6th GEF International Waters Biennial Conference
17-20 October 2011, Dubrovnik, Croatia

Supporting the Implementation of the Operational Plan for the Manila Bay Coastal Strategy: Total Pollution Loading Study
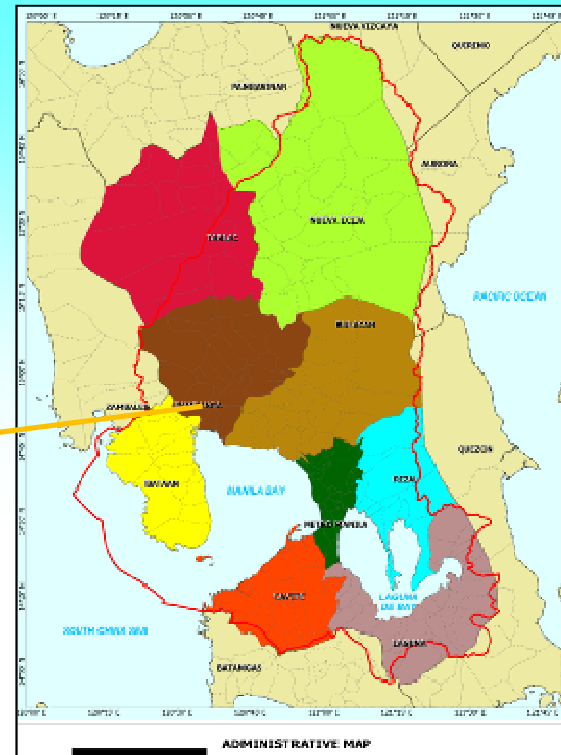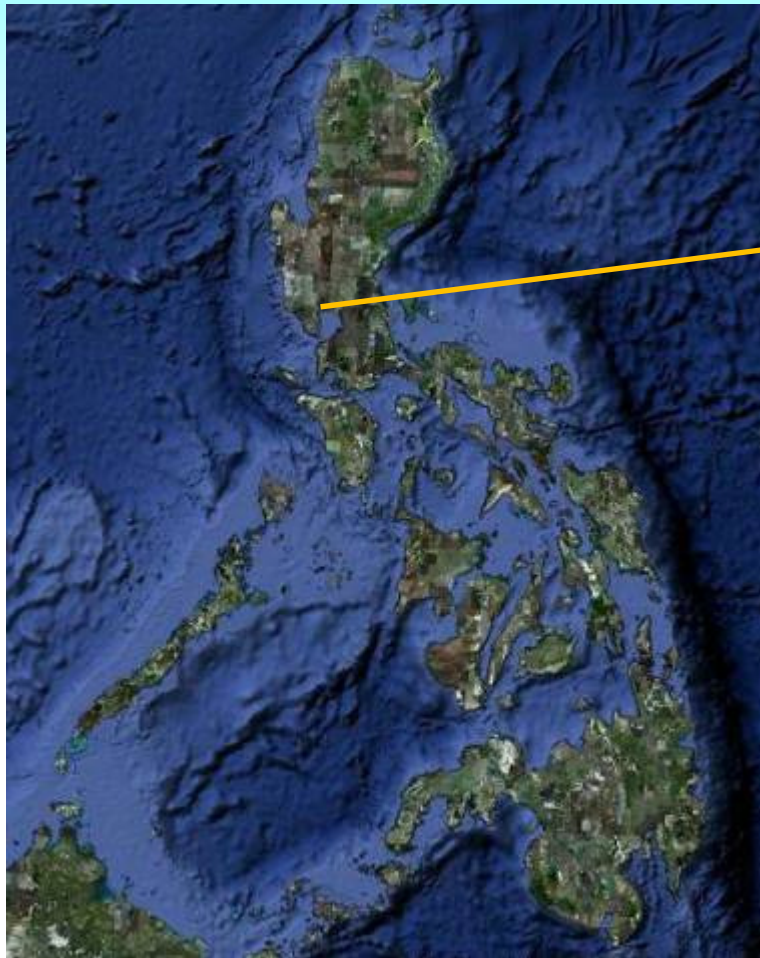
Raphael P.M. Lotilla
Regional Programme Director
GEF/UNDP/UNOPS/PEMSEA

UNDP

PEMSEA

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Manila Bay and its Watershed Area

ADMINISTRATIVE MAP

Bay Area	:	1,800 km^2
Coastline	:	190 km
Watershed Area	:	17,600 km^2
Catchments Area	:	26
Rivers & Creeks	:	131

Home to 25 million Filipinos

Why Manila Bay

Contributes 52.5% of the country's GDP.

Valuation of key coastal habitats and uses

- **mangroves**
- **coral reef**
- **fisheries & aquaculture**
- **ports & shipping**
- **tourism**

PhP 8.3 billion
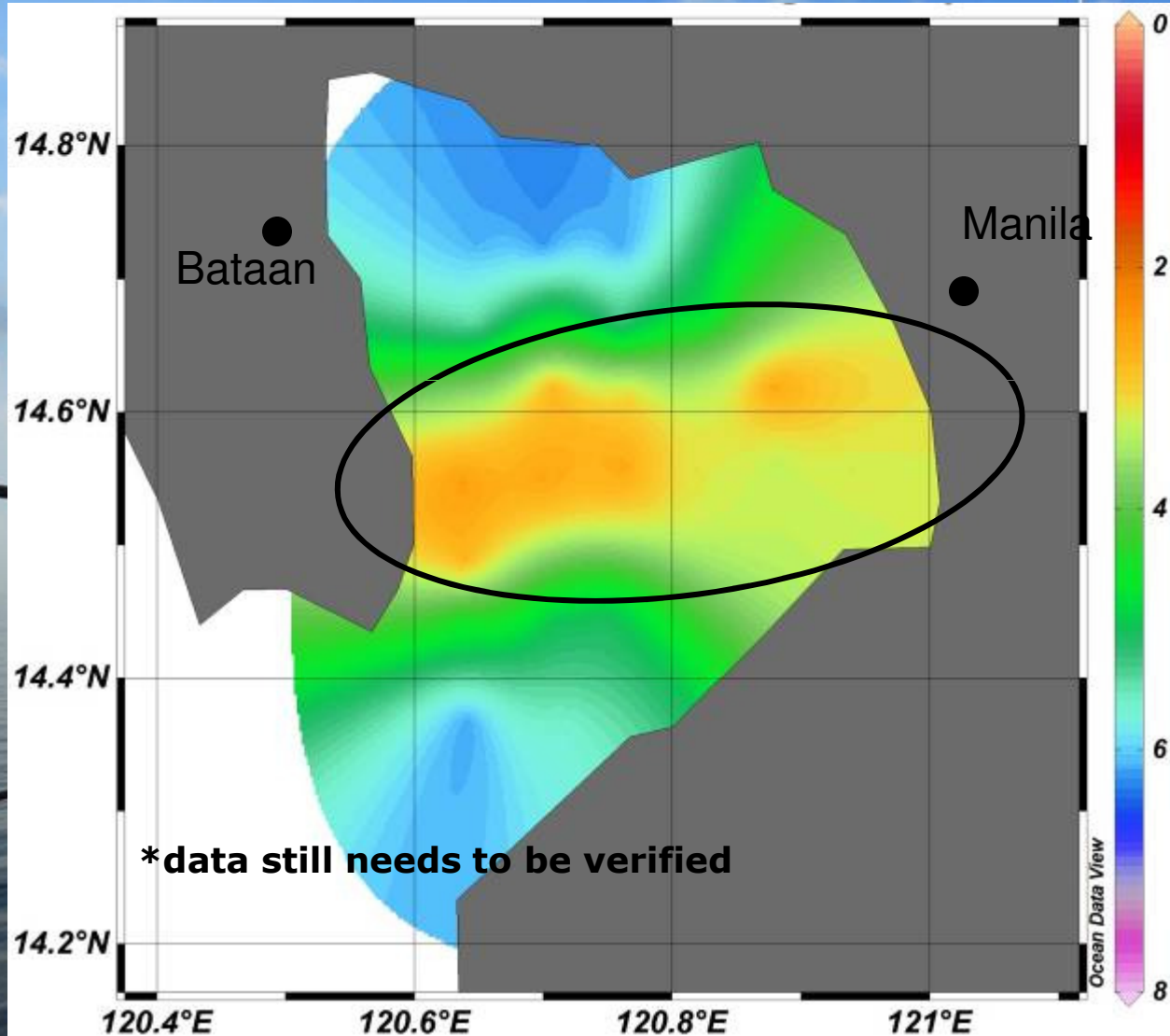
Valuation of environmental damages

- **Loss of mangroves**
- **Impacts on human health and economy due to:**
  - water pollution
  - salt water intrusion
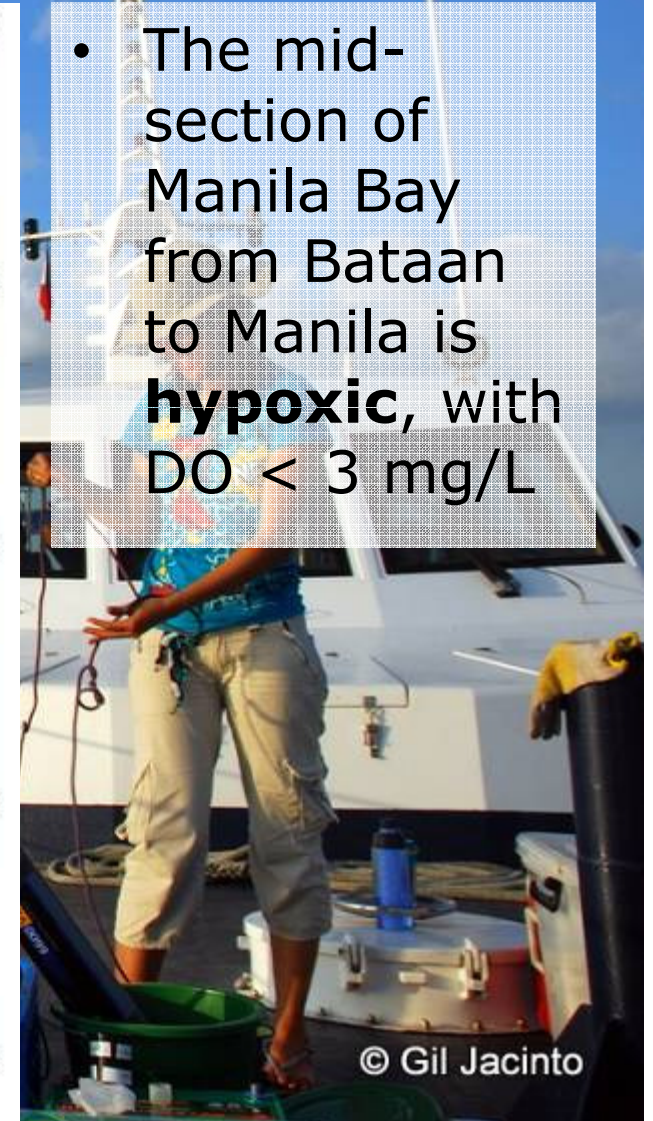 - red tide

PhP 4 billion

Hypoxia and eutrophication in Manila Bay

Preliminary results: bottom dissolved oxygen levels

- The mid-section of Manila Bay from Bataan to Manila is **hypoxic**, with DO < 3 mg/L
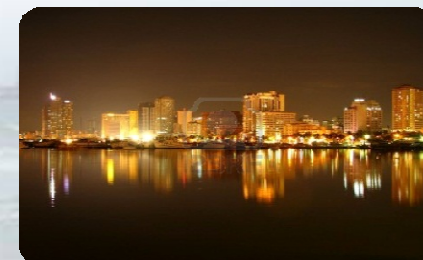
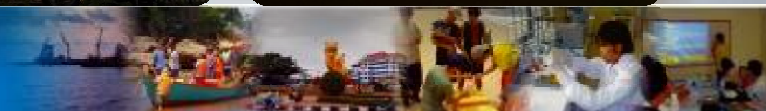*data still needs to be verified

© Gil Jacinto

Supreme Court Decision on the Manila Bay Case (Dec 2008)

- **Reclassification of Manila Bay to 'Class SB' (waters for contact recreation)**

- **'*Continuing mandamus*' for all concerned government agencies to report quarterly to the SC their plans and accomplishments for rehabilitating Manila Bay**

CASE STUDY: WATER QUALITY MODEL FOR MARIKINA RIVER

- **Even if all wastewater were treated to Class C effluent standards (BOD 50), the river water still won't attain Class C target quality (< BOD 7).**

Rodriguez

Payatas

Nangka

Marikina Bridge

Marcos Hi-way

Rosario Weir
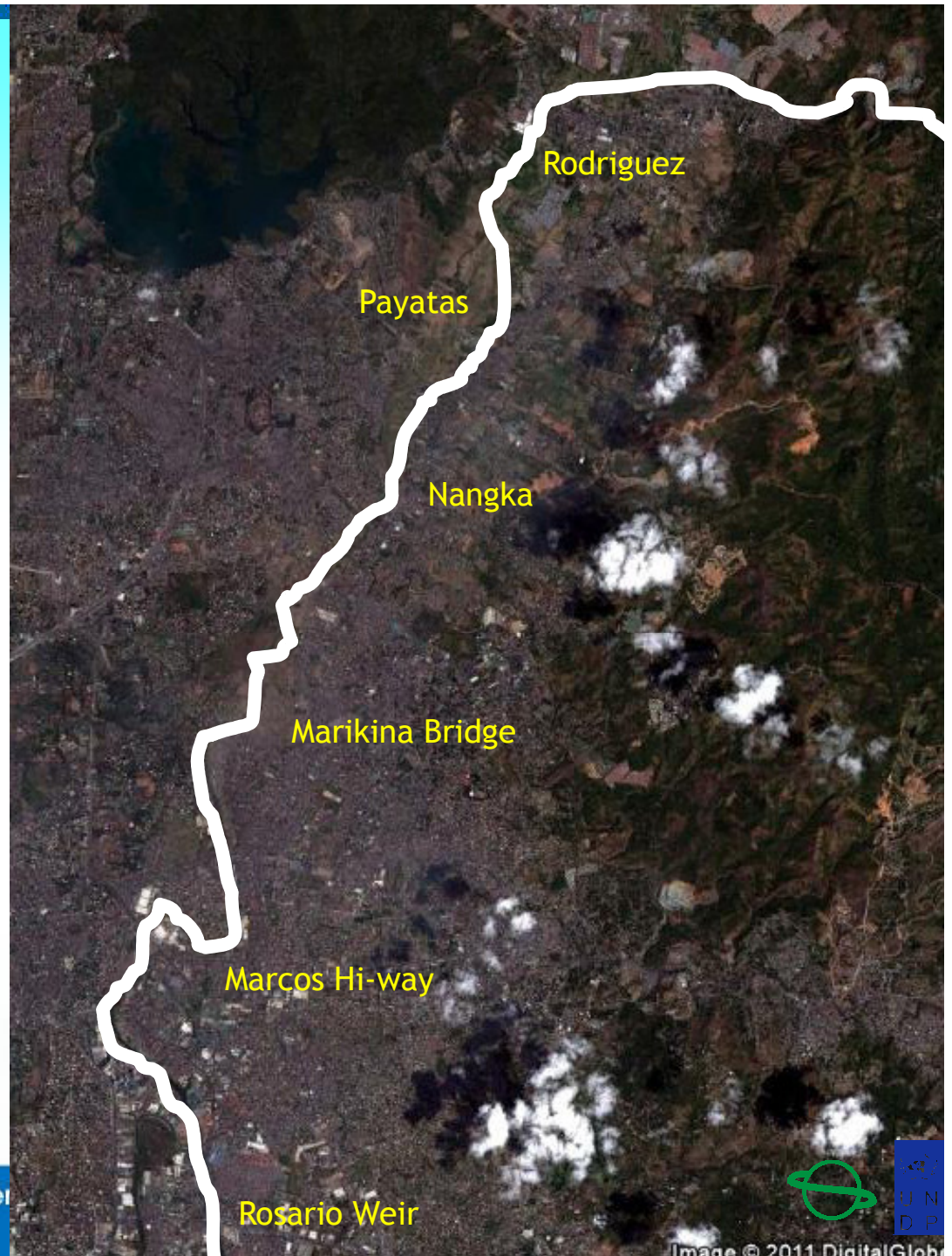
Image © 2011 DigitalGlobe

Sewage Treatment Plant (effluent BOD is 50 mg/L)

Yr 2013 Simulation Run (Ave. Dry Condition Jan-Jun)
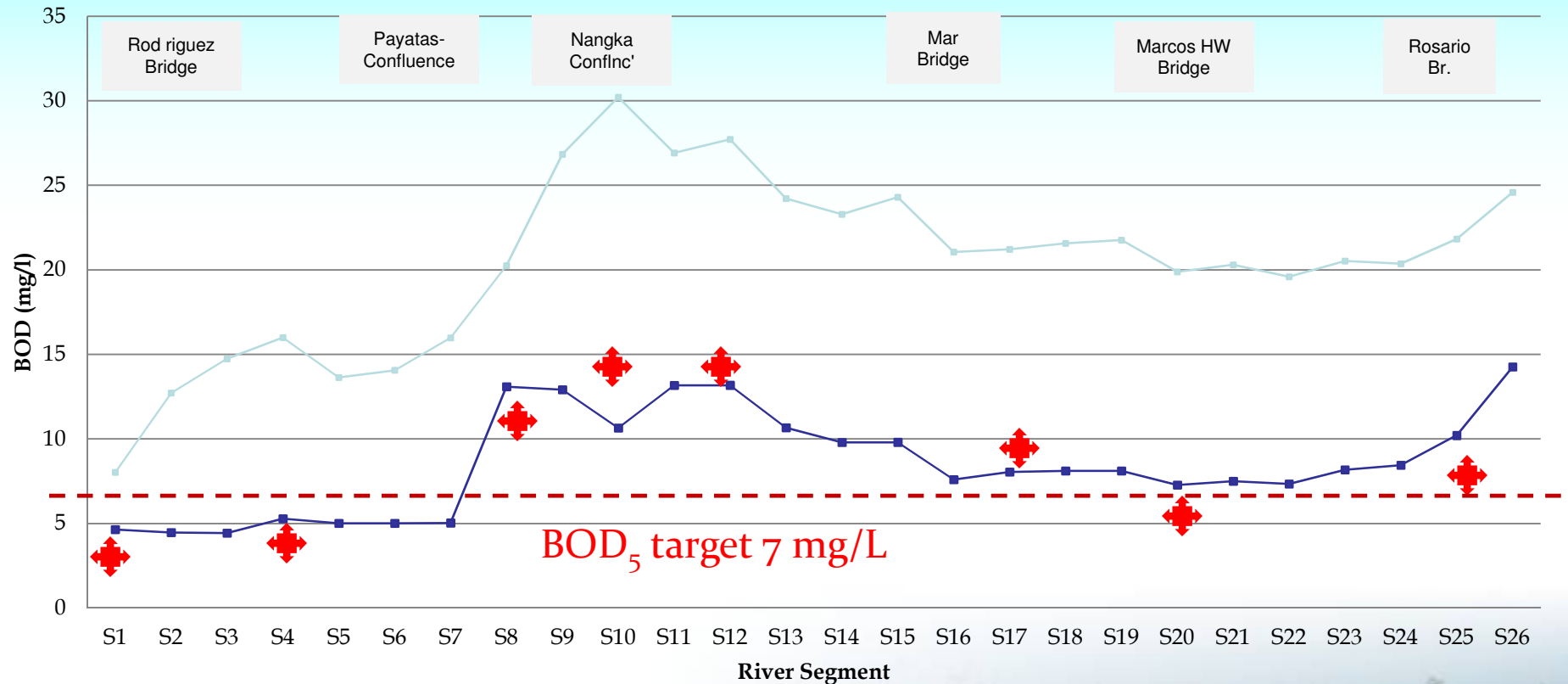
BOD$_5$ target 7 mg/L

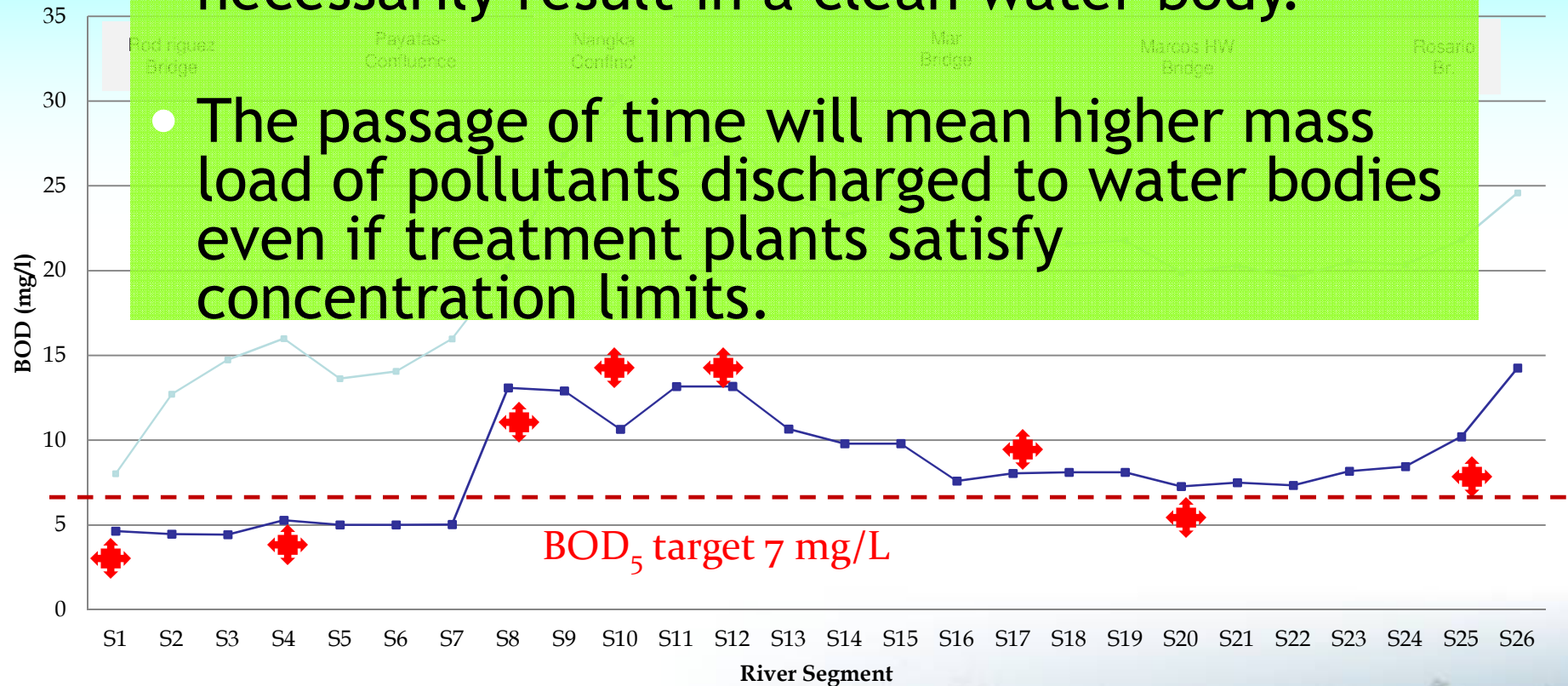CASE 1 (Do Nothing)   CASE 10 (Do All)

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© Manila Water

- Enforcing concentration-based limits will not necessarily result in a clean water body.

- The passage of time will mean higher mass load of pollutants discharged to water bodies even if treatment plants satisfy concentration limits.

BOD$_5$ target 7 mg/L

Y-axis: BOD (mg/l) — 0, 5, 10, 15, 20, 25, 30, 35

X-axis: River Segment — S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26

Top labels: Rodriguez Bridge, Payatas-Confluence, Nangka Confluence, Mar Bridge, Marcos HW Bridge, Rosario Br.

CASE 1 (Do Nothing)   CASE 10 (Do All)
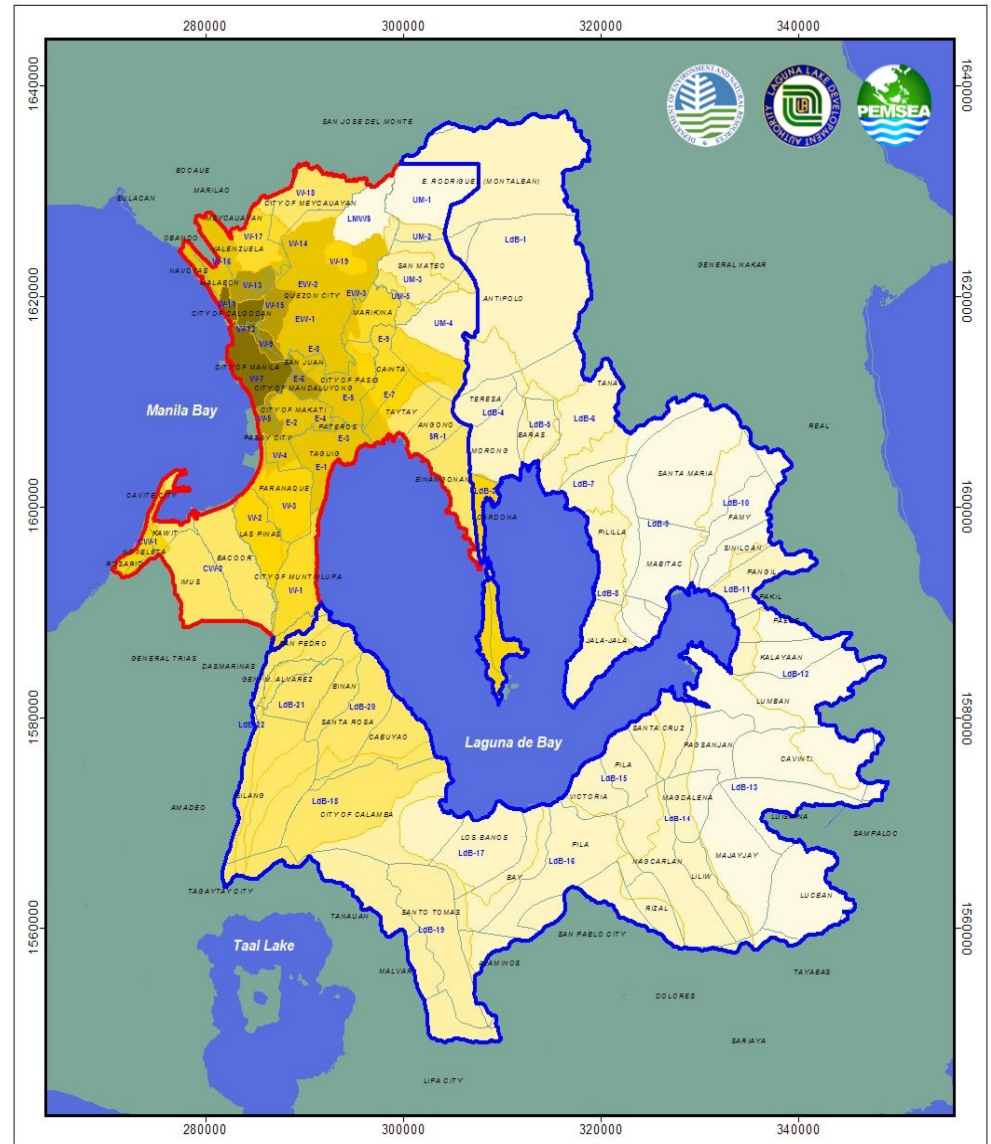
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Preliminary results

2010 Total Nitrogen per area (MT/year/ha)

LEGEND: *Watershed Boundaries*
Manila Bay
Laguna de Bay
Municipal Boundary

TN Loading per hectare (MT/year/ha)
- 0 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.10
- 1.10 - 1.60
- 1.60 - 3.50
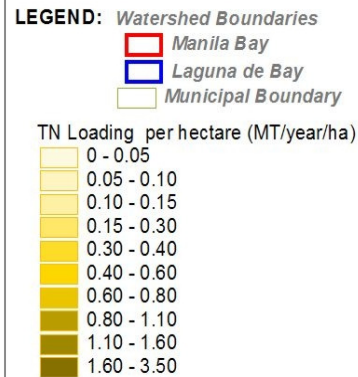
Nitrogen loadings per area (MT/year/area) for 2010, 2015 and 2020

Clean Water Act's Framework on Effluent Management

Concentration-based

Load-based

Improved WQ in the Philippines

Enhanced capacity on WQM

Strengthened Command & Control

Flexibility in Command and Control

General Effluent Standards

Industry-Specific Effluent Standards

Ambient Water Quality Guidelines

- Impacts to human health
- Impacts to aquatic and other terrestrial life
- Sources of pollution
- Capacity for enforcement and compliance

Effluent Quota Allocation (WQ-based Effluent Standards)

Process applied for the development of ambient water quality guidelines and effluent standards

Process applied for the development of effluent quota allocation

Lessons learned and points for improvement

Strategies for further actions

Effluent Management Strategy Policy Review

U N D P

- Determine total pollution loads to Laguna Lake-Pasig River-Manila Bay watershed area from major points (domestic, industrial, commercial) and non-point (agriculture, aquaculture, urban run off) sources using the Waste Load Model of the LLDS-DSS
- Determine corresponding BOD, total phosphorous and total nitrogen loadings of 58 sub-basins from key sources for 2008, 2010, 2015 and 2010
- Provides input to the pollution reduction strategy of the OPMBCS
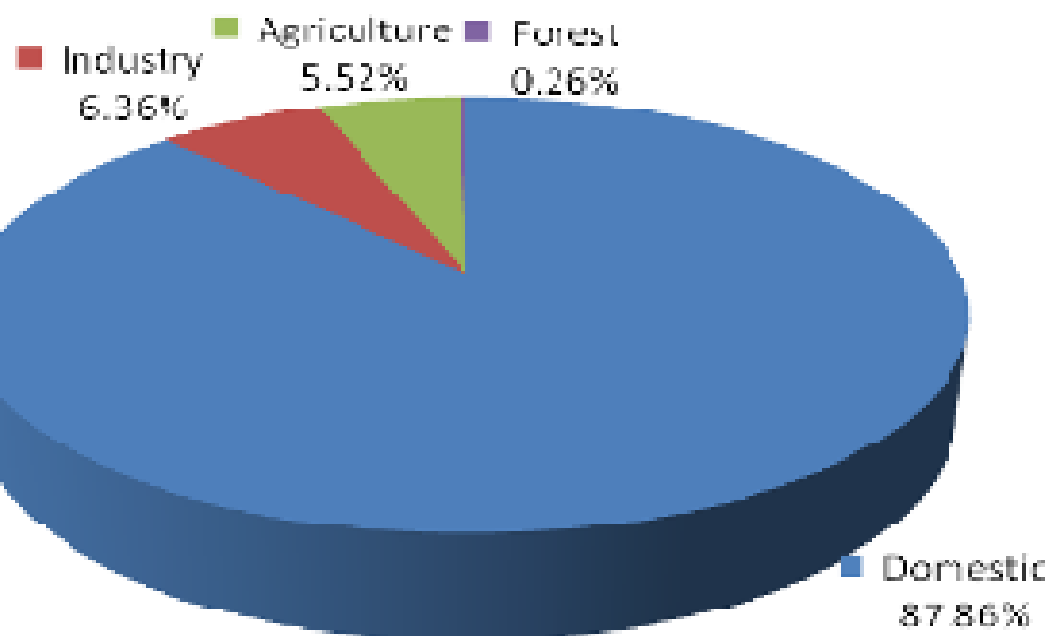
Expansion of LLDA Decision Support System
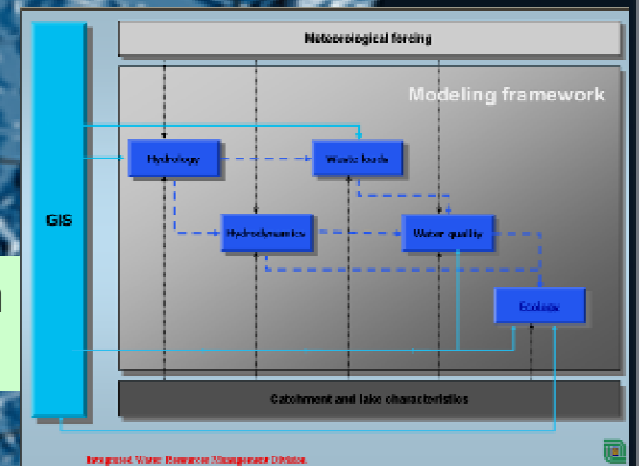
Pasig River

Manila Bay

Laguna Lake

Total nitrogen loadings by sector from the Laguna Lake-Pasig River-Manila Bay Watershed

2008 Total N loading of 58 sub basins (65,487 MT/yr)

- Industry 6.36%
- Agriculture 5.52%
- Forest 0.26%
- Domestic 87.86%

GEF/UNEP Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle

- Improved predictive capability and use of tools, guidelines and modeling outputs by relevant stakeholders in order to attribute nutrient sources within watersheds and to quantitatively analyze relationships between nutrient sources in watersheds and impacts in coastal waters

- Obtain a complete picture of nutrients in coastal ecosystems

- The impacts which will be considered will be harmful algal blooms, hypoxia and effects on fisheries and coral reefs

Sub-project 4: Development of regional models of coastal effects under different physical regions using regional data for the Manila Bay demonstration region

4.1: Data collection Manila Bay
4.2: High resolution river export model for Manila Bay rivers
4.3: Ecosystem model for Manila Bay
4.4: Underpinning nutrient reduction plan for Manila Bay

Thank you!

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