



FOR ITW ONLY





Mines and Geosciences Bureau
Department of Environment and Natural
Resources
PHILIPPINES

The DENR-MGB Geohazards
Mapping Program – Minimizing
Risk on Disaster For Safer
Communities

CARLOS A. TAYAG
Regional Director, MGB Regional Office No. I

"2012 International Training Workshop for Natural Disaster Reduction"
14-18 May 2012, Taipei, Taiwan



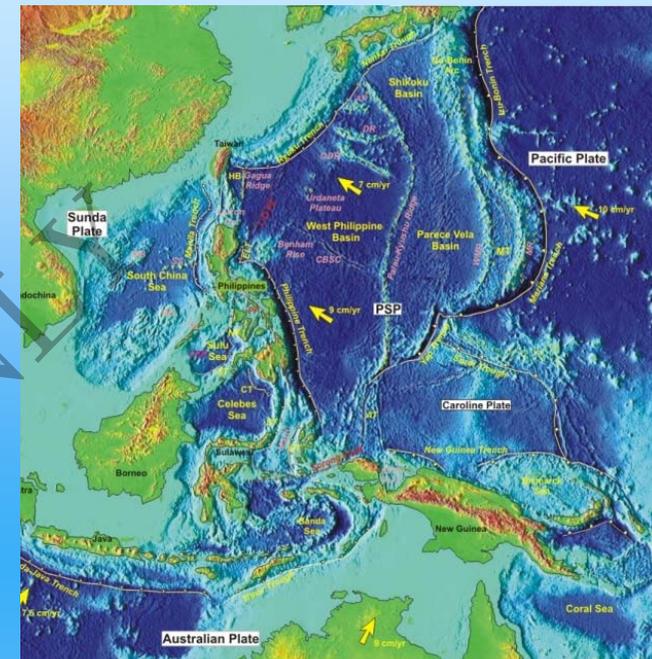
The Philippines: A geohazards-prone country

The geographic and geologic setting of the Philippines (part of Pacific Ring of Fire and Earthquake Belt) and with around 20 typhoons/year entering the Philippine area of responsibility, make it prone to various hazards, including:

- typhoon/rain-related such as landslides and flooding
- earthquake-related including tsunami
- volcano-related

Exacerbated by.....

HUMAN INTERVENTION (e.g., Deforestation)
POOR SITE SELECTION OF SETTLEMENT SITES!





Landslides and Flooding in the Philippines





DENR-MGB's response...

National Geohazards Mapping and Assessment Program of the Mines and Geosciences Bureau-Department of Environment and Natural Resources





National Geohazard Mapping and Assessment Programme

The Geohazard Mapping and Assessment Program is an on-going priority undertaking of the Department of Environment & Natural Resources (DENR) being implemented by the Mines & Geosciences Bureau (MGB).

Its main objective is to identify areas in the country that are susceptible or vulnerable to various geologic hazards (GEOHAZARDS), and increase public awareness in order to lessen or mitigate the negative impacts of these events.





Major Activities

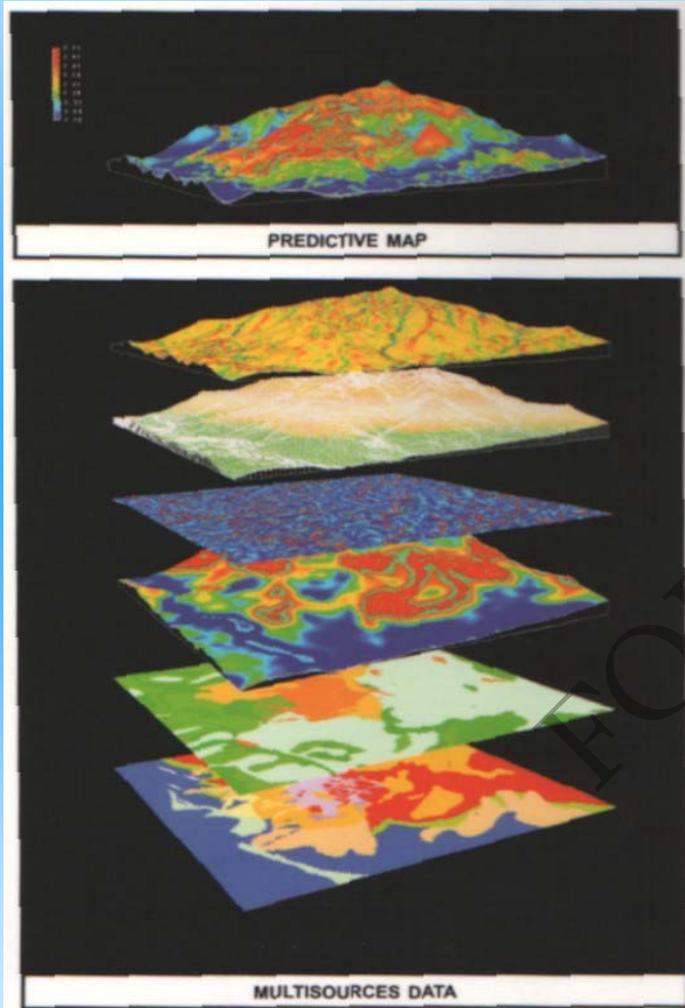
- Geohazards Mapping at 1:50,000 scale and detailed Geohazards Mapping at 1:10,000 scale
- Conduct of province- and municipal-wide information and education campaigns
- Provision of geohazard maps/information and issuance of advisories to LGUs identified as prone to geohazards
- Identification of relocation sites/establishment of community-based early warning system

Jan 5, 2012, Pantukan,
Compostela Valley Province





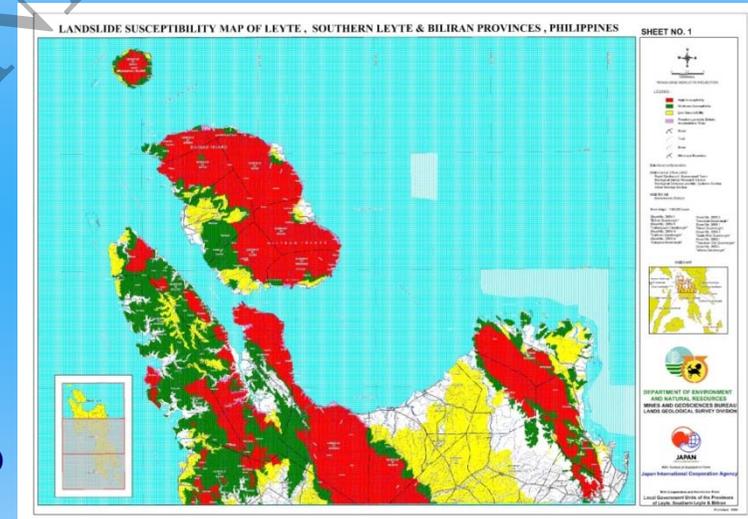
Geohazards Assessment and Mapping at 1:50,000 scale



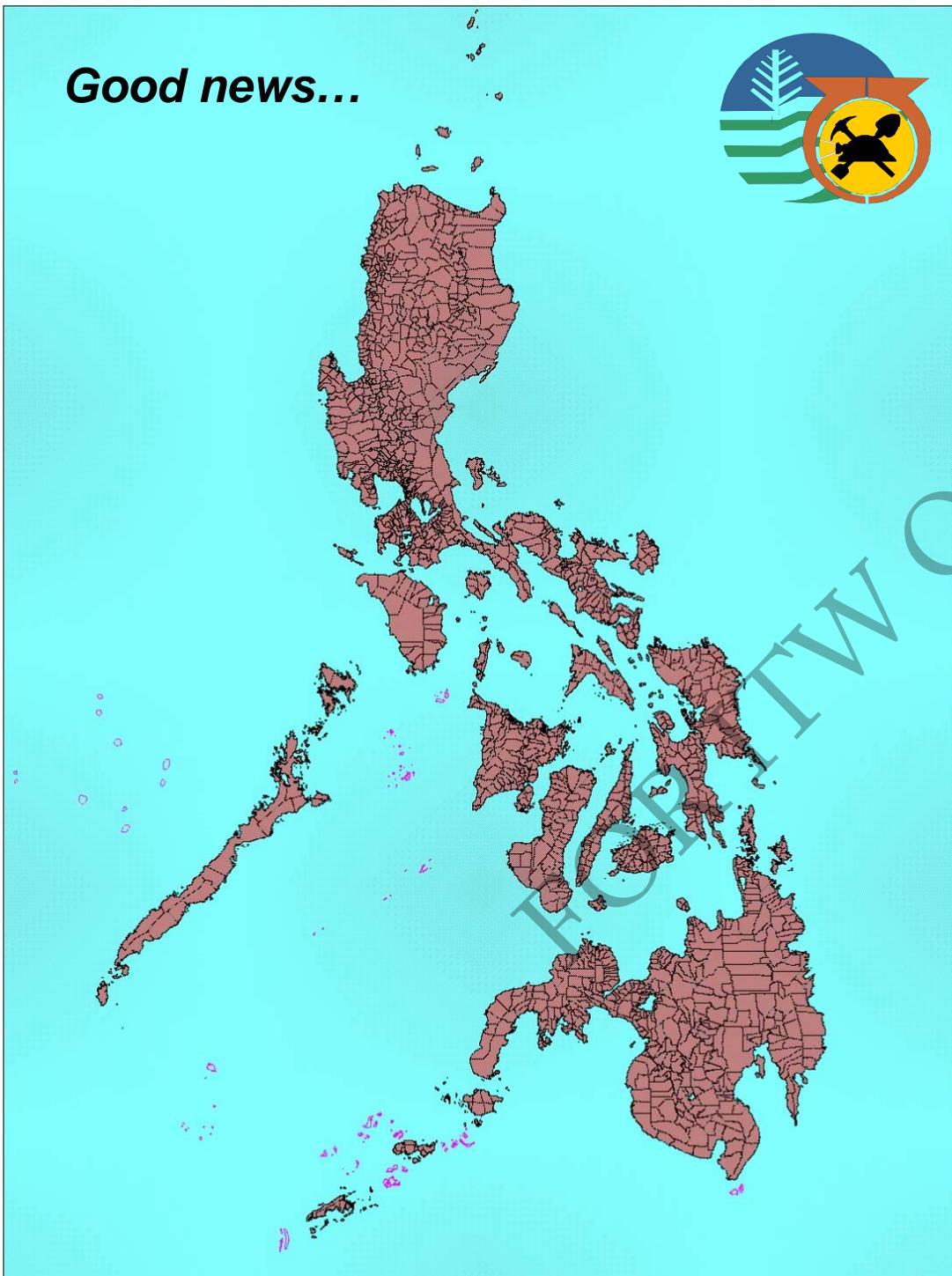
LANDSLIDE POTENTIAL

=

Infrastructures
+
Vegetation map
+
Drainage map
+
Geomorphic map
+
Slope map
+
Geologic map



Good news...



Status of the National Geohazards Assessment and Mapping (1:50,000 scale)

100%
(December 2010)

All 1:50K geohazards
(landslide and flood) maps
can now be downloaded for
free at the following website:

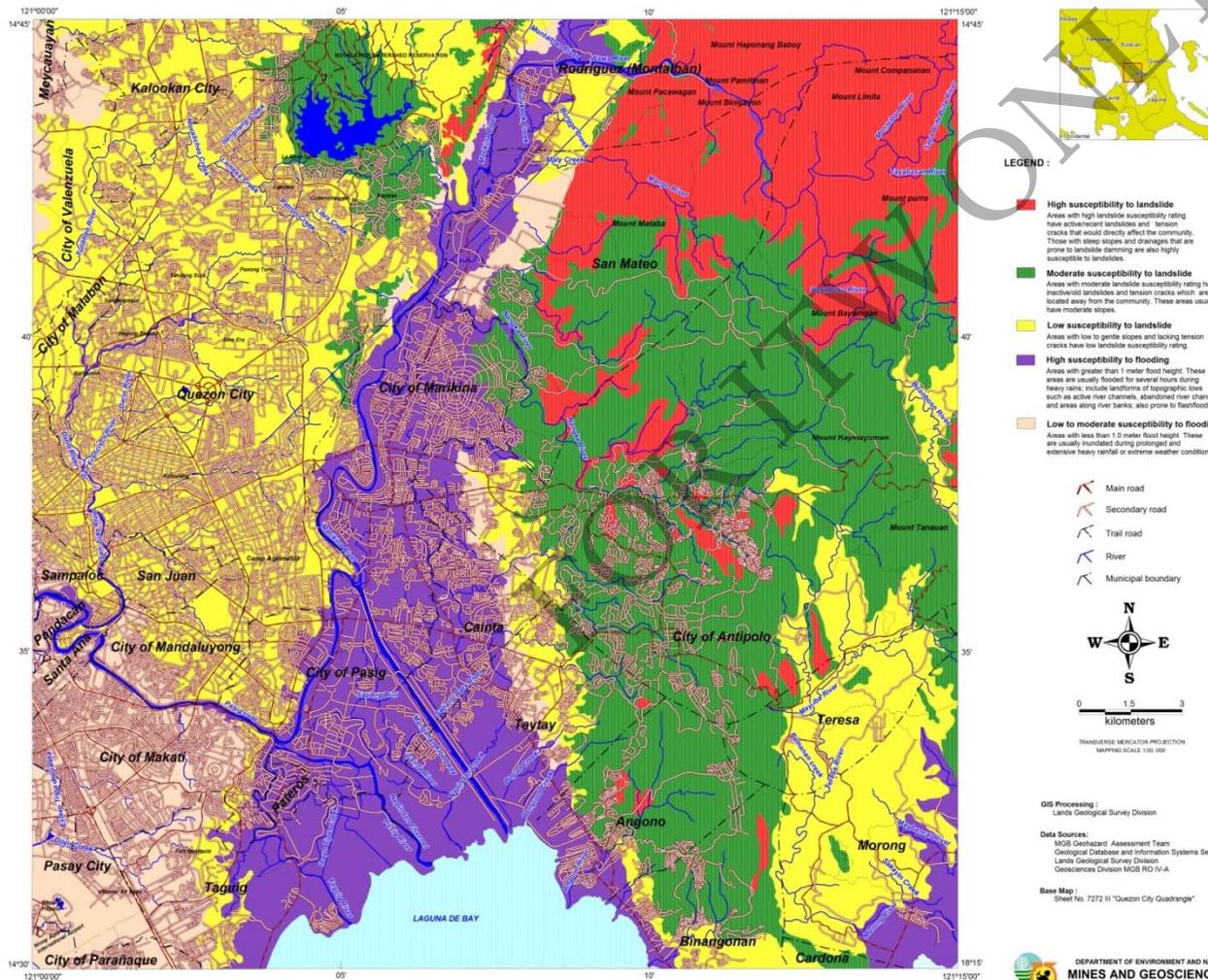
www.mgb.gov.ph





Examples of Geohazards Maps (1:50K) covering Metro Manila and vicinity

**LANDSLIDE AND FLOOD SUSCEPTIBILITY MAP OF QUEZON CITY QUADRANGLE
RIZAL PROVINCE, PHILIPPINES**



High landslide susceptibility

Moderate landslide susceptibility

Low landslide susceptibility

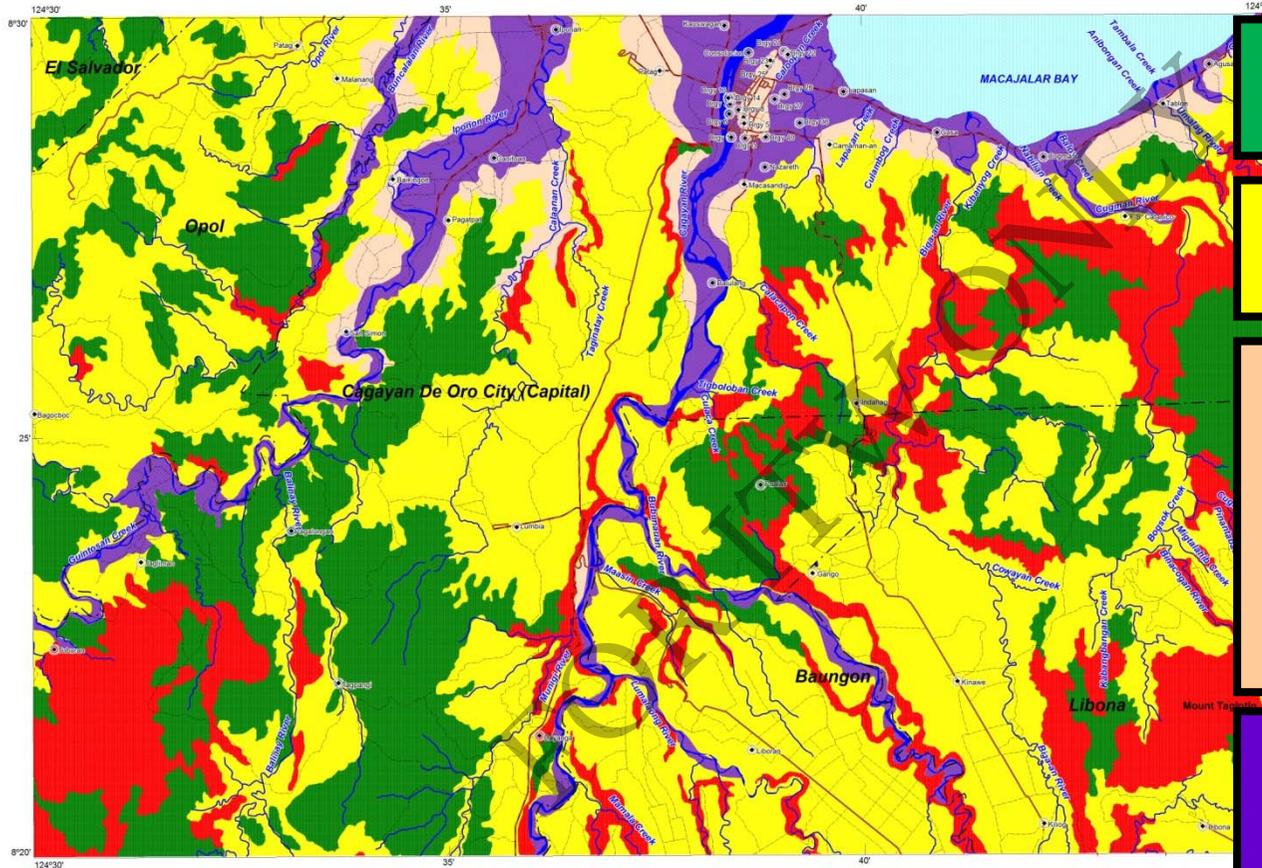
Low to moderate flood susceptibility

Areas affected by less than 1 m high flood. These are usually inundated during prolonged and intense rainfall or extreme weather condition.

High flood susceptibility

Areas affected by greater than 1 m high flood. These areas are usually flooded for several hours during heavy rainfalls. Included are landforms of topographic lows such as active and abandoned river channels and areas along river banks.

LANDSLIDE AND FLOOD SUSCEPTIBILITY MAP OF CAGAYAN DE ORO QUADRANGLE MISAMIS ORIENTAL AND BUKIDNON PROVINCES, PHILIPPINES



High landslide susceptibility

Moderate landslide susceptibility

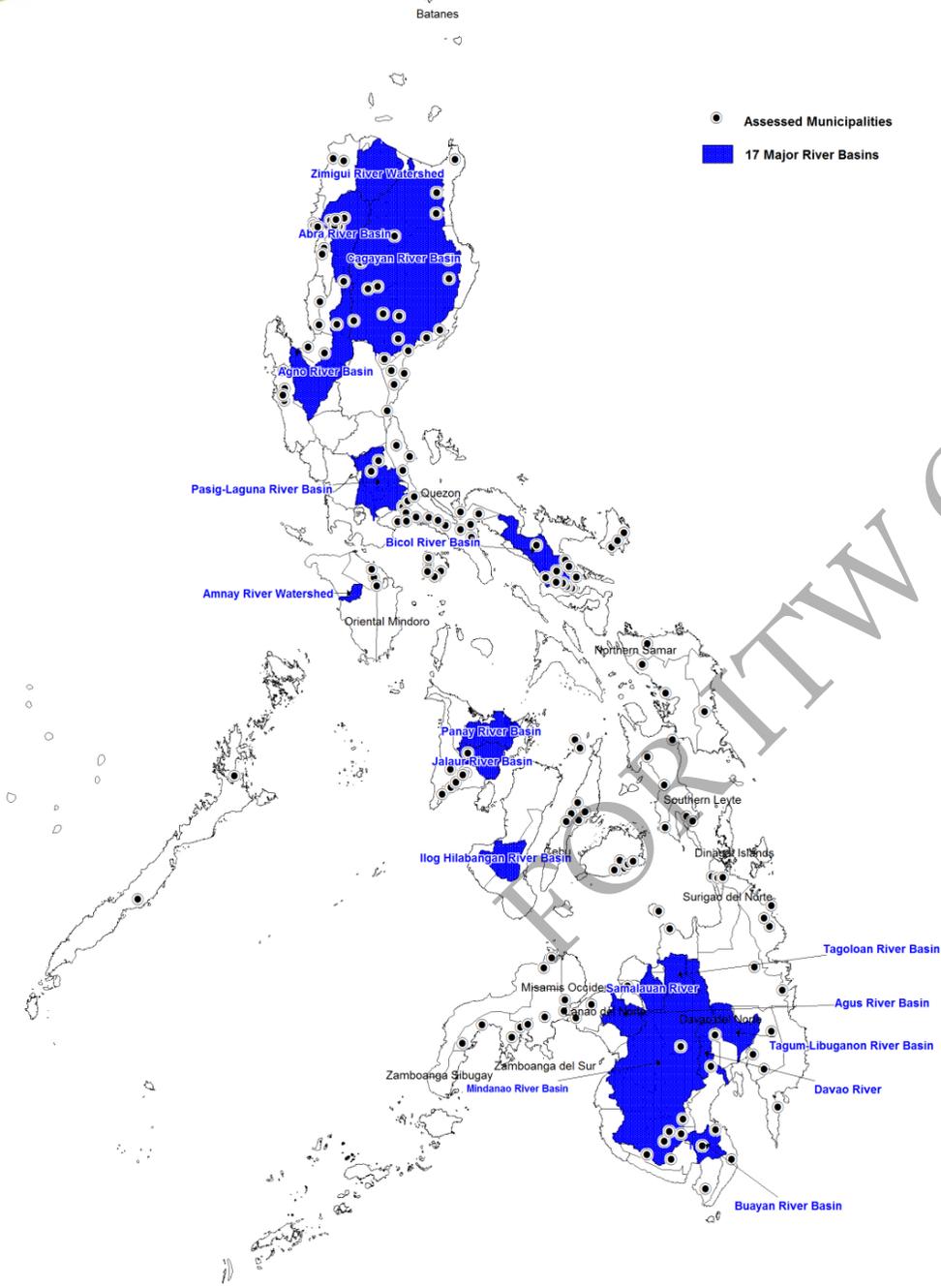
Low landslide susceptibility

Low to moderate flood susceptibility

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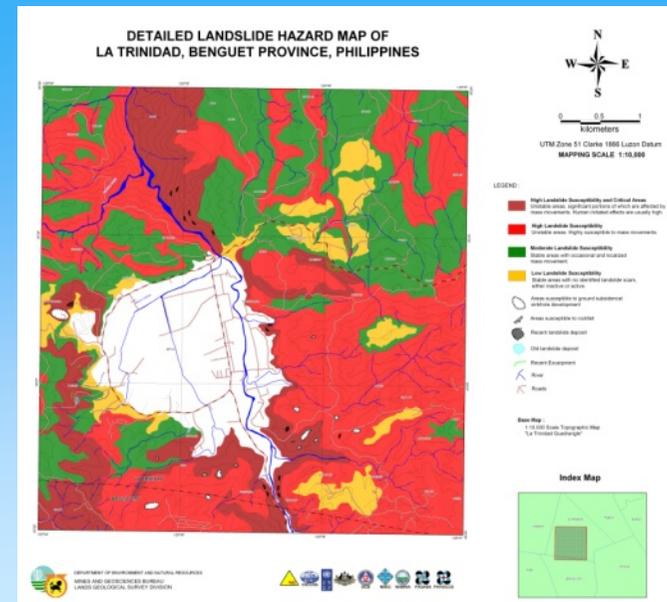
High flood susceptibility

Areas affected by greater than 1 m high flood. These areas are usually flooded for several hours during heavy rainfalls. Included are landforms of topographic lows such as active and abandoned river channels and areas along river banks.



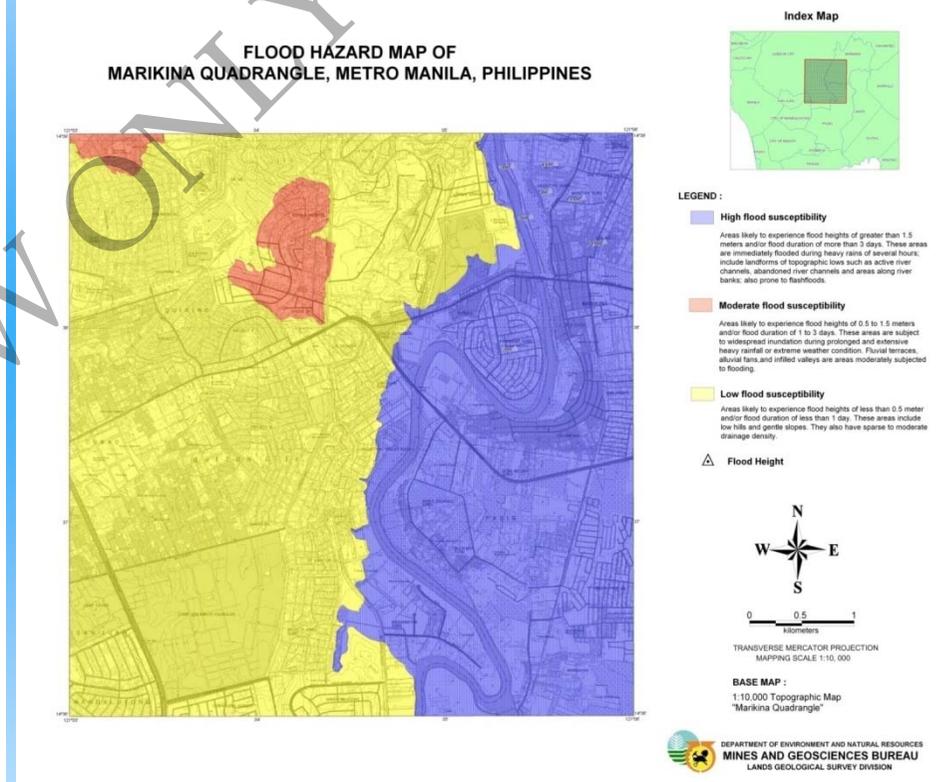
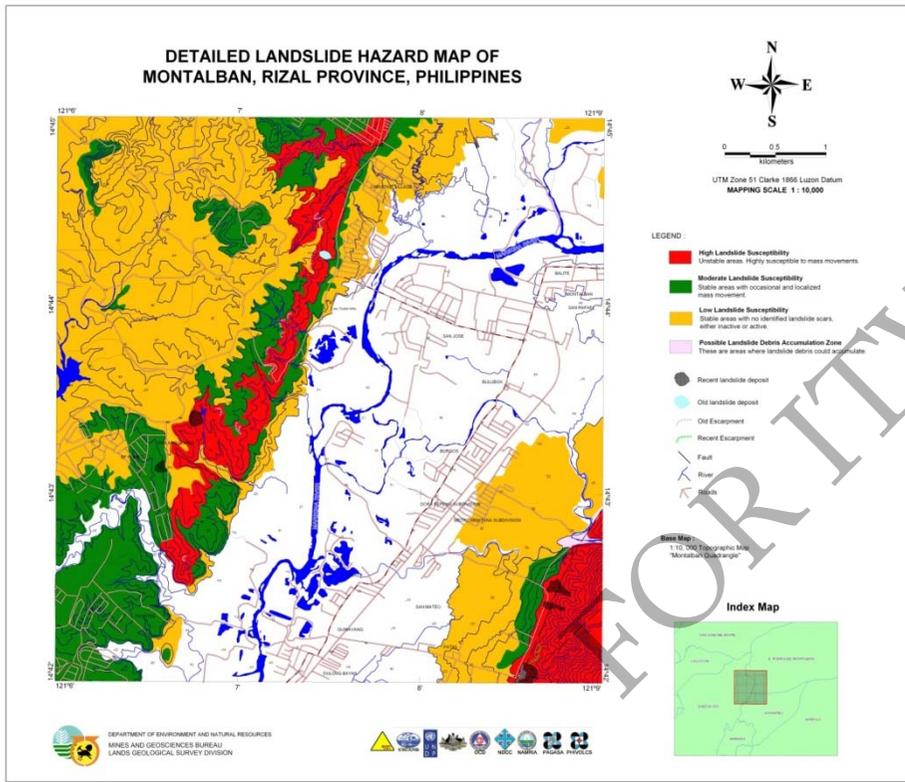
Detailed Geohazards Assessment and Mapping at 1:10,000 scale

To date, DENR-MGB has conducted detailed geohazards assessment of at least 172 cities/ municipalities at 1:10,000 scale





Landslide and flood hazards map of Rodriguez and Marikina, Rizal Province at 1:10,000 scale





Making people informed

Provided geohazard maps to local government units and advisories to communities identified as prone to landslide and flood hazards

RESULTS OF THE MGB RAPID GEOHAZARD ASSESSMENT OF BARANGAYS IN CAGAYAN DE ORO CITY, MISAMIS ORIENTAL

In line with the recent Presidential Directive and NDCC resolutions following the February 17 Southern Leyte landslide incident, and the need to fast track the geohazard mapping program of the Philippines, six (6) geologists from the Mines and Geosciences Bureau (MGB), namely, Salvio B. Laserna, Alvin Lucio M. Fernando, Lutgardo S. Laraño, Angelica B. Sajona, Maria Elena S. Lupo, and Beverly Mae M. Brebent conducted a field assessment of 80 barangays in Cagayan de Oro City, Misamis Oriental on July 18-20, 2009. The field assessment focused on both the landslide and flood susceptibilities of the barangays.

In terms of landslide susceptibility, each barangay was rated. The rating parameters are as follows:

High

- Presence of active and/ or recent landslides
- Presence of numerous and large tension cracks
- Areas with drainages that are prone to debris damming
- Areas with numerous old landslides/escarpments
- Steep slopes
- Presence of weak/rock slope materials
- Structures (joints, beds) dipping towards the slope face
- Neareness to faults

Moderate

- Areas with indicative and/or old landslides
- Presence of small tension cracks
- Moderate slopes

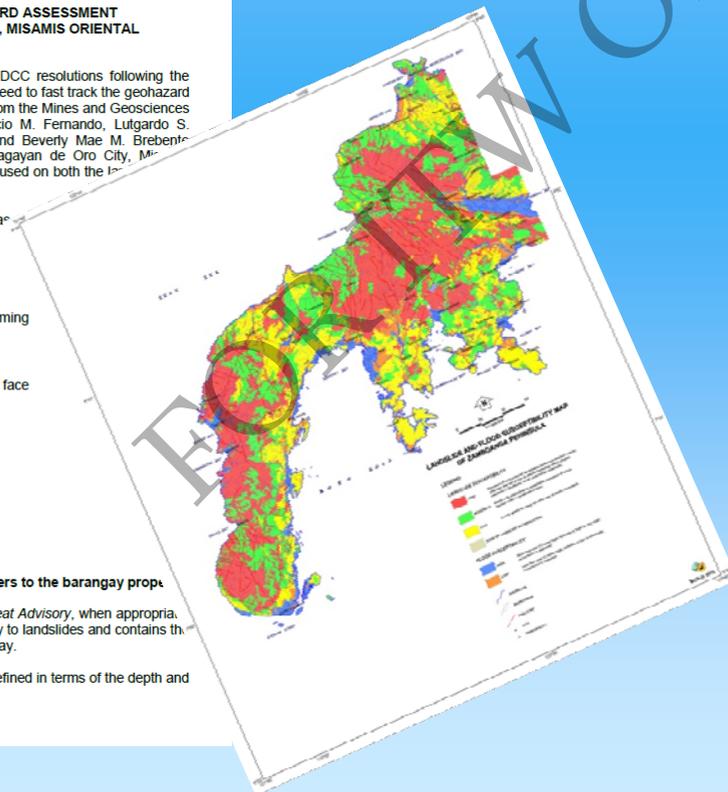
Low

- Low to gently sloping
- No evidence of mass movement

The rating of each barangay, unless specified, refers to the barangay proper.

The barangays were presented with a *Landslide Threat Advisory*, when appropriate. The Advisory informs the barangays of their susceptibility to landslides and contains the corresponding recommendations particular to the barangay.

In terms of flood susceptibility, the barangays were defined in terms of the depth and frequency of flooding.





THREAT ADVISORY ISSUED



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Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
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LANDSLIDE THREAT ADVISORY

Date: June 1, 2011

To: **Brgy. Chairman Rolando M. Talon**
Brgy. Bitag Grande
Municipality of Baggao
Province of Cagayan

*Recd. by:
 Gost
 06-07-11*

Dear Sir:

Please be advised that the Geohazards Mapping and Assessment Team (GMAT) of the Mines and Geosciences Bureau (MGB) has conducted landslide hazard assessment in your barangay. The following are the results and recommendations following the assessment:

1	Sitio Tueg	Moderate to high	Sitio proper has moderate landslide susceptibility. Slopes bounding the sitio has high landslide susceptibility. Old landslides and creeping noted in some portions of the slope. 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.
2	Purok 6, Sitio Acsao	High	Slopes are underlain by weak materials. Recent/active and old landslides were noted. Creeping (manifested by the development of terracetes) is also present. Modification of the slope following the development of the road has contributed significantly to slope instability. Observe for and/or monitor for presence of mass

			the foot of steep slopes as well as in areas fronting active gully development.
3	Purok 7	High	Deforestation and subsequent tilling of the land have contributed significantly to the weakening of the slope materials. Recent/active and old landslides were noted. 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; Implement slope stabilization measures.

Kindly advise your affected constituents to initiate readiness and measures for this identified geohazard. This susceptibility rating was arrived at as of this field assessment. It should be noted that the rating could advance (e.g. from low to moderate, moderate to high) as mass movement progresses. Hence, the MGB constantly recommends strict and continuous implementation of the MGB recommendations by the barangay.

Your office is encouraged to contact your Municipality Disaster Risk Reduction and Management Council to plan for any emergency.

Thank you very much.

By the authority of the Director:

Karlo L. Queaño
KARLO L. QUEAÑO, Ph. D.

Mariane Eve G. Ordoñez
MARIANE ÈVE G. ORDOÑEZ



GEOHAZARDS ASSESSMENT REPORT (issued to the Office of the City/Municipality Mayor)

RESULTS OF THE MINES AND GEOSCIENCES BUREAU'S (MGB) 1:10,000 SCALE LANDSLIDE ASSESSMENT AND MAPPING OF THE MUNICIPALITY OF ITOGON, BENGUET PROVINCE



RESULTS OF THE MINES AND GEOSCIENCES BUREAU'S (MGB) 1:10,000 SCALE LANDSLIDE ASSESSMENT AND MAPPING OF THE MUNICIPALITY ITOGON, BENGUET

In view of the need to fast track the geohazards survey in the country, six (6) geologists from the Mines and Geosciences Bureau (Central Office)-Department of Environment and Natural Resources (MGB-DENR) conducted geohazards mapping (1:10,000 scale) and assessment of barangays in Itogon, Benguet on August 23 to September 7, 2011. This undertaking is a follow-up to the 1:50,000 scale geohazards mapping conducted by geologists from MGB-CO and Regional Office (CAR). Comprising the geohazards team are Dr. Karlo L. Queaño, Ms. Fay Apil and Ms. Jocelyn C. Villanueva.

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 was only limited to areas covered by the 1:10,000 scale base maps provided to the team. The said maps cover the more populated and more "critical" barangays, basing on the 1:50,000 scale geohazards map previously generated by the MGB. The assessed areas were rated as having low, moderate, high or very high (critical) susceptibility to landslide. **Table 1** shows the parameters used for the assessment.

When appropriate, the barangay officials were presented with a *Landslide Threat Advisory*. This advisory informs them of their area's susceptibility to



Making people aware thru IEC

Conducted province- and municipal-wide information and awareness campaign including Surigao del Norte, Surigao del Sur, Davao Oriental, and Camiguin

Development and distribution of IEC materials on geohazards (posters, flyers, comics, videos)





Community-Based Early Warning System for Landslide

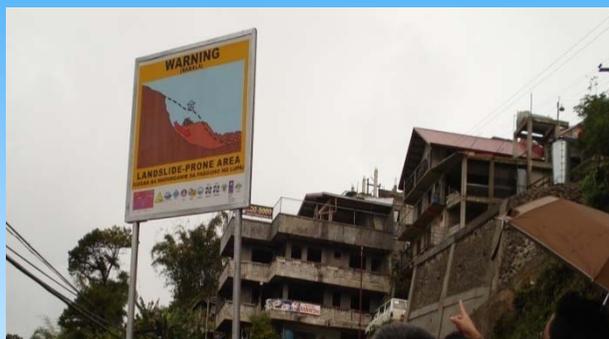
1. Coordination meetings with LGUs



2. Conduct of Special IEC



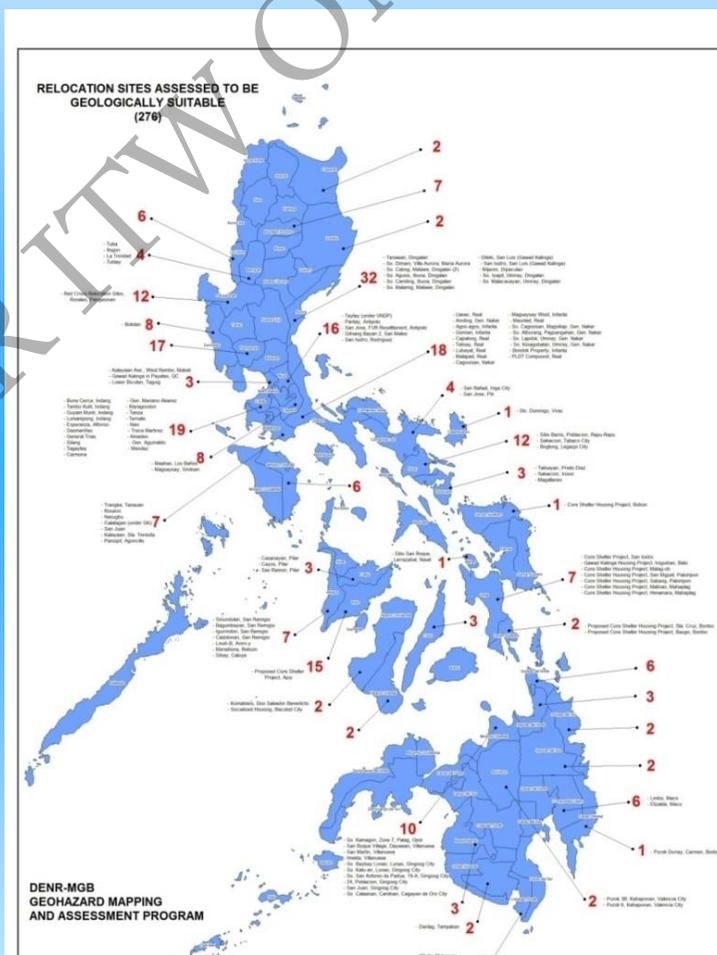
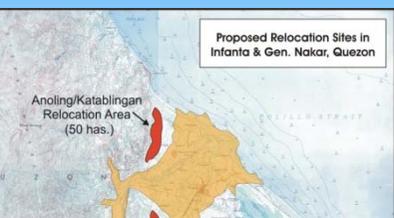
3. Installation of landslide warning signage





Identification of relocation sites

Identified relocation sites of communities affected by disasters (e.g. Pantukan, Compostela Valley and St. Bernard and Naigaugon, Southern Leyte





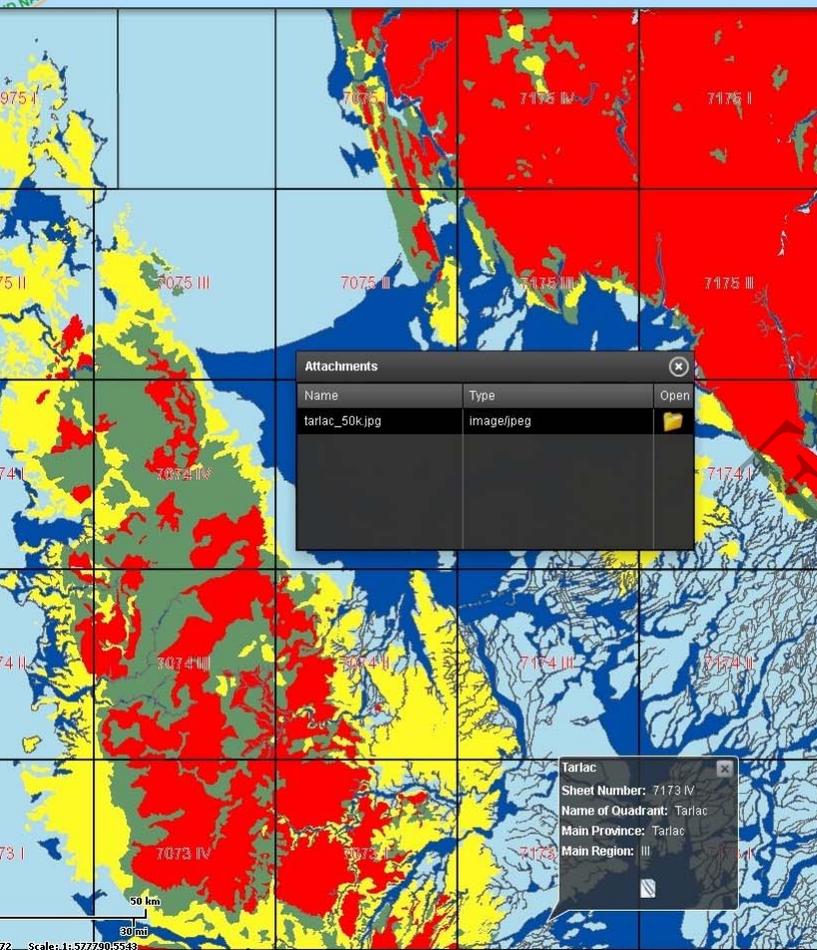
The DENR Geohazards Website

www.mgb.gov.ph

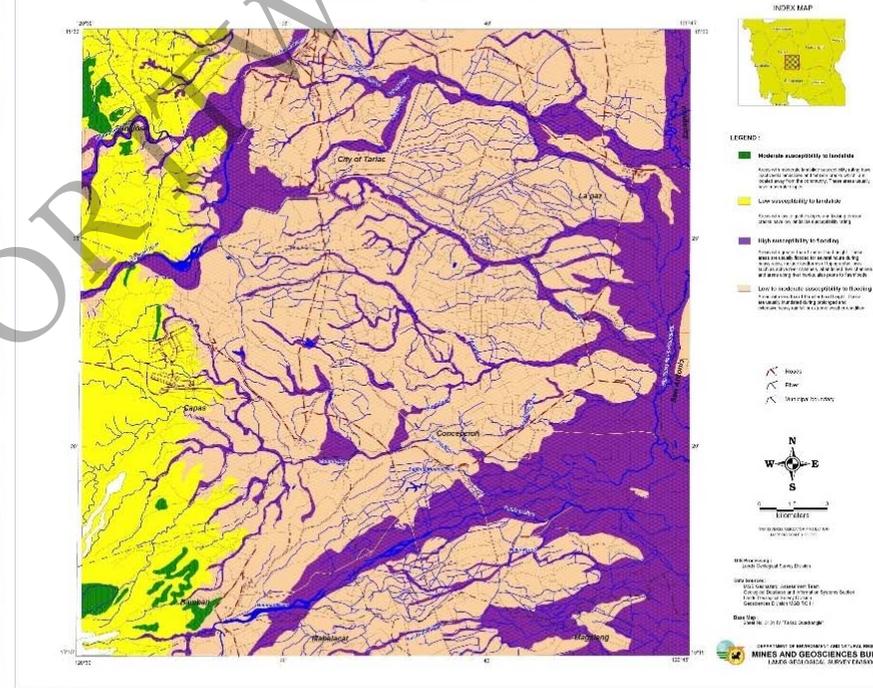
Geosciences Bureau
Information System

Help Contact Us





LANDSLIDE AND FLOOD SUSCEPTIBILITY MAP OF TARLAC QUADRANGLE TARLAC PROVINCE, PHILIPPINES



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main point: The need to take the information by geohazards maps seriously





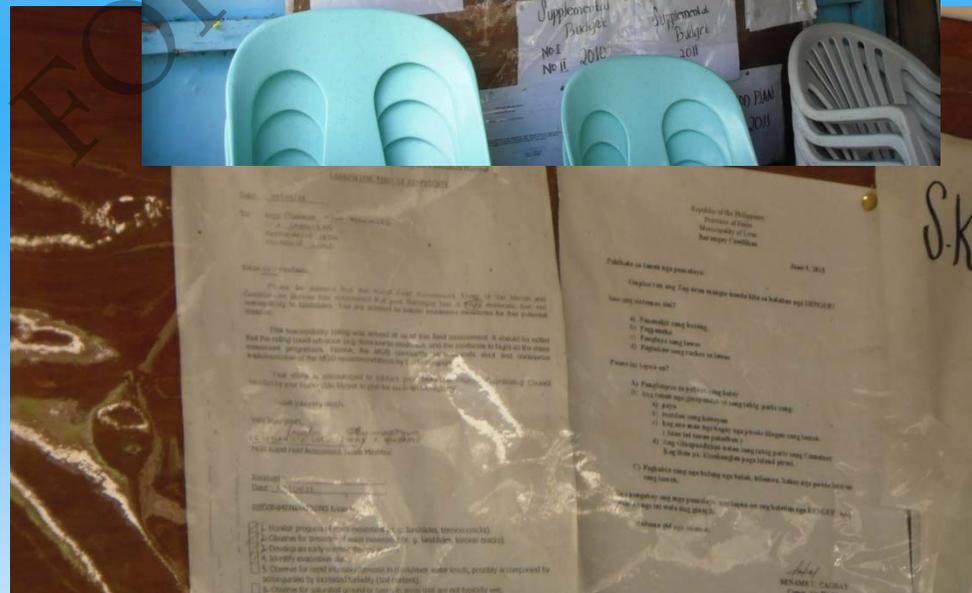
Good Practice and Lessons Learned

Barangay. Cawilhan, Leon, Iloilo

Classified as highly susceptible to landslides during the 2008 hazard assessment

Landslide threat advisory with corresponding recommendations issued and discussed then to the community in the barangay;

The advisory was posted in the bulletin board at the barangay hall for the barangay official's reference;





On August 27, 2011, a landslide affected Brgy. Milihan due to strong and continuous monsoon rains brought by Typhoon Mina

Due to the landslide, tension cracks were observed in the barangay proper for about a week. This prompted the barangay officials and residents in the affected area to start clearing their houses, to prepare for evacuation and to constantly monitor the progress





- **By the time the landslide occurred at about 10:30 P.M. on August 27, 2011, the residents had already evacuated to safer areas and the houses were already cleared of their important properties and belongings.**





Barangay Puguis, La Trinidad, Benguet

Before

After

DENR-MGB Landslide Warning Signage



the Kibungan Village in Barangay Puguis, La Trinidad, Benguet, as viewed

upwards looking westward BEFORE and AFTER Turbopump





The way forward...

**Increase awareness and familiarize early warning signs
of various geohazards present in the community**

**Maximize utilization of information on geohazards for
disaster risk management and land use and
development planning**

**Communication process to decision makers to develop
consciousness**





Thank you!

www.mgb.gov.ph

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