Monthly Summary of Tropical Cyclones that Entered the Philippine Area of Responsibility[‡]

January 2015

Overview

The first tropical cyclone (TC) that entered the Philippine Area of Responsibility (PAR) in 2015 was observed during this month (January). It was named Tropical Storm (TS) "Amang". TS Amang was generated over the western North Pacific. It was initially categorized as a tropical depression (TD) on January 14, 2015 at 8:00 A.M., Philippine Standard Time (PST). As it strengthened into TS, it was given its international name "Mekkhala". TS Amang (International name: Mekkhala) entered the PAR in the early morning of January 15, 2015 at 4:00 A.M., PST and moved into west, southwest, then to northwest direction until it made its first landfall over Dolores, Eastern Samar in the afternoon of January 17. It continuously moved into northwestward direction traversing the eastern sections of Bicol Region, where it brought its impacts in terms of floodings, landslides, and damaged houses, among others. Because of cold intrusion brought by the prevailing East Asian winter monsoon, TS Amang eventually weakened and dissipated as it approached the vicinity of Casiguran, Aurora after its fifth day of existence within the PAR (January 19, 2015 at 4:00 A.M., PST).

[‡] Please address your concerns regarding this report either to the Chief of Climatology and Agrometeorology Division or to the Chief of Weather Division, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Science Garden Complex, Agham Road, Diliman, Quezon City.

Climatological Background

During the month of January, 23 TCs existed within PAR from 1951 to 2013 (Fig. 1a). In general, the path taken by these TCs were westward and almost all of them (except for 1 TC) have not taken farther north of 20°N because of the prevailing East Asian winter monsoon during this month. Fourteen of these TCs (60.9%) crossed the Philippine landmass (Fig. 1b). Notably, most of the TCs that crossed the Philippines hit the regions between 7° and 15°N (northern Mindanao, the Visayas, and southern sections of Luzon). Again, there is an exceptional TC which taken a northwestward path and hit the northeastern portion of Luzon (marked with red track in Fig. 1b).

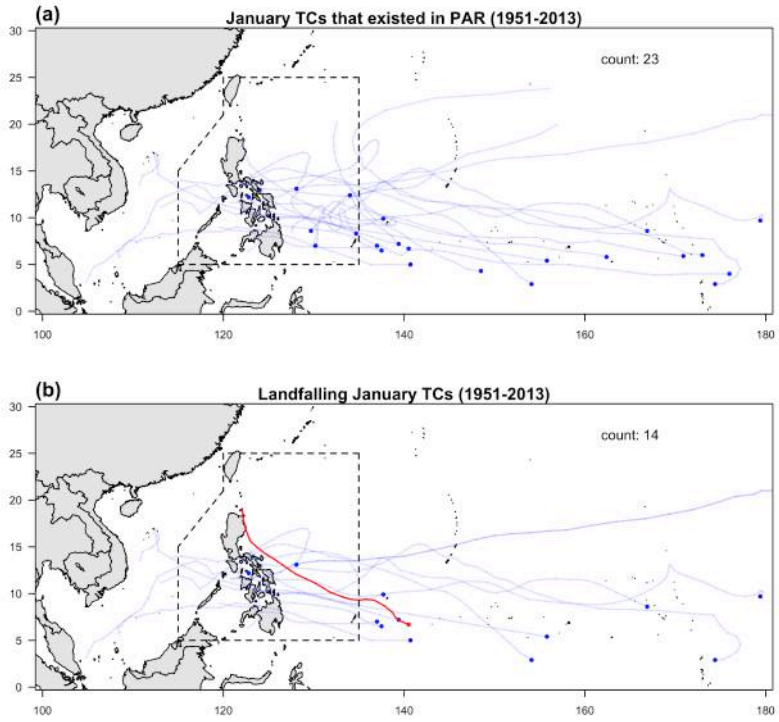

Fig. 1. Tracks of TCs: (a) that existed within PAR and (b) that crossed the Philippine landmass during January from 1951 to 2013 (Data source: JTWC best track available at http://www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/best_tracks/).

Chronology of Meteorological Events

An organized cloud cluster was observed over the western North Pacific (approximately centered at 8°N, 155°E) on January 9, 2015 at 00:00 UTC (8:00 A.M., PST) (Fig. 2a). The environmental conditions at that time appeared to be favorable for a tropical cyclogenesis. Such conditions include a weak vertical wind shear (Fig. 2b), strong 850-hPa relative vorticity (Fig. 2c), and warm sea surface temperatures (Fig. 2d) over the same region. These conditions have appeared to continue in the next couple of days, and the cloud cluster that was initially seen has propagated northwestward, became well organized, and indicates a counterclockwise motion of the low-level winds (Fig. 3a). Consequently, the Regional Specialized Meteorological Center (RSMC) in Tokyo, Japan issued its first warning on January 14 at 01:00 UTC

(9:00 A.M., PST) indicating an existence of a tropical depression (TD) within its designated area (Fig. 3b). After 6 hr, the Tokyo RSMC upgraded its initial warning and named the tropical disturbance as TS “Mekkhala”. TS Mekkhala was the first observed TC in 2015 under the jurisdiction of Tokyo RSMC.

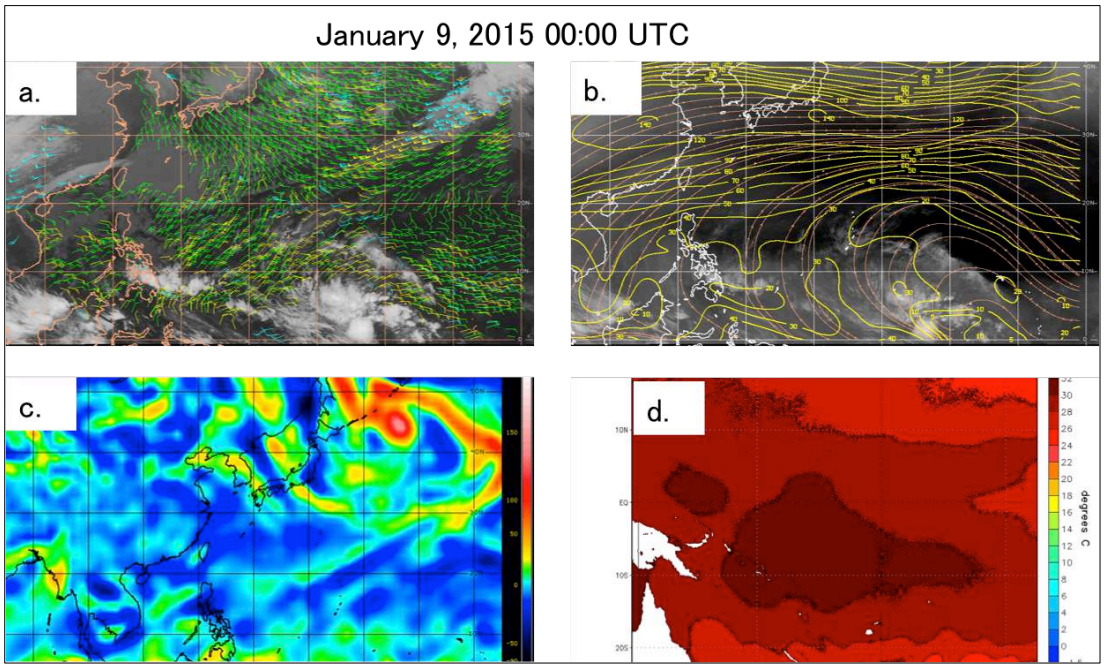

Fig. 2. Large-scale environmental conditions on January 9, 2015, 00:00 UTC (8:00 A.M., PST): (a) MTSAT infrared snapshot overlaid with low-level winds, (b) vertical windshear, (c) 850-hPa relative vorticity, and (d) sea surface temperature. [Sources: (a)–(c) http://tropic.ssec.wisc.edu/ and (d) http://polar.ncep.noaa.gov/sst/ophi/.]

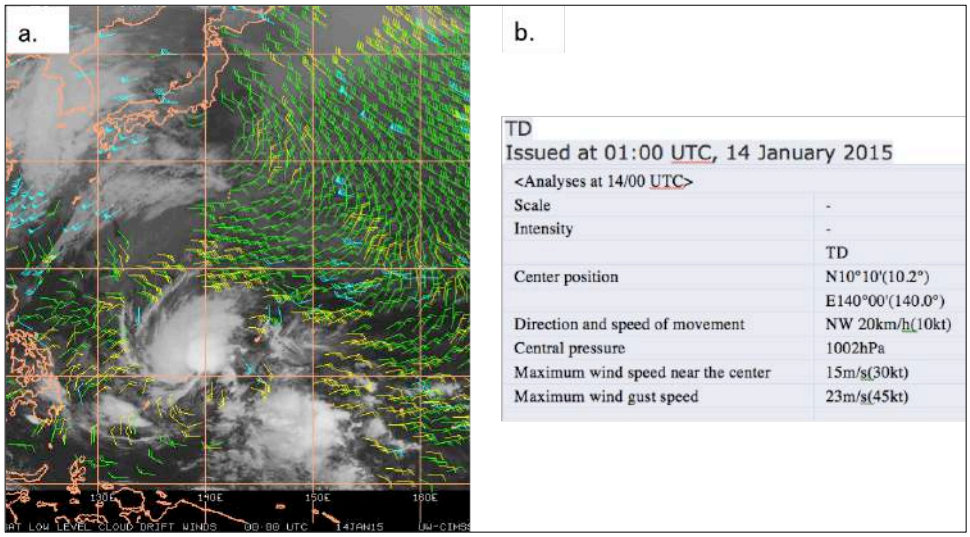

Fig. 3. Screenshots of (a) low-level winds overlaid with infrared MTSAT satellite image on January 14, 2015 (00:00 UTC) and (b) the first warning issued by the Tokyo RSMC. [Sources: http://tropic.ssec.wisc.edu/ for (a) and http://www.jma.go.jp/jma/indexe.html for (b)].

On the following day (January 15 at 4:00 A.M., PST), TS Mekkhala entered the PAR and was named locally as TS “Amang” based on the Severe Weather Bulletin (SWB) Number One issued by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). TS Amang was the first TC that entered the PAR in 2015 and was forecasted to move in a west-northwest direction at 19 kph. Based on the forecasted track for TS Amang (SWB Number Three, issued on January 15 at 11:00 P.M., PST), it threatens the areas of Northern Samar and Catanduanes; thus, the Public Storm Warning Signal (PSWS) Number 1 was raised over these areas indicating that a 30–60 kph wind is expected to be felt in the next 36 hr. After 12 hr, there was no significant deviations seen based on the forecasted tracks for TS Amang but as it approaches closer to land, the nearby provinces of those initially raised to PSWS Number 1 were similarly raised to PSWS Number 1. In the evening of January 16 (8:00 P.M., PST), TS Amang slightly slowed down into 15 kph and was expected to be over the Samar area in the evening of the following day (see, the forecasted track of TS Amang issued on January 16 at 11:00 P.M.) (Fig. 4). Because of that, PSWS Number 2 was raised in the provinces of Northern Samar, Eastern Samar, and Samar, signifying that 61–100 kph strength of wind is expected to be felt in the next 24 hr over these areas, while PSWS Number 1 was raised farther north to southern Quezon and as far west as the provinces in the Western Visayas.

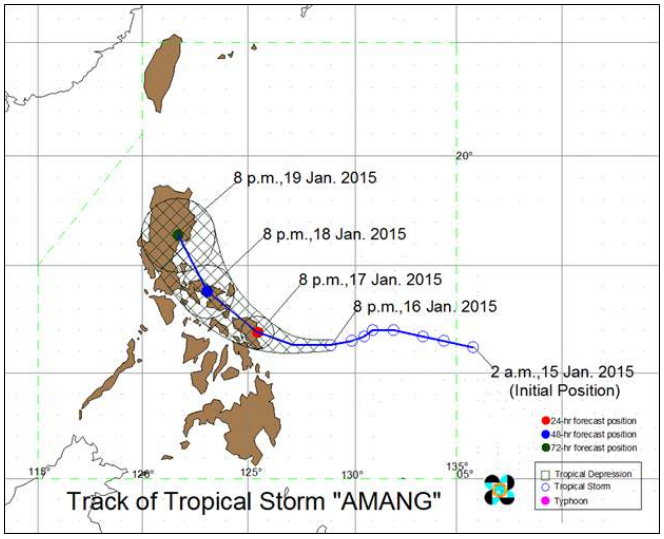

Fig. 4. Forecast track of TS Amang as of 8:00 P.M., 16 January 2015 issued at 11:00 P.M. (SWB Number Seven).

It has to be noted, however, that Pope Francis was scheduled to visit Tacloban City and the nearby municipality of Palo, Leyte on the same day as TS Amang is expected to hit the Samar area (see, http://www.gov.ph/state-visits-ph/popeph/ for the complete itinerary of the Pope during his visit in the Philippines). Tacloban City and Palo are adjacent to Samar and therefore the radius of maximum wind covers these areas as TS Amang approaches Samar. Such circumstances were carefully considered and therefore close monitoring on the potential changes in the movement of TS Amang was done using various sources of information including satellite data, radar data, hourly surface observations of atmospheric pressure, winds, and rainfall at PAGASA stations in the central Philippines, among others. At the same time, hourly

initialization of numerical weather prediction models and the outputs they generated were carefully analyzed to provide an accurate forecast for TS Amang.

Synoptic charts were carefully analyzed to consider the factors that may affect the movement of TS Amang. Considering the 500-hPa charts, which may serve as the steering level of tropical storm Amang (marked with "**C**" in Figs. 5a and 5b), it indicates that TS Amang will be steered on a southwestward direction (red arrow in Fig. 5a) due to the influence of the anticyclone or high-pressure system located over the northern tip of the Philippines (marked with "**H**" in Fig. 5a). However, based on the 24-hr model forecast (Fig. 5b), the high pressure area will move slightly off to the northwest from its initial position, allowing TS Amang to move northwestward and thus will directly hit Samar traversing through Northern Samar and then to Bicol region. Based on this, it was decided that TS Amang would skirt northward sparing Tacloban area.

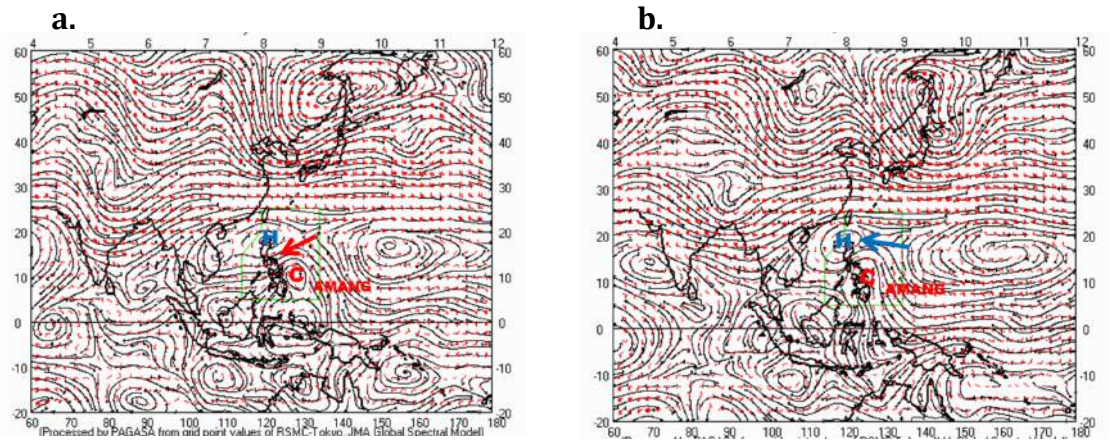

Fig. 5. Synoptic charts at 500 hPa based on the JMA's Global Spectral Model: (a) analysis on January 16, 2015 at 8:00 P.M., PST and (b) 24-hr forecast for January 17, 2015 (8:00 P.M., PST).

At around 3:00 to 4:00 A.M. on January 17, it was noted based on the hourly observation reports that TS Amang was already interacting with the landmass of Samar as indicated on the reduction of its movement speed. On the basis of these observations and model analyses, PAGASA maintained the Storm intensity of Amang even if the Joint Typhoon Warning Center (JTWC) and the Japan Meteorological Agency have upgraded it to typhoon. Moreover, PAGASA forecasters predicted that Amang will further weaken as it recurves and moves toward northern Samar due to its interaction with the dry, cold air brought by the East Asian winter monsoon (locally known as "Amihan"). Hence, instead of raising to PSWS Number 3 (upgrading to a Typhoon intensity), PSWS Number 2 was maintained (i.e., storm intensity) in the 5:00 A.M. issued SWB (SWB Number Eight). Such decision played a very critical role in the Pope's scheduled visit to Tacloban City and Palo, Leyte. If the province of Leyte was under PSWS Number 3, all airline flights going to Tacloban would be cancelled and hence the Pope's visit as well. The safety of the Pope and the entire team going to Tacloban was also at stake so the forecast must be precise. The analyses done based on hourly surface observations, backed-up with the useful information coming from radar data, and the experience and technical know-how of the

forecasters were vital in coming up with such very critical decision. Eventually, the Pope's visit to Tacloban and Palo, Leyte on January 17 (although shortened by few hours) became successful.

Based on SWB Number 10 issued at 5:00 P.M. on January 17 (PST), TS Amang made its first landfall over Dolores, Eastern Samar and was forecasted to move northwestward at 19 kph; because of that, most of the provinces in Bicol region and southern Quezon were raised to PSWS Number 2 while the remaining provinces in CALABARZON and most of the provinces in Central Luzon, including Metro Manila were raised to PSWS Number 1. After its first landfall, TS Amang has slightly weakened and continued to move northwestward and made its second landfall over Camarines Sur in the early morning of the following day (January 18; SWB Number 13). After traversing the rugged terrain of Bicol region, TS Amang has weakened into TD and continued to move north-northwest. It further weakened into a low-pressure area as it approached the vicinity of Casiguran, Aurora in the early morning of January 19; subsequently, the PSWS was lifted elsewhere in the country.

The complete track of TS Amang (international name: Mekkhala) is shown in Fig. 6. The approximate location of its center prior to entering the PAR was based on the Tropical Cyclone Warnings issued by the Japan Meteorological Agency while the approximate locations of its center when it was inside the PAR until it dissipated were based on the SWBs issued by PAGASA.

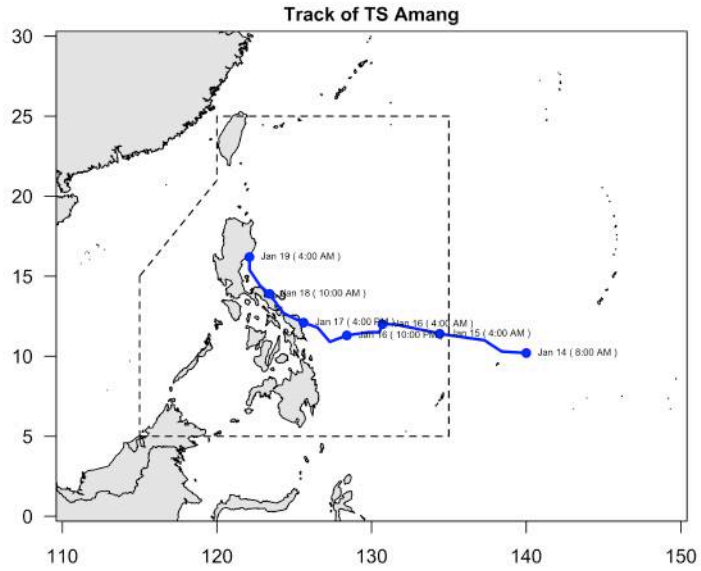

Fig. 6. The path taken by TS Amang from its development until it dissipated.

Selected Meteorological Parameters Observed During the Passage of TS Amang

The lowest mean sea level pressure (MSLP) during the passage of TS Amang was recorded at Catarman (993.4 hPa), followed by Borongan, and then at Daet (Fig. 7a). These were the areas where TS Amang passed through (see, Fig. 6). To further reveal of what really happened on the ground, the 3-hourly series of the observed MSLP is shown in Fig. 7b. Starting from the southernmost station close to the track of TS

Amang, it can be noticed that the lowest MSLP was recorded at Guiuan on January 17 at 09:00 UTC (5:00 P.M., PST), as well as in Tacloban, but 3 hr earlier at Borongan, while a "U-shaped" MSLP dip was recorded at Catbalogan. Afterwards, as TS Amang moved northwestward, the noticeable "V-shaped" MSLP plunge was observed at Catarman at around 15:00 UTC (11:00 P.M., PST), then to Legaspi and Virac in the next 3 hr. The Center of TS Amang came closest to Daet on January 18 at 06:00 UTC (2:00 P.M., PST) based on the "V-shaped" MSLP that was observed around that time. The lowest pressure at Baler was observed after 3 hr and such indications observed earlier was no longer been observed at Casiguran as TS Amang dissipated near its vicinity.

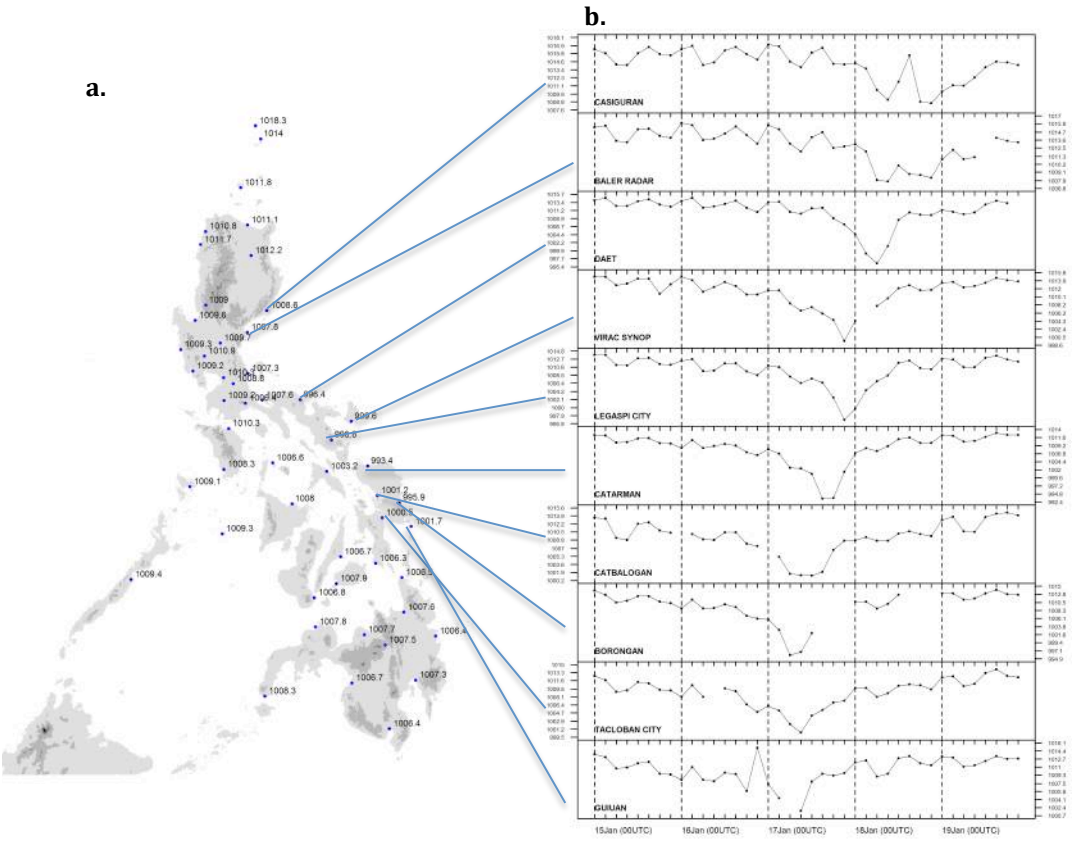

Fig. 7. (a) The lowest MSLP recorded at the stations across the Philippines from January 15 to 19 and (b) the 3-hourly series of MSLP at the stations near the path taken by TS Amang (Units: hPa).

During the 5-day existence of TS Amang within the PAR (January 15–19), the highest rainfall accumulation was recorded at Catarman 294.2 mm (Fig. 8a). Nine stations across the Philippines have exceeded 100 mm of 5-day accumulated rainfall. These stations are primarily located near the track of TS Amang. The 3-hourly rainfall recorded from January 15 to 19 at these stations is shown in Fig. 8b. To comprehend it better, the 3-hourly rainfall is plotted at local time (PST). Note that the rainfall reading at 5:00 A.M. is based on the previous 3 hr accumulation (i.e., the rainfall accumulated from 2:00 A.M. to 5:00 A.M.), and so on. It can be noticed that much of the rains were felt in the areas one day ahead as the center of TS Amang approached

closest to them. Such conditions demonstrate that the greatest amount of rainfall is located roughly on the north and northwest directions of the approaching TC. In Daet and Alabat, the rains were felt mainly on January 17 because TS Amang approached these areas later than the stations located south of them.

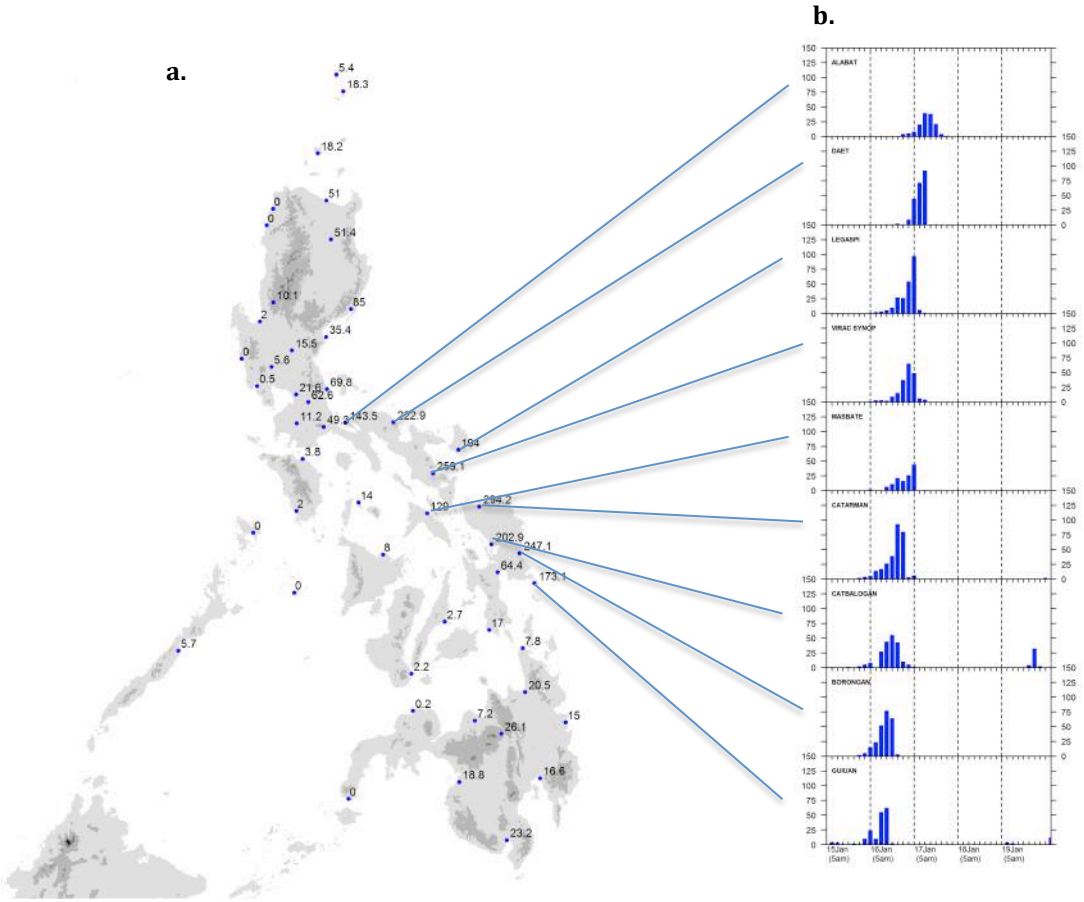

Fig. 8. (a) The 5-day accumulated rainfall at the stations across the Philippines from January 15 to 19 and (b) the 3-hourly rainfall series at the stations where significantly high amount of rainfall was recorded (Units: mm).

Impacts of TS Amang[1]

In general, the areas affected by TS Amang were those directly hit provinces. The affected population reached >25,000 individuals primarily in the provinces of Northern Samar and Albay (Fig. 9a). As TS Amang initially hit the island of Samar, its strength was directly felt over the island as reflected in the province of Northern Samar with the greatest number of damaged houses (partially and totally damaged houses combined). Surprisingly, there was no reported house damaged in Eastern Samar despite being the first hit area (Fig. 9b).

[1] The impacts brought by TS Amang were based on the data taken from the Situational Report No. 10 prepared by the National Disaster Risk Reduction and Management Council (NDRRMC) available at http://www.ndrrmc.gov.ph/.

The island of Catanduanes was the most affected area in terms of flooding. There were seven reported impassable roads and bridges during the rampage of TS Amang, but the floodwaters eventually subsided on January 20, 2015. Meanwhile, flooding was also reported in Isabela, particularly in Ilagan City (Fig. 9c), but that may not be directly attributed to TS Amang. Landslides were also reported in Catanduanes and Sorsogon. Again, Catanduanes recorded the highest number of landslides that occurred during the passage of TS Amang (Fig. 9d).

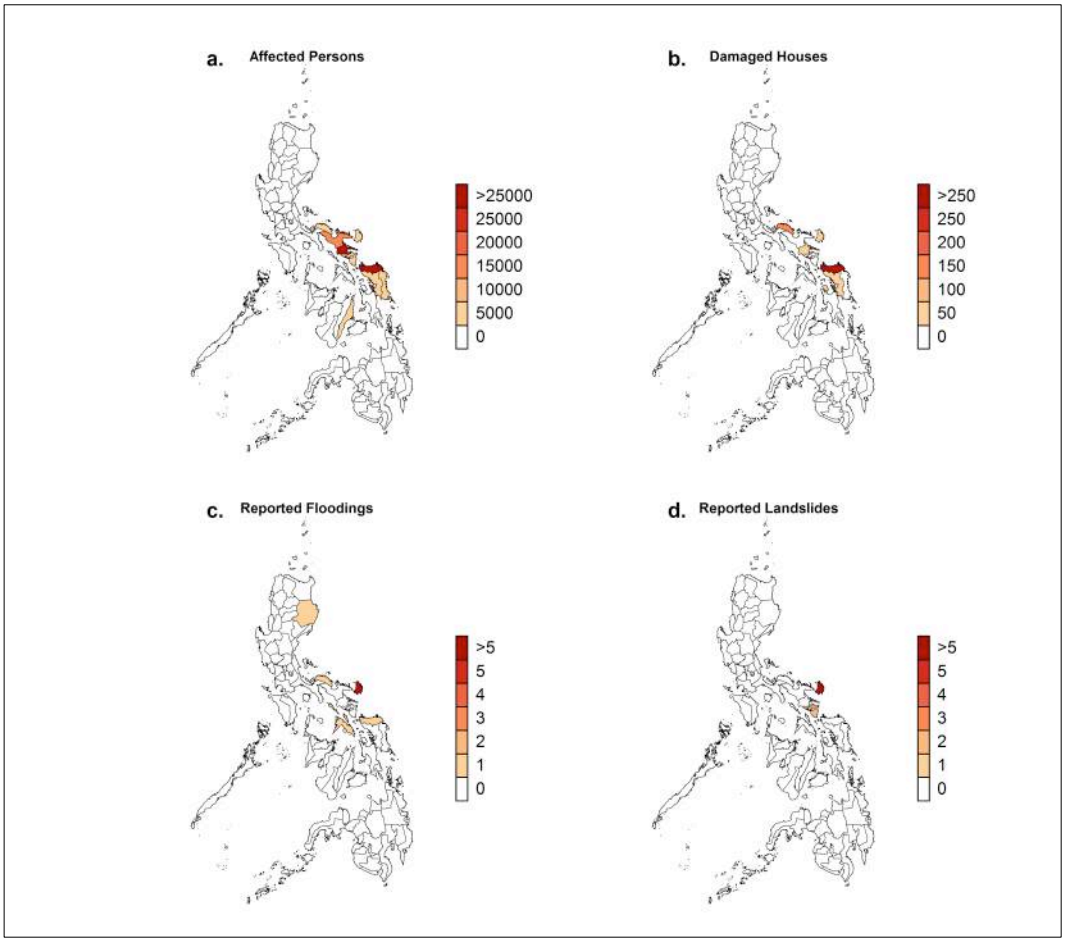

Fig. 9. Reported impacts of TS Amang across the Philippines (Source of raw data: NDRRMC).