COASTAL EVENTS TIMELINES OF BARANGAYS INZAMBOANGA DEL NORTE

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Abstract

The study determined coastal hazards in six selected barangays of Zamboanga del Norte. The hazards were based on a historical timeline of 43 years on accounts of six focus groups participated by purok presidents and sector organizations of the barangay. The Cities of Dapitan, Dipolog and Municipality of Katipunan were the areas included. The study revealed that flooding, strong wind, big waves and storm surge are common coastal hazards in the area. The occurrence of typhoon increases the intensity. Occurrence of riverine flooding and shore erosion were most devastating in the puroks of Barangay San Antonio, Katipunan.

Keywords*: historical timeline, coastal hazards, Zamboanga del Norte*

Introduction

Coastlines buffeted in hazard prone locations are evolving perceived largely by elderly who remained in coastal areas for at least 30 years. Literatures provide that with accelerated intensity of typhoons that brought strong winds and current can eliminate islands, carve inlets and completely flood low lying areas (Bloustein 2012). In the province of Zamboanga del Norte, three case study cities and municipality are selected to illustrate their story in the face of climate change and coastal hazards for the past 50 years. Each area is engulfed with at least two rivers, exposed mainly to flood and erosion risks, drain towards Sulu Sea and Bohol Sea.

The barangays of Polo and San Pedro in Dapitan City has a combined 543.6 ha or more than one percentage of the total land area in the City. Combined population of the two barangays in 2010 alone is 4,932 or more than six percentage of the total population. The Barangay of Polo has the densest residents among the 50 barangays and cluster in Purok Tanguegue. Households distribute in six puroks named after marine and aquamarine species, anduhaw, tanguigue, alimango, bangus, locon and pasayan. Rizal Bridge is the entrance to the poblacion such that any posed physical risks to the barangay puts off the only passage towards the city. Fishpond, nipa palms and mangroves grown are its main land use. Crabs, prawn and milkfish are produced by fishpond operators. Barangay San Pedro is the entrance to province's sea port called Pulawan Warf. Eight puroks, mostly named after trees that grow along the areas, are Bakhaw, Kawayan, Naga, Nipa Pasil, Piape, Sanga and Talisay. Antipolo River, Owa-on Creek, Dapitan River and Dapitan Bay provide both livelihood and natural hazards to households in Dapitan coastal barangays.

Dipolog City is the provincial capital of Zamboanga del Norte. It is comprised of 21

barangays with 97.87 sq. km. devoted to agriculture and residential areas. Major products are bottled sardines, fish products, rice, copra, fruits, meat, pastries, furniture, souvenir items and handicrafts. The city has five coastal barangays: Barra, Minaog, Sicayab, Olingan, and Galas. In 2009, geohazard records showed flooding, coastal erosion, and storm surges in the barangays of Barra, Minaog, Sicayab and Olingan. Galas inhabitants experienced localized flooding based on the same report. Barangays Olingan and Galas were the most populous barangays in Dipolog. More than 22% or 26, 570 of the population resides in the two barangays and covers about four percentage of the city's land area. Its combine land area is 1,415.1038 ha.

Barangay Tuburan was identified with the highest coastal hazard than Barangay San Antonio in a 2009 geohazard report. Records and accounts of today showed the opposite. In a survey of 50 fisher folk conducted by the JRMSU Research Unit for the 2011 RFLP Philippines Baseline Study Final Report, the municipality of Katipunan registered a poverty index of 58.87%, the highest among coastal municipalities in Zamboanga del Norte een hogher than the 2009 region's poverty incidence among families at 39.5%. About 32% of the fishers in the municipality earn less than P 3,000 each month, four folds below the region's per capita income of an ordinary family in 2009 at P12,000. This sector barely attended elementary education. Moreover, indications of poverty among fisher folks also showed that majority of the settlers had nipa or cogon roofing (42%) and use firewood gathered from around (100%). Of those interviewed, 74% live without toilet facilities and only 39% have electricity connections. Basic fishing methods are used among fishers in Katipunan. Common fishing gears used are surface set gill nets (*panulot*) also locally called *pamo*, fish traps, drift gill net (*kurantay*), bottom set long line (*palangre*), and hook and line (*tonton*) also locally called *pasul*. Among the fishing gears, *palangre* is mostly used. As observed today, extensions of academic and non-governmental institutions are pouring in coastal barangays of San Antonio and Tuburan.

Nine puroks in Barangay San Antonio are constantly and completely flooded most of the time. Four of the five puroks in Barangay Tuburan are subjected to flooding, coastal erosion and storm surge. On the other hand, topography of the fifth purok is from moderate to steep slope. Earthquake is a constant experience of inhabitants in Barangay Tuburan.

Theoretical Considerations

Zamboanga del Norte: Its Geography and Vulnerability to Coastal Hazards

Reports in the Zamboanga Peninsula Regional Development Plan 2011/2016 identified its three component provinces – Zamboanga del Norte, Zamboanga del Sur and Zamboanga Sibugay – as highly susceptible to typhoons, storm surges, sea level rise, earthquakes, tsunamis and volcanic hazards, and extreme weather conditions such as El Niño and La Niña.

At least five major hydrologic hazards displaced 90 to 4,000 households in the region during Feb 2012/Feb 2013 in spite of a location generally outside the typhoon belt. Zamboanga Peninsula ranks second in terms of land area most vulnerable to a one-meter

rise in sea level with 40 of its 67 municipalities susceptible to submergence due to sea level rise. Actual accounts of 90 families in almost 2,000 households were displaced in four of the towns due to tropical depression Auring and flooding last Jan 2013/Feb 2013.

Figure1 The Zamboanga Peninsula
Source: Google Maps

The Zamboanga Peninsula provinces comprising Region 9 are included in the top 20 provinces vulnerable to a one-meter rise in sea level (ZPRDP 2011/16). Zamboanga del Norte, with a total of 1,057 hectares of coastal areas, ranks 19th among the top 20 provinces in the country vulnerable to a one-meter sea level rise (TWG-DENR 2010). Sea level rise is seen to inundate biodiversity-rich coastal habitats such as mangroves and beach vegetation. Sea level rise will also affect seagrass beds and mangroves and cause the intrusion of saline waters in groundwater, lakes and rivers (GTZ-DENR 2010).

Climate trends in the province from 1971-2000 show there is a statistically significant decrease in number of hot days and warm nights but an increasing number of cold days and cool nights (PAGASA 2011). Average annual rainfall in Zamboanga del Norte is 1,750-2,450 mm and the typhoon frequency is once in 12 years. Specifically, a maximum rain period occurs from October to December in Dipolog.

Figure 2 Dapitan City, Dipolog City and Municipality of Katipunan
Source: Google Maps

Some indications of upwelling like cooler temperatures and elevated chlorophyll *a* are also observed off the coast of Zamboanga Peninsula, Philippines. Analysis of sea surface temperature time series reveals interannual variations in upwelling, with weakening during the 2007/2008 La Niña and strengthening during the 2006/2007 El Niño. Interannual variations in upwelling, phytoplankton productivity, and sardine catch suggest that interannual El Niño-Southern Oscillation variations can affect the small Zamboanga Peninsula pelagic fishery (Villanoy et al, 2011).

Method

Historical Timeline as a method used in this study captures changes and events that have happened over the puroks and barangays over a span of 50 years that have had major influence on the livelihood and activities of inhabitants. The changes and coastal events are the focus of this study. Other non-coastal hazards enumerated by participants were also included in the discussion. These are earthquake, drought and inland flooding.

In the conduct of the mapping, at least two hours were allotted to develop the timeline. Timelines were illustrated in a manila paper to represent the passage of time for the past 50 years. Participants were asked to recall coastal hazard events starting with

1970 up to the present. Participants were asked also to rate intensity of the coastal hazard based on the damages, effect they observed and experience.

Focus Group Discussions (FGD) and Key Informant Interviews (KII) were conducted within barangays to document narration and experiences of six hazard-prone barangays in three municipality and cities of Zamboanga del Norte. The FGD method is a general participatory and cross-cutting tool in participatory climate change adaptation assessment. Key informants were from Barangays Olingan and Galas. The KIs were from Purok Ofisco and Purok De Oro in Barangay Olingan. Extents of identified hazards within the different puroks of the barangay were narrated. Each barangay was participated by an average of 26 sector representatives. Each barangay is represented by purok presidents, sitio presidents and president of every sector organization in the area Table 1.

The narrations of hazards in the barangays are limited to names of typhoons and years mentioned. Based on participants' accounts, these were verified through PAGASA reports. Common observation was that big waves, storm surge, coastal erosion, strong winds and in few narrations flooding events depending on personal experiences were entirely brought by varying intensities of typhoons that hit Mindanao and passed the Zamboanga Peninsula Region. Likewise, common scenarios of flooding incidents were brought about by overflowing of rivers and creeks.

Table 1 Distribution of Sector Representatives During the FGD

Project Site	Organization	Position of Participant
Dapitan		
Barangay San Pedro	Local Government Unit	Barangay Chairman, Councilor and Secretary, Barangay Health Worker, Barangay Nutrition Scholar, Purok President, Purok Secretary
	San Pedro Minagsoon Multipurpose Cooperative	Chairman
	BSPO	President
	Parents Teachers Association	President
	Talaba Association	President
	Senior Citizen Association	President
	Habal-Habal Association	President
	Women's Association	President
Barangay Polo	Local Government Unit	Barangay Chairman, Councilor, Secretary, Tanod, Purok President, Purok Secretary
	Fishermen's Sector	Member

Project Site	Organization	Position of Participant
	Biblical Sectoral Council (BSC)	Chairman
	Youth/ Worship	Secretary
	Women's Association	President
	Fish Vendors' Association	Member
	Senior Citizen Association	President
	BRK	President
Dipolog City		
Barangay Galas	Local Government Unit	Barangay Chairman, Councilor, Secretary, Tanod, Purok President, Purok Secretary, Sitio President
	Galas Multipurpose Cooperative	Secretary
	Galas Feeder Port Laborers Association	President and Secretary
	Worldfish	Community Facilitator
	Women's Association	Member
	Senior Citizen's Association	Member
Barangay Olingan	Local Government Unit	Barangay Chairman, Councilor, Secretary, Tanod, Purok President, Purok Secretary
	Senior Citizens' Association	Member
	Elementary Schools –Laoy, Sta Cruz and Olingan	Master Teacher and Teacher
	Organized Radio Assistance and Communication Information Services	President, Member
	Youth Association	President
Municipality of Katipunan		
Barangay Tuburan	Local Government Unit	Barangay Chairman, Councilor, Secretary, Tanod, Purok President, Treasurer, Purok Secretary, Parent Leader, Barangay Health Worker
	Community Health Team	Member
	Women's' Association	President
	Bantay Dagat	Member
Barangay San Antonio	Local Government Unit	Barangay Chairman, Councilor, Secretary,

Project Site	Organization	Position of Participant
		Tanod, Purok President, Treasurer, Purok Secretary, Parent Leader, Barangay Health Worker, Day Care Worker
	Business Sector	Member
	Parents Teachers Association	Secretary
	Women's Association	Representative

Results and Discussion

Dapitan City. Occurrences of typhoon in Barangay San Pedro brought flooding, storm surges, and coastal erosion in four of the eight puroks. The intensity of hazards resulting from typhoon occurrences based on damage inhabitants once had on properties and livelihood were described by participants. Inhabitants in Purok Naga and Nipa were flooded as drawn and narrated FGD participants. Based on their mapping, Purok Naga and Nipa residents live at the foot of the moderately sloped and steep parts of the barangay thus rain water would plunge among residences and the area was described as flooded. These puroks lead to Pulawan Wharf of the city.

During the enumeration of typhoons that passed over Barangay San Pedro, the 1970's and 2000's were remembered and mentioned. The PAGASA-named typhoon Ruping and Sening were also enumerated. Typhoon Sening was considered a super typhoon that hit the Philippines in Oct 11 to 15, 1970. This super typhoon devastated south of Luzon after it swirled from the Samar provinces in the Visayas.

In 1972, typhoon Titang was also mentioned by a participant. Historically, Titang already decelerated when it passed the provinces of Western Mindanao on October 16 to 23, 1973 before its exit towards South China Sea. Even with its deceleration, the typhoon still flattened houses in many puroks. A large proportion of the total 1.75 billion-peso damage was in Central Mindanao and Lanao areas. With a wind speed of 95 kph, it was considered the only tropical cyclone until 2002. The same participant recalled that Titang devastated their houses blowing one of their neighbors'roof.

Reports provide that Typhoon Ruping struck Mindanao in November 10 to 14, 1990 and was the most costly typhoon in Mindanao, with damages amounting to Php 10.846 B. Many houses were devastated in the barangay of San Pedro at that time, recalled a female participant.

It can be deduced from the identification of participants that these typhoons in the years mentioned were actually felt among inhabitants. The land mass of Barangay San Pedro lies along the shore of Dapitan Bay and at the mouth of Antipolo River. These means any occurrence of typhoon even with the least intensity brings big waves, flooding and coastal erosion in San Pedro.

The group described Purok Pasil as flooded during typhoon occurrences. They added that Purok Pasil inhabitants experience coastal erosion. Purok Bakhaw inhabitants and properties are affected with storm surges. It could be noted that middle class residents in Purok Pasil constructed sea walls in front of their houses but were unable to restrain coastal erosion and, in rare cases, big waves.

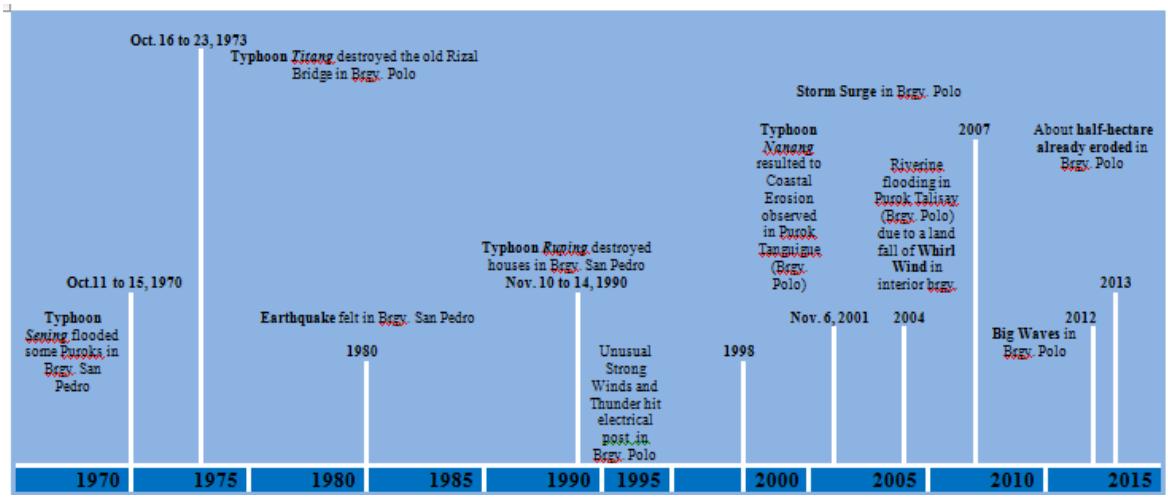

Figure 3 Coastal Events Timeline in Dapitan City

Purok Talisay inhabitants were flooded due to heavy volumes of water carried along Antipolo River draining towards Dapitan Bay. Another participant narrated that in 2004 a whirlwind made landfall in an interior barangay of Dapitan after passing along the river that made the water rise and caused flooding in Purok Talisay. Owa-on Creek also drains in Antipolo River.

Typhoon Titang again was remembered by a male participant. He perceived the damage to be worse in the barangay. The longest bridge in Mindanao at that time, Rizal Bridge was yet made predominantly of hard wood. It took a detour in Purok Anduhaw to cross the bridge and enter the poblacion of Dapitan City. The bridge was partly collapsed thus very inconvenient for inhabitants and many settlers of Dapitan as this was yet the only pedestrian entrance to the poblacion. Moreover, an islet formed through accumulated land mass seen in Dapitan River disappeared after the typhoon.

In 1998, an unusual thunder and lightning occurrence with strong winds hit an electrical post in the barangay. In 2001, erosion along the shore of Purok Tanguigue was observed and narrated. The eroded part is observed to increase each year taking about half a hectare of the purok today. On the other hand, another participant narrated storm surge in the same year. Based on reports, Typhoon Nanang hit the Philippines in November 6, 2001. Though it did not made its land fall in the Camiguin Island part of Northern Mindanao, it cost about $7 million damage to infrastructure, crops and private properties while a more devastating 173,000 families reported affected in the entire Visayas and Mindanao. Added reports on death toll of more than 200 peopled killed while other s were missing and presumed dead.

In February 2012, women respondents remembered they evacuated their family and properties for possible damage due to big waves. In another case, schools of fish floated along rivers after an extreme event.

Dipolog City. The entire province of Zamboanga del Norte was placed under public storm signal number 3 as typhoon Pablo swept many parts of the Philippines in December of 2012. In January 2013, tropical depression Auring brought heavy rains and caused floods that affected about 90 families. In the next month, February 2013, continuous rain flooded 1,855 households and 422 hectares of agricultural land in Dipolog City and in the nearby Municipality of Katipunan.

From June to July, coastal erosion and strong waves, sometimes along with a typhoon, are prominent in the Sitio of North Baybay. An unfinished feeder port in North Baybay is evidence of coastal hazards. In the 1940's, coconut trees were eroded. The 1960's and 1970's had strong waves. The 1980's saw the narrowing of the bucana of South Baybay with the accumulation of soil and sand, but is now part of the sea. A female participant declared the once playing field in their younger years no longer exists today. Flooding in North and South Baybay often resulted during heavy rains in the upland.

Titang in December 1976 was remembered by one female participant, who has been in Galas since 1946, as the most destructive. Typhoon Titang carried along strong winds and heavy rains that drowned one of the inhabitants in the Municipality of Polanco where one of the waterways in Galas exits.

Typhoons Neneng, Rosing and Ondoy were the storms in the history of Galas recalled by the male participants. There was also coastal erosion, and the earthquake that doomed Bohol was also felt by the Galas residents though it did not cause much damage. Flooding and flashfloods were experienced during these typhoons they mentioned. Commercial areas such as rice fields were the most affected during these calamities.

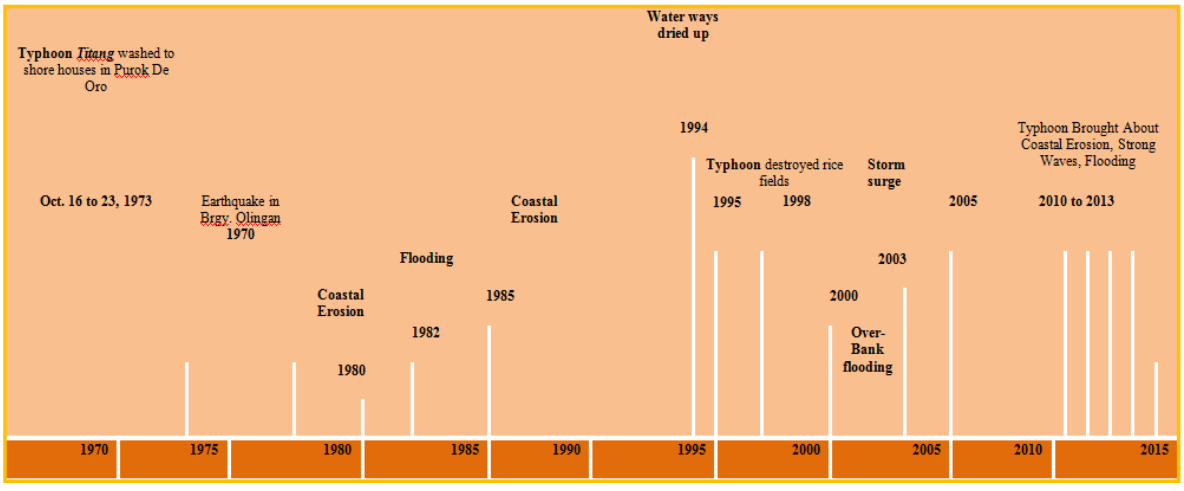

Figure 4 Coastal Events Timeline in Dipolog City

On accounts of a key informer in Purok Cory located near the coast line, Typhoons Ondoy and Sendong brought strong waves, flooding and coastal erosion that devastated the brother's house of the key informer, washed out and driven away in the open sea. The KI also described the shoreline to be 50 meters away 10 years ago and only 8 meters now. It is said that when the Feeder Port was built, they started to experience sudden strong waves and coastal erosion in their area.

On other accounts of a KI in Eco 5, Typhoon Ruping struck the area with flood water that rose up to their elevated floor. The presence of nipa in Eco 5 were said to protect the houses and households from devastation that strong winds and waves might cause during typhoon occurrences in Zamboanga del Norte.

There has been no experience of evacuation since the 1980's when the Eco 5 KI resided in the place. Mangroves and mahogany trees are visible in the purok. Presently, a narrow, shallow creek in Purok Eco 5 results to speedy rise in flood water. The barangay organized excavation and shoveling of the accumulated soil in the creek as a flood protection measure. The couple interviewed, who had been residing in Eco 5 since 1980, lamented on the presence of the unfinished feeder port in Sitio North Baybay.

Galas Feeder Port is a project of the Department of Transportation and Communication (DOTC). Among the intentions of building the infrastructure facility were to hasten commercial development within the city, industrial development in the southern portions of the region and provision of a transshipment point to complement existing wharf and seaport of the province in the nearby city and municipality. Settlers within the area, however, are blaming the project for causing the adverse coastal hazards being experienced in the locality.

In terms of risk reduction and disaster management, the local government unit of Dipolog identified 51 evacuations centers with Local Disaster Risk Reduction Management Council (LDRRMC) Plan, LDRRMC Office, available warning device system and ready emergency response team.

Earthquake, drought and storm surge were identified by other FGD participants as hazards experienced so far in Barangay Olingan. In 1977, an earthquake was felt. Flooding is a yearly hazard in the barangay affecting rice fields in Purok Central. In 1994, drought was remembered because of a nearly total absence of water in the area. Waterways along Purok Parpagayo dried up.

In 2007, a storm surge was observed by severely affected coastal settlers in Purok Corales and the fishermen's village in Purok Ofisco. Big waves, high tide and the overflowing of Olingan River added to the storm surge, damages were most spelt in Purok Ofisco. This was further clarified during a KII when Typhoon Unsang was remembered to have damaged the purok. High tide was also present during Typhoon Unsang.

Typhoon Titang that resulted to flooding was mentioned by a male participant. Other participants remember storm surge, typhoon, flooding and coastal erosion for a span of 50 years in the barangay. The narrowing of creeks was vividly described by one

participant while others agreed that it resulted to the overflowing of creek water and flooded their elementary and secondary schools, and TESDA situated in Purok Riverside. It was explained by the marine biologist facilitator during the FGD that the type of mangrove planted in the swamp areas of the barangay could be attributed for the accumulation of soil along water ways. During continuous rain, flooding within the purok was worse in 2000.

In 2011, one participant recalled that coastal purok inhabitants' houses in Purok De Oro were washed to shore. The lady barangay captain and medical doctor described De Oro as without drainage thus rain water from the national highway would find its way to the purok as well as Purok Parpagayo, Purok Everlasting, Purok Mangga, Purok Sampaguita, Purok Riverside and Purok Central. Purok Central and a large portion of Purok Mangga are more than 100 meters from the shore. Purok Everlasting, Mangga and Central settlers experience in-land flooding for more than 30 years now.

Municipality of Katipunan. Occurrences of typhoon in Barangay San Antonio brought out flooding, storm surges, strong waves and coastal erosion that undermined much properties and livelihood and created fear and learning among inhabitants. Puroks along the coasts have been experiencing salt water intrusion. Other occurrences like drought and cyclone though minimal in effect were also remembered by FGD participants. Their stories allowed them to embrace again the scenarios that had stricken their barangay.

In Barangay San Antonio, strong waves accompanied typhoon Ruping that equally battered and washed out almost all assets there were in the nine puroks. The bridge in Dikayu River was almost unpassable.

Damage brought about by typhoon is well remembered by the 13 male participants. On the other hand, the 11 mother participants remembered the intensity of hazards based on the economic losses that they could account. These include eroded land masses where homes were erected since the 1980's. In 2003, flooding cost life of police officer during a child rescue.

Coastal erosion started to be visible in Purok 1 during the 1980's, and continues up to the present. Extent of the soil eroded was spotted from shrinking of their houses. However, they continue to build new ones and see their houses gradually sinking again.

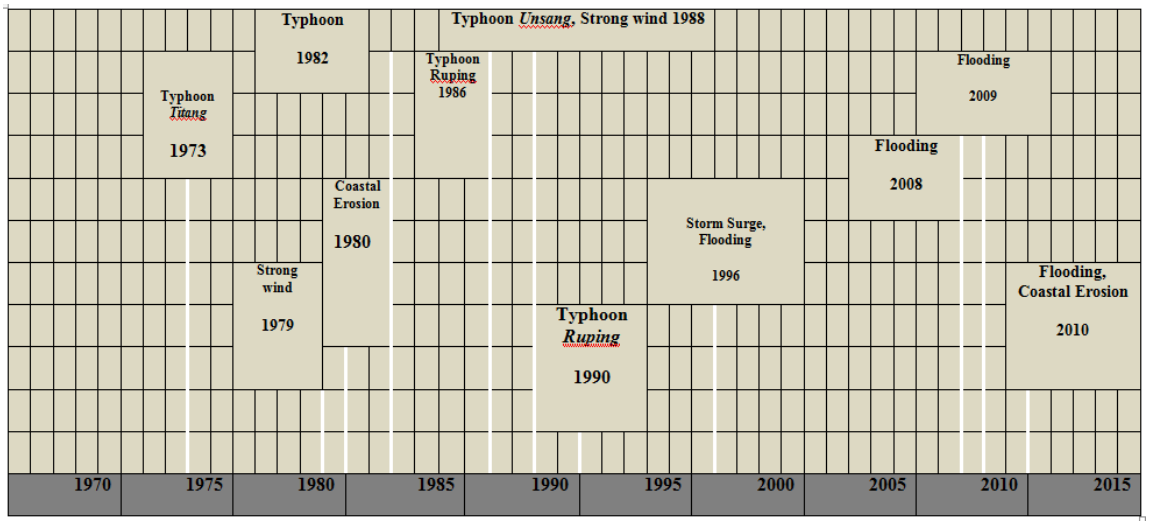

Figure 5 Coastal Events Timeline in the Municipality of Katipunan

Flooding or *layas* is a yearly occurrence in San Antonio. In December 2003, Dikayu and Liburan rivers overflowed extremely that flood water reached the national highway. Flood water went through three-fourths of the land area in Purok 6 then overflowed towards Purok 7 and 8. The remaining puroks were unaffected with the flood but inhabitants along the coastal areas were trapped and left waiting to be rescued.

In 2010, little whirlwind or *ipo-ipo* and drought in 1998 were also experienced. Their effects did not adversely ruin the community compared to the losses from flooding and coastal erosion caused by typhoons.

Typhoon that resulted to flooding and strong waves in San Antonio ravaged the property, livelihood, health, institutional services and lives of settlers. Flood water washed out houses in Purok 6, 7 and 8. It should be noted that consumption of almost half of the number of households are propelled by activities in these areas.

A concrete barangay bridge is the main link between Purok 3 and 6. Its destruction after flooding compelled inhabitants to temporarily replace it with bamboo. It could be inferred that during strong waves, inhabitants in Purok 1,2,3,4,5 and 9 need to immediately evacuate their dwellings.

Frequent occurrences of typhoon were remembered by FGD participants in Barangay Tuburan. On the other hand, another FGD participant remembered frequent flooding in the barangay. Participants narrated that every three years there had been flooding in the barangay. This has cost life and properties. Swollen Minang Creek and Ibo-an Creek have affected many families living alongside.

Women participants attributed flooding to occurrence of typhoon that brought along heavy rains added with high tide. Landslide is also a common experience of inhabitants in the barangay. On the other hand, earthquake is also identified by one participant and claimed destructive to many of their domesticated animals. The Sindangan-Cotabato Fault is found nearest to the Municipality of Katipunan thus medium-scale earthquakes

were felt. Some participants believe that Barangay Tuburan has much of this fault line than any other barangays in the Municipality of Katipunan.

From 1972 to 2009, PAGASA-named typhoons recalled by FGD male participants were clearly enumerated. Typhoon Unsang was remembered to be the most damaging. Typhoon Ondoy was narrated to be the second damaging typhoon in Barangay Tuburan. This was followed by Typhoon Ruping then Typhoon Titang.

Typhoon "Unsang" in October 1988 was identified as a tropical cyclone in terms of wind speed. It sank a passenger ferry Doña Marilyn in the Visayas Sea taking 389 people with it. It brought heavy rains and 12 ft. storm surge to Guam and Marianas Islands. In the Philippines alone, damage totalled 5.64 B Php to include fishing boats and drowned people.

Maps showed that the northernmost part of the barangay is the coasts. In the east is the Minang Creek that cuts across the national highway leading towards Zamboanga City. Ibo-an Creek divides Purok 1 and Purok 2. Minang Creek and Ibo-an Creek bounded the 145 households from other puroks in the barangay. During typhoon with heavy rains or continued rain, the two creeks swell and poured in majority of the land areas in Purok 1. The costal area of Purok 1 experience strong waves, coastal erosion, salt water intrusion, storm surge during typhoon and tropical storms.

Purok 2 has strong waves, coastal erosion, salt water intrusion and storm surge. Purok 3, on the other hand, is flooded according to both male and female participants. The male group added that the coastal portion of Purok 3 experiences the same coastal hazards happening in Purok 2. Likewise, big waves, coastal erosion, salt water intrusion and storm surges happened in Purok 4. Participants believe these coastal hazards occur during typhoons and storms that pass this area of Zamboanga del Norte province before they exit the country.

Conclusion

This study showed that flooding, strong wind, big waves and storm surge are common coastal hazards in the Cities of Dapitan, Dipolog and the Municipality of Katipunan. Scenarios of inhabitants in a purok level recollected during coastal events described changes in their purok landscapes through time. In all cases, they opted to rebuild, remain and adapt to protect assets and lives. Plans on climate change adaptation and other risk management efforts today increase extensively. However, fiscal impact of coastal hazards in the barangay level should also progress to better understand coastal management efforts both within the household and local government level.

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