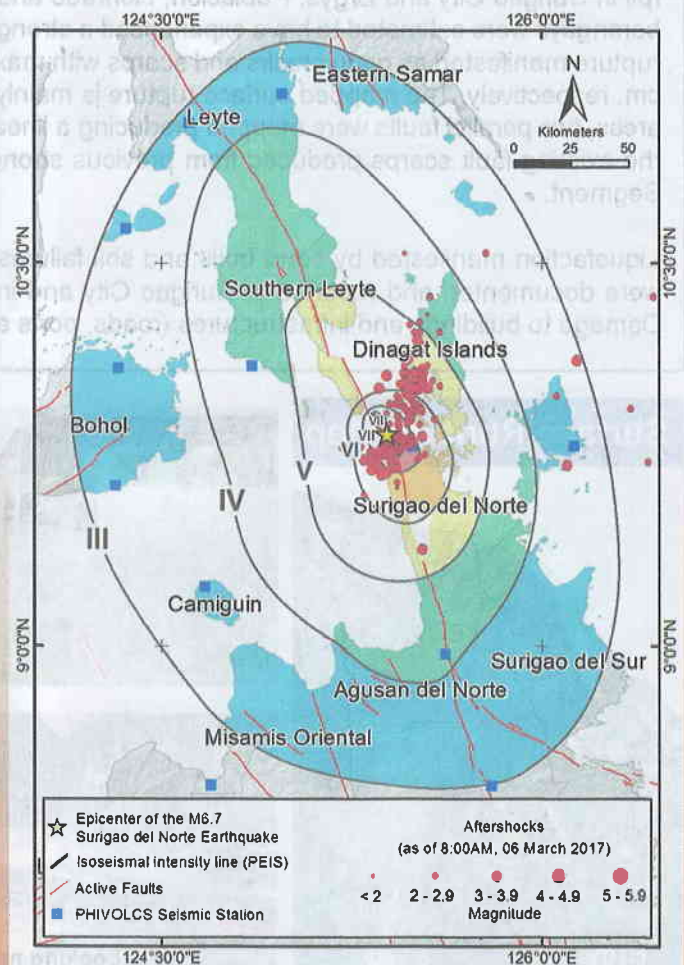


THE 10 FEBRUARY 2017 MAGNITUDE 6.7 SURIGAO DEL NORTE EARTHQUAKE

On 10 February 2017 at 10:03 PM Philippine Standard Time (PST), a magnitude (M_s) 6.7 earthquake shook the province of Surigao del Norte (SDN) in northeastern Mindanao. Using the data from the Philippine Seismic Network (PSN) of the Philippine Institute of Volcanology and Seismology - Department of Science and Technology (PHIVOLCS-DOST), the epicenter was located in Surigao Strait at 9.80° N and 125.35° E or 16 km offshore northwest of Surigao City at a shallow depth of 10 km. The earthquake was generated by the movement of the Philippine Fault - Surigao Segment. Very strong ground shaking was felt at PHIVOLCS Earthquake Intensity Scale (PEIS) VII (destructive) in Surigao City and Municipality of San Francisco, SDN while areas along the surface rupture experienced PEIS VIII (very destructive). The rest of the municipalities in SDN experienced PEIS VI (very strong) to IV (moderately strong). This earthquake was felt at PEIS IV to I as far as 250 km away from the epicentral area. Small magnitude earthquakes followed afterwards. As of 06 March 2017 6:00 AM, 2,941 aftershocks were recorded by the PSN, of which, 137 were plotted and 38 were reportedly felt. The largest aftershock was recorded on 05 March 2017 at 8:08 AM with a magnitude of (M_s) 5.9 and was felt in Surigao City at PEIS VI (very strong).

The earthquake was associated with a surface rupture that produced a strong ground shaking that damaged buildings and infrastructures in Surigao City and San Francisco, SDN. Liquefaction and earthquake-induced landslides were also documented and reported. There were eight (8) reported deaths, 249 sustained injuries and 10,691 affected families due to the earthquake. The estimated cost of damage to public infrastructures amounted to at least 700 million Philippine pesos or 14 million US dollars (NDRRMC Situational Report No.19).



Isoseismal map with preliminary plotting of aftershocks of the 10 February Magnitude 6.7 Surigao Del Norte Earthquake as of 06 March 2017.



The collapsed Anao-aon bridge in Brgy. Poblacion, San Francisco is transected by the Philippine Fault - Surigao Segment (red line)

Why do earthquakes occur in Surigao del Norte?

Eastern Mindanao, including SDN, is one of the seismically active areas in the country because of the Philippine Fault and Philippine Trench. On 01 July 1879, a magnitude 7.4 earthquake was generated by the movement of Philippine Fault - Surigao Segment. This earthquake is considered to be the largest historical earthquake in the region. During this event, strong ground shaking was felt in SDN that caused significant damage to churches, buildings and other infrastructures. Surface rupture, as well as liquefaction and earthquake-induced landslides, were also documented. Other local faults can also be sources of small- to large-magnitude earthquakes in SDN.

The Surface Rupture of the 2017 Surigao del Norte

The Philippine Fault - Surigao Segment, a NNW-SSE trending left-lateral strike-slip fault, generated the 2017 M6.7 Surigao del Norte Earthquake. This event produced a 4.3-km long surface rupture on land that was mapped in Brgy. Ipil in Surigao City and Brgys. Poblacion, Honrado and Macopa in the Municipality of San Francisco, SDN. These barangays were estimated to have experienced a strong ground shaking at PEIS VIII (very destructive). The surface rupture manifested as open cracks and scarps with maximum horizontal and vertical displacement of 60 cm and 40 cm, respectively. The mapped surface rupture is mainly characterized by right-stepping en echelon faults. In some areas, two parallel faults were mapped producing a linear depression. The surface rupture also follows along or near the existing fault scarps produced from previous strong earthquakes generated by the Philippine Fault - Surigao Segment.

Liquefaction manifested by sand boils and soil failures, as well as shallow-seated earthquake-induced landslides were documented and reported in Surigao City and in the Municipalities of San Francisco and Malimono, SDN. Damage to buildings and infrastructures (roads, ports and bridges) due to ground shaking were also documented.

Surface Rupture Map



- Surface Rupture
- ↗ Red arrows indicate location of fault and direction of displacement
- 1 Number on the map corresponds to the location of the photo



A chapel in Brgy. Ipil, Surigao City, SDN transected by the active fault



Two parallel fault traces forming a depression



Undamaged house less than 5 m from the surface rupture of the 2017 Surigao del Norte Earthquake in Brgy. Ipil, Surigao City, SDN



Looking east



West-facing (3a) and east-facing (3b) scarps of surface rupture. Sand boil also coincides with the surface rupture in Brgy. Poblacion, San Francisco, SDN



Looking north

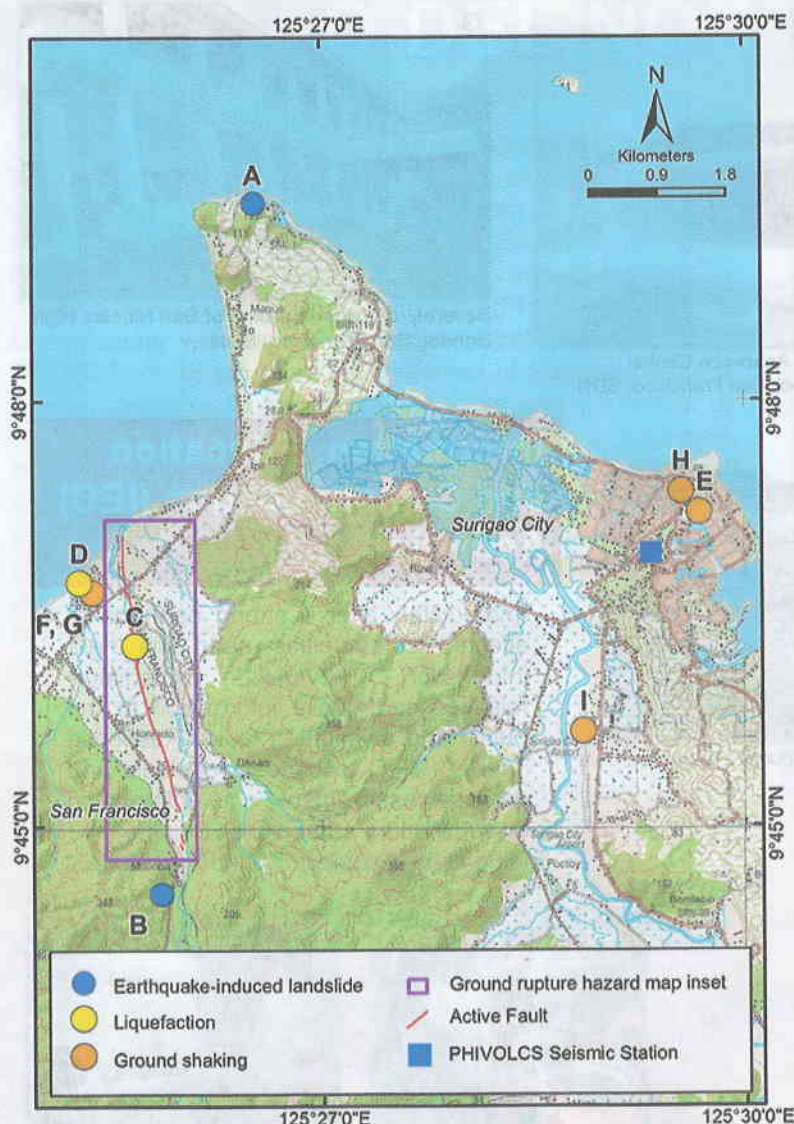


Aerial photo (5a) of rice paddies and road displaced to the left in Brgy. Honrado, San Francisco, SDN. About 30 cm horizontal (5a) and vertical (5b) displacement on rice field



Looking north

Earthquake and other Earthquake - related Impacts



Map showing the earthquake-affected areas in Surigao del Norte. The purple rectangle shows the location of the Philippine Fault - Surigao Segment surface rupture map. The letters indicate the location of photos that correspond to the impacts of earthquake.

About 20 cm left-laterally offset rice paddies in Brgy. Macopa, San Francisco, SDN (photos 7 and 8)



A tree in Brgy. Honrado, San Francisco, SDN transected by the active fault



Earthquake - Induced Landslide



Shallow-seated landslide along Looc - Punta Bilar Road, Surigao City



Aerial view of landslides in Brgy. Macopa, San Francisco, SDN

Liquefaction



Aerial view of sand boils coinciding with the surface rupture in Brgy. Poblacion, San Francisco, SDN



Series of sand boils in the reclaimed area of Brgy. Poblacion, San Francisco, SDN



Severely-damaged building of Surigao City State College of Technology



Collapsed wall of Anao-aon Central Elementary School, San Francisco, SDN



Severely-damaged building of San Nicolas High School, San Francisco, SDN



Damaged building of Absolute Essentials Traders Inc. in Surigao City



Buckled runway of Surigao Airport

Information, Education and Communication (IEC) Activities

Immediately after a strong earthquake, affected communities need the right information. PHIVOLCS immediately released earthquake information to the public and dispatched Quick Response Teams (QRT) to conduct geologic and damage assessment and information dissemination campaigns to allay the fears of the people in Surigao del Norte.

What should be done by the affected communities?

- The best course of action is **preparedness**.
- Damaged buildings and infrastructures should not be used and should be inspected by civil and/or structural engineers.
- Slopes should be checked for tension cracks that may cause landslide during strong earthquake and/or prolonged or heavy rainfall.
- Reconstruction or construction of houses should conform with the National Building Code of the Philippines.
- In case of another felt earthquake, do the **"Duck/Drop, Cover and Hold"**.



Dissemination of IEC materials



Municipal-wide IEC in San Francisco, SDN



Briefing and turnover of the 2017 Magnitude 6.7 Surigao del Norte Earthquake poster to LGUs



Walk-the-Fault with the media



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2017 M6.7 Surigao del Norte Earthquake PHIVOLCS Quick Response Team (QRT)

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