

RESULTS OF THE MGB LANDSLIDE AND FLOOD ASSESSMENT (1:10,000 SCALE) OF PARTS OF CATEEL IN THE PROVINCE OF DAVAO ORIENTAL

The Mines and Geosciences Bureau-Department of Environment and Natural Resources Regional Office No. 11 (MGB-DENR XI) conducted a landslide and flood assessment and mapping (1:10,000 scale) of areas within the municipality of Cateel, Davao Oriental on September 10 to 21, 2012. 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 Ms. Beverly Mae M. Brebante and Ms. Abigail June L. Agus, geologists; Mr. Virgilio C. Torcido, geologic aide and Mr. Pedro P. Calunsag, driver, all from the MGB regional office.

The MGB-DENR particularly covered the following areas:

- Sos. Dasubo, Lower Abejod and Brgy Proper of Brgy. Abejod;
- Sos. Guhang, Liwan, Lumao, Yahuno and Quarry 1 of Brgy. Alegria;
- So. Aliwagwag Proper, Brgy. Aliwagwag;
- Sos. Pugad ng Halas, Paitan, Hulid, Inoandan, Langyawan, Tuburan and Brgy. Proper of Brgy. Aragon;
- Sos. Molave, Panupasan, Ipil-ipil and Narra of Brgy. Baybay;
- Sos. Maglahus Proper, Simsimon, Caghumay, Mahu, Camansi, Tagatuog, Tandawan and Tambuang of Brgy. Maglahus;
- Sos. Phase 2, Mahan-ob and Proper of Brgy. Mainit;
- Sos. Sabangan, Banlod, Patong, proper and La Fortuna of Brgy. Malibago;
- Sos. Magupay, Kamagong-on, Ipil-ipil, Mangga, Acacia, Talisay, Gmelina, Maribojoc, Madre de Cacao and Almasiga of Brgy. Poblacion;
- Sos. Riverside, Mariposa, Makahigad and Lambog of Brgy. San Alfonso;
- Sos. Upper and Lower Canangahan, Yahuno-Maiti, San Isidro, Mahug, Gangas, Sagimsim, Bawod and Proper of Brgy. San Antonio
- Sos. Kalarian, Tamuag, Papag, Kabak and Proper of Brgy. San Miguel
- Sos. Cogon, Panan-awan, Tagadao, Proper, Magong-ong and Tina of Brgy. San Rafael
- Sos. Upper and Lower Caticugan, Proper, Lampa, Upper and Lower Riverside and Sojoton of Brgy. San Vicente
- Sos. Nangka, Canube, Caimito, Tongap and Santol of Brgy. Sta. Felomina; and
- Sos. Yapsay, Paglusngan, Mambuanan, Crossing, Hebron, Mantunao, Bulao, Tawid and Brgy Proper of Brgy. Taytayan

The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. The same areas were also evaluated and rated as low, moderate or high susceptibility to flooding.

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.

The flood susceptibility rating parameters are as follows:

High	Areas likely to experience flood heights of greater than 1 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 prone to flashfloods.
Moderate	Areas likely to experience flood heights of 0.5 to 1 meter 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 infilled valleys are areas moderately subjected to flooding.
Low	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

When appropriate, the barangay official/s were presented with a *Landslide/Flood Threat Advisory*. This advisory informs them of their area’s susceptibility to landslides and contains the corresponding recommendations.

Below summarizes the results of the landslide and flood assessment of the covered areas:

Table 1. Results of Landslide Assessment at Barangay Abejod

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Brgy. Proper	High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities;Constant communication and updates with the barangay officials on geohazard situation
So. Dasubo	High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities;Constant communication and updates with the barangay officials on geohazard situation

So. Lower Abejod		Low to Moderate	Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content).
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Table 2 . Results of Landslide Assessment at Barangay Alegria

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Sos. Guhang, Liwan and Lumao		High	Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content); for relocation/evacuation of residents living in areas near creeks
So. Yahuno		Moderate to High in areas proximal to creeks	Monitor rapid increase/decrease in creek/river water levels, possibly accompanied by increase turbidity (soil content).
So. Quarry 1	Moderate		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities;Constant communication and updates with the barangay officials on geohazard situation

Table 3 . Results of Landslide Assessment at Barangay Aliwagwag

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Aliwagwag Proper	Moderate to High especially along road cuts		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities;Constant communication and updates with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) for critical areas along the provincial road.

Table 4 . Results of Landslide Assessment at Barangay Aragon

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Sos. Pugad ng Halas, Paitan, Hulid and Inoandan	High	High	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities;Constant communication and updates with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) for

			critical areas; for relocation of houses in So. Pugad ng Halas ; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content).
Brgy. Proper	High	Moderate to High	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content).
So. Langyawan		High	Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content).
So. Tuburan	Moderate		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities

Table 5. Results of Landslide Assessment at Barangay Baybay

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Molave		High	Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content); for relocation of houses in puroks situated in island bars
So. Panupasan		High	Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content)
So. Ipil-ipil and Narra		Moderate	Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)

Table 6. Results of Landslide Assessment at Barangay Maglahus

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Caghumay	High to Very High	High	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates

			with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) for critical areas; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content).
Sos. Mahu, Camansi, Tagatuog and Tandawan	High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) for critical areas
So. Sinsimon	Moderate	High	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content); for relocation of residents situated very near to Cateel River
Maglahus Proper	Moderate	Moderate	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Monitor rapid increase/decrease in Cateel River water levels, possibly accompanied by increase turbidity (soil content)
So. Tambuang	Moderate		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities

Table 7. Results of Landslide Assessment at Barangay Mainit

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Brgy. Proper	High to Very High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) for critical areas; for relocation of barangay hall and daycare center
Sos. Phase 2, Mahan-ob and Phae 1		High	Monitor rapid increase/decrease in Manat River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay

			officials on geohazard situation; relocation of houses along river banks were scouring is very active
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Table 8. Results of Landslide Assessment at Barangay Malibago

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Sabangan, Banlod and Patong	Moderate to High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Develop an early warning device (e.g. signages) particularly along road cuts
Proper		Low to Moderate	Monitor rapid increase/decrease in Manat River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
La Fortuna	Moderate to High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation

Table 9. Results of Landslide Assessment at Barangay Poblacion

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Magupay and Kamagong-ong		High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation; relocation of houses along creeks and river banks of Cateel River
So. Ipil-ipil, Mangga, Acacia, Talisay, Gmelina and Maribojoc		Moderate	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Almasiga and Madre de Cacao		Low	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)

Table 10. Results of Landslide Assessment at Barangay San Alfonso

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Riverside		High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation; relocation of houses along the river banks of Cateel River
So. Mariposa		Moderate	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Makahigad and Lambog		Low	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)

Table 11. Results of Landslide Assessment at Barangay San Antonio

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Sagimsim and Bawod		High	Monitor rapid increase/decrease in creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Upper and Lower Canangahan	Moderate to High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation
So. Yahuno-Maiti	Moderate to High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation
Sos. San Isidro, Mahug, Gangas	Moderate		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities
Brgy. Proper		Moderate	Monitor rapid increase/decrease in creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation

Table 12. Results of Landslide Assessment at Barangay San Miguel

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Kalarian, Tamuag, Proper, Papag and Kabak		High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation

Table 13. Results of Landslide Assessment at Barangay San Rafael

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Sos. Cogon and Panan-awan		High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation; relocation of remaining houses in the lower portions of So. Panan-awan
So. Tagadao and Proper		Moderate	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Magong-ong and Tina	Moderate	Moderate	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)

Table 14. Results of Landslide Assessment at Barangay San Vicente

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
Sos. Upper and Lower Caticugan, Proper, Iampa, Upper and Lower Riverside		High	Monitor rapid increase/decrease in Cateel River and surrounding creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Sojoton		Moderate to High	Monitor rapid increase/decrease in Cateel River and surrounding creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation

Table 15. Results of Landslide Assessment at Barangay Sta. Felomina

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Nangka	High	Moderate	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in creek water levels, possibly accompanied by increase turbidity (soil content)
So. Canube	High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation
So. Caimito, Tongap and Santol		Moderate	Monitor rapid increase/decrease in creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation

Table 16. Results of Landslide Assessment at Barangay Taytayan

Location	Landslide Susceptibility Rating	Flood Susceptibility Rating	Remarks/ Recommendations
So. Bulao	Moderate to High		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city authorities; Constant communication and updates with the barangay officials on geohazard situation
So. Crossing		Moderate to High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation
So. Tawid and Proper		Moderate to High	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content); Constant communication and updates with the barangay officials on geohazard situation; relocation of houses in So. Tawid located along the riverbanks of Cateel River
So. Hebron and Mantunao	Moderate	Moderate	Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces; Report situation to MGB office and the municipal/city

			authorities; Constant communication and updates with the barangay officials on geohazard situation; Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)
So. Yapsay and Paglusngan	Moderate		Observe for and/or monitor for presence of mass movement (e.g. landslide, tension cracks); Report situation to MGB office and the municipal/city authorities; Observed for saturated ground/seeps and sunken or displaced road surfaces
So. Mambuanan		Moderate	Monitor rapid increase/decrease in Cateel River and creek water levels, possibly accompanied by increase turbidity (soil content)

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, and moderate to high). Hence, the MGB constantly recommends strict and continuous monitoring by the barangays.

MGB GEOHAZARD ASSESSMENT TEAM

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PHOTOS



Flood height as indicated by local residents in So. Panan-awan



Scoured river bank and water level of Cateel river during high tide in So. Panan-awan



Houses in So. Cogon situated along a creek



Active riverbank scouring along Lumao Creek



Translatational slide along the road to Canangahan



Brgy. San Antonio



So. Molave in Brgy Baybay is situated on an island bar which is a flood deposit



Flood height in Brgy. San Vicente



Houses at risk in Phase 2 Brgy. Mainit



Reactivated rotational landslide directed toward Mainit Brgy Hall and Day Care Center



Active slump along the road to So. Canube



Active slump in Lower Abejod



Houses in So. Magupay situated along Cateel Riverbank



Flood mark in So. Riverside, Brgy. San Alfonso



Active slope failure along the road from So. Mangga to So. Magong-ong



Previously damaged hanging bridge by floodwater in Brgy. Maglahus