchase of 4 ha of land for resettlement	Address problems on vulnerability to disasters.	502 HHs	21.34
San Roque	Purchase of 1.5 ha of land for resettlement	Address problems on vulnerability to disasters and eviction.	220 HHs	8
Santiago	Purchase of 1.5 ha of land for resettlement	Address problems on vulnerability to disasters and eviction.	213 HHs	8
Total	7 ha		935 HHs	37.34

Table 7. Livelihood projects of the three high-risk barangays.

Barangay	Project	Justification	Target Beneficiaries	Estimated Cost (PhP)
Hinaplanon	Establishment of 4 community Bake Shops	For poverty alleviation	502 HHs	325,000.00
San Roque	Establishment of four barangay sari-sari store	For poverty alleviation	200 HHs	70,000.00
Santiago	Establishment of four barangay sari-sari store	For poverty alleviation	213 HHs	70,000.00
Total			935 HHs	465,000.00

The three high-risk barangays identified their priority needs for essential services that their respective local government units provide per Republic Act 7279. Table 8 shows the projects recommended by the three high-risk barangays for essential services.

The priority projects of the three high-risk barangays on shelter needs include a total of seven hectares of land for 935 households worth PhP 26,195,000.00, where they could construct their homes through a social housing financing scheme that would match their capacity to pay. For livelihood, Hinaplanon requested funding for a community bakery, while San Roque and Santiago requested community sari-sari stores. These livelihood projects cost PhP 465,000.00 as their starting capital. For essential services, all three barangays asked for the construction of drainage systems, barangays material recovery facilities, the purchase of vetiver grass to solve soil erosion, additional health care facilities, and bio-sand filters water potability and sanitation. San Roque requested the repair and fencing of Echavez Elementary School, which was also used as their evacuation center. The total amount requested for these essential services projects is PhP 26,195,000.00. These empowered communities placed these priority projects into four-year action plans (2017-2020), which are synchronized and integrated into the regular LGU systems and structures with budgets and time frame for incorporation in the Annual Investment Program, and the Medium-Term Public Investment Program of the city.

Table 8. Basic services projects of the three high-risk barangays.

Barangay	Project	Justification	Target Beneficiaries	Estimated Cost or Resource Inputs
Hinaplanton	Construction of a 3.5-km drainage system	Mitigate flooding due to heavy rainfall.	Purok 5-A, Purok 5-8 and Purok 9 Riverside	Php 2,085,000.00
	Construction of Barangay Material Recovery Facility	To manage garbage disposal	23 Puroks	Php 7,600,000.00
	Purchase of equipment facilities for emergency response and capability building	To equip the community for disaster response.	23 Puroks	Php 1,500,000.00
San Roque	Rehabilitation of Echavez Elementary School Evacuation Center and construction of 300-m perimeter fence.	To make the school safe from disasters for school children and for people who may use it as an evacuation center To address the problem of local flooding	Echavez Elementary School	Php 6,300,000.00
	Construction of drainage system	To address the problem of soil erosion control and landslide	1000 HHs	Php 2,500,000
	Vetiver growing for soil erosion control and landslide	To address the problem of soil erosion and rock slide	Massive vetiver grass growing in the whole barangay	Php 30,000.00 for purchase of grass; planted through pabina system (cooperative work).
Santiago	Construction of 100 biosand filter units for water potability (with livelihood component)	Address problem on drinking water and sanitation	100 HHs	Php 175,000.00
	Construction of Central Material Recovery Facility (with livelihood component)	For solid waste management and recycling of garbage	1,000 HHs	Php 1,500,000.00
	Procurement of additional health care facility and honorarium of barangay health workers.	To address health management problems of the barangay	1,000 HHs	Php 150,000.00 for facility. Honorarium will be given by the Barangay Council
Santiago	Construction and rehabilitation of drainage system	To address problem on local flooding	2,000 HHs	Php 2,500,000
	Planting of vetiver grass	To address soil erosion	700 HHs	Php 30,000.00 to purchase vetiver grass; The community people will plant the grass as their resource inputs or contributions.
	Construction of 100 biosand filter units for water potability (with livelihood component)	To address problem on drinking water and sanitation; Biosand filters can be sold to households from neighboring barangays.	100 HHs	Php 175,000.00 cost of material; The community will construct the biosand filter as their counterpart inputs.
Santiago	Construction of Central Material Recovery Facility (with livelihood component)	For solid waste management and for recycling of waste materials	1,000 HHs	Php 1,500,000 for the construction; The community will recycle waste materials as part of their livelihood.
	Procurement of additional health care facility and honorarium of barangay health care workers.	To address shortage of health facilities and health care workers	1,000 HHs	Php 150,000.00 for facility; Honorarium will be given by the Barangay Council
	Total Budget Requested:			

4. Conclusions

Barangays San Roque, Hinaplanon, and Santiago of Iligan City, whose people are survivors of typhoon storm Washi (local name: Sendong), actively participated in creating their local barangay shelter plans that are disaster risk-sensitive. Through participatory situational analysis, it was revealed that these communities were exposed to geological and climatological hazards of floods due to overflowing of the river, heavy rains, sea-level rise, and storm surge. They were also exposed to human-induced threats such as fire, health risks such as living near the garbage dumpsite, unsecured land tenure, and the presence of aggravating circumstances, such as high poverty incidence and lack of access to essential services. In working for their welfare, they actively identified community problems and proposed solutions. Their four-year barangay disaster risk-sensitive shelter plans (2017-2020) became part of the local government plan and budgeting structure and Iligan City's Medium-Term Development Plan. By working together as people's organizations, they were able to monitor the implementation of their projects.

As of date, an estimated 70% of their plans have been realized. Today, about 70% of households from the three barangays are relocated to safe settlements such as the Fil-lux Village of Barangay Buruun, in Bayanihan Village of Barangay Sta. Elena, and in the National Housing Authority project in Paitan, Dalipuga. About 30% of households have changed their minds for relocation and have opted to remain in their respective barangays when they saw that many of their projects for basic services are taking shape, such as the riprap and retaining walls built by government to stop soil erosion, and to minimize flooding, the construction and expansion of the drainage system, road repair, school repair, the acquisition of additional health facilities, and many others. They also did their part in planting trees and Vetiver grass and in protecting the environment. They are also enjoying their livelihood projects of bakery and sari-sari stores. The people who choose to remain are always mindful of the environment and ready for future disasters. By empowering them to participate in this research study, they have become well-informed and responsible people who worked together for their own good.

The study recommends that disaster-prone communities in the whole Philippines and other countries should include disaster risk-reduction management in shelter planning to improve people's well-being and the environment. Governments worldwide should make disaster risk-reduction management a high priority in programs and projects on climate change mitigation and adaptation for poverty alleviation and environmental management.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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References

1. Barangay San Roque Information Management System (March 2012). List of Deaths and Missing Persons during Typhoon Washi/Sendong (Unpublished Material).
2. Barangay Hinaplanon Information Management System (March 2012). List of Deaths and Missing Persons during Typhoon Washi/Sendong (Unpublished Material).
3. Barangay Santiago Information Management System (March 2012). List of Deaths and Missing Persons during Typhoon Washi/Sendong (Unpublished Material).
4. Tejero, H.S. Lessons learned from Typhoon Washi: Saving the river as a way to healing nature. *Inter Forum J*, **2015**, *18*, 26-44.
5. Iligan City Disaster Risk Reduction Management Council (2013). Iligan City Strategic Early Recovery Plan (Unpublished Material).
6. Heavy rainfall, topography deadly mix in Iligan flooding. Available online: <https://www.rappler.com/nation/626-heavy-rainfall,-topography-deadly-mix-in-iligan-flooding> (accessed on 12 December 2018).
7. Global climate risk index 2017. Who suffers most from extreme weather events? Weather-related loss events in 2015 and 1996 to 2015. Available online: <https://germanwatch.org/fr/download/16411.pdf> (accessed on 12 December 2018).
8. About Iligan City (2017). Available online: <https://www.iligan.gov.ph/about-iligan/city-profile-3/> (accessed on 12 December 2018).
9. Iligan City 2015 Census, Population and Housing. Available online: http://psa.gov.ph/sites/default/files/10_Iligan%20City.pdf (accessed on 12 December 2018).
10. Redublado, S.; Marquez, L. Disaster risk-sensitive shelter planning: An application of participatory risk assessment and decision support in Legazpi city, Philippines. *Inter Fed of Oper Res Soc Newsletter*, **2014**, *8*, 21-22.
11. Local Government Code of 1991 (Republic Act 7160). Available online: <http://extwprlegs1.fao.org/docs/pdf/phi93246.pdf> (accessed on 12 December 2018).
12. Housing and Urban Development Coordinating Council (2016) - Local Shelter Planning Manual. Available online: <http://unhabitat.org/wp-content/uploads/2018/01/Local-Shelter-Planning-Manual-2016-Web-Edition.pdf> (accessed on 12 December 2018).
13. Housing Act of 1992 (Republic Act 7279). Available online: <https://www.shfcph.com/RA7279.pdf> (accessed on 12 December 2018).
14. Implementing Rules and Regulation of Republic Act Number 10121. Available online: <https://ndrrmc.gov.ph/2-uncategorised/1547-implementing-rules-and-regulation-of-republic-act-no-10121> (accessed on 12 December 2018).
15. The City Ordinance of Iligan No. 13-6125 Entitled, "An Ordinance Institutionalizing and Strengthening the Iligan City Disaster Risk Reduction and Management System Pursuant to and in accordance with RA 10121 and providing funds thereof" (Unpublished Material).

16. Marquez, L.; Redoblado, S.; Prudente, M.; Serote, E.; De Rosas, N.; Llanes, M.; Belarmino, J.; Sierra, E.; Apuli, B. Development of disaster risk-sensitive shelter plans from community-based risk analysis. Available online: https://www.researchgate.net/publication/275036124_Development_of_Disaster_Risk-Sensitive_Shelter_Plans_from_Community-Based_Risk_Analysis (accessed on 12 December 2018).
17. Serote, E. Toward geohazard – sensitive human settlements: a framework for analysis, planning and policy making. Available online: http://www.alterplan.org.ph/documents/ErnestoMSerote_TowardGeohazardSensitiveHumanSettlements.pdf (accessed on 12 December 2018)
18. Petal, M.; Green, R.; Kelman, I.; Shaw, R.; Dixit, A. *Community-based construction for disaster risk reduction*. Routledge: London, United Kingdom, 2008; pp. 191-217.
19. Beard V.A. Community-based planning, collective action and the challenges of confronting urban poverty in Southeast Asia. *Environ Urban*, **2019**, *31*, 575-96.
20. Labis F.A.; Huerbana R.S. Participatory situational analysis of the twenty two river barangays of Cagayan de Oro city. *Liceo J Higher Educ Res*, **2017**, *13*, 12-32.
21. Using Participatory Action Research to Improve Development Practice. Available online: <https://www.ids.ac.uk/events/using-participatory-action-research-to-improve-development-practice/> (accessed on 12 December 2018).
22. Action for the Rights of Children (n.d.) – Situation Analysis. Available online: <https://www.unhcr.org/3f82da124.pdf> (accessed on 12 December 2018).
23. Barangay Hinaplanon, Iligan City, Region 10, Philippines. Available online: <https://www.philatlas.com/mindanao/r10/iligan/hinaplanon.html> (accessed on 12 December 2018).
24. Barangay San Roque, Iligan City, Region 10, Philippines. Available online: <https://www.philatlas.com/mindanao/r10/iligan/san-roque.html> (accessed on 12 December 2018).
25. Barangay Santiago, Iligan City, Region 10, Philippines. Available online: <https://www.philatlas.com/mindanao/r10/iligan/santiago.html> (accessed on 12 December 2018).
26. National Home Mortgage Finance Corporation. Article VIII Community Mortgage Program of RA 7279. Available online: <https://www.shfcph.com/RA7279.pdf> (accessed on 12 December 2018).

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