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Barangay Lydia	Barangay Villa Paz
Barangay Osmeña Sr.	



Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. XIII

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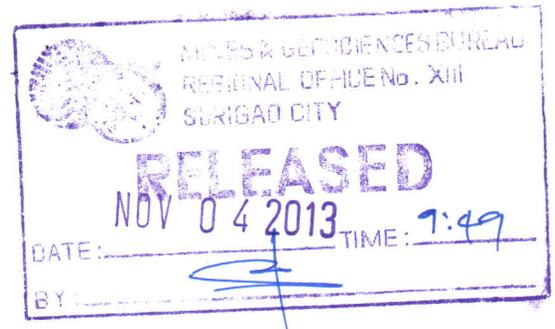
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November 4, 2013

HONORABLE AMBROSIO O. LIM

Municipal Mayor
Municipality of La Paz
Province of Agusan del Sur



Dear **Mayor Lim**,

Respectfully furnishing your end the document entitled "Results of the MGB Landslide and Flood Assessment and Mapping (1:10,000 scale) of the Municipality of La Paz, Province of Agusan del Sur". The assessment is in line with the government's effort aimed at reducing, if not totally mitigating the destructive effects and impacts of natural hazards to the populace.

The Office expresses its deep gratitude for the support and assistance rendered to the Geohazard Mapping and Assessment Team of our Regional Office during the conduct of the field survey.

We look forward to a continuing partnership and collaboration with the LGU of La Paz, Agusan del Sur in the nation's overall disaster risk reduction program.

Very truly yours,

BY THE AUTHORITY OF THE OIC, MMD:


ROMEO M. DALODADO
Chief, Geosciences Division
Officer, In-Charge



GSD-13-10-Ghz-51

Cc: Hon. Director, DENR, MGB
Hon. Gov., ADS
Honorable Representative, 2nd District, ADS
OCD-RDRRMC Caraga

RED, DENR, R-XIII
PENRO, ADS
CENRO, Loreto, ADS
DILG, R-XIII

**"MINING SHALL BE PRO-PEOPLE AND PRO-ENVIRONMENT
IN SUSTAINING WEALTH CREATION AND IMPROVED QUALITY OF LIFE."**

RESULTS OF THE MGB LANDSLIDE AND FLOOD ASSESSMENT AND MAPPING (1:10,000 SCALE) OF THE MUNICIPALITY OF LA PAZ, PROVINCE OF AGUSAN DEL SUR

The Mines and Geosciences Bureau-Department of Environment and Natural Resources (MGB-DENR) conducted landslide and flood assessment and mapping (1:10,000 scale) of areas within the municipality of La Paz on September 6-17, 2013. 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. Comprising the geohazard assessment team are Joel A. Calugcugan, Melvin A. Mantilla, Elaine L. Galido, geologists from MGB – Caraga Region XIII with the assistance of GSD personnel Mr. Evangelino M. Morales, Jr., Dionesio A. Surigao, Julius A. Sulapas and Samuel A. Jardenil.

The MGB-DENR particularly covered the following areas:

- Puroks 1 to 3 in Barangay Angeles
- Puroks 1 to 6 in Barangay Bataan
- Puroks 1 to 7 in Barangay Comota
- Puroks 1 to 4 in Barangay Halapitan
- Puroks 1 to 3 in Barangay Kasapa II
- Puroks 1 to 5 in Barangay Langasian
- Puroks 1 to 3 in Barangay Lydia
- Puroks 1 to 9 in Barangay Osmeña, Sr.
- Puroks 1 to 8 in Barangay Panagangan
- Puroks 1 to 16 in Barangay Poblacion
- Puroks 1 to 5 in Barangay Sabang Adgawan
- Puroks 1 to 7 in Barangay Sagunto
- Puroks 1 to 5 in Barangay San Patricio
- Puroks 1 to 4 in Barangay Valentina
- Puroks 1 to 10 in Barangay Villa Paz

The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. The landslide susceptibility rating parameters are as follows:

Very High : Areas usually with steep to very steep slopes and underlain by weak materials. Recent landslides, escarpments and tension cracks are present. Human initiated effects could be an aggravating factor.

High : Areas usually with steep to very steep slopes and underlain by weak materials. Areas with numerous old/inactive landslides.

Moderate : Areas with moderately steep slopes. Soil creep and other indications for possible landslide occurrence are present.

Low : Gently sloping areas with no identified landslides.

Likewise, the assessed areas were also rated as having low, moderate or high susceptibility to flooding. The flood susceptibility parameters are as follows:

High : Areas likely to experience flood heights of greater than 1.0 meter 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 areas prone to flashfloods

Moderate : Areas likely to experience flood heights of 0.5 to 1.0 meter and flood duration of 1 to 3 days. These areas are subject to widespread inundation during periods of prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and infilled valleys are areas subjected to moderate flooding

Low : Areas likely to experience flood heights of less than 0.5 meter and/or flood duration of less than one day. These areas include low hills and gentle slopes. They also have sparse to moderate drainage density

The barangay officials were presented with a *Landslide and Flood Threat Advisory* when appropriate. This advisory informs them of their area's susceptibility to landslides and floods and contains the corresponding recommendations.

Summarized below are the results of the assessment of the covered areas:

Table 1. Results of Landslide and Flood Assessment at Barangay Angeles

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	Low to Moderate	High	Observe for presence of mass movement (e.g., landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces. Report situation to the concerned municipal authorities or to the MGB. Observe for rapid increase/decrease in Tagacupan Creek water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along creek embankments. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease in creek's water level is observed especially during extreme weather events. For immediate relocation of houses directly located at creek

			embankments, especially those affected by scouring; for long term solutions, relocating the entire Barangay Angeles is recommended. Provide a pilot road connecting Barangay Angeles to Barangay Langasian for an easy and safe access towards the barangay. Acquiring rubber boats is recommended for rescue operation purposes.
2	Low to Moderate	High	Observe for presence of mass movement (e.g., landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces. Report situation to the concerned municipal authorities or to the MGB. Observe for rapid increase/decrease in Tagacupan Creek water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along creek embankments. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease in creek's water level is observed especially during extreme weather events. For immediate relocation of houses directly located at creek embankments, especially those affected by scouring; for long term solutions, relocating the entire Barangay Angeles is recommended. Provide a pilot road connecting Barangay Angeles to Barangay Langasian for an easy and safe access towards the barangay. Acquiring rubber boats is recommended for rescue operation purposes.
3	Low to Moderate	High	Observe for presence of mass movement (e.g., landslides, tension cracks). Observe for saturated ground or seeps and sunken or displaced road surfaces. Report situation to the concerned municipal authorities or to the MGB. Observe for rapid increase/decrease in Tagacupan Creek water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along creek embankments. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease in creek's

			<p>water level is observed especially during extreme weather events. For immediate relocation of houses directly located at creek embankments, especially those affected by scouring; for long term solutions, relocating the entire Barangay Angeles is recommended. Provide a pilot road connecting Barangay Angeles to Barangay Langasian for an easy and safe access towards the barangay. Acquiring rubber boats is recommended for rescue operation purposes.</p>
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Table 2. Results of Landslide and Flood Assessment at Barangay Bataan

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Moderate	<p>Observe for rapid increase/decrease of water levels at Bataan Creek, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Bataan Creek is observed especially during inclement weather conditions. The barangay should acquire rubber boats for rescue operation purposes. Define and conduct regular maintenance on existing drainage canals.</p>
2	Low	Portion Low; Portion Moderate near Isot Creek	<p>Observe for rapid increase/decrease of water levels at Bataan Creek and Isot creek, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Bataan Creek and Isot Creek is observed especially during inclement weather conditions. The barangay should acquire rubber boats for rescue operation purposes. Define and conduct regular maintenance on existing drainage canals.</p>
3	None	Moderate	<p>Observe for rapid increase/decrease of water levels at Bataan Creek, possibly accompanied by increased</p>

			turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Bataan Creek is observed especially during inclement weather conditions. The barangay should acquire rubber boats for rescue operation purposes. Define and conduct regular maintenance on existing drainage canals.
Sitio Ipil	None	High	Observe for rapid increase/decrease of water level at creeks possibly accompanied with increased turbidity (soil content). Prohibit future settlement along river/creek embankments. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is advised when rapid increase/decrease of water level in the creek is observed especially during inclement weather conditions. The barangay should acquire rubber boats for rescue operation purposes. For long term solution, relocating Sitio Ipil is an option.
Sitio Pinamayanan	Low	Moderate to High	Observe for rapid increase/decrease of water levels at Pinamayanan creek traversing the sitio possibly accompanied by increased turbidity (soil content). For relocation of houses directly located at Pinamayanan Creek embankments and prohibit future settlement along river/creek embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in the creek is observed especially during inclement weather conditions. The barangay should acquire rubber boats for rescue operation purposes.
Sitio Kamamunan	None	High	Observe for rapid increase/decrease of water level at creeks possibly accompanied with increased turbidity (soil content). Prohibit future settlement along river/creek embankments. Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is advised when rapid increase/decrease of water level in the creek is observed especially during inclement weather conditions. The barangay should acquire rubber

			boats for rescue operation purposes. For long term solution, relocating Sitio Kamamaunan is an option.
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Table 3. Results of Landslide and Flood Assessment at Barangay Comota

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1A	None	High	<p>The area is prone to flooding; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°17'57.6"-N/125°43'34.9"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
1B	None	High	<p>The area is prone to flooding; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only)</p>

			<p>on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°17'53.5"-N/125°43'55.4"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
2	None	Low to Moderate	<p>The area is prone to flooding and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road/within Comota Elementary School campus with GPS reading 8°17'57.6"-N/125°43'31.8"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding</p>

			and flash-flood.
3	None	Moderate to High	<p>The area is prone to flooding and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°18'00.3"-N/125°43'30.7"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
4	None	High	<p>The area is prone to flooding and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p>

			<p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°18'08.5"-N/125°43'35.4"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
5	None	High	<p>The area is prone to flooding, flash-flood and river-scouring; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°18'00"-N/125°43'24.8"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
6 "Asuncion"	None	Moderate to High	<p>No proper access road toward the sitio proper. The area is prone to flooding, flash-flood and river-scouring; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is</p>

			<p>prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed from barangay proper toward sitio proper with GPS reading 8°18'36.9"-N/125°42'38.7"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
Sitio Magboya	Low	High	<p>Observe for rapid increase/decrease in water level at Adgawan River, possibly accompanied with increased turbidity (soil content). Provide an evacuation site which is safe from landslide and flooding. Pre-emptive evacuation is recommended when sudden increase/decrease in water level along Adgawan River is observed especially during extreme weather conditions. Prohibit future settlement directly along Adgawan River embankments. For immediate relocation of the residents located at Adgawan River embankments; also for long term solution, relocating the entire sitio is recommended. The barangay is recommended to acquire rubber boats for rescue operation purposes.</p>

Table 4. Results of Landslide and Flood Assessment at Barangay Halapitan

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Low to Moderate (due to ponding of water and Adgawan River)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Adgawan River's water level

		overflow)	and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Prohibit future settlement and construction of new structures near the banks of river. Improve barangay access road.
2	None	Low to Moderate (due to ponding of water and Adgawan River overflow)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Adgawan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river. Provide concrete line canal along the sides of the barangay access road.
3	None	Low to Moderate (due to ponding of water and Adgawan River overflow)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Adgawan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river. Provide concrete line canal along the sides of the barangay access road.
4	None	High (due to ponding of water and Adgawan River overflow)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Adgawan River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. . Acquire rescue boat (e.g. speed boat, pump boat or out board). Provide sufficient culvert on barangay road. For long term solution, relocate houses that are greatly affected with flooding.

Table 5. Results of Landslide and Flood Assessment at Barangay Kasapa II

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	Low; Partly None	None; Partly High	<p>The area is generally prone to landslide, flash-flood and flooding; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°10'54.1"-N/125°36'44.9"-E.</p> <p>Existing old metal bridge must be replaced by concrete bridge type with GPS reading 8°10'55.1"-N/125°36'45.4"-E. This old bridge is prone to collapse.</p> <p>Proper drainage canals should be constructed along access road going to Kasapa II proper from National Highway.</p>
2	Low; Partly None	None; Partly High	<p>The area is prone to flooding; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit</p>

			<p>settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete roads should be constructed along barangay road with GPS reading 8°10'55.4"-N/125°36'43.9"-E.</p>
3	None; Partly Low to Moderate	Low to None; Partly High	<p>The area is prone to flooding, flash-flood and landslide; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete roads should be constructed along barangay road with GPS reading 8°10'57.4"-N/125°36'43.1"-E.</p> <p>No proper barangay hall was noted on the area. Proper barangay hall must be constructed.</p> <p>Barangay Daycare Center should be repaired. This building was damaged by typhoon "Pablo" last December 2012.</p> <p>Flood control should be constructed at the Kasapa II Elementary School along Talacogon River flowing N45°E. This school situated along Talacogon River embankment and recent river-scouring was noted on this section. Proper concrete</p>

			drainage canals should be constructed within the school campus. GPS reading is 8°10'57"-N/125°36'40.1"-E.
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Table 6. Results of Landslide and Flood Assessment at Barangay Langasian

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Low; Partly High	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Road piloting must be established from Purok 1, Brgy. Langasian to Brgy. Angeles proper.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'51.9"-N/125°42'54.9"-E.</p> <p>Flood control structure must be constructed near the Langasian Elementary School. The said school situated beside the perennial river and recent river-scouring were observed. Concrete pathway should be constructed from the barangay proper toward the school campus. GPS reading is 8°14'55.6"-N/125°42'57"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area</p>

			situated within the meandering river channel which is prone to flooding and flash-flood.
2	None	Low; Partly High	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>No waiting shed on this purok. Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'52.6"-N/125°42'52.2"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
3	Low to Moderate; Partly None	Low to Moderate	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two</p>

			<p>(2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>No waiting shed on this purok. Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'52.2"-N/125°42'50"-E.</p> <p>Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
4	None	Low to Moderate; Partly High	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>No waiting shed on this purok. Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'51.1"-N/125°42'46.7"-E.</p> <p>Intense river-scouring was noted on this section. Some local residents are very close to the river embankments. GPS reading is 8°14'48"-N/125°42'44"-E.</p> <p>Concrete bridge type should be constructed on this section. Current cable bridge type was observed which can facilitate single motorcycle only. GPS reading is 8°14'48.2"-N/125°42'49.3"-E.</p>

			Total relocation of the entire barangay is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.
5	Low to None; Partly Moderate	None; Partly High	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/streams should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'50.4"-N/125°43'03.8"-E.</p> <p>Proper box-culvert should be constructed on this section along barangay road with GPS reading 8°14'46.1"-N/125°42'52.8"-E.</p>

Table 7. Results of Landslide and Flood Assessment at Barangay Lydia

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
Purok Lydia Proper	Low	Moderate to High	Observe for rapid increase/decrease in Adgawan River water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Adgawan River is observed especially during inclement weather conditions. Recommend to

			install flood protective structure (gabion) along Adgawan River where river overflows generally starts and causes flooding in the purok. Provision of drainage canals is also recommended.
Sitio Balitos	Low	Moderate to High	Observe for rapid increase/decrease in Adgawan River water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Adgawan River is observed especially during inclement weather conditions. Recommend to define waterway along Minambungaw Creek and conduct regular maintenance to provide smooth flow of water. Also provision of culverts is recommended.
Sitio Durian	Low	Low to Moderate	Observe for rapid increase/decrease in Adgawan River water levels, possibly accompanied by increased turbidity (soil content). Prohibit future settlement along river embankments. Provide an evacuation which is safe from landslide and flooding. Pre-emptive evacuation is recommended when rapid increase/decrease of water level in Adgawan River is observed especially during inclement weather conditions.

Table 8. Results of Landslide and Flood Assessment at Barangay Osmeña, Sr.

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	Moderate	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) for immediate response. Prohibit future settlement and construction of new structures near the banks of river. Rechannel Suba River.
2	None	Moderate	Develop an early warning system

			and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. . Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board) Prohibit future settlement and construction of new structures near the banks of river. Rechannel Suba River.
3	None	Gen. Low with High portion near Suba River	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. . Acquire rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river. Provide concrete line canal along the barangay road at the back of Barangay Hall. Rechannel Suba River.
4	None	Moderate	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river. Provide concrete line canal.
5 (Durian)	None	Low to Moderate (due to Suba River overflow and ponding of water near ricefield area)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river.



6 (Binitayan)	None	High (due to Suba River overflow and ponding of water near ricefield area)	Develop an early warning system and flood preparedness plan thru periodic conduct of evacuation drills. Monitor Suba River's water level and flow during extreme rainfall events and initiate readiness and if necessary, pre-emptive evacuation. Identify evacuation site that is safe from landslide and flooding. . Acquire mobile truck and rescue boat (e.g. speed boat, pump boat or out board). Prohibit future settlement and construction of new structures near the banks of river. Improve NIA culvert on the barangay road.
7 (Tagyago)	Moderate to High	None	Observe for presence of mass movement (e.g., landslides, tension cracks). Report situation to the concerned municipal authorities; for vigilance of residents in areas located near the foot of slope during inclement weather condition. Prohibit future settlement and construction of new structures on areas at the cliff, slope and at/near the foot slope. For relocation of 6 houses that are near the cliff.
8	None	Low	
9 (Crossing Magbuya)	Low	None	

Relocation Site	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
Purok 7 (Tagyago) (GPS reading: N 8° 19' 24.7" E 126° 45' 57.7")	Moderate	None	May be suitable as relocation site for the houses near the cliff but it is still subject for further detailed geohazard identification survey.

Table 9. Results of Landslide and Flood Assessment at Barangay Panagangan

Purok	Landslide Susceptibility Rating	Flood Susceptibility Rating	Recommendations
1	None	High	The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers

			<p>should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'27.6"-N/125°46'48.5"-E.</p> <p>Total relocation of the entire purok is highly recommended for long-term and absolute solution due to the geographic location of the area situated within the meandering river channel which is prone to flooding and flash-flood.</p>
2	None	High	<p>The area is prone to flooding, river-scouring and flash-flood; Construct proper drainage canals on this area to facilitate surface run-off; Identify and construct permanent evacuation site which is safe from flooding and landslide; Prohibit settlement along intermittent/perennial creeks/rivers should be implemented which is prone to flooding; Observed for sunken or displaced road surfaces; Develop an early warning (e.g., signages) at (for critical areas only) on steep-slopes where houses situated foot-slopes; Prohibit settlement directly located on foot-slopes; Develop an early warning device/system; Activate BDCC all the time for quick response during emergency; Acquiring at-least two (2) mobile dump-trucks and two (2) rubber boats are badly needed for rescue operation and mobilization.</p> <p>Proper concrete drainage canals and concrete road should be constructed along barangay road with GPS reading 8°14'27.8"-N/125°46'52.4"-E.</p> <p>Total relocation of the entire purok is highly recommended for long-term and absolute solution due to the</p>