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# Learning from the Ondoy Flood – A Dialogue with Experts

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*Leonardo Q. Liongson*

*National Hydraulic Research Center & Institute of Civil Engineering,  
UP Diliman*

## Vulnerability:

- The record-high **12-hour rainfall amounts in Metro Manila** on 26 Sept attained the annual maximum rainfall values for 150-year return period (or higher).
- The **peak flood flows of Pasig-Marikina River** (around 4000 m<sup>3</sup>/s or higher) may be assigned a 150-year return period or higher (for further studies). **It exceeded the 30-year design flood capacity of 2900 m<sup>3</sup>/s for the DPWH flood control project, PMRCIP.**
- **Laguna Lake level** reached a maximum of 14 meters compared to Manila Bay low-water datum of 10 meters, due to flood diversions through the Mangahan Floodway **as well as inflows from other rivers such as Pagsanjan River, Sta Cruz River, etc. in the Laguna Lake basin. Lakeshore towns are inundated.**
- The **overflow of rivers** inundated villages and towns in the banks and floodplains.
- **Flash floods and inundation** also occurred in elevated communities due to inadequate storm drainage facilities and failing walls (“dam breaks”).

## Disaster Risk (1):

- **Rainfall & flood forecasting and warning** under EFCOS in Metro Manila was apparently not operational during TS Ondoy. *Measurements at EFCOS telemetry rainfall & river level stations were done however. The people did not expect the record-high magnitude of the rainfall and floods from the early weather reports.*
- The construction of the **DPWH diking system under PMRCIP** for Pasig River (Phase I) is still on-going and unfinished, while Phase II for Marikina River has not yet been started. *The on-going/unfinished 30-year return period design of PMRCIP was naturally surpassed and overwhelmed by the 150-year-plus storm and flood event.*
- The inundated low towns inside the finished **DPWH lakeshore diking system West of Mangahan** had to contend with two merging sources of flooding: Pasig-Marikina River and Laguna Lake. *There were news reports of failure of pumping stations to function due to submergence of electrical systems.*

## Disaster Risk (2):

- Poor settlements in the river banks, as well as upscale communities in the floodplain, suffered **inundation, property damage and loss of lives**. *Strong water currents were also cause of death by drowning. Erosion and debris flows occurred in steep or exposed localities, affecting the urban poor more in particular.*
- *Due to **inadequate local storm drainage facilities** in elevated communities, the risks are also present for inundation, backflow of sewers and septic tanks, and the consequent damage to property. Flood recession is slower especially where dumped solid waste and encroachment in waterways impede the retreat of water.*

## **Disaster Reduction (1):** Non-structural Mitigation Measures (specific recommendations)

- New **topographic survey with centimeter-vertical precision** (such as LIDAR) in order to develop accurate digital elevation models (DEM) and other GIS-based models of all flood-prone areas in Metro Manila,
- development of the **GIS overlays** of soils type , land-use, slope, river/lake network, and other themes,
- next development of the **GIS-based hydrological catchment and hydraulic river-and-floodplain inundation models**, whose results shall be basis for evaluating the effectiveness of flood control plans and assessing of their economic and environmental benefits.
- and the desired products of **quantitative GIS-based flood risk and vulnerability models** (with indicated depths and directions of inundations according to return period), **under projected scenarios of climate change, sea-level rise, urbanization and other drivers to change**. The models will be decision-support instruments for land-use planning and zoning as well as bases for community-based warning and actions programs.

## **Disaster Reduction (2):** Non-structural Mitigation Measures (specific recommendations) – (cont'd)

- Inclusion in **community-based warning and action programs** for high-risk areas of the **complementary structural protection measures** such as construction of village-sized emergency high safe commons/places (multi-purpose for usual athletics and community functions), **and provision/acquisition affordably by the village associations/barangay LGUs of rescue rubber boats or else fiberglass boats (such as used in coastal towns whose resilience to coastal flooding is afforded by stilt houses and boats).**
- Improving the **monitoring and forecasting of real-time storm rainfall** (through more and better use of telemetry, doppler radar, NASA TRMM or tropical rainfall measuring mission, statistical models, etc.) and **flood forecasting using both the rainfall telemetry and forecasts, flow-to-flow correlation, and physically-based hydrological (rainfall-runoff) models, and hydraulic flood-and-inundations models.** Likewise, the same models can be used for long-term risk assessment and mitigation plans.
- Implementation of **capacity-building programs (with “DM cookbooks”)** such that the appropriate advanced tools as mentioned can be adopted and made operational by agencies and LGUs tasked with flood management.
- **Better explained and more understandable flood bulletins** in media and Internet, using vernaculars, graphics, multi-media, as well as printed guides or comics. Technical flood terms must be made understood.