

**RESULTS OF THE MINES AND GEOSCIENCES BUREAU'S (MGB)
1:10,000 SCALE GEOHAZARDS (LANDSLIDE AND FLOOD) ASSESSMENT AND
MAPPING OF COMPOSTELA, COMPOSTELA VALLEY PROVINCE**

The Mines and Geosciences Bureau (Central Office)-Department of Environment and Natural Resources (MGB-DENR) conducted geohazards (landslide and flood) assessment and mapping (1:10,000 scale) of areas within the municipality of Compostela on March 5 to 8, 2013. Comprising the geohazards assessment team are geologists from the MGB-Central Office (MGB-CO) namely Mr. Salvio B. Laserna, Ms. Christine Jeiselle G. Guarino, Ms. Vanessa Andrea V. Llagas, Mr. Kevin L. Garas, Mr. Mel Anthony A. Casulla and Ms. Princess Danielle B. Matas.

The assessment is in line with the government's efforts aimed at reducing, if not, totally mitigating the destructive effects and impacts of natural hazards on the populace. The assessment is also a follow-up to the geohazards assessment and mapping (1:50,000 scale) previously conducted by geologists from MGB Region XI.

The assessment was only limited to areas covered by the 1:10,000 scale base maps provided to the team. The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. Similar flood susceptibility rating (i.e., high, moderate or low) was also given to the assessed barangays. **Tables 1 and 2** show the parameters used for the assessment.

When appropriate, the barangay officials were presented with *Landslide and/or Flood Threat Advisories*. These advisories inform them of their area's susceptibility to landslide and flooding and also contain the corresponding recommendations.

Notable results were obtained by the MGB-DENR from the following barangays: Bagongon, Siocon, Maparat, San Miguel, Gabi, Tamia, Poblacion, Aurora, New Alegria, Lagab, Mapaca, Mangayon, Panansalan, San Jose, Ngan and Osmeña. These results are tabulated in **Tables 3 and 4**.

Table 1. Landslide susceptibility parameters used during the assessment

Landslide Susceptibility Parameters	Low	Moderate	High	Very High
A. Slope Gradient	Low to moderate (<18°)	Moderate to steep (18°-35°)	Steep to very steep (>35°)	Steep to very steep (>35°)
B. Weathering/ Soil Characteristics	Slight to moderate	Moderate	Intense; Soil usually non-cohesive	Intense; Soil usually non-cohesive
C. Rock mass strength	Very good to good	Fair	Poor to very poor	Poor to very poor
D. Ground Stability	Stable with no identified landslide scars, either old, recent or active	Soil creep and other indications for possible landslide occurrence are present.	Inactive landslides evident; tension cracks present	Active landslides evident; tension cracks, bulges, terracets, seepage present.
E. Human Initiated effects				May be an aggravating factor

Table 2. Flood susceptibility parameters used during the assessment

Very high/Critical flood susceptibility	Areas likely to experience flood heights in excess of 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
High flood susceptibility	Areas likely to experience flood heights of 1.0 to 2.0 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.
Moderate flood susceptibility	Areas likely to experience flood heights of 0.5 to 1.0 meters and/or flood duration of 1 to 3 days. These areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and in-filled valleys are areas moderately subjected to flooding.
Low flood susceptibility	Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than 1 day. These areas include low hills and gentle slopes. They also have sparse to moderate drainage density

Table3. Results of Landslide Assessment

Location	Landslide Susceptibility Rating	Remarks/ Recommendations
Barangay Mangayon		
Purok 3B (GPS reading: N 7° 43' 28.6"/E 126° 06' 31.9")	Very High	Though the purok center is located on a gently sloping area, its eastern portion is bounded by active landslides. The noted wide mass movements in the area are located adjacent to a creek (approximately @N 7° 43' 49"/E 126° 06' 58"). The slope material is generally soil with some highly weathered clastic rocks. Recommendations: Settlement at the steep slopes should be discouraged. Lands may be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. This area should be declared as danger zone prohibited for residential settlements.
Purok 4A and Purok 4B (GPS reading: N 7° 44' 16.8"/E 126° 05' 53.3")	Very High	In general, the area is underlain by highly weathered clastic rocks with thick soil cover that resulted to several landslides to the eastern part of purok 4A (approximately @N 7° 44' 30"/E 126° 07' 10"). Majority of the eastern area is steep sided making it highly susceptible to mass movement. Purok 4B center is located to the NE mountainous portion of Brgy. Mangayon with high to critical susceptibility to landslide. Almost whole of the land area of Purok 4B have steep to very steep slopes. Recommendations: Settlement at the steep slopes should be

		discouraged. Lands may be utilized for non-residential purposes (e.g., agricultural) only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. This area should be declared as danger zone prohibited for residential settlements.
Purok 2C (GPS reading: N 7° 42' 37.1"/E 126° 06' 24.4")	High	To the eastern portion of Purok 2C is a steep mountainous area with noted mass movements. The area is also prone to debris flow since it is situated on the mouth of a creek draining from relatively huge watershed with active landslides. Recommendations: Relocate the residents near creek of the eastern purok 2C to elevated areas of Purok 2B. The area must be maintained for agricultural purposes only. Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.
Barangay Mapaca		
Purok 2 N 7° 43' 12.2" E 126° 2' 42.0"	Very High	Several translational landslides were observed along the steep slopes of Purok 2. These are shallow slides made up of soil material and rock fragments. Occurrence of large landslide in the area might result to river damming that will aggravate flashflooding in the area. Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of

		incipient landslide should be reported to the MGB office concerned and the municipal authorities.
Purok 3 N 7° 42' 46.6" E 126° 2' 44.2"	High	<p>Landslide escarpments have been observed along the steep slopes of a N-S trending ridge in Brgy. Mapaca. An inactive landslide slump was observed adjacent to the present community in Purok 3. This area is assessed to be highly susceptible to landslide that may be aggravated by heavy rain, overloading of houses and modification of slope. Water saturation due to presence of creeks might affect the present condition of underlying material.</p> <p>Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.</p>
Barangay Maparat		
Purok 6A N 7° 41' 15.2" E 126° 1' 56.1"	Moderate	<p>Portion of this purok is characterized by rolling to moderately sloping terrain. This is covered mostly by banana plantation and minor settlements. Overloading and modification (agricultural use) of the slope might aggravate the present condition of underlying material.</p> <p>Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.</p>

<p>Purok 5</p> <p>N 7° 41' 15.2'' E 126° 1' 56.1''</p>	<p>High</p>	<p>A N-S trending ridge is highly susceptible to landslide due to its steep slope. No landslide occurrence has been observed. Moderate slope gradient was observed in the area adjacent to the road.</p> <p>Local residents and barangay officials should observe and/or monitor for presence of mass movement (e.g. landslides, tension cracks). Any signs (i.e saturated ground or seeps, displaced or sunken road) of incipient landslide should be reported to the MGB office concerned and the municipal authorities.</p>
<p>Barangay Ngan</p>		
<p>Purok 9 (southwestern slopes bounding the area)</p>	<p>High</p>	<p>An active rotational landslide is observed on the southeastern slopes bounding the area. Settlement at the foot of these slopes should be discouraged.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
<p>Purok 14 (GPS reading: N 7° 42' 4.3''/E 126° 7' 52.0'')</p>	<p>High</p>	<p>Several active translational landslides pervade the northern and southeastern slopes bounding the area. The bedrock material is highly weathered, fractured and has a poor rock mass class; thus, making it prone to landslides. The area is unsuitable for habitation. Settlements on and along the foot of these slopes are not advised.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once the landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities.</p>

		Develop early warning system (e.g. signage posts) for critical areas.
Purok 15 (northern slopes bounding the area)	High	<p>Gullies and wedge landslides are present on the northern slopes bounding the area. Debris accumulation zones are present at the mouth of gullies. These areas are unsuitable for settlements and may be used instead for agricultural purposes.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area. Report to MGB/municipal authorities once the landslide reactivates. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
Purok 16, northern slopes bounding Sitio Bongkilaton (GPS reading: N 7° 42' 12.8"/E 126° 8' 45.9")	High	<p>Wedge landslides are present along gully developments. Debris accumulation zones occur at the mouth of these gullies. A house sits on the slope that is affected by landslides. Relocation may be considered unless slope stabilization measures are observed (e.g. benching).</p> <p>Organize emergency evacuation protocol with the community in coordination with municipal authorities. Identify the nearest evacuation center for affected residents especially those living at the mouth of the gullies. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
Purok 17 (GPS reading: N 7° 42' 4.7"/E 126° 8' 12.1")	Very High	<p>Several rotational and translational landslides pervade the northern slopes bounding the area. Gullies act as loci for wedge landslides that occur in the area. Avoid settlement at the base of these slopes and at the mouth of gullies as debris flows may occur during heavy rains.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks)</p>

		<p>in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
<p>Purok 18 (GPS reading: N 7° 42' 4.3"/E 126° 8' 16.7")</p>	<p>Very High</p>	<p>The northern slopes bounding the area are similar to those of the adjacent Purok 17 slopes where several rotational and translational landslides pervade. Gully developments are also observed. These areas may be utilized as agricultural lands but are not suitable for residential purposes.</p> <p>Organize emergency evacuation protocol with the community in coordination with municipal authorities. Identify the nearest evacuation center for affected residents especially those living at the mouth of the gullies. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.</p>
<p>Spur 2 (Purok 28)</p>	<p>Moderate</p>	<p>The purok center is characterized by broad ridges with low to moderate landslide susceptibility. The ridges surrounding the purok center are narrow with steep slopes making it very prone to landslide. Thick soil cover were also observed increasing its proneness to landslide.</p> <p>Barangay officials(BDRRMC) must observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g., landslides, tension cracks).Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities.Develop an early warning system (e.g., signages).Avoid construction of house along edge of slopes.</p>

<p>Purok 26 Quarry (GPS reading: N 7° 41' 3.1"/E 126° 11' 40.5")</p>	<p>Low to Moderate</p>	<p>Purok site is underlain by limestone with moderate slopes. No landslides were observed within the purok proper. However, several shallow landslides were noted along the roadcuts.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Avoid construction of house along edge of slopes.</p>
<p>Upper Bango (GPS reading: N 7° 40' 55.3"/E 126° 11' 18.5")</p>	<p>Moderate High to</p>	<p>Shallow landslides were observed along the roadcuts. Ball mills and tailings ponds present in the area have contributed to the weakening of the slopes. Slope modification causes some shallow landslides in the area.</p> <p>BDRRMC must observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).). Avoid construction of house on creeping slopes and footslope.</p>
<p>Pulang Lupa (Purok 23) (GPS reading: N 7° 41' 04.0"/E 126° 11' 9.0")</p>	<p>High</p>	<p>The area is covered by thick soil with observed creeping movement along the road. Bulging of slopes are present in the area suggesting creeping movement. Houses along the path of the creeping movement should be transferred to another place.</p> <p>Avoid construction of houses along and in front of creeping slopes. Avoid construction of houses along footslopes and edge of slopes.</p>
<p>Mambusao (Purok 21) (GPS reading: N 7°</p>	<p>High</p>	<p>Several landslides were observed along the roadcuts and along the ridges were there are mining activities. Thick soil cover combined with steep slopes makes the area very prone to landslides.</p>

<p>40' 12.5"/E 126° 10' 15.5")</p>		<p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Houses along the midslope is susceptible to landslide .Avoid construction of house along the footslopes. Area for gold processing zone should be established.</p>
<p>Kantigbao (Purok 22) (GPS reading: N 7° 40' 35.9"/E 126° 10' 54.8")</p>	<p>High</p>	<p>Several landslides were observed along the roadcuts. The area is covered by thick soil , showing creeping movement.</p> <p>BDRRMC must observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Construction of houses and other structure along creeping areas should be discouraged. Ballmills and processing plants should be placed in one processing zone.</p>
<p>Nursery (Purok 20) (GPS reading: N 7° 40' 5.5"/E 126° 9' 57")</p>	<p>Moderate</p>	<p>Slopes along the hill were altered due to the mining activity increasing its proneness to landslide. The purok is located on a wide valley with moderate slopes. Damming of the river might cause flooding in the area.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Ballmills should be placed in one processing zone. Construction of houses and ballmills along footslope should be avoided. Avoid construction of houses along river banks.</p>

<p>Purok 19 (GPS reading: N 7° 41' 7.9"/E 126° 7' 49.6")</p>	<p>Low</p>	<p>The purok site has low to moderate slopes without landslide manifestations. It is away from the mining activity making it free from any slope modification. However, several landslides were observed along the road going to purok nursery. The area is high to critically high for landslide. The army detachment location is also highly susceptible to landslide.</p> <p>Recommendations: Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Put signages along the road with landslides.</p>
<p>Barangay Panansalan</p>		
<p>Purok 2 (GPS reading: N 7° 27' 51.3"/E 126° 17' 03.9")</p>	<p>Very High/Critical</p>	<p>The site is underlain by weathered limestone and located on a moderately sloping ground towards the valley. Several tension cracks were observed within the purok site. Vertical displacements were from 0.2 to 0.5 meters while horizontal displacements ranges from 0.1 to 0.3 meters. Residents of Purok 2 will be relocated to a site that was assessed and found to be suitable for housing; the proposed relocation site is an old quarry area.</p>
<p>Purok 1 (GPS reading: N 7° 36' 43.8"/E 126° 17' 32.7")</p>	<p>Moderate</p>	<p>The purok center is located near the river. Although it is located on an area with moderate slopes, the area is prone to flashflood.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages). Put signages along the road with landslides. The area is prone to debris flow.</p>

Barangay San Miguel		
<p>Northeastern slopes bounding Sitio Kanubi, Purok 12 (GPS reading: N 7° 38' 24.0"/E 126° 07' 54.2")</p>	<p>High</p>	<p>Few translational slides were observed in the moderately to steeply sloping northeastern slopes bounding the purok. Gully developments are also present.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p> <p>Settlement at the base of this slope should be discouraged. The lands may be utilized for agricultural but not for residential purposes.</p>
<p>Northeastern slopes bounding Sitio Tingali, Purok 10 as sited from purok center: N 7°39'31.3" /E 126°7'35.8",</p>	<p>High</p>	<p>Moderate to steep slopes bounding Purok 10 have notable translational and wedge-type landslides. Old landslide escarpments were also noted in the area. The slope material is dominantly loose unconsolidated soil material which may pose potential hazard thus settlement near and along the base of the slopes must not be encouraged.</p> <p>The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p>
<p>Eastern slopes bounding Purok 13 sited from Purok 14: (GPS Reading: N 7° 37' 55.2"/E 120° 07' 38.6")</p>	<p>High</p>	<p>Active translational landslides are present on the eastern and northeastern slopes bounding the area, as seen from Purok 4 Center. Several gully developments were also noted along these slopes which may potentially lead to wedge-type slides once triggered. Settlement at the toe of these slides and debris accumulation zones are highly discouraged.</p> <p>Observe for and/or monitor for presence of</p>

		<p>mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
<p>Eastern slopes bounding Purok 9 sited from purok center: (GPS Reading: N 7° 39' 16"/E 126° 07' 40")</p>	<p>High</p>	<p>Several translational slides were noted along the eastern and southeastern slopes bounding the purok. The headwaters of Aguibawa river flowing eastwards transect these slopes which make its banks and valleys susceptible to ground collapse and slide.</p> <p>Settlement at the base of this slope should be discouraged. The lands may be utilized for non-residential purposes (e.g. agricultural). Slope stabilization measures (e.g. retaining walls) may be constructed to prevent further mass movements.</p> <p>Observe for and/or monitor for presence of mass movement and report to the MGB/municipal authorities (e.g. landslides, tension cracks). Observe for further saturated ground or seeps and sunken or displaced road surfaces and report to the MGB/municipal authorities. Develop early warning system (e.g. signages).</p>
<p>Barangay Siocon</p>		
<p>Barangay Tamia</p>		
<p>Purok 3 (GPS reading: N 7° 41' 54.4"/E 126° 7' 14.3")</p>	<p>High</p>	<p>Several translational landslides are present on the eastern slopes bounding the purok. These slopes are not suitable for settlements.</p> <p>Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal</p>

		authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 4 (GPS reading: N 7° 42' 19.6"/E 126° 6' 57.9")	High	The eastern slopes of Purok 4 are pervaded by several active translational landslides. Edges of top slopes and foot slopes are not suitable for settlements. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.
Purok 7 (GPS reading: N 7° 47' 43.7"/E 126° 7' 21.6")	High	Areas along the Ngan River are possible debris flow paths. Landslides on the upper portions of the barangay may be reactivated by heavy rains and cause debris flows on the lower portion of Ngan. Debris accumulations are already present on the banks of Ngan River. Prohibit settlements along the banks of Ngan River. Observe and/or monitor further mass movement (e.g. landslides, tension cracks) in the area and report to MGB/municipal authorities. Observe for saturated ground or seeps and sunken or displaced road surfaces and report to MGB/municipal authorities. Develop early warning system (e.g. signage posts) for critical areas.

Table 4. Results of Flood Hazard Assessment

Location	Flood Susceptibility Rating	Remarks/ Recommendations
Barangay Aurora		
Purok 1 Center N 07°38'57.3"	Low	0.3m localized flood height due to clogged canals and drainages which overflow during heavy downpours. Recommendations:

E 126°03'29.4"		Maintain proper wastes disposal and regular cleaning of canal and water ways.
Purok 2 Center N 07°39'03 E 126°03'07.2"	Moderate	<p>Interviewed residents experienced flood height of 0.5m-0.8m last typhoon Pablo. Water emanates from the overflow of Batoto River.</p> <p>Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways. Dredging of Batoto River is highly recommended.</p>
Purok 3 Center 07°39'21.1" 126°02'35.4"	Very High	<p>Entire Purok experienced >2m flood height during Typhoon Pablo. Active riverbank erosion is evident in Batoto River rating it very susceptible in flooding. Collapsed/dammed portion of the riverbank was also noted. Alluvial sediment composed of fine to pebbly sandstones shifted way NW through the ricefields covering a large area.</p> <p>Recommendations: Unless flood control measures be ensured, resettlement of affected residents is likely the only option. Maintain the area as an agricultural area and discourage settlement along the river. Buffer zones must be se. Batoto River must undergo dredging. Bank stabilization must be implemented. Proper wastes disposal of canals and waterways must be maintained.</p>
Purok 4A Center N 07°39'17" E 126°02'53.2"	Moderate	<p>Purok House of 4A experienced 0.5m-0.8m flood last typhoon Pablo resulting from the overflow of Batoto river and localized flood due to clogged drainage and insufficient waterways.</p> <p>Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>

<p>Purok 4</p> <p>Center N 07°39'31.7" E 126°02'48.3"</p> <p>Paaralang Elementarya ng Aurora: 07°39'31.6" 126°02'48.0"</p>	<p>Moderate</p>	<p>Flood height in Purok varies from 0.5m-0.8m last typhoon Pablo. Purok house was inundated up to knee level including the adjacent school (Paaralang Elementarya ng Aurora) resulting from the overflow of Batoto river and localized flood due to clogged drainage and insufficient waterways.</p> <p>Recommendations:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 5</p> <p>Center N 07°39'53.8" E 126°02'42.6"</p>	<p>High</p>	<p>Purok 5 was inundated up to 1m-1.5m based on the interview of the affected residents due to the overflow of a nearby creek and Batoto River.</p> <p>Recommendations:</p> <p>Discourage settlement near the river and allocate permanent settlement of affected residents to safer grounds. Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 6</p> <p>Center N 07°39'59.5" E 126°02'35.1"</p>	<p>Very high</p>	<p>Purok 6 serves as the catch basin of flood water emanating from Purok 7 and Purok8 because of its topography which causes inundation of up to 2m. Clogged drainage and insufficient waterways hamper water flows which recede in 2 days after heavy downpours. Water emanates from a nearby creek and overflow of Batoto river.</p> <p>Recommendations:</p> <p>Allocate residents to resettle to higher and safer grounds. Construct waterways for surface runoff that could carry voluminous water during heavy rains. Develop early warning devices (e.g. signages). Maintain proper wastes disposal and cleaning of drainage canals and waterways.</p>
<p>Purok 7</p> <p>Center N 07°40'5.6"</p>	<p>High</p>	<p>Purok 7 is situated near Batoto River making it highly susceptible to flooding.</p> <p>Recommendations:</p>

E 126°01'56.6"		Resettle families residing proximal to the river. Develop early warning devices (e.g. signage). Maintain buffer zones from the river.
Purok 8 Center N 07°39'31.8" E 126°03'12.6"	Very High	Purok 8 is situated near Batoto River making it very susceptible in flooding. Residents experienced >2m flood height last typhoon Pablo. Recommendations: Provide permanent resettlement of the affected residents to safer and distal to water overflow sources. Provide an early warning device and conduct drill program for evacuation of residents to permanent evacuation site/s.
Barangay Bagongon		
Purok 2 Center: N 7° 42' 32.6" E 126° 3' 56.7"	High	Purok 2 is very susceptible to flooding due to its flat terrain. Reported flood heights in the area is 1.2 m which lasted for 24 hours. Barangay Hall and Bagongon Elementary School were both flooded. Recommendations: Brgy. Bagongon is a natural floodplain, thus early warning system (i.e.siren or signages) and evacuation protocol must be critically planned for the community. Relocation of settlements can be done but not within the barangay. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.
Purok 1 Center: N 7° 42' 26.5" E 126° 3' 52.3"	High	The area is natural floodplain for Agusan River and Bagongon Creek, thus sheet flooding is the primary hazard in the area. Flood heights in the purok vary from 1.5 m – 1.8 m which lasted for 120 hours. Thick

		<p>(0.5 m) pile of fine sediments was deposited in the area after flood.</p> <p>Recommendations: Early warning system (i.e.signages) and evacuation protocol must be critically planned for the community. Relocation of settlements can be done but not within the barangay. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.</p>
Purok 3 Center: N 7° 42' 07.4" E 126° 3' 57.3"	High	Purok 3 is located along Bagongon Creek. Overflowing of the creek during heavy rains caused severe flooding in the area. Flood in the area could reach up to 1.5 m and persisted for 120 hours. <p>Recommendations: Early warning system and evacuation protocol must be critically planned for the community. Regular dredging of the creek must be done to increase its depth. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation of settlements can be done but not within the barangay. Furthermore, adaptation to sheet flooding such as structural designs of houses (i.e elevated houses) should be carefully studied by LGUs.</p>
Purok 4 Center: N 7° 42' 19.8" E 126° 4' 08.8"	High	Purok 4 is a natural floodplain with two drainage systems, Agusan River and Bagongon Creek draining the area. Reported flood heights in the area is 1.5 m which lasted for 24 hours. <p>Recommendations: Early warning system (i.e. siren or signages) and evacuation protocol must be critically planned for the community.</p>

		Relocation of settlements can be done but not within the barangay. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.
Purok 5 Center: N 7° 41' 37.0" E 126° 4' 6.4"	High	<p>The area is characterized by flat terrain covered with rice fields. Overflowing of the nearby Bagongon Creek resulted to 1.5 m flood in the area. Floodwaters receded after 24 hours.</p> <p>Recommendations: Early warning system and evacuation protocol must be critically planned for the community. Regular dredging of the creek must be done to increase its depth. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation of settlements can be done but not within the barangay. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.</p>
Purok 7 Center: N 7° 41' 39.6" E 126° 4' 29.8"	High	<p>Residential houses in Purok 7 are concentrated in purok center. Majority of the area is covered with banana plantation. The reported flood height in the vicinity of the purok center is 1.0 m which lasted for 72 hours.</p> <p>Recommendations: Early warning system (i.e.siren) and evacuation protocol must be critically planned for the community. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.</p>

<p>Purok 6 Center: N 7° 41' 56.7" E 126° 4' 44.1"</p>	<p>Very High</p>	<p>Agusan River is a large meandering stream channel traversing the municipality of Compostela. It has an approximate width of 175 – 200 m. Fluvial deposits are composed of sand, silt and clay. Presence of coarser sediments is minimal.</p> <p>The location of the purok is a part of an old meander bend of Agusan River, thus, it can be easily inundated during heavy rains. Flood can reach more than 2.0 m. Last Typhoon Pablo, the area was inundated for 96 hours.</p> <p>The area is underlain with unstable fluvial deposits that will be eventually eroded by the river.</p> <p>Recommendations: The area is not suitable for residential purposes. It must be permanently declared as critical area. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Present residents must be immediately relocated to a safer site.</p>
<p>Purok 8 Center: N 7° 41' 2.7" E 126° 4' 50.6"</p>	<p>High</p>	<p>Purok 8 can be easily inundated during heavy and prolonged rains because it is still part of the floodplain of Agusan River. Last Typhoon Pablo, flood height reached 1.7 m for 24 hours.</p> <p>Recommendations: Early warning system and evacuation protocol must be critically planned for the community. Furthermore, adaptation to sheet flooding such as structural designs in houses (i.e elevated houses) should be carefully studied by LGUs.</p>
<p>Barangay Gabi</p>		

<p>Gabi Brgy. Hall (GPS reading: N 7° 36' 30.1"/E 126° 03' 21.5")</p>	<p>Moderate</p>	<p>Gabi Brgy. Hall is situated to the east of the active Gabi Creek making the area inundated of about 0.5m during Typhoon Pablo. Floodwaters came from the SE mountainous portion of Brgy. Panag and was noted to recede after 1.</p> <p>Recommendations: Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Evacuate to the elevated portion of purok 7 in case of heavy rain or typhoon.</p>
<p>Purok 12 (GPS reading: N 7° 36' 19.7"/E 126° 3' 21.7")</p>	<p>High</p>	<p>Purok 12 Hall is adjacent to Gabi Creek giving the majority of the area high susceptibility to flooding. In average, Purok 12 residents reported 1.2m flood depth during Typhoon Pablo that receded after a day.</p> <p>Recommendations: Avoid settlement on the banks of creeks. Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Purok 1 (GPS reading: N 7° 36' 3 2.1"/E 126° 3' 09.7")</p>	<p>Moderate</p>	<p>Gabi Creek is located to the east of purok center. This creek inundates the eastern side of purok 1 when there is heavy rain/typhoon. Flood depth of about 0.5m totally receded after 1 day during Typhoon Pablo.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Evacuate to the western elevated portion of purok in case of heavy rain or typhoon. Widening and frequent dredging of creek channels may be done to</p>

		increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.
Purok 2 (GPS reading: N 7° 36' 24.7"/E 126° 3' 16.7")	High	<p>Purok 2 is sandwiched by two active creeks making the area highly susceptible to flooding. For worst case scenario, the highest recorded flood height is 1.2m and receded after 4 days. Floodwater drains from the creek of Purok 12.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Flood protection structures (e.g. dikes riprap) must be constructed in order to lessen overflow of creeks during extreme heavy rains. Settlement along the banks of creek is still discouraged.</p>
Purok 9 (GPS reading: N 7° 37' 33.8"/E 126° 02' 47.2")	Moderate	<p>The area is majority covered by banana plantation submerged for about 0.6m during Typhoon Pablo. The duration of inundation is 1 day draining from Purok 1.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Flood protection structures must be constructed in order to lessen overflow of creeks during heavy rains.</p>
Purok 11 (GPS reading: N 7° 37' 17.7"/E 126° 02' 43.1")	High	<p>Though the purok center has low susceptibility to flooding, other portions including areas along creeks and rice plantation received 1m flood depth during Typhoon Pablo. The westward flow of floodwater recedes after 1 day in average.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for rapid increase in creek water levels for early plan of evacuation. Culverts must be renovated/replaced with large diameter ducts in order to accommodate floodwaters draining from the brgy. hall area.</p>

<p>Purok 6 (GPS reading: N 7° 36' 26.5"/E 126° 03' 20.6")</p>	<p>Moderate</p>	<p>The area is located adjacent to brgy. hall which is also traversed by the active Gabi Creek. The duration of inundation is 2 days and the highest recorded flood height is 0.7m.</p> <p>Recommendations: Organize emergency evacuation protocols in the community together with municipal authorities. Widening and frequent dredging of creek channels must be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop early warning device/system. Evacuate to the elevated portion of purok 7 in case of heavy rain or typhoon.</p>
<p>Barangay Lagab</p>		
<p>Purok 1</p> <p>Center: N 07°40'09.2" E 126°03'46.7"</p>	<p>Low</p>	<p>Characterized by flat and gentle terrain. No significant flooding in the area except for localized flooding during heavy rains but readily subsides within hours.</p> <p>Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 2</p> <p>Center: N 07°40'32.0" E 126°03'48.7"</p>	<p>Low</p>	<p>No significant flood report in the area.</p> <p>Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 3</p> <p>Center: N 07°40'51.1" E 126°4'19.7"</p>	<p>Moderate</p>	<p>The area is characterized by flat and gentle terrain covered mainly with rice fields. The irrigation canal causes low areas to be inundated up to 0.5m-0.8m flood height during excessive precipitation</p> <p>Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 4</p> <p>Center: N 07°40'17.1" E 126°04'15.9"</p>	<p>Moderate</p>	<p>The area is characterized by flat and gentle terrain covered mainly with rice fields. The irrigation canal causes low areas to be inundated up to 0.5m-0.8m flood height during excessive precipitation.</p>

		<p>Recommendations: Implement flood control measures. Residential houses lying in lowland should further elevate their areas through backfilling with consultation from engineers to somehow constrict water overflow emanating from creeks and the plantation nearby. Must observe for rapid increase/decrease in creek/river water levels, accompanied by increased turbidity. Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 5</p> <p>Center: N 07°40'03.8" E 126°04'06.0"</p>	<p>Moderate</p>	<p>Purok 5 is located Southwest of Purok 4. More likely experienced same flooding situation of Purok 4. The area is characterized by flat and gentle terrain covered mainly with rice fields. The irrigation canals cause lowland areas to be inundated up to 0.5m-0.8m flood height during excessive precipitation.</p> <p>Recommendations: Implement flood control measures. Residential houses lying in lowland should further elevate their areas through backfilling with consultation from engineers to somehow constrict water overflow emanating from creeks and the plantation nearby. Must observe for rapid increase/decrease in creek/river water levels, accompanied by increased turbidity. Construct sufficient waterways and canals and maintain proper wastes disposal and regular cleaning.</p>
<p>Purok 6</p> <p>Center: N 07°40'4.1" E 126°03'8.7"</p>	<p>High</p>	<p>Purok 6 is situated near the highly silted Batoto River rating it with high susceptibility in flooding. Heavy siltation (partly due to riverbank erosion) has caused the river to shallow up. Residents nearby had experienced inundation of up to 1m-1.5m during typhoon Pablo and with higher possibility of deeper flood height when excessive rain comes. Water subsides within two days after the typhoon.</p> <p>Recommendations: Implement flood control measures.</p>

		Settlement along the riverbanks is highly discouraged. Dredging of Batoto River is strictly recommended. Observe for rapid increase/decrease in creek/river water levels, possibly accompanied by increased turbidity. Early warning device should be developed.
Purok 7 Center: N 07°41'1.6" E 126°03'40.6"	Moderate	The Purok is located in naturally flood prone area in which flood height varies from 0.5m-1.0m. Low land areas of the purok are more likely to experience higher flood depth. Recommendations: Implement flood control measures. Maintain proper wastes disposal and regular cleaning of canal and water ways.
Barangay Mangayon		
Mangayon Brgy. Hall (GPS reading: N 7° 42' 56.8"/E 126° 6' 15.2")	Moderate	Brgy. Mangayon is sandwiched by two active creeks draining from the eastern mountainous portion. Residents must be evacuated to eastern elevated area far from tributaries in case of heavy rain or typhoon. During Typhoon Pablo, the recorded flood depth in the vicinity is 0.5m and receded after 1 day. Recommendations: Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Develop an early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 4A (GPS reading: N 7° 44' 16.8"/E 126° 5' 53.3")	High	The area is prone to both sheet flooding and flashflooding. Floodwaters come from the western mountainous area with high possibility of flashflood when heavy rain/typhoon occurs. 1m flood depth is reported within the area that receded after a day during Typhoon Pablo. Recommendations:

		Avoid building adjacent/on the mouth of a creek/river emanating from the eastern mountains due to the area's very high susceptibility to flashfloods. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 3C (GPS reading: N 7° 43' 51.7"/E 126° 6' 10.5")	Moderate	Purok 3C is situated on the foot of the eastern mountain making the area susceptible to floods coming from the active creek to the north and south of the purok center. The duration of 0.5m inundation in the area during Typhoon Pablo is 1 day. Recommendations: Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Purok 3A (GPS reading: N 7° 43' 45"/E 126° 6' 19.8")	High	The area is critically susceptible to flashflooding since it is located on the exit point of two tributaries with relatively huge watershed. The area is considered to be a part of alluvial fan considering it unsuitable for settlement. The reported flood height is 1.2m and receded after 1.5 days. Recommendations: Relocation of residents within/adjacent to the active creek to the elevated south of the creek is highly recommended. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Purok 3B (GPS reading: N 7° 43' 27.7"/E 126° 6' 22.9")	High	Purok 3 is located adjacent to a stream draining from the eastern mountainous area. It is also susceptible to flashflooding if heavy rain/typhoon occurs. During Typhoon

		<p>Pablo, 1.1m is the maximum flood depth reported within the area and regressed after a day.</p> <p>Recommendations: In case of heavy rain/ typhoon, residents are recommended to evacuate to the elevated area to the south of the active creek (@N 7° 43' 15"/E 126° 06' 15"). Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 1C (GPS reading: N 7° 42' 59.6"/E 126° 06' 15.3")</p>	<p>High</p>	<p>The area is prone to both flashfloods and sheet floods. If heavy rain occurs and the tributary at the elevated area is blocked, a sudden rush of water may wash away the low-lying area adjacent to the creek. The recorded flood depth in the area is 1.3m that receded after a day.</p> <p>Recommendations: Further buildup on the area adjacent to the mouth of the creek should be discouraged. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 1B (GPS reading: N 7° 42' 53.5"/E 126° 6' 17.6")</p>	<p>Moderate</p>	<p>Floodwaters from the eastern mountainous portion inundate the vicinity of the purok for about 1day. For worst case scenario, the reported depth of flood in the area is 0.6m. The creek at the south of purok center worsens the flooding in locale.</p> <p>Recommendations: The residents must be evacuated to eastern elevated area far from tributaries in case of heavy rain or typhoon. Observe for flash flood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 2C (GPS reading: N 7° 42' 41.7"/E 126° 6' 13.9")</p>	<p>High</p>	<p>The purok center is located south of an active river channel. Floodwaters drain from the east submerging the area for about 1.4m and receded after a day. Some of the areas including the NE part are also highly susceptible to flashfloods.</p> <p>Recommendations: The residents must be evacuated to Purok2B in case of heavy rain or typhoon. Observe for flash flood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 2A (GPS reading: N 7° 42' 35.9"/E 126° 6' 16.4")</p>	<p>Moderate</p>	<p>The area is relatively far from an active creek but prone to flooding due to the minute creeks emanating from the eastern mountainous portion. During Typhoon Pablo, the recorded flood height in the vicinity is 0.5 and receded after a day. In times of heavy rain or typhoon, residents must go to purok 2B for evacuation purposes.</p> <p>Recommendations: Develop early warning device/system. Observe for flash flood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 5A (GPS reading: N 7° 43' 7.3"/E 126° 5' 35.8")</p>	<p>High</p>	<p>Purok 5A is an area used as rice field. It is sandwiched by two active creeks that drain from Purok 1A. It is not suitable for residential purposes due to its topographically critical location. The area is highly silted after Typhoon Pablo owing to the muddy sediments from rice field area. 1.2m is the maximum depth of flood recorded within the area.</p> <p>Recommendations: Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity. Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 5B (GPS reading: N 7° 43' 25.5"/E 126° 4' 57.4")</p>	<p>High</p>	<p>The area is utilized as banana plantation having a maximum recorded flood depth of 1.4m during Typhoon Pablo. The purok must not be developed as residential area since almost whole of the area is highly susceptible to flood due to the adjacent creeks.</p> <p>Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 6 (GPS reading: N 7° 43' 9.7"/E 126° 4' 40.6")</p>	<p>Moderate</p>	<p>The purok is not highly flooded since it is relatively far from an active river/creek. During Typhoon Pablo, muddy floodwater inundated majority of the banana plantation area. The maximum duration of flood is 1 day flowing due north.</p> <p>Recommendations: If not properly mitigated, the area is also not suitable for residential purposes since it is situated within the floodplain of Agusan River. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 7 (GPS reading: N 7° 42' 31.5"/E 126° 5' 00.3")</p>	<p>Moderate</p>	<p>Majority of the purok land is covered by banana plantation. Floodwaters overflowed from Agusan River to the west and others are runoffs from the creeks to the east of purok center. Flood depth of 0.6m is noted in the area that deposited muddy/silty sediments after Typhoon Pablo.</p> <p>Recommendations: For evacuation purposes, in case of heavy rain or typhoon, the residents must go to the elevated portion to the east of purok center. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity. Organize emergency evacuation</p>

		protocols in the community together with municipal authorities.
Barangay Mapaca		
Purok 4 Center: N 7° 41' 28.1" E 126° 3' 18.0"	High	<p>A north-northeast flowing creek transects residential areas of Purok 4 going towards the corn fields. Purok 4 is located in the natural floodplain of the creek, thus the area is very susceptible to flooding. Overflowing of this creek resulted to inundation for around 36 hours. Reported flood heights in the area vary from 1.2 m – 1.5 m.</p> <p>Recommendations: Local government should devise an early warning system and proper evacuation protocol for the residents of Purok 4. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation to the elevated area of purok should also be considered.</p>
Purok 5 Center: N 7° 42' 19.0" E 126° 3' 5.9"	High	<p>A 2.0 m-wide creek, flowing southwards, supplying waters to the irrigation canals of the rice fields. Banks of the creek were flooded last December 2012 due to heavy rains brought by Typhoon Pablo. Flood could reach 1.3 m for 2 days. Houses in the elevated portion of the purok were not affected by flood</p> <p>Recommendations: Local government should devise an early warning system. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation to the elevated area of purok should also be considered. If there's no relocation site</p>

		available, proper evacuation protocol must be planned for an impending typhoon.
<p>Purok 1B N 7° 43' 4.8'' E 126° 2' 45.1''</p> <p>Center: N 7° 43' 2.6'' E 126° 2' 51.2''</p> <p>N 7° 43' 3.7'' E 126° 2' 52.7''</p>	<p>High</p> <p>Moderate</p> <p>Low</p>	<p>A flashflood occurred in the area last December 2012 during Typhoon Pablo. High energy floodwaters from nearby mountainous areas rush over the vicinity for 3 – 4 m. Thick pile of fine sediments were deposited after the flashflood. Possibly, an old channel traversed parallel in the area where floodwaters were channeled during heavy rains.</p> <p>Recommendations: An early warning signage indicating that the area is prone to flashflooding should be placed in the area. Evacuation should be done prior to the heavy rainfall to minimize the risk of flashfloods. Resettlement for residents is necessary.</p> <p>Areas at the boundary of Purok 1B and 1C are prone to moderate flooding with flood heights vary from 0.5 m – 1.0 m.</p> <p>Vicinity of Mapaca Elementary School were not flooded during Typhoon Pablo.</p>
<p>Purok 2 Center: N 7° 43' 12.2'' E 126° 2' 42.0''</p>	<p>Very High</p>	<p>Flashflood occurred in area due to its geomorphologic location. It lies in the vicinity of a large channel from the mountains that carries large volume of high energy – floodwaters. The said river channel is 20 m wide. The height of the banks is 5 – 6 m from the stream bed. It has high competence that can carry sand sized to cobble sized sediments.</p> <p>Purok 2 is underlain by unconsolidated fluvial deposits which is unstable for river erosion. Flood height could reach up to 1.7 m for 2 – 3 hours.</p>

		<p>Recommendations:</p> <p>An early warning signage indicating that the area is prone to flashflooding should be placed in the area. Evacuation should be done prior to the heavy rainfall to minimize the risk of flashfloods. Purok 2 residents should be relocated.</p>
<p>Purok 8 N 7° 43' 4.2" E 126° 3' 16.0 "</p> <p>Center: N 7° 43' 18.4" E 126° 3' 16.1 "</p>	<p>High</p> <p>Moderate</p>	<p>A 2.0 m wide, west-northwest flowing creek transects across Purok 8. Flood in the banks could reach up to 0.75 m for 2 hours.</p> <p>Recommendations:</p> <p>Local government should devise an early warning system. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Relocation to the elevated area of purok should also be considered.</p> <p>In the purok center, a small creek overflowed during Typhoon Pablo that caused flooding in the residential areas. Reported flood height is 0.75 m.</p> <p>Recommendations:</p> <p>Local government should devise an early warning system. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation protocol should be implemented during typhoon season every November to January or heavy rainfall.</p>
<p>Purok 7 Center: N 7° 42' 51.1" E 126° 3' 22.0 "</p>	<p>High</p>	<p>Overflowing of local creek parallel to the road of Purok 7 during heavy and prolonged rains resulted to the flooding of its banks. Estimated flood height is around 1.0 m in the house along the banks. Flood in the road could reach up to 0.5 m.</p>

		<p>Recommendations: Early warning system/measures should be implemented by the local government. Residents should be proactive when there's an impending typhoon or calamity. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Evacuation centers should be identified and proper evacuation protocol must be established.</p>
<p>Purok 6 N 7° 42' 45.9" E 126° 3' 45.4"</p> <p>Center: N 7° 42' 52.5" E 126° 3' 29.5"</p>	<p>Very High</p> <p>Moderate</p>	<p>Mapaca Creek has 4 – 5 m width, flowing SW towards Brgy. Bagongon. Settlements along Mapaca Creek are minimal. Most of the lands are agricultural areas (i.e. banana plantation). Flood height in the area is > 2.0 m. Active river erosion weakens the concrete foundation of steel bridge.</p> <p>Recommendations: An early warning device (i.e. siren or signage) should be placed in the area. These areas are not suitable for human settlements, thus it should be continuously used as agricultural area. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Banks of the creek should be protected to avoid further erosion and scouring. Local government should install riprap or dike wall.</p> <p>In the purok center, residents experienced 0.75 m – 1.0 m flood for 72 hours.</p> <p>Recommendations: Signages indicating flood hazards should be placed in the area. Evacuation of residents should be done prior to heavy rains to avoid disaster.</p>
<p>Brgy. Maparat</p>		

<p>E 126° 2' 08.2''</p> <p>Local creek in Sitio Calupogon N 7° 41' 37.1'' E 126° 2' 23.0''</p>	<p>Moderate</p>	<p>Flood was able to reach 0.5 - 0.6 m.</p> <p>Banks of SSW flowing creek in the area were inundated by 0.75 m – 1.0 m flood during Typhoon Pablo.</p> <p>Recommendations: An early warning system should be developed in the barangay. Monitor for murky discoloration of water in the creek accompanied by rapid increase or decrease of water levels. Residents of Purok 1 should be evacuated when there's an alert warning for heavy rain or typhoon.</p>
<p>Purok 2A Center: N 7° 41' 02.4'' E 126° 2' 36.1''</p>	<p>Moderate</p>	<p>Low lying areas of Purok 2A experienced a 0.5 m flood during Typhoon Pablo. Maparat Elementary School, situated in an elevated area in Purok 2 designated as evacuation center for affected residents.</p> <p>Recommendations: Early warning system/measures should be implemented by the local government. Residents should be proactive when there's an impending typhoon or calamity. Evacuation centers should be identified for future use.</p>
<p>Purok 2B Center: N 7° 40' 48.4'' E 126° 2' 32.3''</p>	<p>High</p>	<p>Purok 2B's topography is characterized by flat plains covered by rice fields. Several river tributaries, traversing the plain, overflowed during recent typhoon event. West-northwest flowing tributaries are 7 – 10 m wide, depositing fine sediments (clay, silt, sand) over its floodplains. Flood heights in the banks reached 1.7 m and persisted for almost one (1) week.</p> <p>Recommendations: Signages indicating flood hazards should be placed in the area. Monitor for murky discoloration of water in the creek</p>

		<p>accompanied by rapid increase or decrease of water levels. Residents should be relocated to a safer place to avoid an impending disaster due heavy and prolonged rainfall.</p>
<p>Purok 4 Center: N 7° 40' 48.4" E 126° 2' 32.3"</p>	<p>Moderate</p>	<p>Most of the flooded areas in Purok 4 are rice fields. Some houses along the road were also flooded. Reported flood heights vary from 0.6 m - 1.0 m. Waters receded after 36 hours.</p> <p>Recommendations: Early warning system/measures should be implemented by the local government. Residents should be proactive when there's an impending typhoon or calamity. Evacuation centers should be identified and proper evacuation protocol must be established.</p>
<p>Purok 6C Center: N 7° 41' 15.2" E 126° 1' 56.1"</p>	<p>High Moderate</p>	<p>Agricultural lands are the most affected by flooding in the purok. Flood height could reach up to 1.5 m.</p> <p>Residential areas of Purok 6C experienced 0.75 m – 1.0 m flood during typhoon. Flood persisted for almost a week before it receded.</p> <p>Recommendations: Local government should establish an early warning device (i.e signages or sirens). Minimize residential settlements in the area; instead, this should be utilized as agricultural lands. Evacuation of residents should be done during heavy and prolonged rainfall.</p>
<p>Purok 6A Center: N 7° 41' 15.2"</p>	<p>Low</p>	<p>Residential areas of Purok 6A are located In elevated portion which experienced up to 0.5 m flood during typhoon.</p>

E 126° 1' 56.1"		
Purok 3 Center: N 7° 41' 17.8" E 126° 3' 9.6"	Moderate	Residents of Purok 3 were inundated by 0.5 m flood coming from Bagongon creek for 60 hours. Floodwaters in the rice fields were higher relative to the residential areas. Recommendations: Early warning device/system (i.e. signages) should be put up in the area. Minimize residential settlements in the area. Evacuation of residents should be done during heavy and prolonged rainfall.
Purok 5 N 7° 41' 45.5" E 126° 3' 15.7" Center: N 7° 41' 28.1" E 126° 3' 18.0"	Moderate Low	Areas affected by flood are mostly agricultural lands. Flood height could reach up to 0.75 m. Recommendations: An early warning device (i.e. signage) should be placed in the area. These areas are not suitable for human settlements, thus it should be continuously used as agricultural area. Purok center, where settlements are concentrated, did not experience flooding during typhoon even though the location is still in the flat and susceptible to 0.5 m flooding.
Barangay New Algeria		
New Alegria Brgy. Hall (GPS reading: N 7° 37' 57.9"/E 126° 3' 57")	Low	Brgy. hall is far from an active creek/river making it low in flood susceptibility. The area suffers minor sheet floods and surface run-offs from the elevated portion. To the NE is a creek that may inundate the northern portion of the vicinity when heavy rain or intense typhoon occurs. Recommendations:

		Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop an early warning device/system.
Tuplon 1 (GPS reading: N 7° 37' 57.5"/E 126° 3' 59.5")	Moderate	The NW part of Purok Tuplon 1 is adjacent to a creek categorizing the area under moderate to flood susceptibility. 0.5m is the highest flood depth recorded within the area. Floodwater receded after 1day during Typhoon Pablo. Recommendations: Develop an early warning device/system. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.
Kawasan 2 (GPS reading: N 7° 36' 30.7"/E 126° 7' 36.5")	High	The area is flanking Batoto River with 50m width and approximately 4m depth. During Typhoon Pablo, the river inundated the adjacent puroks including Kawasan2 center. The highest recorded flood depth is 1.1m and receded after 2 days. Recommendations: Develop an early warning device/system. Avoid construction of houses within/ adjacent to the active river channel. Evacuate to the elevated portion of Purok Valencia 2 in case of heavy rain or typhoon.
Kawasan 1 (GPS reading: N 7° 38' 7.3"/E 126° 4' 4.7")	Moderate	For worst case scenario, the representative flood depth in the area is about 0.5m and receded after 1 day. To the western portion of Kawasan 1 is an active creek inundating the lower area adjacent to the tributary. Recommendations: Develop an early warning device/system. Avoid construction of houses adjacent to the creek channel. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.

<p>Lanapan 1 (GPS reading: N 7° 38' 39.5"/E 126° 3' 49.5")</p>	<p>High</p>	<p>Lanapan 1 Hall and its vicinity were highly flooded during Typhoon Pablo that receded after 1day. 1.2m depth of silted/muddy floodwater is recorded to the south of purok center coming from the Batoto Creek. The majority of the area is used as rice field and must not be developed as residential area.</p> <p>Recommendations: Develop an early warning device/system. Avoid construction of houses along active river channel. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p>
<p>Lanapan 2 (GPS reading: N 7° 38' 49.9"/E 126° 3' 36.6")</p>	<p>Moderate</p>	<p>The area is situated on a low-lying rice field making it moderately susceptible to flood. The recorded flood depth near the purok center is 0.5 and receded after 1 day during Typhoon Pablo. Silted/ Muddy floodwaters overflowed from the Batoto Creek draining from Lanapan 1.</p> <p>Recommendations: Avoid construction of houses along active river channel. Widening and frequent dredging of creek channels may be done to increase the capacity and ensure efficient flow of floodwaters during strong typhoons/heavy rains. Develop an early warning device/system.</p>
<p>Barangay Ngan</p>		
<p>Purok 7 (spillway near boundary with Purok 5) (GPS reading: N 7° 41' 29.8"/E 126° 7' 20.6")</p>	<p>High</p>	<p>The spillway in area is impassable during heavy rains. A creek that drains northwest into the Ngan River overflows making the low-lying portions of the purok unsuitable for habitation.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 14 (GPS reading: N 7° 42' 4.3"/E 126° 7')</p>	<p>Very High</p>	<p>Undercutting of banks along Ngan River is very evident. Bank erosion is extensive. Slope stabilization measures (e.g. riprap) may be constructed to prevent further</p>

52.0")		<p>scouring.</p> <p>The area is flashflood-prone and a debris flow path due several gullies and debris accumulation zones present on the upstream portions of the barangay. Residents should be wary of impending flashfloods during heavy rains. Once flashflood signs (rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity) are observed, residents should immediately evacuate to higher, stable areas of the barangay.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community in coordination with the municipal authorities. Settlements along rivers should be discouraged and closely monitored by the barangay authorities.</p>
<p>Purok 17, near Ngan River and Lubog Creek (GPS reading: N 7° 42' 4.7"/E 126° 8' 12.1")</p>	Very High	<p>The convergence of Lubog Creek and Ngan River in the area escalates flood heights during heavy rains. Floods reach more than 2 meters from its immediate banks. Settlements on these areas are highly discouraged.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 18, near Ngan River (GPS reading: N 7° 42' 4.3"/E 126° 8' 16.7")</p>	Very High	<p>Heavy rains cause Ngan River to overflow, inundating its banks with flood heights of up to 1.6 meters. The area is a possible flashflood path and debris flow path due to several gullies and debris accumulation zones located upstream. Avoid settlement on the immediate banks of Ngan River.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>

<p>All other areas of the barangay (Puroks 1, 2, 3, 4, 5, 7, 9 and 10)</p>	<p>Moderate</p>	<p>Creeks seldom overflow during extreme heavy rains. Immediate banks of these creeks are not suitable for settlements.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Barangay Osmeña</p>		
<p>Purok 7, purok center (GPS reading: N 7° 39' 49.2"/E 126° 06' 6.2")</p>	<p>Moderate</p>	<p>The purok serves as a catchment basin of floodwater from upland areas during excessive rainfall and typhoons such as the recent typhoon Pablo. It is coupled by floodwater coming from Agusan River which traverses most of the puroks in the barangay.</p> <p>Install flood protection structures (e.g. dikes, riprap) and ensure its design and quality to withstand flashfloods. Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during extreme heavy rains.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 9, in front of Agusan River (GPS reading: N 7° 39' 59.6"/E 126° 05' 41.7")</p>	<p>Very High</p>	<p>The Agusan river transects the purok flowing northwards. The river overflows during extensive, heavy downpours critically inundating a greater part of the purok. River scouring and erosion is exceedingly active in this side of the river progressing roughly 5m in every heavy rainfall event.</p> <p>Flood protection structures (e.g. dikes riprap) must be installed to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged.</p>

		Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system.
Purok 2, purok center (GPS reading: N 7° 39' 49.2"/E 126° 06' 6.2")	Low	The purok center and its immediate vicinity have low susceptibility to flooding in events of continuous rainfall. Drainage canals and waterways must be properly maintained to avoid further inundation.
Low-lying areas of Purok 2 and regions near to the creek/river	Moderate	Lower portions of Purok 2 along the floodplains of Agusan River may experience moderate floods during excessive downpours and typhoons. Flooding may affect existing plantation fields. Settlement in regions near the river must be avoided. Shallow creeks in the area may be dredged to prevent inundating streets. Frequent declogging of canals may be done to ensure efficient flow of water.
Purok 6, purok center (GPS reading: N 7° 39' 10.6"/E 126° 6' 23.3")	High	The purok center and its immediate vicinity are prone to high floods during heavy rainfall and typhoons. Agusan River, Tadia Creek, and Cumilid Creek transect the purok and are the primary sources of floodwater in the area. The purok serves as a partial catchment area of water from up-lying barangays and sitios. Flood protection structures (e.g. dikes riprap) must be installed to lessen overflow during extreme heavy rains. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system.
Areas in Purok 6 that are adjacent to Agusan River, Cumilid Creek and Tadia Creek	Very High	Flooding reaches critical level in areas within the purok adjacent to these river systems. Discourage settlement on these areas. Flood protection structures (e.g. dikes riprap) must be installed to lessen overflow during extreme heavy rains.

		<p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 3, purok center (GPS reading: N 7° 40' 28.6"/E 126° 5' 42.4")</p>	<p>Very High</p>	<p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during extreme heavy rains.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 5, purok center (GPS reading: N 7° 39' 48.3"/E 126° 06' 56.0")</p>	<p>High</p>	<p>The purok center and its immediate vicinity is likely to experience high floods as it is situated near the north-flowing Aguibawa River and being the river's natural floodplain. During heavy rainfall and typhoons, floodwater may reach 1-2m in the purok center and surrounding regions.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Banks of Aguibawa River (GPS reading: N 7° 39' 45.2"/E 126° 06' 59.9")</p>	<p>Very High</p>	<p>The regions near and along the banks of Aguibawa River are critically susceptible to flooding. Scouring of the river walls are also active thus necessitates the construction of slope stabilization structures (e.g. dikes, riprap) to withstand floods and prevent further scouring of the riverbanks.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the creek and ensure efficient flow of floodwaters during extreme heavy rains.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 8, purok center (GPS reading: N 7° 40' 01.3"/E 126° 6' 01.8")</p>	<p>High</p>	<p>The purok serves as a catchment area of water coming from the overflow of Agusan River and Bamboo Creek belonging to New Bataan. Such overflow during extreme rainfall results to critical level of 1->2m floods in low-lying areas of the purok including the purok center. The road being considerably elevated from surrounding areas experiences ~1m floods. Flow of water is impeded as waterways are clogged and are not large enough to accommodate the volume of water.</p> <p>Additional waterways and drainages must be constructed to accommodate water during extreme heavy rains.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 1, purok center (GPS reading: N 7° 39' 56.4"/E 126° 05' 36.0")</p>	<p>Moderate</p>	<p>The purok center being situated in relatively higher grounds than other regions of the purok may experience moderate floods of 0.5-1m during extremely heavy rains. Water emanating from north-flowing Agusan River and its tributary Baclog creek are the main sources of floodwater.</p> <p>Proper maintenance of drainage canals and waterways must be done. Flood mitigating measures (e.g. dike) along the river must be placed.</p> <p>Parts of the purok near the Agusan River are highly susceptible to flooding thus settlement in these areas must be avoided.</p>
<p>Areas near Agusan River</p>	<p>High</p>	<p>Develop early warning device/system. Flood mitigating measures (e.g. dike) along the river must be placed. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 4, purok center (GPS reading: N 7° 38' 13.0"/E 126° 06')</p>	<p>Moderate</p>	<p>Northeast-flowing Bacnog River overflows during excessive rainfall moderately inundating residences and plantations in Purok 4. Flood level of about 0.5-1m lasts</p>

4.7")		<p>for 3 to 4 days.</p> <p>Flood mitigating measures (e.g. dike) along the creek must be placed.</p>
<p>Purok 11, purok center (GPS reading: N 7° 37' 59.3"/E 126° 06' 14.3")</p> <p>Near Bacnog Creek (GPS reading: N 7° 38' 00.5"/E 126° 06' 10.1")</p>	<p>Moderate</p> <p>High</p>	<p>The purok center and its immediate vicinity have moderate susceptibility to floods during heavy downpours. Water emanating from north-east flowing Bacnog Creek inundates the area.</p> <p>Flood mitigating measures (e.g. dike) along the creek must be placed. Constant dredging of the creek must be implemented.</p> <p>Portions of the barangay near Bacnog Creek are highly susceptible to flooding. Settlement in areas immediately adjacent to the creeks must be discouraged.</p> <p>Flood mitigating measures (e.g. dike) along the creek must be placed. Constant dredging of the creek must be implemented.</p>
<p>Purok 10, purok center (GPS reading: N 7° 40' 20.6"/E 126° 07' 11")</p>	<p>Very High</p>	<p>The purok serves as a temporary catchment basin of floodwater draining from nearby Ambawan Creek and Agusan River. Water reaches a height of about 2-3 m during continuous heavy downpour.</p> <p>Early warning systems/measures must be implemented by the local gov't. Flood mitigating measures (e.g. dike) along the creek must be placed. Constant dredging of the creek must be implemented to prevent further inundation and accumulation of sediments from previous flooding events. Settlement in areas immediately adjacent to the creeks must be discouraged.</p>
<p>Barangay Poblacion</p>		

<p>Brgy Hall/Purok 9 (GPS reading: N 7° 40' 33.5"/E 126° 5' 0.1")</p>	<p>High</p>	<p>Batoto Creek overflows and inundates the area during continuous heavy rains. Flood heights reach more than a meter in the area. Dredging of the creek may be done to alleviate flooding.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 6 (GPS reading: N 7° 40' 13.6"/E 126° 5' 36.1")</p>	<p>Very High</p>	<p>The area is traversed by the Cambanog and Maputi Creeks and the Agusan River. Scouring of riverbanks is present. The area is not suitable as a relocation site. Houses along the banks are critical to bank erosion. Further settlement on the banks of rivers is discouraged.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 1 (GPS reading: N 7° 40' 32.5"/E 126° 5' 20.9")</p>	<p>Very High</p>	<p>Flooding in the area is due to the confluence of floodwaters from the Agusan River, Batoto Creek and Agibawa Creek. Flood heights reach more than 2 meters. On the floodplains, inundation lasts for 48 hours.</p> <p>The recent strong typhoons have destroyed several rip-raps along the river. Fixing of these flood protection structures should be done immediately. Settlement along banks of rivers should be discouraged as bank scouring is extensive.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>

<p>Purok 14 (GPS reading: N 7° 40' 47.6"/E 126° 5' 8.5")</p>	<p>Very High</p>	<p>Batoto Creek overflows during extreme heavy rains, affecting 58 houses. Floods reach up to more than 2 meters in the area, lasting for 24 hours. Evacuation of residents should be done during typhoons.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 10 (GPS reading: N 7° 40' 44.2"/E 126° 5' 5.1")</p>	<p>High</p>	<p>A portion of the Batoto Creek passes through the area, draining northeast towards the Agusan River. Settlements along the banks of rivers should be discouraged.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 15 (GPS reading: N 7° 40' 47.6"/E 126° 5' 0.7")</p>	<p>High</p>	<p>Areas along the immediate banks of Agusan River are highly prone to flashfloods. Flood protection structures (e.g. riprap) may be constructed to prevent scouring of banks. Flood plains in the area may be utilized as agricultural lands but not for residential purposes.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 4 (GPS reading: N 7° 40' 29.7"/E 126° 4' 54.1")</p>	<p>High</p>	<p>Maputi Creek overflows during continuous heavy rains. Settlement along the banks of the river is discouraged. Floodplain zoning should be adopted though residents along the floodplain may adapt by elevating their houses.</p> <p>Organize emergency evacuation protocols for the community in coordination with the</p>

		<p>municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 11 (GPS reading: N 7° 40' 49.2"/E 126° 4' 53.5")</p>	Moderate	<p>Floodwaters from the Agusan River backflows towards the creeks passing in the area. Dredging if canals may be done to increase their capacity.</p> <p>Constant declogging and dredging if canals may ensure efficient flow of floodwaters during heavy rains.</p>
<p>Purok 7 (GPS reading: N 7° 40' 3.0"/E 126° 5' 26.0")</p>	Very High	<p>Flood heights along the Agusan River reaches up to 2 meters during extreme heavy rains. Settlement along the banks is discouraged.</p> <p>Other parts of the purok have moderate susceptibility to floods.</p> <p>Dredging and frequent declogging of canals may help alleviate flooding in the area.</p>
<p>Purok 2 (GPS reading: N 7° 40' 2.0"/E 126° 5' 20.1")</p>	High	<p>Cambaong River passes through the area, inundating its banks with more than a meter of floodwaters. Settlement along the banks of river is not advised.</p> <p>Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Develop early warning device/system.</p>
<p>Purok 8 (GPS reading: N 7° 40' 3.7"/E 126° 4' 49.7")</p>	Moderate	<p>Floodwaters along the banks of Batoto Creek reach up to a meter. Settlement along the banks is discouraged.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 3 (GPS reading: N 7° 40' 13.9"/E 126° 4' 50.3")</p>	Low	<p>Localized flooding occurs in the area. Constant declogging of canals and dredging if creeks may be done to ensure efficient flow of floodwaters during heavy rains.</p>

<p>Purok 12 (GPS reading: N 7° 40' 21.7"/E 126° 5' 3.5")</p>	<p>High</p>	<p>The purok is situated on a floodplain. Elevation of houses may be done to prevent inundation of residences.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities.</p>
<p>Puroks 5 and 13</p>	<p>Very High</p>	<p>Residents along the banks of Agusan River are critical to flashfloods. Settlement along the banks should be discouraged.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Barangay San Jose</p>		
<p>San Jose Brgy. Hall (GPS reading: N 7° 38' 54.5"/E 126° 4' 22.9")</p>	<p>Low</p>	<p>San Jose Hall is relatively far from the active Batoto Creek classifying it as low in flood susceptibility. During Typhoon Pablo, the recorded flood height is only 0.1 to 0.2m that receded after an hour.</p> <p>Recommendations: Develop an early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 7 (GPS reading: N 7° 38' 56.9"/E 126° 5' 2.6")</p>	<p>Moderate</p>	<p>To the western portion of the purok center is the active Batoto River. The said river is the main cause of inundation within the banana plantation area. The flood depth in the area is 0.5m that receded after 1 day during Typhoon Pablo.</p> <p>Recommendations: Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 3 (GPS reading: N 7° 39' 15.1"/E 126° 3' 50.4")</p>	<p>High</p>	<p>The majority of the area is covered by rice field that was submerged for about 1.1m during Typhoon Pablo. The duration of inundation is 1 day with silty/muddy deposits coming from the rice plantation.</p> <p>Recommendations: Develop early warning device/system. Organize emergency evacuation protocols in the community together with municipal authorities. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 5 (GPS reading: N 7° 38' 4.4"/E 126° 5' 0.2")</p>	<p>High</p>	<p>Scouring is very active in the zones traversed by Batoto River. During Typhoon Pablo, the flood depth was approximately 1m washing away the corn and rice field. The duration of inundation is 4 days draining due north.</p> <p>Recommendations: Building adjacent to Batoto River is highly discouraged due to its active shifting of river course that may damage your properties. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>
<p>Purok 4 (GPS reading: N 7° 38' 45.4"/E 126° 4' 40")</p>	<p>Moderate</p>	<p>The eastern portion of purok center was moderately to highly inundated by Batoto River during Typhoon Pablo. Commonly, the recorded flood depth in the area is 0.5m that receded after 1 day.</p> <p>Recommendations: In case of heavy rain/ typhoon, residents are recommended to evacuate to the elevated area to the west of purok center. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.</p>

<p>Purok 2 (GPS reading: N 7° 38' 56.5"/E 126° 04' 18.4")</p>	<p>Moderate</p>	<p>To the west of purok center is an active creek that causes the inundation within the area. The duration of 0.5m flood is 12 hours draining due NW.</p> <p>Recommendations: Dredging of the creek must be done to increase the capacity of the stream. Further buildup in the area should be discouraged. Develop early warning device/system. Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 1A (GPS reading: N 7° 39' 39.6"/E 126° 4' 34.2")</p>	<p>Moderate</p>	<p>Floodwaters emanate from Batoto River located in the eastern portion of the purok center. Majority of the area is covered by rice fields that were inundated for about 0.5m during Typhoon Pablo. Flood recedes after 3 days when heavy rain occurs.</p> <p>Recommendations: Observe for rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities. Dredging of the creek must be done to increase the capacity of the stream.</p>
<p>Barangay San Miguel</p>		
<p>Purok 16, Agusan River channel (GPS reading: N 7° 38' 23.9"/E 126° 06' 35.5")</p>	<p>Very High</p>	<p>Agusan River channel has widened and shifted its flow path through time. Profound siltation of the riverbed also shallows the channel. Riverbed scouring is active and potentially may reach the banks along Purok 18 where several houses are situated as sited from this area. Settlement near these areas is highly discouraged.</p> <p>Widening and frequent dredging of river channels may be done to increase the capacity of the river and ensure efficient flow of floodwaters during strong typhoons/heavy rains.</p> <p>Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels,</p>

		possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Sitio Aguibawa, Purok 8, purok center (GPS reading: N 7° 39' 20.5"/E 126° 7' 6.5")	Moderate	The purok being situated in a flood plain and generally flat topography is prone to low to moderate floods during excessive downpours. Water drains towards the nearest major river channel, Aguibawa River. Avoid settlement on the banks of rivers. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Sitio Kanubi, Purok 12, purok center (GPS reading: N 7° 38' 24.0"/E 126° 7' 54.2")	Moderate	Kanubi Creek overflows during extreme heavy rains and inundates the area. The downstream portion of Purok 12 is a possible flashflood exit point. Settlements at the base of the gully developments and along river banks are highly discouraged. Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Sitio Tingali, Purok 10, purok center (GPS reading: N 7° 30' 19.5"/E 126° 9' 43.0")	Moderate	Kanubi Creek flowing westerly traverses the purok generating moderate floods in the purok proper and its immediate vicinity. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Organize emergency evacuation protocols in the community together with municipal authorities.
Banks of Kanubi Creek traversing Purok 10	High	Areas adjacent to the Kanubi creek in Purok 10 have high susceptibility to flooding particularly flash floods as headwaters of the creek are found in area and the adjacent purok 9.

		<p>Flood protection structures (e.g. dikes riprap) are advised to prevent riverbank erosion and lessen overflow during extreme heavy rains. However, settlement along the banks of river is still discouraged.</p> <p>Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Sitio Kamudlot, Purok 6, purok center (GPS Reading: N 7° 39' 20.5"/E 126° 07' 06.5")</p>	Moderate	<p>A tributary of Aguibawa River traverses the purok moderately inundating this portion of the purok.</p> <p>Frequent declogging of canals may be done to ensure efficient flow of water.</p>
<p>Sitio Tingali, Purok 9, purok center (GPS Reading: N 7° 39' 16"/E 126° 07' 40")</p> <p>Moderate to steep slopes bounding the purok</p>	<p>High</p> <p>Low</p>	<p>Tingali Creek traverses the purok making areas surrounding the creek including the purok center highly susceptible to flooding. Its main channel has widened and deviated from its original alleyway and affected more areas in the purok particularly its rice plantations. The headwaters of Aguibawa River can also be found in Sitio Tingali thus making it vulnerable to flashfloods during excessive rainfall.</p> <p>Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p> <p>Moderate to steep slopes bounding the purok on the eastern side have low susceptibility to floods.</p>
<p>Sitio Kanubi, Purok 11, purok center (GPS Reading: N 7° 38' 32.9"/E 126° 07' 25.4")</p>	High	<p>The Aguibawa River flowing northwards transects the purok thus making regions proximal to the river highly susceptible to flooding during heavy downpours and excessive precipitation.</p> <p>Flood protection structures (e.g. dikes riprap) are advised to prevent riverbank</p>

		Organize emergency evacuation protocols in the community together with municipal authorities. Develop early warning device/system. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).
Barangay Siocon		
Purok 1 Center N 07°38'30.9" E 126°01'57.1"	Low	Minimal flood report in the area. Purok situated in higher grounds far from sources of any water overflow unless may connect to anthropogenic factors such as improper wastes disposal and clogged drainage canals. Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways.
Purok 2 Center N 07°38'46.5" E 126°02'11.8" Siocon Elementary School N 07°38'45.9" E 126°02'09.9"	High	Silted Batoto River where Purok 2 is nearly situated promotes the area as highly susceptible to flooding. Purok house experienced up to chest level flood height and knee-waist level along roads adjacent to Siocon Elementary school Recommendations: Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/rivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.
Purok 3 Center N 07°38'37.5" E 126°02'12.4"	High	The location of Purok 3 which is situated near Batoto River makes it highly susceptible to flooding. Flood height varies from 0.3m-1.5m. Low/depressed area acts as catch basin with insufficient waterways which obstructs water flow. Water recedes

		<p>slowly 24 hours after the heavy rain.</p> <p>Recommendations:</p> <p>Develop an early warning device in the area. Restrict settlement along the banks of the river. Drainage canals must be regularly cleaned and maintain proper wastes disposal.</p>
<p>Purok 4: (Upper Siocon)</p> <p>Center N 07°38'17.5" E 126°02'39.7"</p>	Very High	<p>Eastern part of Purok 4 lying near to the highly silted batoto river experienced flood height of >2m last typhoon Pablo.</p> <p>Recommendations:</p> <p>Relocate affected residents to permanent and safer areas. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan must properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/streams should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 5</p> <p>Center N 07°37'49.1" E 126°02'22.8"</p>	Low	<p>Experienced minimal flooding.</p> <p>Recommendations:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 6</p> <p>Center N 07°37'50.1" E 126°02'04.4"</p>	Low	<p>No significant flood report in the area.</p> <p>Recommendations:</p> <p>Maintain proper wastes disposal and regular cleaning of canal and water ways.</p>
<p>Purok 7</p> <p>Center N 07°38'47.2" E 126°01'54.7"</p>	Low	<p>Areas likely to experienced flood of 0.2m-0.3m are depressed areas with insufficient waterways.</p> <p>Recommendations:</p>

		Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 8 Center N 07°37'59.5" E 126°02'01.3"	Low	Areas likely to experienced flood of 0.2m-0.3m are depressed areas with insufficient waterways. Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 9 Center N 07°38'53.0" E 126°02'10.4"	Very high	Purok 9 is situated near Batoto river making it very susceptible in flooding. River scouring is active in its bank and is highly silted thus making it shallow causes it to overflow during long duration of rain. Recommendations: Dredging of Batoto River is highly suggested. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/streams should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.
Purok 10 Center N 07°38'40.6" E 126°01'58.7"	Low	No significant flood report in the area. Purok lies at higher elevations draining water to lower grounds. Recommendations: Maintain proper wastes disposal and regular cleaning of canal and water ways for surface runoff.
Purok 11 Center N 07°38'47.0" E 126°02'13.9"	Very high	Flooding occurs in depressed/low areas acting as local catch basins with inadequate drainage in Purok 11. Experienced >2m flood height during the course of typhoon Pablo. Overflow of

<p>Evacuation Center: Siocon National High School N 07°38'42.2" E 126°02'00.5"</p> <p>Church near SNHS: N 07°38'39.9" E 126°02'00.5"</p>		<p>Batoto River is the major contributing factor of such flooding. Along the road of Siocon Elementary school, facing Eastward experienced from knee to waist flood height. Affected residents left for higher grounds and temporarily evacuated to Siocon National High School and to the adjacent Church.</p> <p>Recommendations:</p> <p>Dredging or Batoto River is highly suggested.</p> <p>Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/ivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Purok 12 (Riverside)</p> <p>Center N 07°38'58.1" E 126°02'27.6"</p>	<p>Very high</p>	<p>Purok 12 is situated proximal to Batoto River making it very susceptible to flood.</p> <p>Recommendations:</p> <p>Settlement along river banks is highly discourage thus relocation of affected residents must be persisted. Develop an early warning device/system for flood to be implemented during the season of typhoon and monsoon rains. Evacuation plan is properly organize and see to it that evacuation sites are already identified before flood events. Houses near/along creeks/ivers should be relocated. Monitor for the rapid decrease/increase in creek water levels and coordinate with the city disaster management team/barangay disaster team for rescue operation.</p>
<p>Barangay Tamia</p>		

<p>Purok 1 (GPS reading: N 7° 41' 58.6"/E 126° 5' 51.2")</p>	<p>Moderate</p>	<p>High siltation of Ngan River causes shallowing of the channel which eventually results to overflowing during continuous heavy rains.</p> <p>Dredging of canals and creeks may be done to alleviate flooding. Declogging of drainages will also ensure efficient flow of water during floods.</p>
<p>Purok 5 (GPS reading: N 7° 42' 1.6"/E 126° 5' 45.6")</p>	<p>High</p>	<p>Creeks passing through the area drain southwest towards Ngan River. These streams are shallow causing floodwaters to overflow and inundate the surrounding areas. Settlements along the banks of creeks are discouraged.</p> <p>Desilting of creeks may be done to increase the stream's capacity especially during times of increased precipitation. Regular declogging of canals may also be scheduled to ensure efficient flow of floodwaters.</p>
<p>Purok 6 (GPS reading: N 7° 42' 1.0"/E 126° 5' 45.2")</p>	<p>High</p>	<p>Flood heights along the banks of creeks reach up to more than a meter. Floodwaters drain southwest into Ngan River. Settlements on banks of creeks are discouraged.</p> <p>Frequent dredging and declogging of canals may be done to alleviate flooding.</p>
<p>Purok 3 (GPS reading: N 7° 41' 54.4"/E 126° 7' 14.3")</p>	<p>Moderate</p>	<p>Gullies from the uplands of Purok 3 drain into the area towards Ngan River.</p> <p>Develop early warning device/system. Organize emergency evacuation protocols for the community in coordination with the municipal authorities. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content).</p>
<p>Purok 7, Ngan River near boundary with Brgy. Ngan (GPS reading: N 7° 41' 43.7"/E 126° 7' 21.6")</p>	<p>Very High</p>	<p>The areas situated on the banks of Ngan River are highly prone to flashfloods and debris flows since the purok is located on the downstream path of Ngan River. Debris accumulations are already present on the banks of the river. Moreover, the area is also a flashflood exit point. Landslide debris present on the upstream portion of Ngan River may dam the waters and cause flashfloods in the area.</p>

		<p>Residents should be wary of impending flashfloods during strong typhoons. Observe for flashflood signs: rapid increase/decrease in creek water levels, possibly accompanied by increased turbidity (soil content). Avoid settlement on banks of Ngan River.</p> <p>Develop early warning device/system and organize emergency evacuation protocols for the community in coordination with the municipal authorities.</p>
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It should be noted that these susceptibility ratings were arrived at as of this field assessment. However, the rating could advance (e.g., from low to moderate, moderate to high). Hence, the MGB constantly recommends strict and continuous monitoring by the barangays.

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