Learning Lessons, Carrying On in the Wake of Storm Ondoy (Ketsana): A Preliminary Engineering Analysis of the Marikina River Basin Flood of September 26, 2009

UP – National Hydraulic Research Center
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The Metro Manila flood on September 26, 2009 was caused by a once-in-180-years extreme storm, water resources engineers at the University of the Philippines estimated a week after the disaster. A 30-minute or 45-minute prior warning, or even earlier, could have been enabled by the proper monitoring and simulation such as demonstrated in their preliminary computer modeling, if made in real time, noted the UP engineers.

Researchers at the UP National Hydraulic Research Center offered recommendations anew, ranging from monitoring, forecasting, and early warning; information dissemination; decision-support system; to immediate response and preparation. These recommendations were endorsed by members of the Institute of Civil Engineering of the College of Engineering and other participants in a special forum at UP Diliman on October 2. The participants hastened to add that multi-hazard, multi-institutional precautions have to be taken, not only for floods and storms, but also for sea level rise, tsunamis, and earthquakes.

According to NHRC preliminary computations, for four hours between 11:30AM and 3:30PM on September 26, the flood discharge greatly exceeded the 30-year design-basis flood that had been considered in the most recent government study for the improvement of the Pasig and Marikina river channels. Partly with corroborating rainfall data from the Manila Observatory of Ateneo de Manila University, the simulations indicated water level rises of 5 meters or 8 meters in several river sections, consistent with field observations at some locations in Marikina City.

Hourly data from rainfall stations within the Marikina River Basin or within Metro Manila would be needed in the computer modeling. The reported rainfall of 448 mm in 12 hours, converted into hourly rainfall, was used in the preliminary simulations to understand what hit Metro Manila. The peak rainfall occurred around 11 AM that Saturday. NHRC's SWATCH hydrologic computer model computed the peak flood discharge at the Sto. Niño, Marikina gaging station to have been about 5,770 cubic meters per second around 12 noon, or within an hour after the peak rainfall.

NHRC's hydraulic model of the network of channels and floodplains along the Marikina and Pasig rivers, by the UNET computer model, subsequently simulated the hourly water level, flood discharge, and water velocity at various locations, as well as flood inundations on the right overbank and left overbank floodplains.

The NHRC had used the SWATCH and UNET computer models for previous studies of the Marikina River Basin and other Metro Manila river basins for DENR, DPWH, and LLDA until 2005. The SWATCH hydrologic model of the Marikina River Basin encompassed the river system from the mountains down to the Sto. Niño station. Steep slopes characterize the upper catchment of the Marikina River Basin, causing very rapid flow rates in the rivers, according to the engineers. The UNET model considered the network of channels and adjoining floodplains, from Sto. Niño, to Napindan at Taguig, to Marikina River, to Pasig River down to Del Pan Bridge at the mouth of Manila Bay, including the vicinity of Provident Village, Marikina which was severely inundated by the flood.

The UP engineers emphasized the importance of monitoring, forecasting, and early warning. With advances in field instrumentations, geomatics, information & communication technologies, and engineering simulations, they said short-term warnings based on reliable information can save many lives and movable properties.

Geographic-information-system (GIS)-based data may also be catalogued, updated, processed, and relayed effectively to ground units for disaster response and/or to mass media outlets.

The same technologies may be used also for medium-term and long-term studies for governance, planning, and engineering to reduce exposure and vulnerability. For example, there is a need to conduct a post-flood hydrographic survey of the Marikina River Basin for updating the hydrologic and hydraulic knowledge base, serving as a decision-support system.

Infrastructures may have to be reengineered to withstand greater hazards; and communities may have to be reorganized to operate under extreme catastrophic conditions, said the UP engineers. *