



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

FLOODING IN METRO MANILA (PASIG-MARIKINA RIVER)

**Typhoon Ulysses triggers worst
floods in Metro Manila in years**



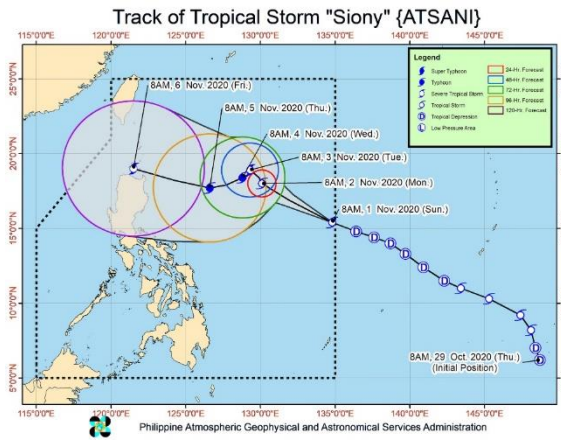
Rescuers evacuate residents from their flooded homes after Typhoon Vamco hit, in Marikina City, suburban Manila on November 12, 2020. (AFP)



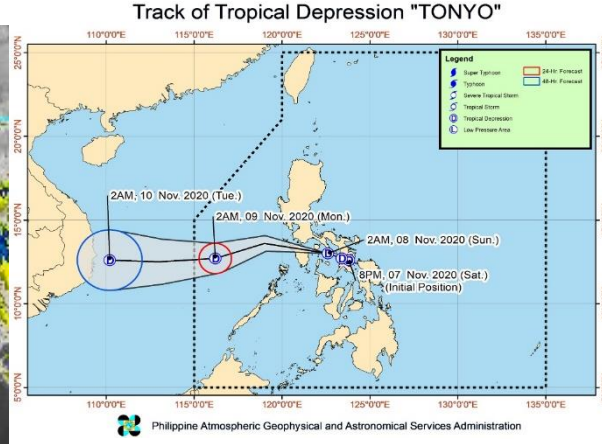
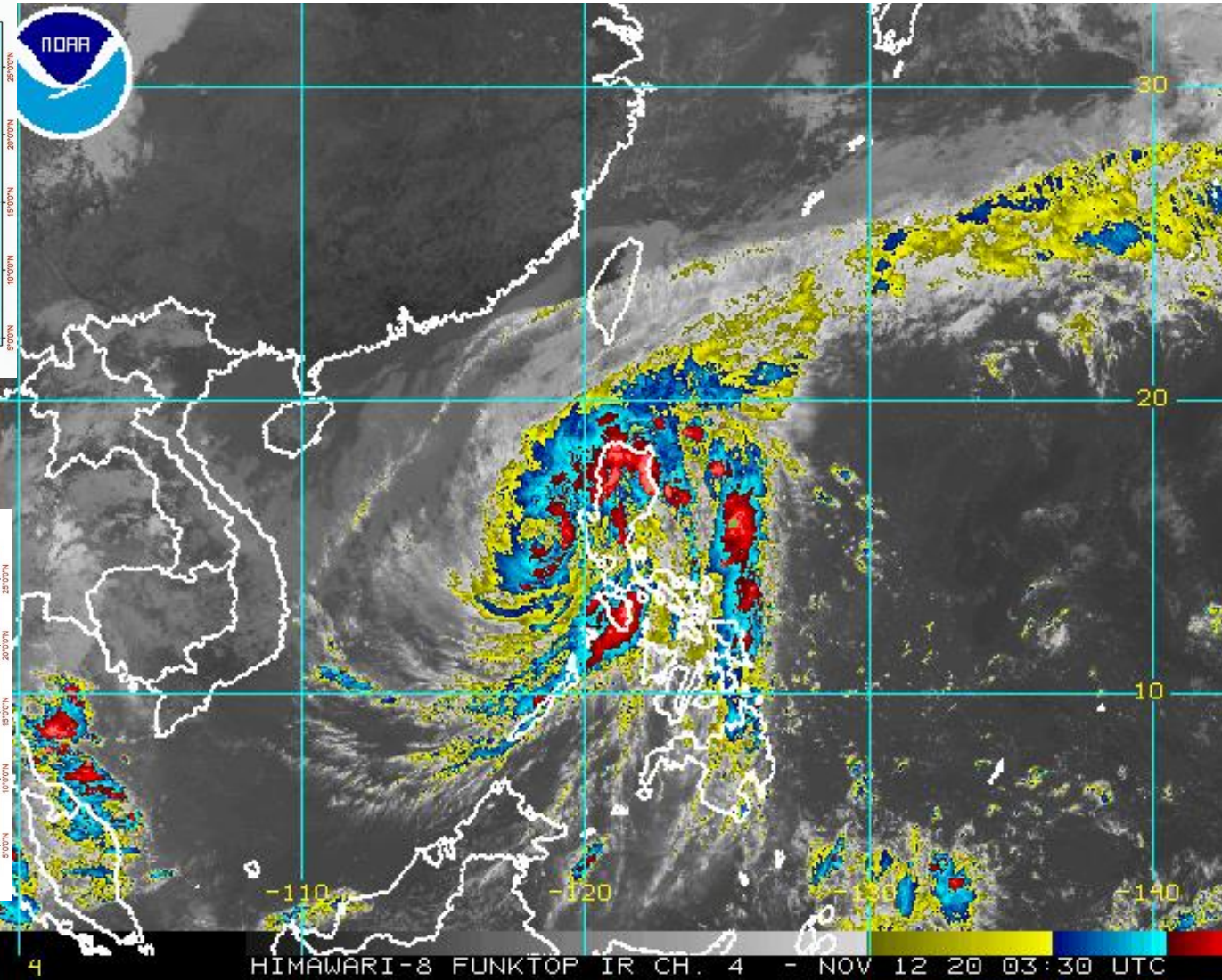
Typhoon Ulysses was preceded by three (3) typhoons that caused too much rainfall.



Typhoon Rolly
(November 1-2, 2020)



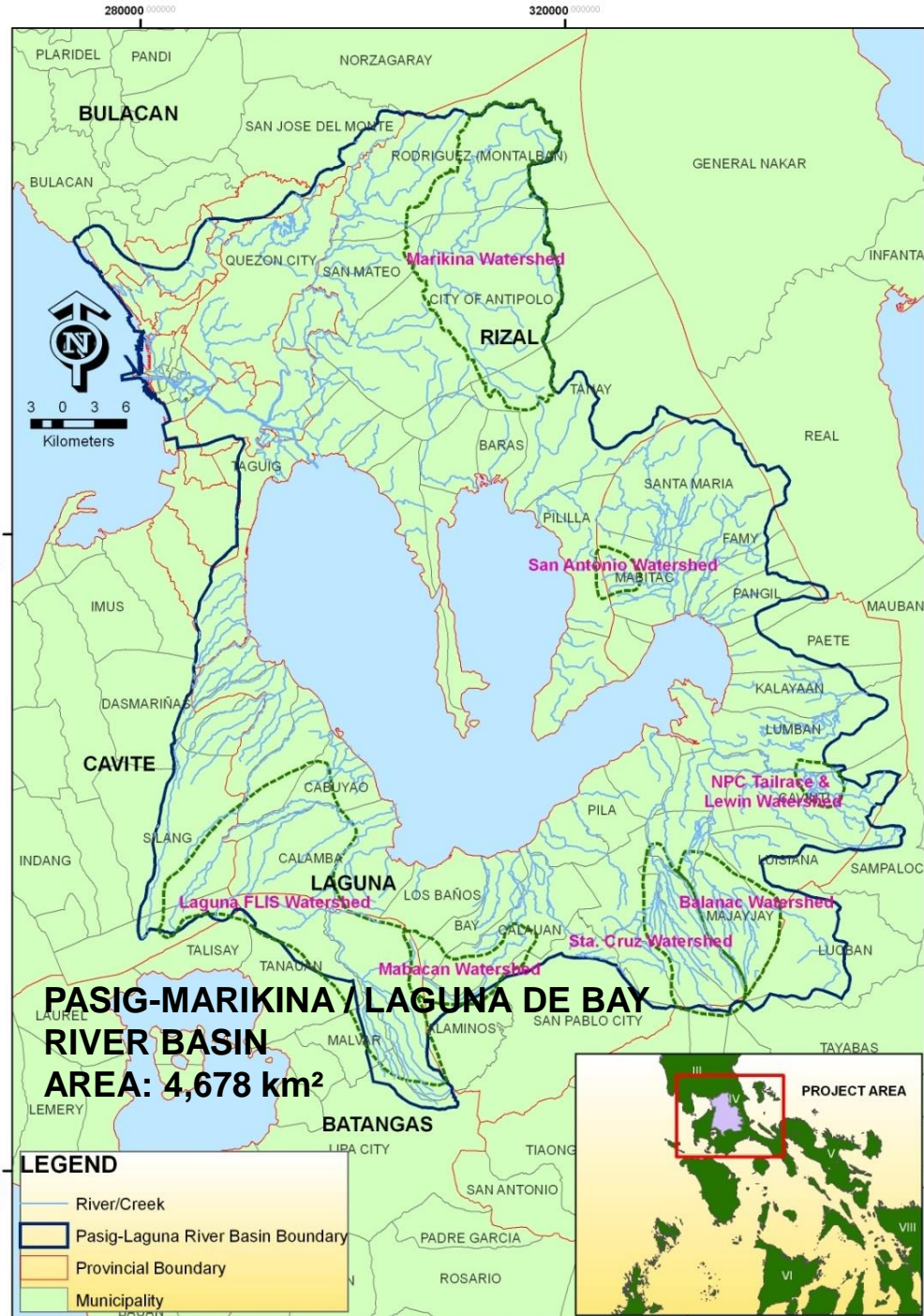
Typhoon Siony
(November 4-6, 2020)



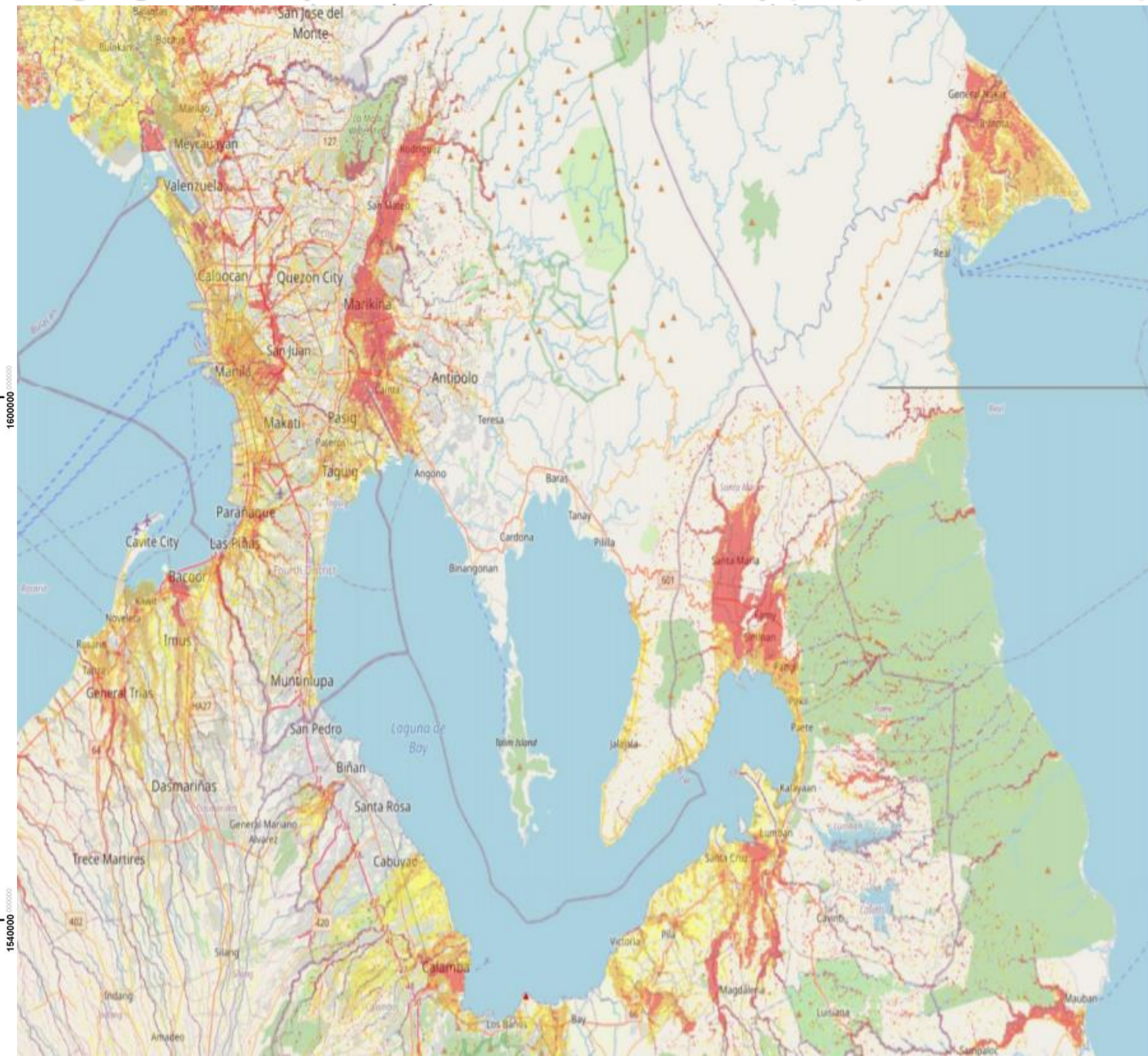
Typhoon Tonyo
(November 8-9, 2020)



Typhoon Ulysses
(November 11-12, 2020)



Pasig-Laguna de Bay River Basin Flood Hazard Map (100yr RETURN PERIOD)



FACTS, FINDINGS AND WAY FORWARD

- **Facts**

- ✓ Water Level and Rainfall in the Pasig-Marikina Basin
- ✓ Peak Discharges and Design Discharge at Sto. Nino Gauging Station

- **Findings and Ways Forward**

- ✓ Why did the water level increased rapidly even though Typhoon Ulysses dumped smaller amount of rainfall compared to Typhoon Ketsana in 2006?
- ✓ Why heavy flood didn't occur around the Laguna Lake?
- ✓ Does deforestation in the Upper Marikina Watershed contribute in the flooding?

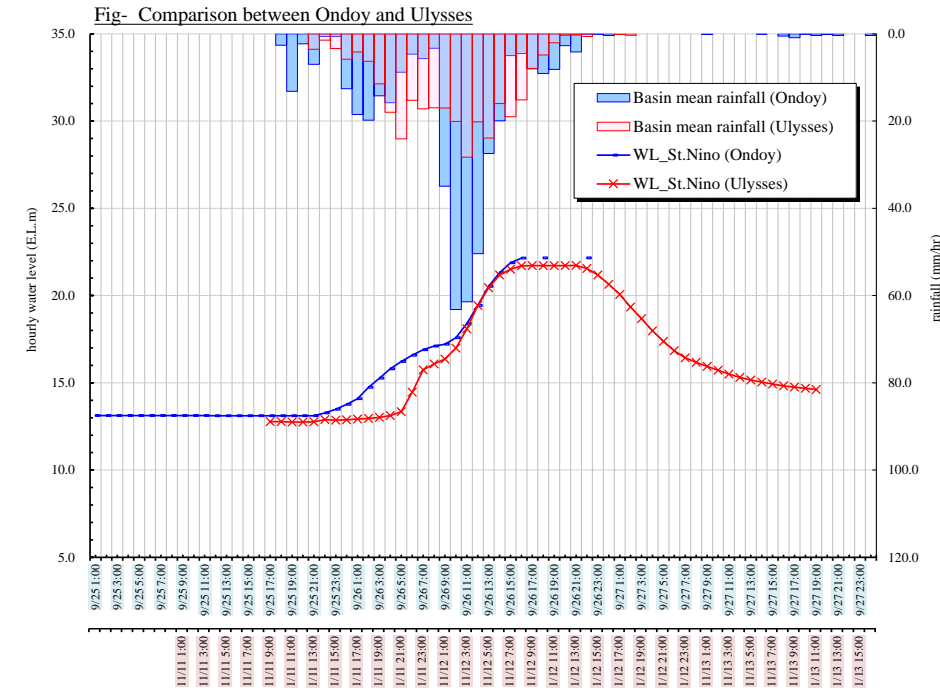
Why the water level rapidly increased in Typhoon Ulysses?

✓ Rainfall in the Pasig-Marikina River Basin

Item	Ondoy	Ulysses
Period of Record	September 26 – 27, 2009 (8AM-8AM)	November 11 – 12, 2020 (8AM-8AM)
Basin Mean Rainfall	299.3mm/day	287.1mm/day
Period of Record	September 25 – 26, 2009 (8PM-8PM)	November 11–12, 2020 (12PM-12PM)
Basin Mean Rainfall	406.3mm/24hours	302.2mm/24hours

✓ Peak Discharges and Design Discharge

Item	Ondoy	Ulysses	Phase 4
Peak Discharge	3,480m ³ /s	3,255m ³ /s	2,900m ³ /s



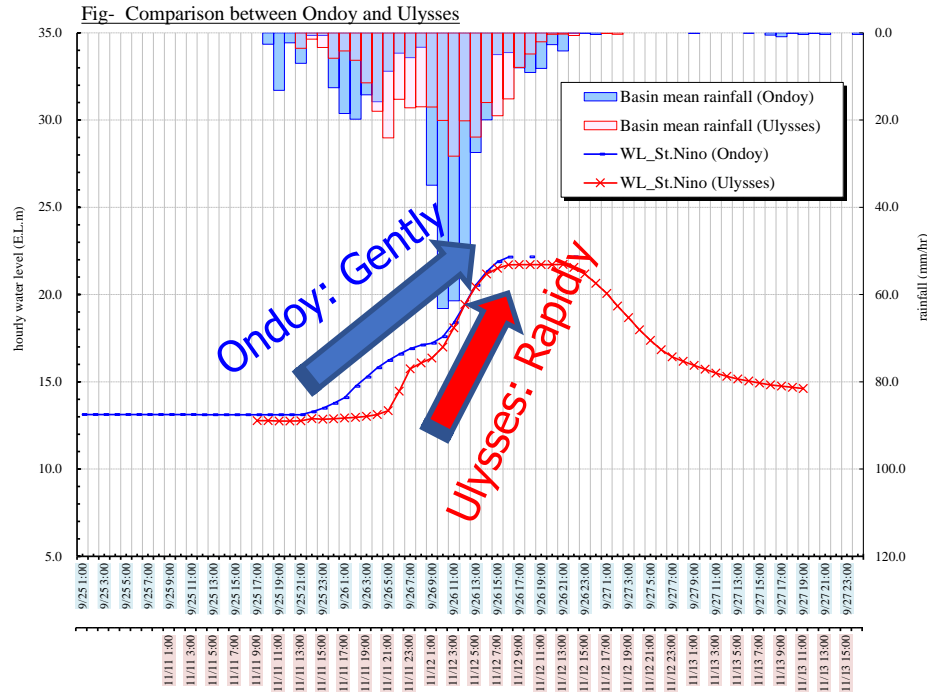
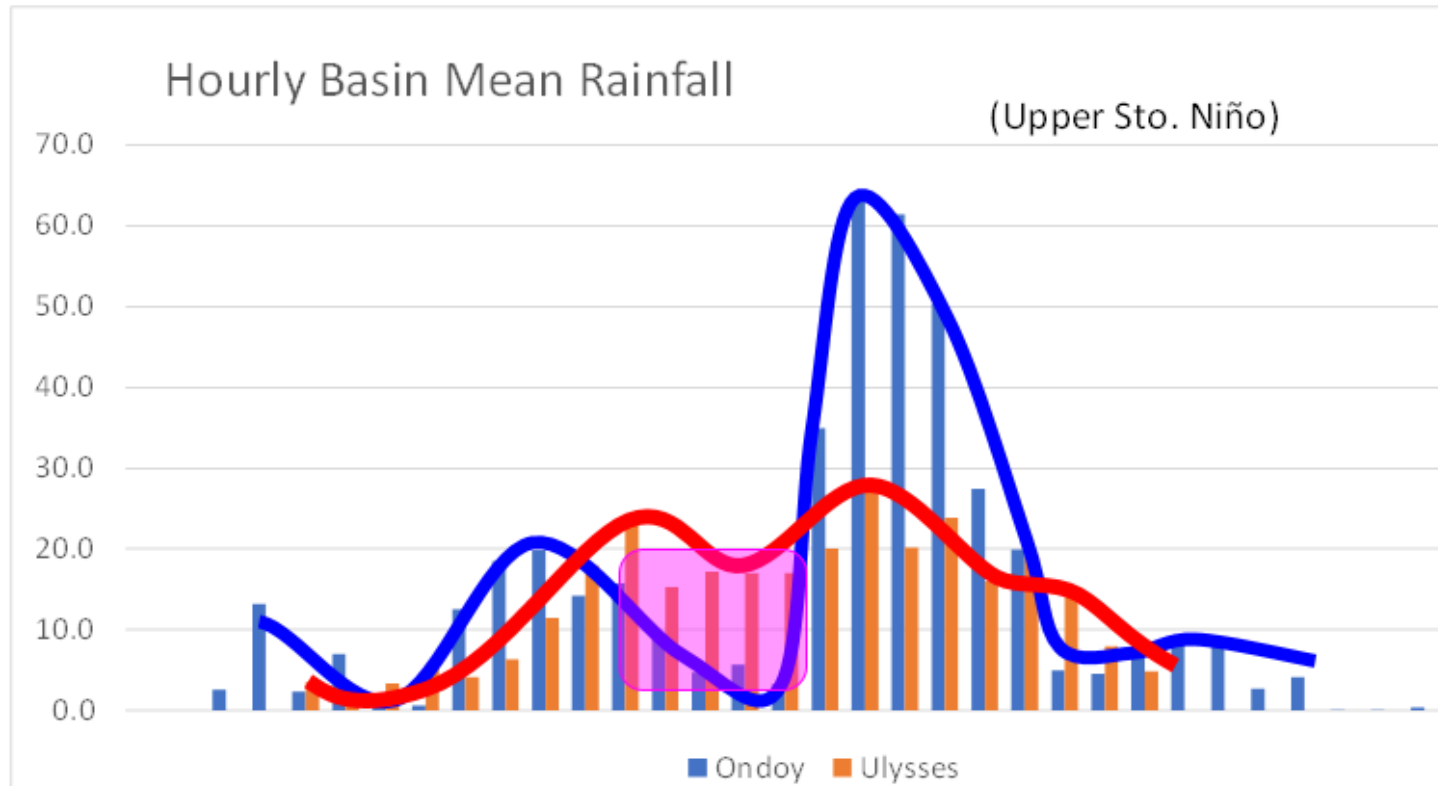
Findings and Ways Forward

Why the water level rapidly increased in Typhoon Ulysses?

Reason-1: Rainfall Pattern

Ondoy: 2 Peaks

Ulysses: Constant

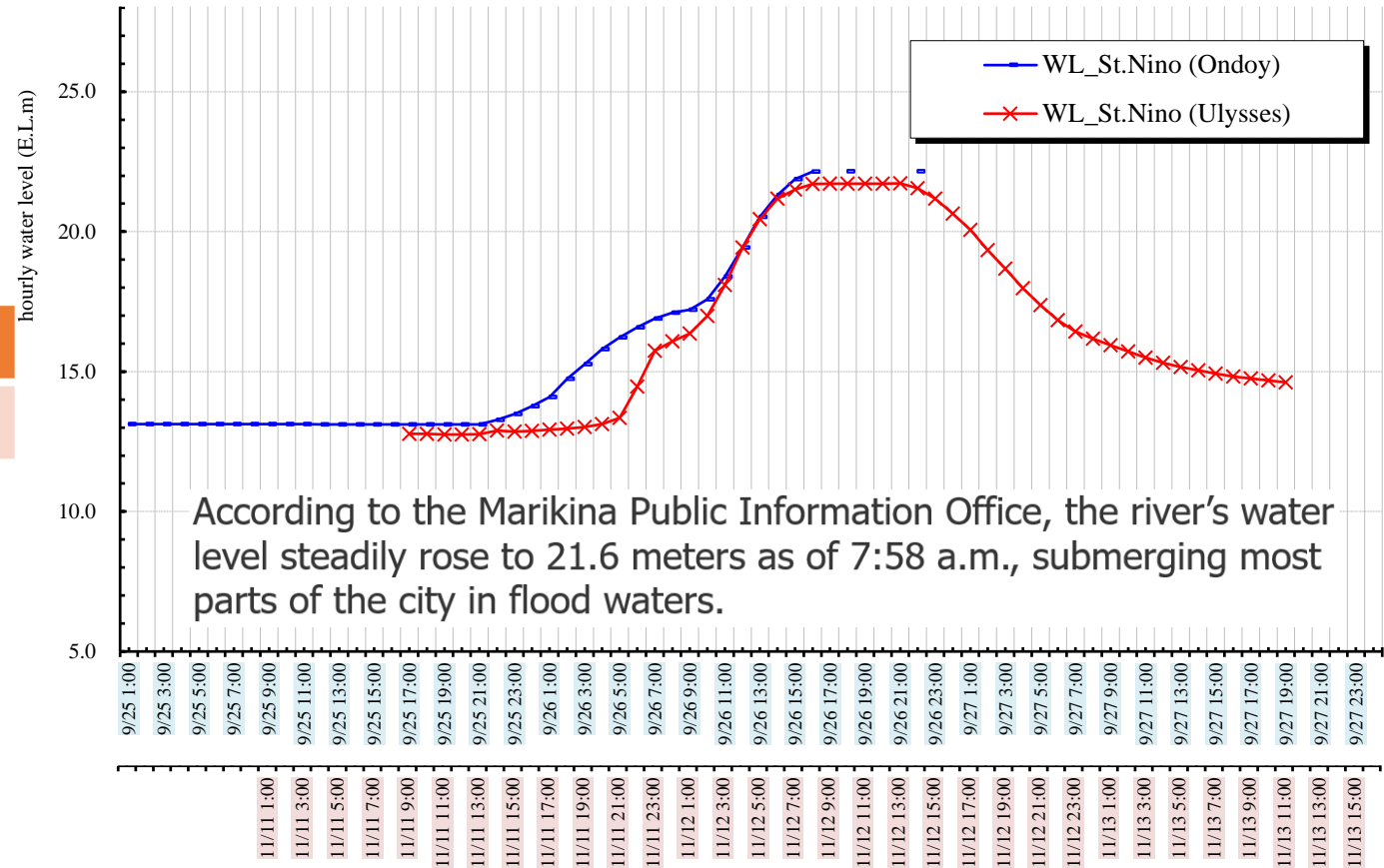


- In the upstream area at Mt. Oro Station (Rodriguez, Rizal), PAGASA recorded heavy rainfall of 374 mm in just 15 hours. The basin average rainfall is 287 mm, meaning a large volume of rainfall was received by the river basin especially from the upstream .

- Fact

✓ Water Level at Sto. Nino

Item	Ondoy	Ulysses
Max. Water Level	EL+22.16m	EL+21.73m



✓ Why heavy flood didn't occur around the Laguna Lake?

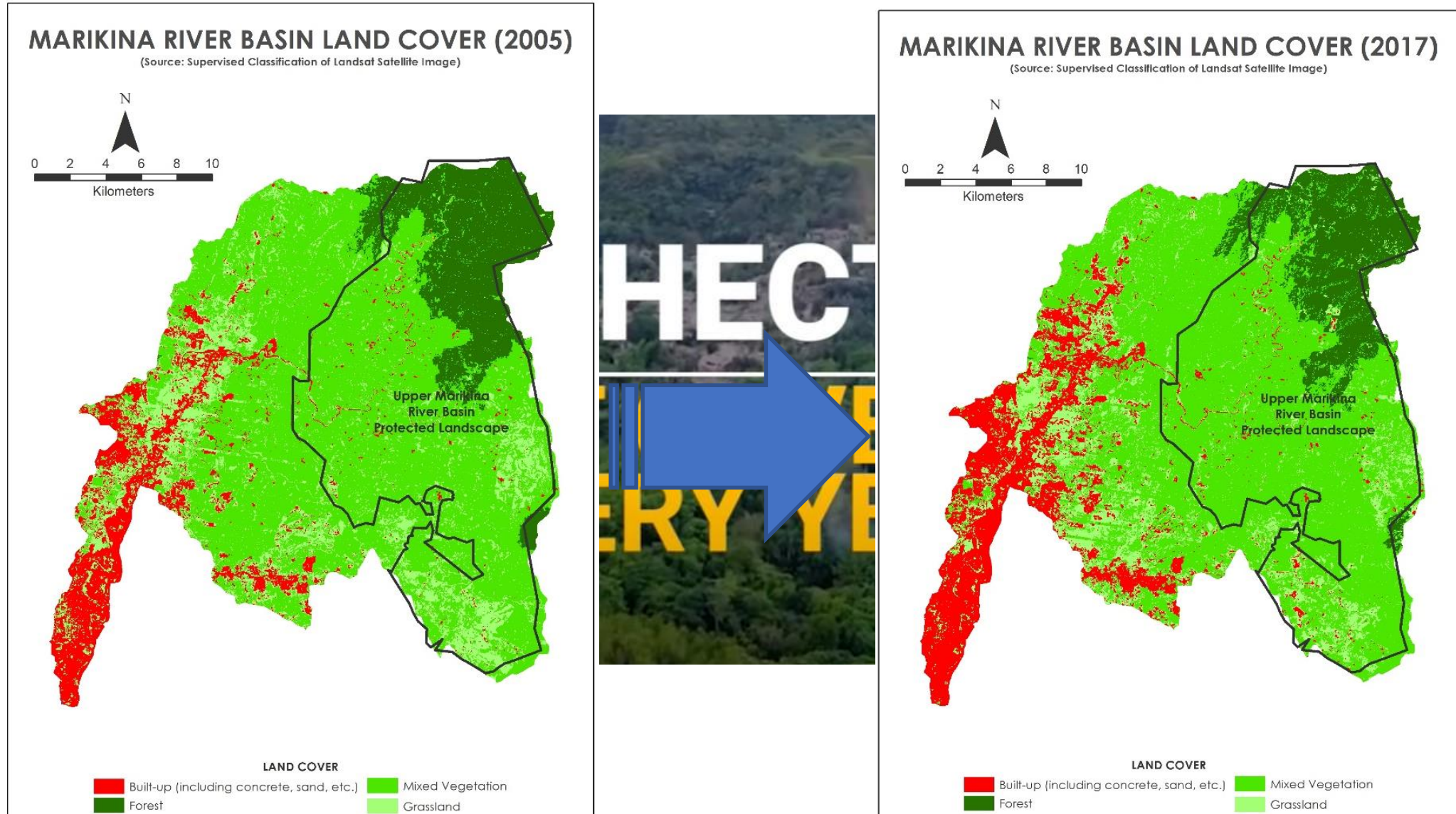
- Reason-1: The water level of Laguna Lake was **low** during that time

Item	Ondoy	Ulysses
Initial W/L of Laguna	September 25 (5PM): EL+12.77m	November 11 (10AM): EL+12.25m
After Typhoon Event	September 27 (6PM): EL+13.84m	November 12 (11AM): EL+13.13m

- Findings and Ways Forward

- Why the water level rapidly increased in Typhoon Ulysses?**

- Reason: Rapid Urbanization / Built Up Areas



1976 Flood Control Master Plan for Metro Manila



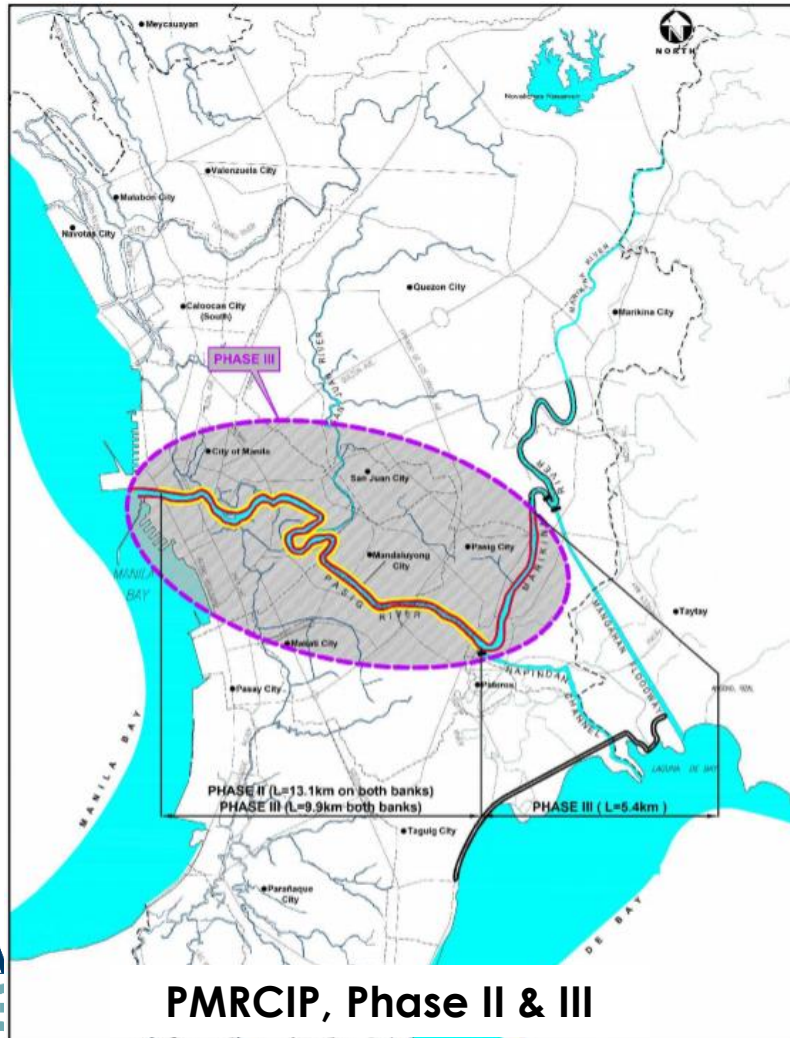
Why heavy flood didn't occur in the downstream areas (Manila, Mandaluyong, Makati, Pasig, Taguig)?



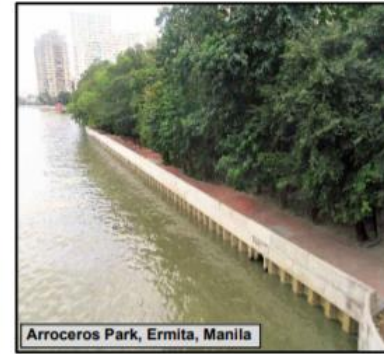
• Findings and Ways Forward

✓ Why heavy flood didn't occur in the Pasig River (Downstream Areas) ?

Reason: Completed Phase 2 and Phase 3 of the Pasig Marikina River Channel Improvement Project as well as Rehabilitation of Pumping Stations along Pasig River



Completed Flood Control Structures along Pasig River



Completed Flood Control Structures along Lower Marikina River



Pasig-Marikina River Channel Improvement Project, Phase IV

PROPOSED FLOOD CONTROL STRUCTURES ALONG MIDDLE MARIKINA RIVER

MANGGAHAN CONTROL GATE STRUCTURE (MCGS)



REVTMENTS AND FLOOD WALLS



REVTMENTS AND FLOOD WALLS



PROPOSED FLOOD CONTROL STRUCTURES ALONG MANGGAHAN FLOODWAY

CAINTA FLOOD GATE

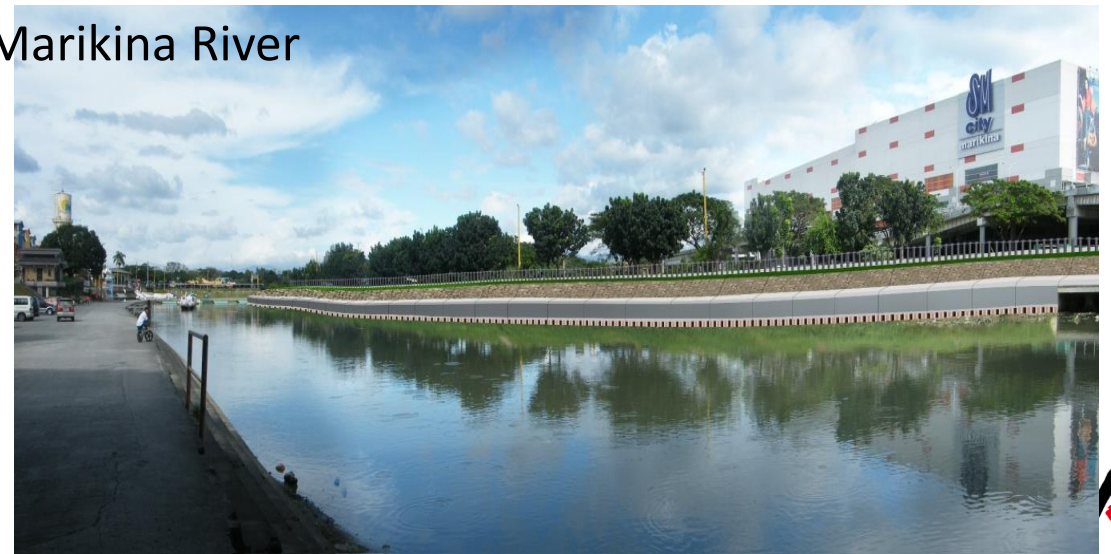


TAYTAY SLUICE GATE

Mangahan Control Gate Structure (MCGS)

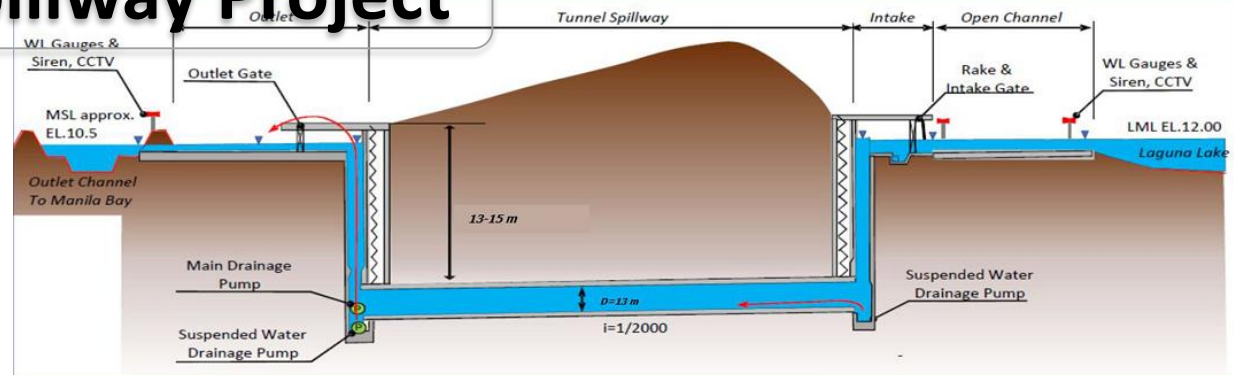


Along Pasig-Marikina River



Parañaque Spillway Project

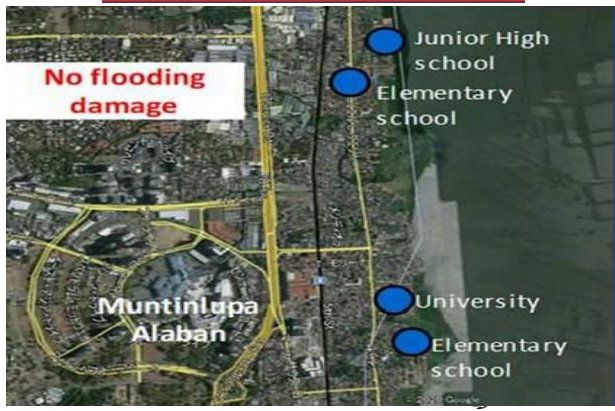
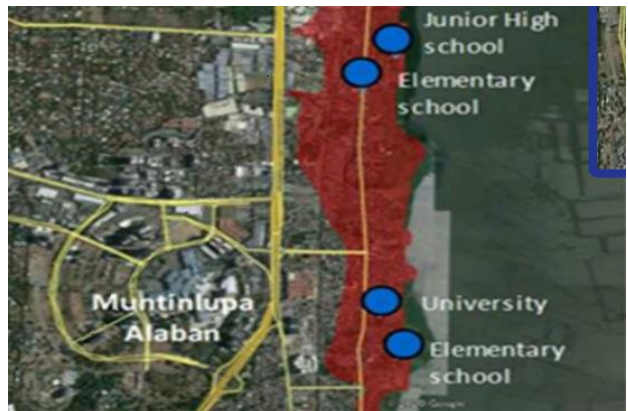
Conceptual Parañaque Spillway Proposed 50 meters Underground



Step-1: Excavation		Step-2: Segment Assembly	
1. Cutting	2. Transporting excavated soil	3. Advancing Shield Machine	4. assemble/insert segment
Revolve the cutter face to cut the ground	Load excavated soil into the machine by a screw conveyor and transport it to the outside	Apply reaction force with jacks installed in the machine against segments and advance the machine accommodating the speed of excavation	Secure the space to assemble installed segments by shortening jacks situated at the element to assemble and insert the segment using an erector

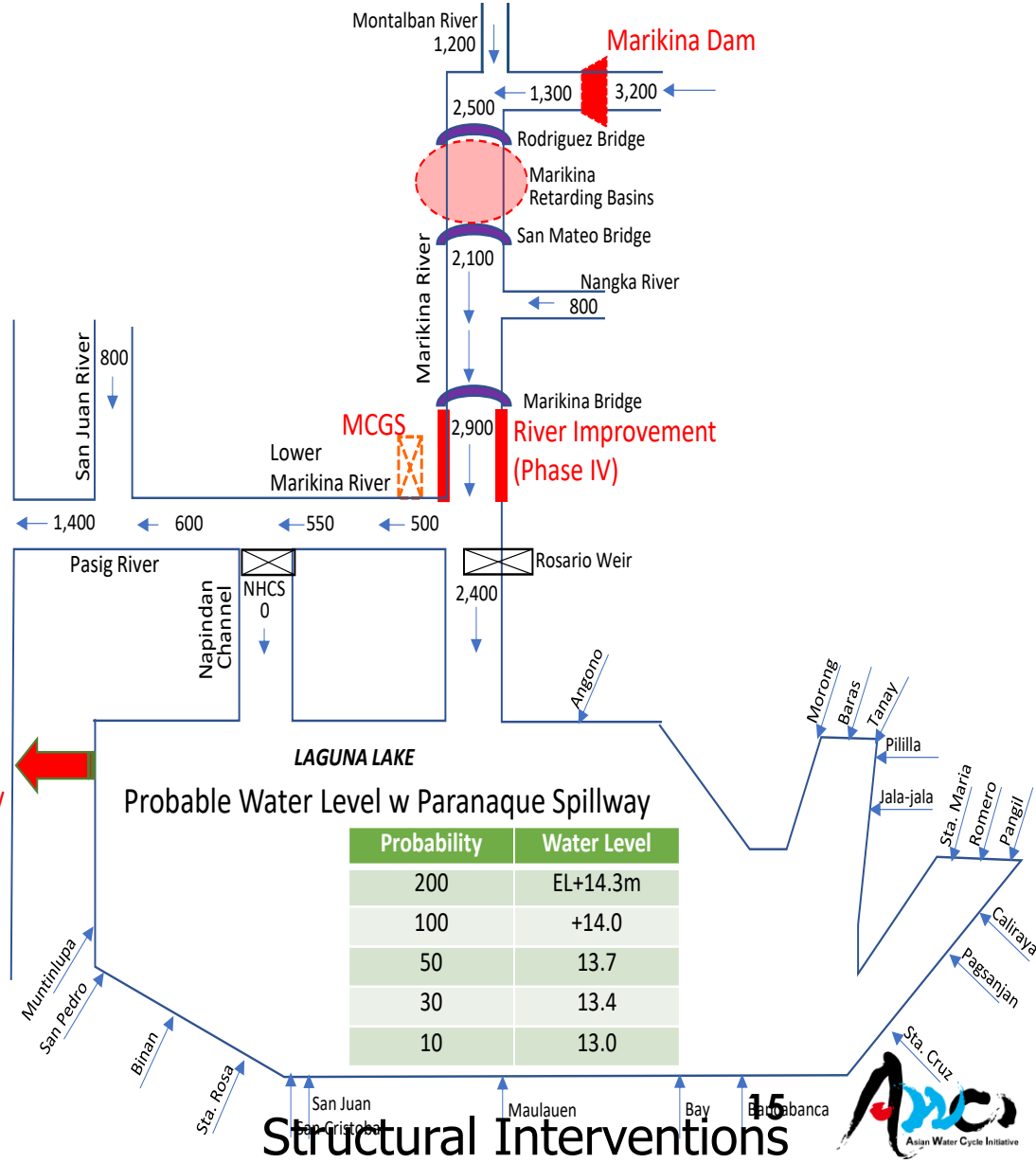
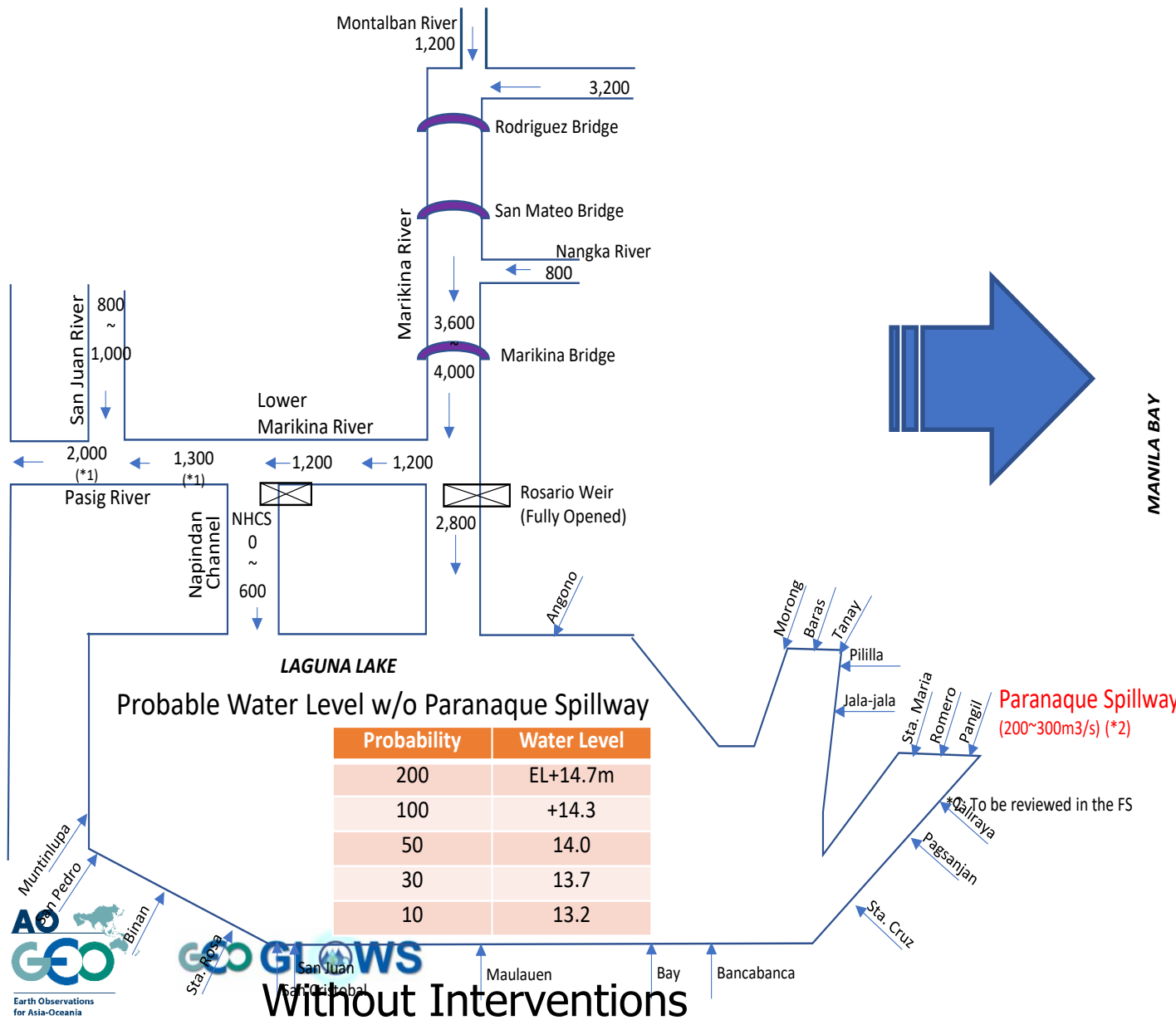
Without PSW
Max Lvl 14.5m (100-yr flood)

With PSW
Max Lvl 12.5m (100-yr flood)



Findings and Ways Forward

✓ The need for Marikina Dam and Paranaque Spillway



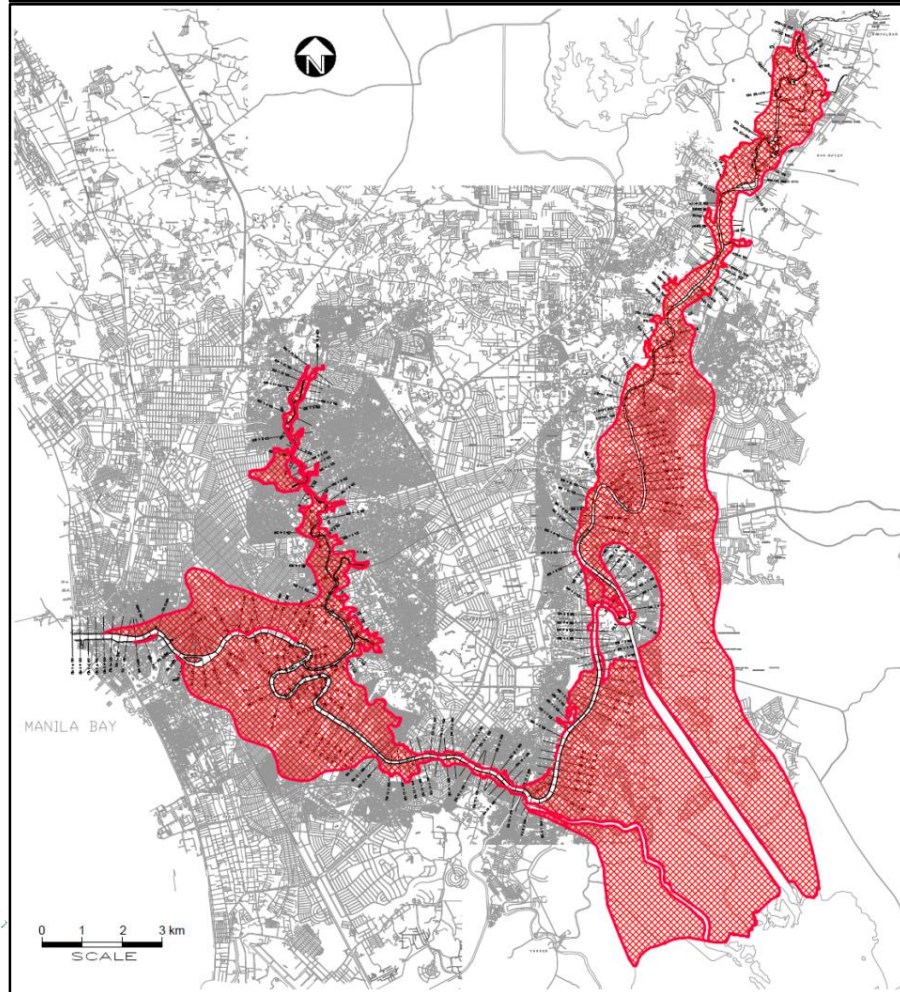
Without Interventions

Structural Interventions

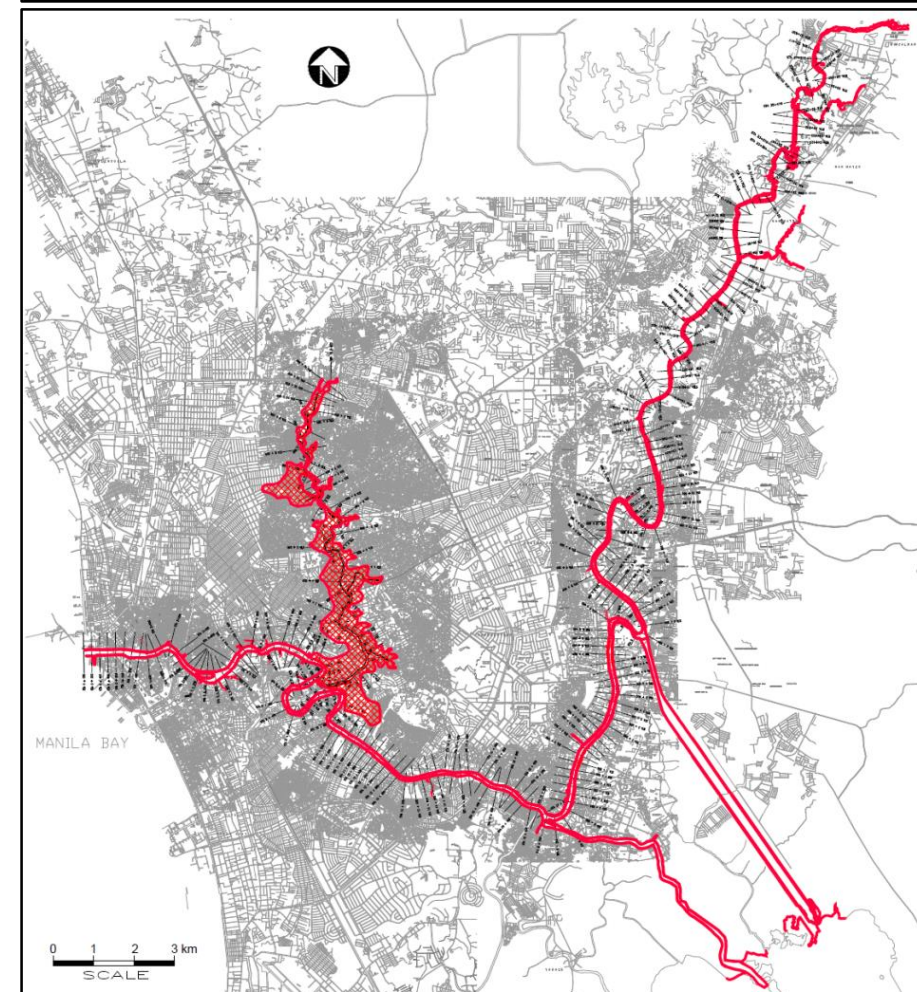
Inundation Conditions for 100-year Return Period Flood With and Without the Project

- Pasig Marikina River Channel Impr. Project (Phase IV), Marikina Dam and Retarding Basin -

Without Project (100-year Return Period Flood)	
Flooded Area (km ²)	79.00
Affected Population (1,000)	2,291
Estimated Damage (Million Pesos)	151,522



With Project (100-year Return Period Flood)	
Flooded Area (km ²)	5.60
Affected Population (1,000)	162
Estimated Damage (Million Pesos)	10,741





End of Presentation

Thank You!