

DISASTER SCIENCE AND MANAGEMENT OF THREE SOUTHERN COASTAL BARANGAYS OF BOTOLAN, ZAMBALES

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Abstract: The study was implemented to strengthen disaster science capacity of the three southern coastal barangays of Panan, Binoclutan and Porac in Botolan, Zambales through the establishment of databases and conduct of risk assessment. All of the respondents in the survey conducted have experienced the occurrence of earthquakes and typhoons. Few have experienced flooding and fires. There were 82% who have experienced the occurrence of volcanic eruption brought about by Mt. Pinatubo.

Among the three barangays surveyed, Barangay Panan appeared to be the most prepared. In case of emergency, they have flashlights with extra batteries, rope and boots. Very few have fire extinguisher, sprinkler, life vest, "salbabida", fire exit, firewall, 3 day survival kit, although some have radio, first aid kit and food stuff prepared. However, they do not change their electrical wirings in their homes after 10 years of installation and do not post the contact numbers of MDRRMC, Fire Department and PHIVOLCS. Farmers or inland fisherfolks would harvest their crops or fishes before any typhoon with heavy rains which may cause flooding. Fishermen do not go out to the open sea if there is a typhoon signal. During and after the occurrence of any disaster, respondents seemed to be well informed on what to do except on asking assistance from MDRRMC.

The structures or buildings found in the three barangays were mostly built after 1992; more than 50% are in good condition and for residential use. The total floor area of the buildings in the three barangays is 109,632.09 m².

Risk assessment analysis revealed that a total of 54,497 sq. m. will be the total damage floor area with a total value of PhP 305,102,210.10 because the three barangays are exposed to the following hazards: 1 to 4 meters storm surge, ground shaking with PEIS of intensity VII and above, rain induced landslides, ground rupture because a faultline is found traversing from Barangay Burgos to Porac along the southern streambank of Bucao River and most likely to experience flooding and liquefaction hazard as well as Tsunami with a maximum wave height of 4 meters. Barangay Porac is also susceptible to the hazard of lahar flow. For the physical damages an estimated amount as follows: Slight = PhP 90,146; Moderate = PhP 100,186; Extensive = PhP 42,538; Complete damage but no collapse = PhP 26,861; and Complete damage with collapse = PhP 2,370. In terms of economic loss for all the basic physical properties of the entire population for the three barangays, this will have an estimated value of PhP 1,000,000,000.00.

From the total population of 6,356 in a 1,511 households for the three barangays, the following will be the number of estimated casualties in case a disaster strikes the places: Fatalities = 4; Very serious injuries = 2; Serious injuries = 253; and Slight injuries = 10

Since most of the people in the three barangays were not aware of the existence and the contact number of either the Barangay/Municipal Disaster Risk Reduction Management Council (BDRRMC/MDRRMC), it is recommended that the Local Government Unit may mobilize the concerned authorities to conduct awareness on the services of the Council and conduct information dissemination campaign to cope with the occurrence of any disaster.

Keywords: awareness, casualties, disaster, emergency, hazard, injuries, preparedness, risk.

1. INTRODUCTION

The municipality of Botolan lies at the central region of the Province of Zambales, 15°11' latitude and 120° longitude. It is bounded on the north by Iba, the capital town of the province; on the south by the municipalities of Cabangan, San Marcelino and San Felipe; on the east by the Province of Pampanga and Tarlac; and on the west by the West Philippine Sea (Profile Municipality of Botolan, 2009). With this strategic location, the province is prone to natural calamities or disasters. Common natural causes of disasters include earthquakes, floods, typhoons and storm surges as well as volcanic eruptions. These may cause damage to lives and properties. Three coastal barangays Panan, Binoclutan and Porac with 252, 202 and 483 households respectively (Barangay Profile of Panan, Binoclutan, Porac, 2009) located in the southern part of the municipality of Botolan were selected as the pilot study area because these are vulnerable to natural calamities.

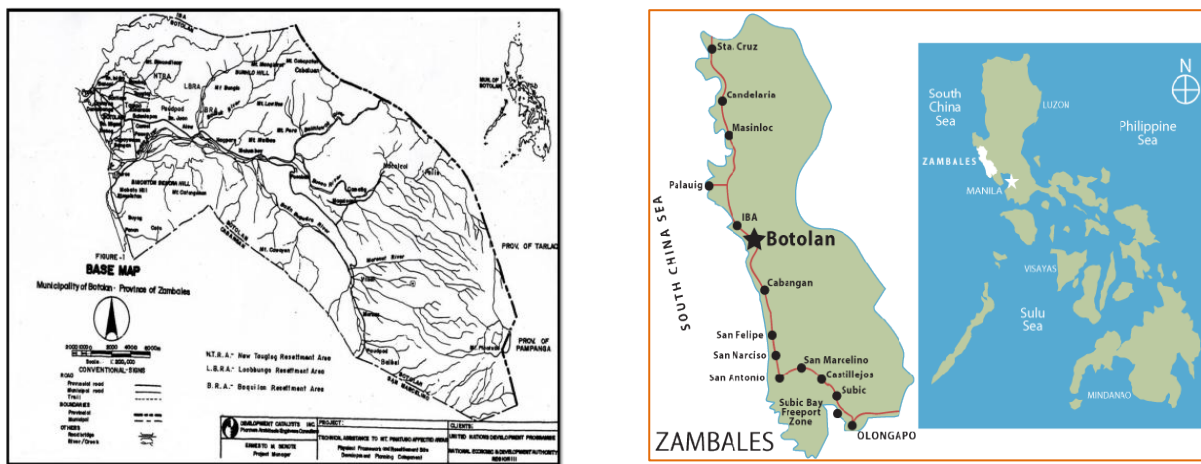


Fig. 1. Map of Botolan

The violent eruption of Mt. Pinatubo on June 15, 1991 as one of the largest volcanic events of the century has left an indelible imprint in the lives of so many Botoleños. Eleven (11) barangays were buried deep in volcanic ash and lahar. Rice fields were submerged by flood and laden with lahar, roads were scoured, classrooms submerged by mud, irrigation canals and waterways were destroyed and silted, and worse was the breaching of the dike.

However, measures to reduce risks or ill effects of disasters may be instituted. The software on Rapid Earthquake Disaster Assessment System (REDAS) developed by Dr. Bart Bautista from PHIVOLCS can be used to assess the damages that can be brought about by such disasters.

Objectives:

The project aimed to:

- To strengthen the barangay disaster science capacity
- To establish barangay hazard exposure databases;
- To conduct barangay risk assessments; and
- To establish inventory database of disaster risk reduction and climate change adaptation studies and hazard maps.

II. METHODOLOGY

Conceptual Framework

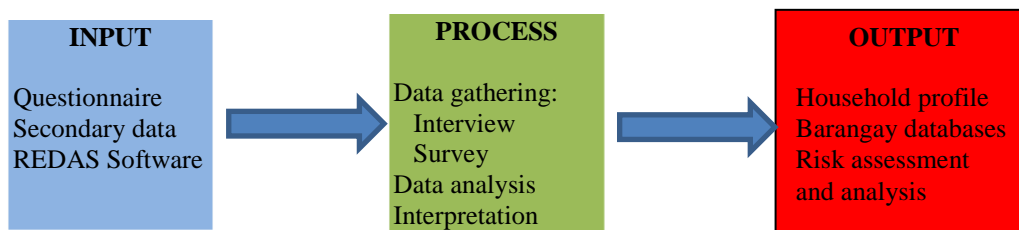


Fig. 2. Conceptual Framework

The study was conducted on the premise that the ill effects of disaster in an area could be reduced if a risk assessment and analysis is conducted in the area. Thus, relevant information such as households, buildings and structures built within the barangay and other relevant information were gathered through survey and interview to establish the household profile, barangay databases and risk assessment and analysis.

Selection of Study Areas

Three adjacent coastal barangays of Botolan (Panang, Binoclatan, and Porac) were chosen. These are bounded on the north by the Bucao River, the West Philippine Sea on the west, the Zambales mountain ranges on the east and the municipality of Cabangan on the south.

Collection of Data

Descriptive type of research was implemented through survey using a questionnaire developed based on the information needed for the software on Rapid Earthquake Disaster Assessment System (REDAS). Coordination with the concerned government officials was undertaken before the conduct of survey and gathering of secondary data needed.

III. RESULTS AND DISCUSSION

A. Disaster Preparedness Analysis

Preparedness Measure Indicators

- **Fire Protection.** The Fire Department of Botolan is headed by SFO3 Danilo Morales with five regular firemen and two volunteer firemen. Two fire trucks are readily available in case of fire. The service of the Botolan Fire Department can be contacted through the CP numbers 09092484091, 09209823065 or 09167483688. They have conducted fire drills and distributed pamphlets in several schools within the municipality.
- **Emergency Medical Services. Health Facilities**

The health needs, family planning, birthing, some emergency cases and other medical services are addressed by the Rural Health Clinic Unit provided with nebulizers, oxygen tanks, BP apparatuses, delivery equipment and medical laboratory equipment. There are 22 barangay health stations with (1) Municipal Health Officer, (2) Rural Health Physician, (2) regular and (6) job-order nurses, (2) sanitary inspectors, (11) regular and (2) job-order midwives, (1) medical technologist and (2) roving dentist who attend to the general health and welfare of the populace through preventive or promotive and curative services. Their other health needs is provided in the provincial hospital.

- **Public Safety.** The Police force (PNP) and Philippine Army (PA) maintain the peace and order situation spearheaded by the municipal Chief-of-Police with the police officer in-charge for the Search and Rescue team and three trained personnel. Barangay Tanods and Lupong Tagapamayapa appointed by barangay chairmen supplement the force in the barangay. The headquarter is equipped with telephones, computers with internet connection for easy access, handheld radios, mobile car/van with microphones and sirens, and motorcycles being used for roving patrols. The Search and rescue Team is provided with 8 life vests, 2 sets of 50 meters rope and an improvised water raft.
- **Planning and Zoning.** The municipality of Botolan has a total land area of 79,124.0457 hectares with a total population of 63, 449 in 14, 820 households with 18,272 families. The town comprises 31 barangay units. Planning and zoning of the town was led by the Municipal Planning and Development Officer (MPDO) taking into consideration the following factors: soil type, topography, and land use.
- **Emergency Management Office.** The emergency management office Municipal Disaster Risk Reduction Management Council (MDRRMC) is headed by the Municipal Mayor with the Chairmanship of the designated MDRRM Officer. The office is provided with one (1) fiberglass based rubber boat, nine (9) kayak, 25 life jackets/vests, two life rings, 1 set of rope and one (1) chain saw. There are two (2) ambulance cars of the municipality with three (3) drivers.

Additional Counter Measures

- **Environmental Management.** Programs undertaken by the LGU includes the Solid Waste Management Scheme, which complies with R.A 9003 or the new "Ecological Solid Waste Management Act of 2000" to promote zero waste within the municipality to address the problem of waste disposal and natural resources preservation. Along with this is the

implementation of clean and green environment through reforestation to revive depleted forests/mountains and to support green revolution.

- Communication and Facilities. Private companies such as Digitel, Globe, Smart and Suncellular with 12 towers or cell sites provide services for fast and reliable communication. In support to these companies is the government communication system which consists of the two-way radio using transceiver equipment and the E-Center (Communication and Research Center). Mail service is provided by the Philippine Postal Corporation with three (3) employees. Additional media and newsprint provides exposure in the country and around the world. Internet café also served more than 12 hours a day.
- Lighting Facilities. Electric power supply is made available and distributed by Zambales Electric Cooperative 1 (ZAMECO 1) through its 5.0 Megawatts plant, which serve the entire municipality. A total of 10,061 or 67.88% households use electric power for lighting.

Hazard Exposure

Storm Surge Hazard

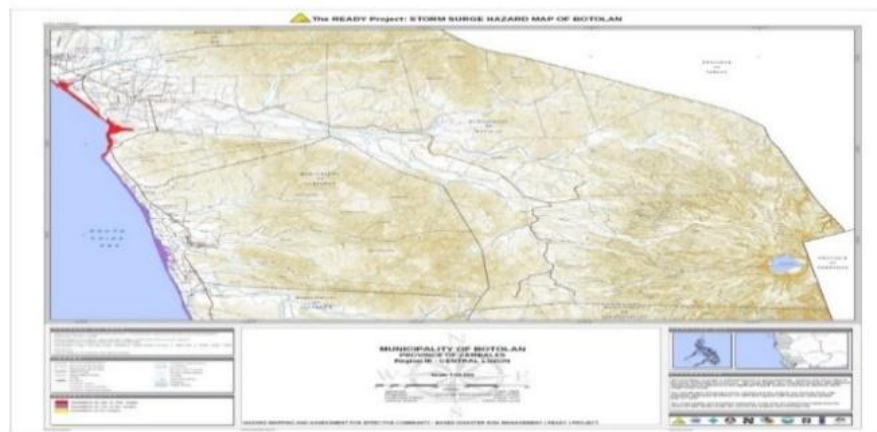


Fig. 3. Storm Surge Hazard Map

The northern coastal barangays Porac, Bangan, Danacbunga, Beneg, Capayawan and Parel are the most prone to storm surge hazard being red in color based on the Fig. 3. These are with inundations of greater than 4 meters up to 12 meters. Areas which may have 1 to 4 meters surges are Barangays Panan, Binoclutan and southern part of Barangay Porac.

Ground Shaking Hazard

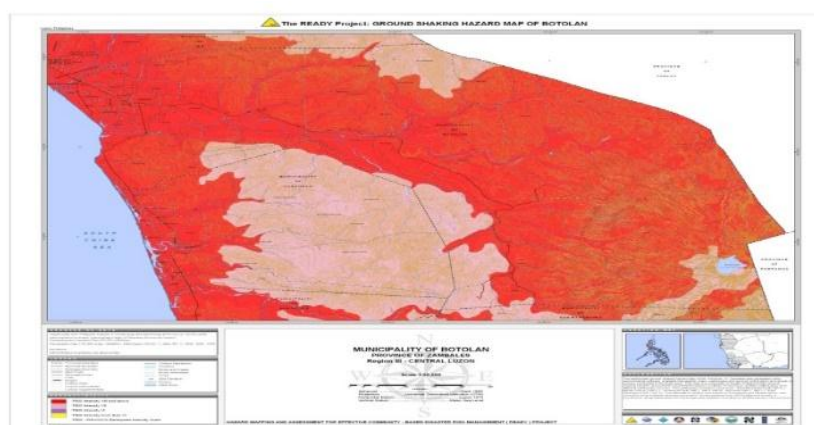


Fig. 4. Ground Shaking Hazard Map

Based on Fig. 4 all of the Barangays of Botolan are prone to ground shaking with PEIS (PHIVOLCS Earthquake Intensity Scale) of Intensity VIII and above. Only the area of Mt. Cahapatan is colored yellow with PEIS below Intensity VI.

Rain-induced Landslide

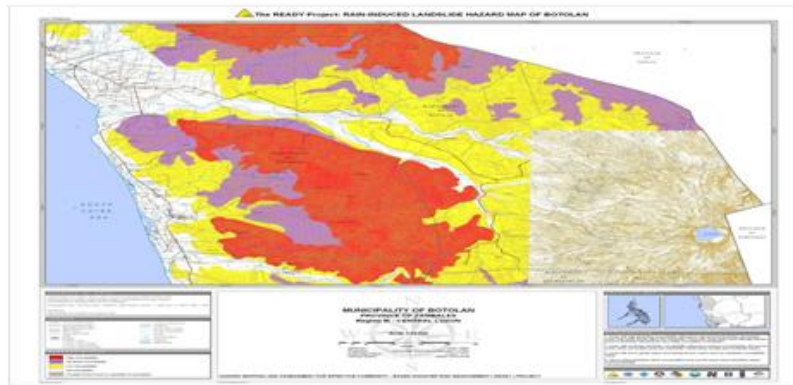


Fig. 5. Rain-induced Landslide Hazard Map

Mt. Mangorat, Mt. Cahapatan, Mt. Pera as well as places like Owaog-Nibloc and high/upland areas of Barangays Mambog, Malomboy, Panan, Binoclutan and Porac are the places most prone to landslide. These areas are colored red in Fig. 5 which means they have high susceptibility.

Ground Rupture

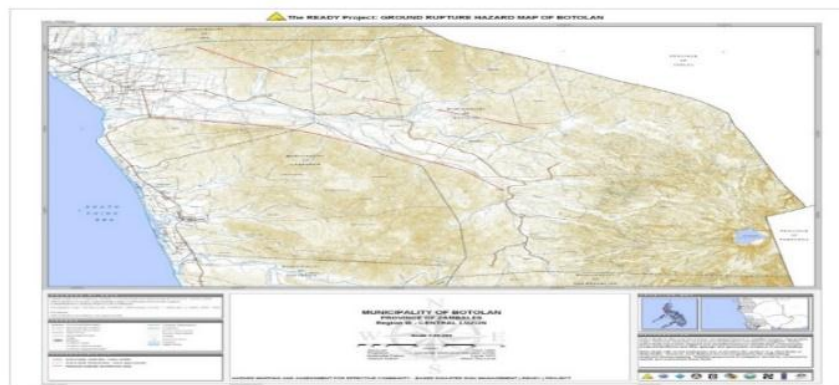


Fig. 6. Ground Rupture Hazard Map

Active faultlines are located in the mountains of Lanitog, Pera and Binandilaan as well Poonbato and Maguisguis. Another faultline is found traversing from Barangay Burgos to Porac along the southern streambank of Bucao River (Fig. 6).

Flood Hazard

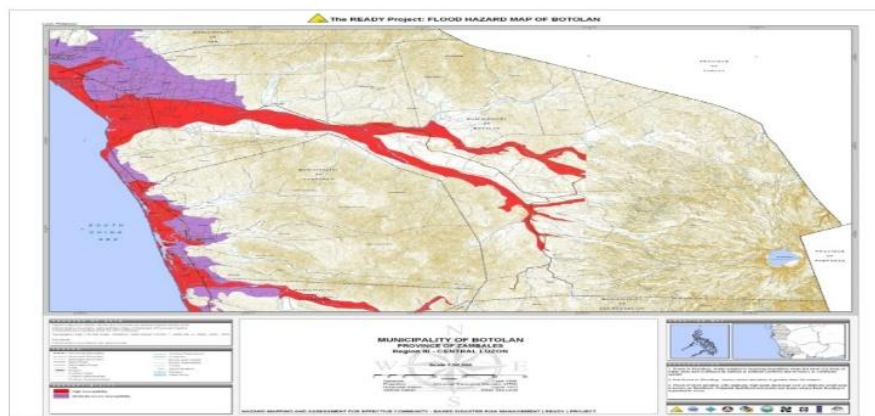


Fig. 7. Flood Hazard Map

Barangays Carael, Paco, Bangan, Capayawan, Beneg, and Parel as well as parts of Barangays Burgos, Maguisguis, Poonbato, Moraza, San Jaun and the coastal areas of Barangays Panan, Binoclutan and Porac are most likely to experience flooding. These are colored red in Figure 8 which means they are highly susceptible

Liquefaction Hazard

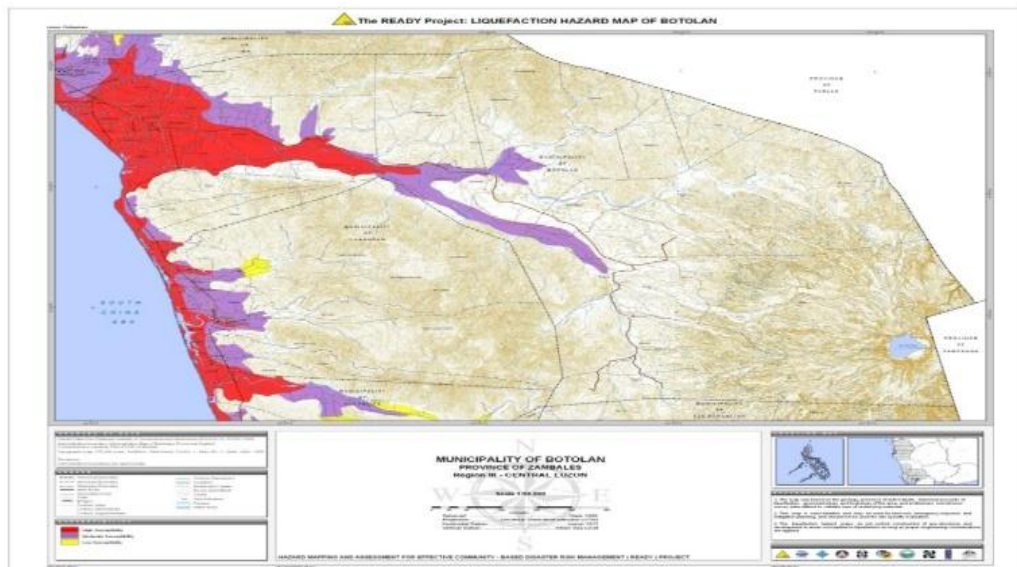


Fig 8. Liquefaction Hazard Map

Barangays which are most likely to be flooded and prone to flooding are also the same areas which may easily undergo liquefaction, these are Barangays Burgos, Maguisguis, Poonbato, Carael, Paco, Bangan, Capayawan, Beneg, Parel, Taugtog, Mambog, Batonlapoc, Tampo, Santiago, San Miguel, Danacbunga, Santiago, San Isidro and Bancal including part of Barangays Mambog, Paudpod, Poonbato, Maguisguis, Porac, Binoclutan and Panan (Figure 8).

Tsunami Hazard

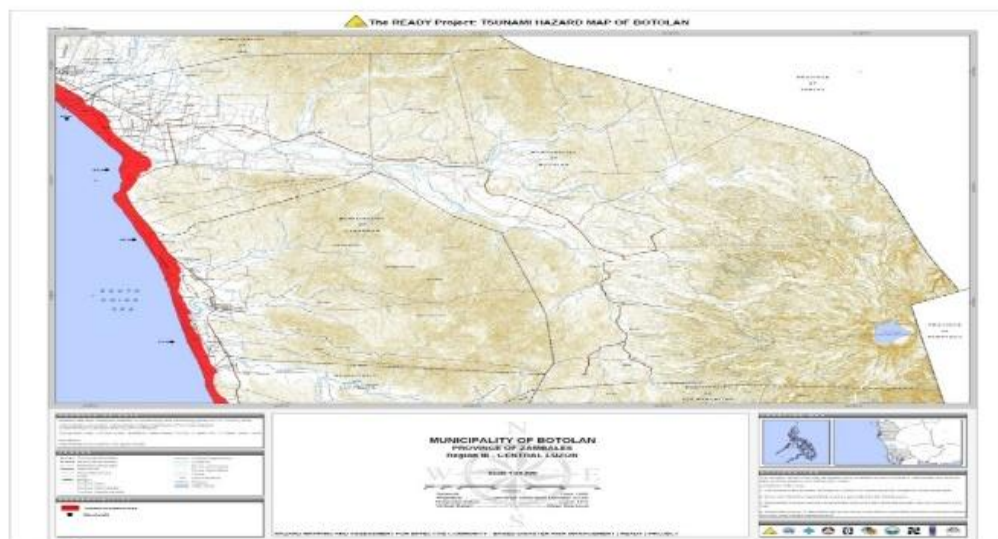


Fig. 9. Tsunami Hazard Map

Fig. 9 shows the Barangays with areas which are along the coast of the West Philippine Sea such as Panan, Binoclutan, Porac, Bangan, Capayawan, and Beneg are prone to disaster due to the occurrence of Tsunami inundation which is usually after an earthquake with a maximum wave height of 4.2 meters.

Volcanic Hazard

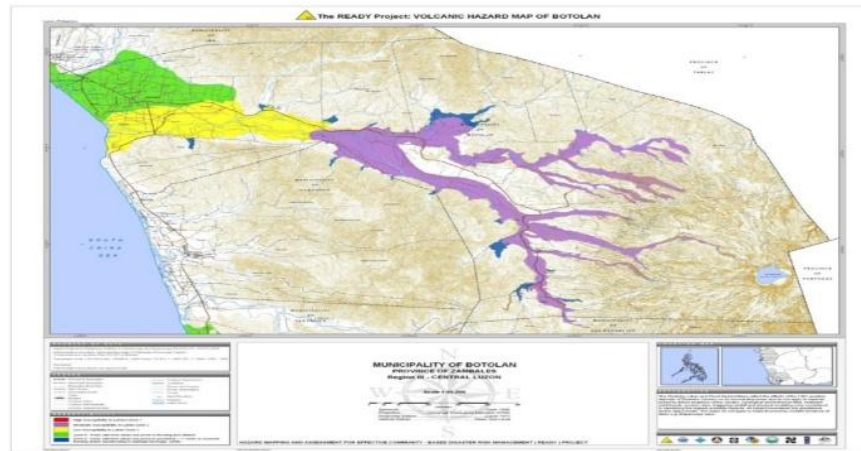


Fig. 10. Volcanic Hazard Map

Though there are no areas which may be severely damaged by lahar or have high susceptibility to lahar because there are no areas colored red in Fig. 10, some are moderately susceptible and these are areas along streams and rivers colored violet while Barangays Carael, Paudpod and Bangan as well as part of Capayawan and Porac are slightly susceptible (colored yellow). Areas safe to lahar but prone to flooding and siltation are colored green. Areas colored blue are safe to lahar but prone to persistent or recurrent flooding and/or backflooding due to drainage blockage.

- Evacuation Warnings. Selected public schools can be used as evacuation sites in case disaster occur. Early warnings are given to the public using the two patrol cars equipped with microphone and siren as well as a motorbike.

B. Disaster Adaptation and Mitigation

Socio-economic Profile. A total of 483 respondents were surveyed in Barangay Porac to determine their adaptation and mitigation practices against disasters. There were more female respondents from Barangay Porac comprising about 58% and about 42 percent were male. About 10 percent of them are single, 83% are married, seven percent are widowed and 0.41% are separated. Most of the respondents are between 21 to 40 years of age with a total of 53% and the remaining 47 percent is from 41 years old and above. Although most of the respondent in Barangay Porac had either elementary or secondary education, there were 4 doctoral and masteral degree graduates while 12.63 percent had a bachelor's degree. All of the households had an average annual income of PhP 100,000 and below. Two hundred two (202) households in Barangay Binoclutan were covered for the study wherein the respondents for the survey study were composed of 76 male (37.62%) and 126 female. In terms of civil status, 14.85% are single, 2.97% are widow/widower and the highest 82.18% are married. Their ages ranged from 21 to 70 years with average of 44.16. Only 9.97% finished a bachelor's degree course and the rest were able to have either an elementary or secondary course for their educational attainment. The family of the respondents had a maximum income of PhP 100,000. There were 53.97% male and 46.03% female involved in the study as respondents in the 252 household surveyed from Barangay Panan. Most of them are in their middle ages comprising about 72%. The rest who are in their twenties and in their sixties above comprised the least percent. Most of the respondents or 85.32% are married. Only 9.13% are single and 5.56% are widow/widower. There were only 23 or 9.13% who were able to finish a bachelor's degree course, 90.87% were able to have an elementary or secondary course. All of them or 100% had an annual family income of about a hundred thousand.

Adaptation and Mitigation

Emergency Items Prepared. The most common materials the households had for emergency preparedness is the flashlight with extra batteries. A few had a rubber boat, two way radio, 3 day survival kit, fire wall and fire extinguisher, life vest and sprinkler. Some household have rubber boots with raincoats, first aid kit and food stuffs were available in case of emergency.

Emergency Preparedness Practices. Most of the households are prepared for the occurrence of any disaster because 70% of the respondents primarily unplug their appliances and other electrical gadgets before leaving their homes. Fifty percent turn off their electric fans when not in use and keep their breakable dining wares in a safe place. Twenty five percent turn off their LPG tanks when not in use and also keep their poisonous chemicals in a safe place. Few of them kept their cabinets are fixed or tied on a wall as well as their chandeliers or ceiling fans installed accurately. Only 10 percent of them have their electrical wirings be changed every 10 years.

Disasters Experienced. All of the respondents in the three pilot barangays have experienced the occurrence of earthquakes and typhoons. There are 92% from Panan, about 95% from Binoclutan and 83% from Porac who have experienced the occurrence of volcanic eruption brought about by Mt. Pinatubo. Out of the 937 respondents from the three barangays 60 experienced flooding and eight on storm surge (Table 1).

TABLE 2. KIND OF DISASTER EXPERIENCED

| Kind of disasters | Panan | | Binoclutan | | Porac | |
|-------------------|-------|-------|------------|--------|-------|--------|
| Earthquake | 252 | 100% | 202 | 100% | 483 | 100% |
| Typhoon | 252 | 100% | 202 | 100% | 483 | 100% |
| Flood | 10 | 3.97% | 20 | 9.90% | 30 | 6.21% |
| Fire | 0 | 0 | 0 | 0 | 0 | 0 |
| Tsunami | 0 | 0 | 0 | 0 | 0 | 0 |
| Storm surge | 3 | 1.19 | 0 | 0 | 5 | 1.04% |
| Volcanic eruption | 232 | 92% | 191 | 94.55% | 400 | 82.82% |

Practices Before the Occurrence of a Disaster

Preparedness for the Occurrence of an Earthquake. In preparation for the occurrence of earthquake 58 percent of the residents read information about earthquake and 54% of them demonstrate what to do to their family members. About 46% of them want to know the location of faultline and assess the foundation and other parts of their houses if these are durable. Thirty five percent prepare emergency exit plans. About 39% of them want to consider the earthquake warning given by the barangay or municipal officials, however, only about 4% know and save the contact number of Phivolcs in their cellphones or post it on their walls.

Preparedness for the Occurrence of Typhoon, Flood and/or Storm Surge. Most of the respondents watched TV or listen to the radio regarding the weather, 67% know where to go as the evacuation center, 53% have ready emergency bag loaded with food, clothes, water, medicines, flashlight, rope and other materials, 50% read materials with topic on typhoon or flood, 45% consider the typhoon warning coming from the barangay or municipal officials. Farmers would harvest their crops or fishes before any typhoon with heavy rains and which may cause flooding. Fishermen do not go out to the open sea if there is a typhoon signal. Twelve percent have plans to construct a second floor for their houses. Only about six percent know or save the contact number of MDRRMC in their cellphones or post it on their walls.

Preparedness on the Occurrence of Fire. The primary thing done by the respondents surveyed is to demonstrate to their family members what to do in case there is fire. They also read information about fire from any reading materials but buying a fire extinguisher for their houses is the least that they resort to.

Coping Capacity Assessment during the Disaster

Coping Capacity during Earthquake. If there is an earthquake residents primarily see to it that they are safe from falling debris, go outside the house and away from breakable and heavy appliances. Some go under a tough table and away from electric post, trees and concrete fence. Only eight percent want to ask assistance from Disaster Risk Reduction and Management Council.

Coping Capacity during Typhoon, Flood, Storm Surge or Tsunami. To cope up with the occurrence of flood, the first thing that respondents do is to go to the evacuation center or to their relatives. One hundred thirty seven (137) use ropes when crossing flood water but 114 do this using a rubber boat. Only 78 wanted to ask assistance from the Disaster Risk Reduction Management Council.

Coping Capacity during Fire. In case fire occurs the primary thing done by the respondents is to ask help from their neighbors and then call the Fire Department. Very few would like to use fire alarm, ask assistance from MDRRMC or use fire extinguisher. The use of fire extinguisher is the last thing they would resort to. A few have this at their homes.

Coping Capacity Assessment after the Disaster

After Earthquake. Respondents revealed that after an earthquake, they usually examine the situation of their family members and make a repair of the damaged part of their house and check the electrical wirings as well. Only 16% listen to news advisory from PHIVOLCS and 6% give report to BDRRMC.

After Typhoon, Flood, Storm Surge or Tsunami. After a typhoon, flood storm surge or tsunami; the respondents have to check on the situation of their houses before getting inside. More than 40% throw collected water inside empty cans, wheels and other materials, report uprooted trees to concerned officials; check electrical wirings left under water and also check if the house is free from snake or any dangerous animals. Seventeen percent listen to the news advisory from PAGASA. Few would like to elevate their houses.

After Fire. After the occurrence of fire, the first thing that the respondents would do is to check if someone among the family members is missing and then to examine the place where fire occurred. The next thing they are going to do is to evaluate the structure burned maybe with the help of the engineer. After evaluating the building, recommendation to the concerned authorities will be done whether to abolish or not the damaged structure. The last thing that they would do is to give a report to the BDRRMC of MDRRMC.

C. Risk Assessment

Era of Construction. Presented on the Table 3 is the total number of buildings or structures surveyed with the corresponding year when they are built. Most of the buildings or structures were built in the year 1992 onwards (Post 1992). There are 1,232 buildings built on this era. For those built between 1972-1992, there are 533 while 102 were built before 1972.

TABLE 3. ERA OF CONSTRUCTION AND YEAR BUILT

| Era of construction | Porac | Panan | Binoclutan | Total |
|---------------------|------------|------------|------------|--------------|
| 1972-1992 | 205 | 164 | 164 | 533 |
| Post-1992 | 548 | 342 | 342 | 1,232 |
| Pre- 1972 | 6 | 48 | 48 | 102 |
| Grand Total | 759 | 554 | 554 | 1,867 |

Structural Type and Total Area. The structures are mostly of made of concrete hollow blocks (CHB) of which there are 884 of this type (TABLE 4). This type of structures has a total area covered of 60,430.90 m². The reinforced concrete with moment frames which are low rise (C1L) type with 241 buildings covers 24,122 m². There are 91 makeshift structures (N) which cover 2,244.75 m². There are 180 made of bamboo (W3) with 6,407 m², 151 are made of wood with light frame (W1) with an area coverage of 8,652.75 m². There are 37 which are hybrid (CWS and MWS). The 8 houses which are classified as CWS cover 1,134 m² while the MWS cover 1,832 m².

TABLE 4. STRUCTURAL TYPE

| Structural type | Porac | | Panan | | Binoclutan | | Total Count | Total Area (m ²) |
|-----------------|-------|------------------------------|-------|------------------------------|------------|------------------------------|-------------|------------------------------|
| | Count | Total Area (m ²) | Count | Total Area (m ²) | Count | Total Area (m ²) | | |
| C1M | 0 | 0 | | 0 | 22 | 2,325 | 22 | 2325 |
| C1L | 161 | 13,582 | 75 | 6,857 | 5 | 3,683 | 241 | 24,122 |
| CHB | 316 | 20,124.75 | 348 | 23,976 | 220 | 16,330.15 | 884 | 60,430.90 |
| CWS | 8 | 496 | 5 | 518 | 2 | 120 | 15 | 1134 |
| MWS | 8 | 232 | 13 | 1,540 | 1 | 60 | 22 | 1832 |

| | | | | | | | | |
|-------------|-----|-----------|-----|-----------|-----|-----------|------|------------|
| N | 0 | 0 | 24 | 959.24 | 13 | 510 | 37 | 1469.24 |
| URA | 91 | 2,444.75 | 2 | 186 | 5 | 412.5 | 98 | 3,043.25 |
| URM | 0 | 0 | 0 | 0 | 1 | 216 | 1 | 216 |
| W1 | 85 | 3,622.25 | 38 | 3,372.5 | 28 | 1,658 | 151 | 8,652.75 |
| W3 | 90 | 2,722 | 49 | 1,869.95 | 41 | 1,815 | 180 | 6,407 |
| Grand Total | 759 | 43,223.75 | 554 | 39,278.69 | 338 | 27,129.65 | 1651 | 109,632.09 |



Fig. 11 Structural Types

Building Use and Condition. Out of the 759 buildings or structures in Barangay Porac 668 are used for residential, 26 are used as government structures, and 23 are commercial structures. There are 11 churches, 9 agricultural structures, 6 are used for schools, 3 are used as offices and 2 are used for storage. Other structures are used as health center, for industrial use also, a mini dam, solar panel, trading post and water reservoir (Figure 12). Most of the structures in Porac are in good condition (Figure 13). There are 395 which are good enough to withstand possible disaster. However, there are 204 which are fair and 97 are poorly built. Sixty three are still under construction. There are 504 residential houses, 23 government buildings, 11 commercial buildings, 9 are industrial buildings, 3 churches, 2 agricultural and 1 each for garage and office. The 362 buildings in Barangay Panan have good condition, but 136 have fair and 36 poor conditions while the remaining 20 are still under construction. Out of the 338 buildings and structures in Barangay Binoclutan, 253 are used for residential, 71 are for commercial, 6 for industrial, 4 government, two churches and 1 each for stockroom and the other category. Two hundred thirty eight structures in Barangay Binoclutan are with good condition which may withstand the occurrence of any disaster but there are 18 which are poorly built. There are 74 with fair condition and eight are still under construction. Among the structural type, the 171 which are made of concrete hollow blocks do have good condition, 40 have fair, 1 poor and 8 are undergoing construction. There are five makeshifts which good condition, four each are with poor and fair conditions. All the URA and URM's still have good conditions.



Fig. 12. Building Uses



Fig. 13. Building Condition

Risk Assessment Analysis

Imagery maps of pilot sites

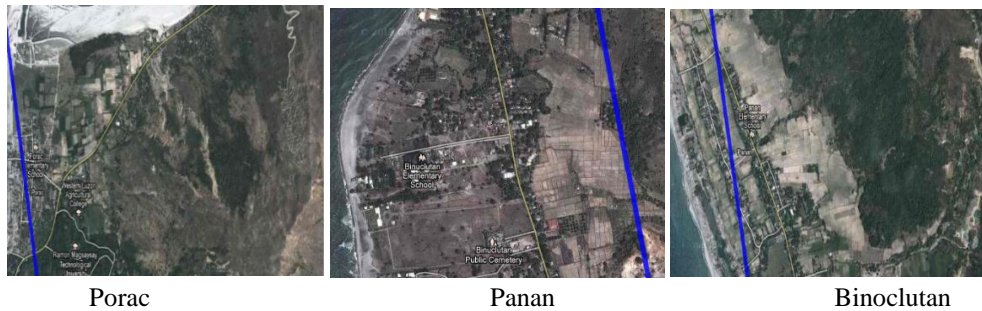


Fig. 14. Barangay Maps

Land use

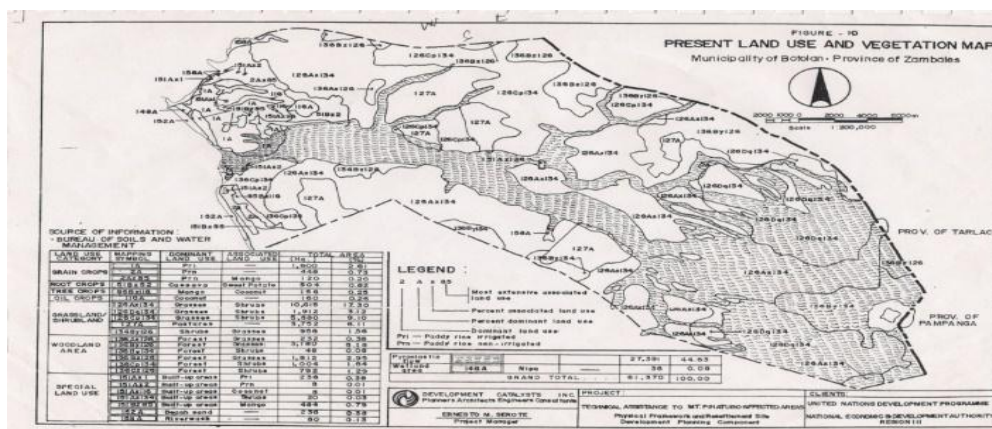


Fig. 15. Land use map of Botolan

Fig. 15 presents the present land use of the municipality of Botolan whereby mostly are used for agricultural production. But there is also on-going development plan for a holistic land use for the whole town is being done by the Municipal Planning and Development Officer (MPDO).

Total Damage Floor Area

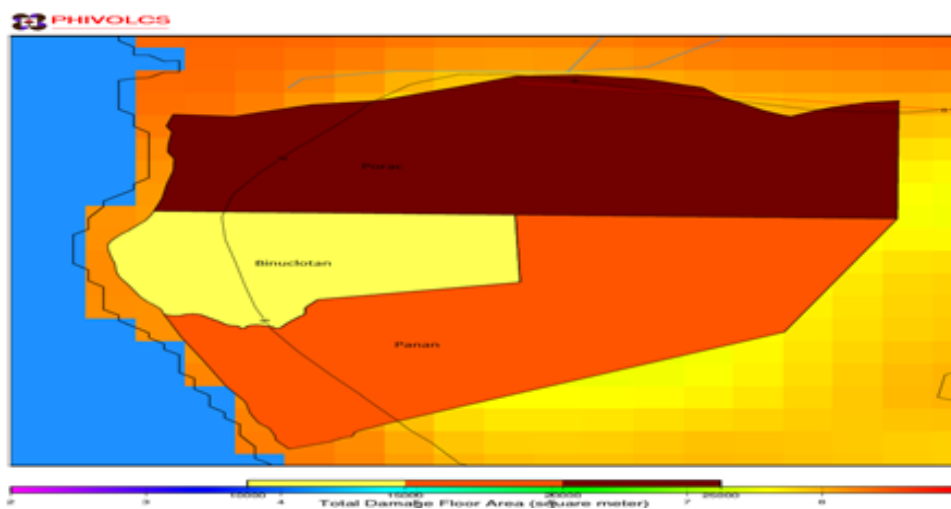


Fig. 16. Total damage floor area

Figure 16 shows the total damage floor area whereby 20,864 sq. m will be the losses in Barangay Porac, while in Barangay Binoclutan is 14,663 sq. m. and in Barangay Panan is 18, 870 sq.

Total Damage Loss

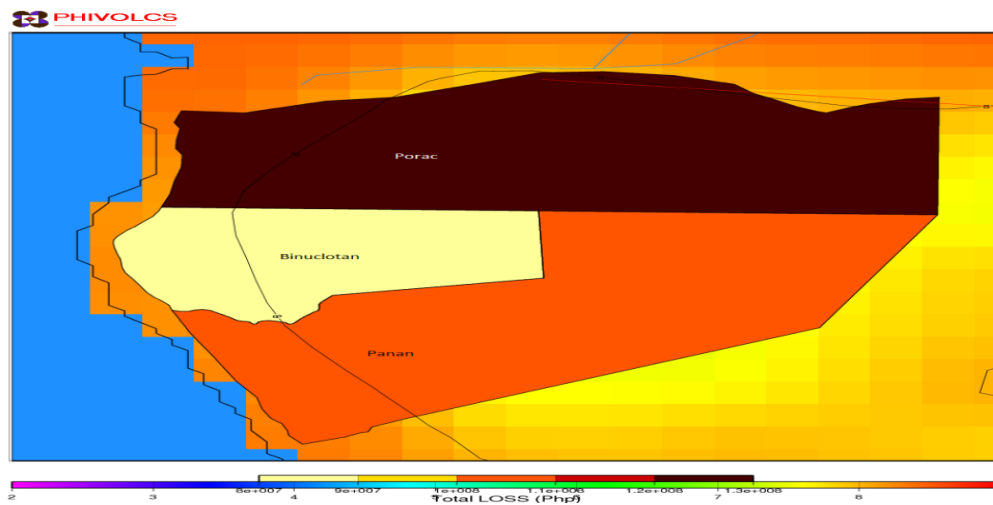


Fig. 17. Total damage loss

Fig. 17 shows the plotted total damage losses in the three pilot barangays of Botolan in which Barangay Porac has the highest amounting to PhP 121,177,987.91, Barangay Binoclutan will have PhP 81,669,949.81 and Barangay Panan will have PhP 102,254,272.43.

IV. CONCLUSION

A total of 483 household/respondents were surveyed in Barangay Porac, 202 households in Barangay Binoclutan, and 252 households from Barangay Panan to determine their adaptation and mitigation practices against disasters. There are more female respondents in Barangays Porac and Binoclutan which is more than half of the respondents but there are more male respondents in Barangay Panan. More than 80% of the respondents in the three barangays are married. There are more respondents who are in their 30's and 40's and with educational background of undergraduate. Their average annual income is PhP 100,000 and below.

In case of emergency, flashlights are the most common gadget they have with extra batteries, rope and boots. Very few have fire extinguisher, sprinkler, life vest, "salbabida", fire exit, firewall, 3 day survival kit, although some have radio, first aid kit and food stuff prepared beforehand.

Emergency preparedness was being practiced by the respondents because their cabinets are fixed or tied on the wall; they keep their poisonous chemicals in safe place; they install their ceiling fan or chandelier on the ceiling accurately, they place their breakable dining wares in a safe place, they also turn off the LPG tank when not in use and they unplug all electrical appliances or gadget before leaving. However, they do not change their electrical wirings in their homes after 10 years of installation.

All of the respondents have experienced the occurrence of earthquakes and typhoons. There were 82% who have experienced the occurrence of volcanic eruption brought about by Mt. Pinatubo. Few have experienced flooding and fires.

Among the three barangays surveyed, Barangay Panan appeared to be the most prepared before the occurrence of earthquakes, floods, storm surges, tsunami, fire and volcanic eruption because they registered the highest percentages on the positive answers to the different questions regarding preparedness. However, all the barangays surveyed, only few practice the saving or posting on the wall of the contact number of MDRRMC, Fire Department and PHIVOLCS.

During the occurrence of any disaster, respondents seemed to be well informed on what to do except on asking assistance from MDRRMC as well as on the use of fire alarm and fire extinguisher because these equipment are not readily available in the locality.

After any disaster had occurred, respondents knew what to do; however, they do not give report to the concerned officials even on the MDRRMC.

The structures or buildings found in the three barangays are made of concrete hollow blocks with no reinforcement; mostly built after 1992; more than 50% are in good condition and for residential use. The total floor area of the buildings for Barangay Porac is 43, 223.75; in Barangay Binoclutan is 27,129.65 and in Barangay Panan is 39,278.69 square meters.

Risk assessment analysis reveal that a total of 54,497 sq. m. will be the total damage floor area in the three barangays of Botolan with a total value of PhP 305,102,210.10.

The following will be the damages and casualties for the total population of 6,356 in a 1,511 households:

Physical Damage

The physical damages for the buildings and other structures found in the three barangays of Botolan will have an estimated amount as follows: Slight – PhP 90,146; Moderate – PhP 100,186; Extensive – PhP 42,538; Complete Damage but no collapse – PhP 26,861; Complete Damage with collapse – PhP 2,370

Economic Loss

Losses for all the basic physical properties of the entire population for Barangays Porac, Binoclutan and Panan will have an estimated value of PhP 1,000,000,000.00.

Casualties

The following will be the number of estimated casualties for the three barangays in case a disaster strikes the place: Fatalities – 4; Very serious injuries – 2; Serious injuries – 253; Slight injuries – 1

V. RECOMMENDATION

Since most of the people in the three barangays were not aware of the existence and the contact number of either the Barangay Disaster Risk Reduction Management Council (BDRRMC) or the Municipal Disaster Risk Reduction Management Council (MDRRMC), it is recommended that the Local Government Unit may mobilize the concerned authorities to conduct awareness and information dissemination campaign to cope with the occurrence of any disaster.

ACKNOWLEDGEMENT

The Ramon Magsaysay Technological University deeply appreciates the funding and technical support from the Department of Science and Technology (DOST) through the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD), Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Commission on Higher Education (CHED) as well as the support of the Local Government Unit of Botolan (Municipal and Barangay Officials) for the use of secondary data and the hazard maps under the READY Project.

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