CECAM IDSS

Integrated Decision Support System

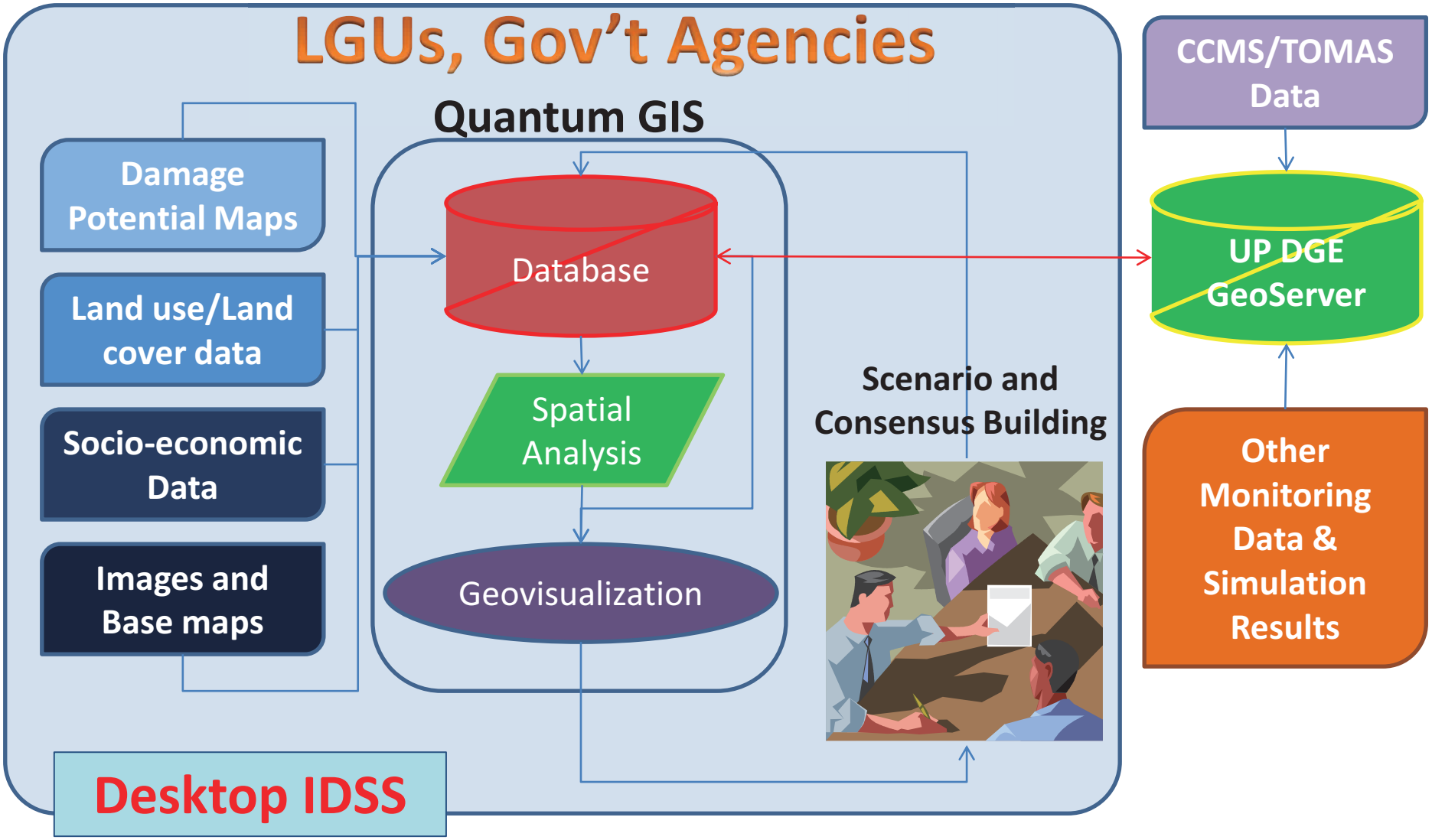
For which applications/questions will the IDSS be used?

- General: **CONSERVING and PROTECTING the COASTAL ENVIRONMENT**
  - Regulating aquaculture/mariculture activities
  - Enhancing MPAs; Proposing better MPA locations
  - Reducing sediment and nutrient loadings (e.g., by reforestation)

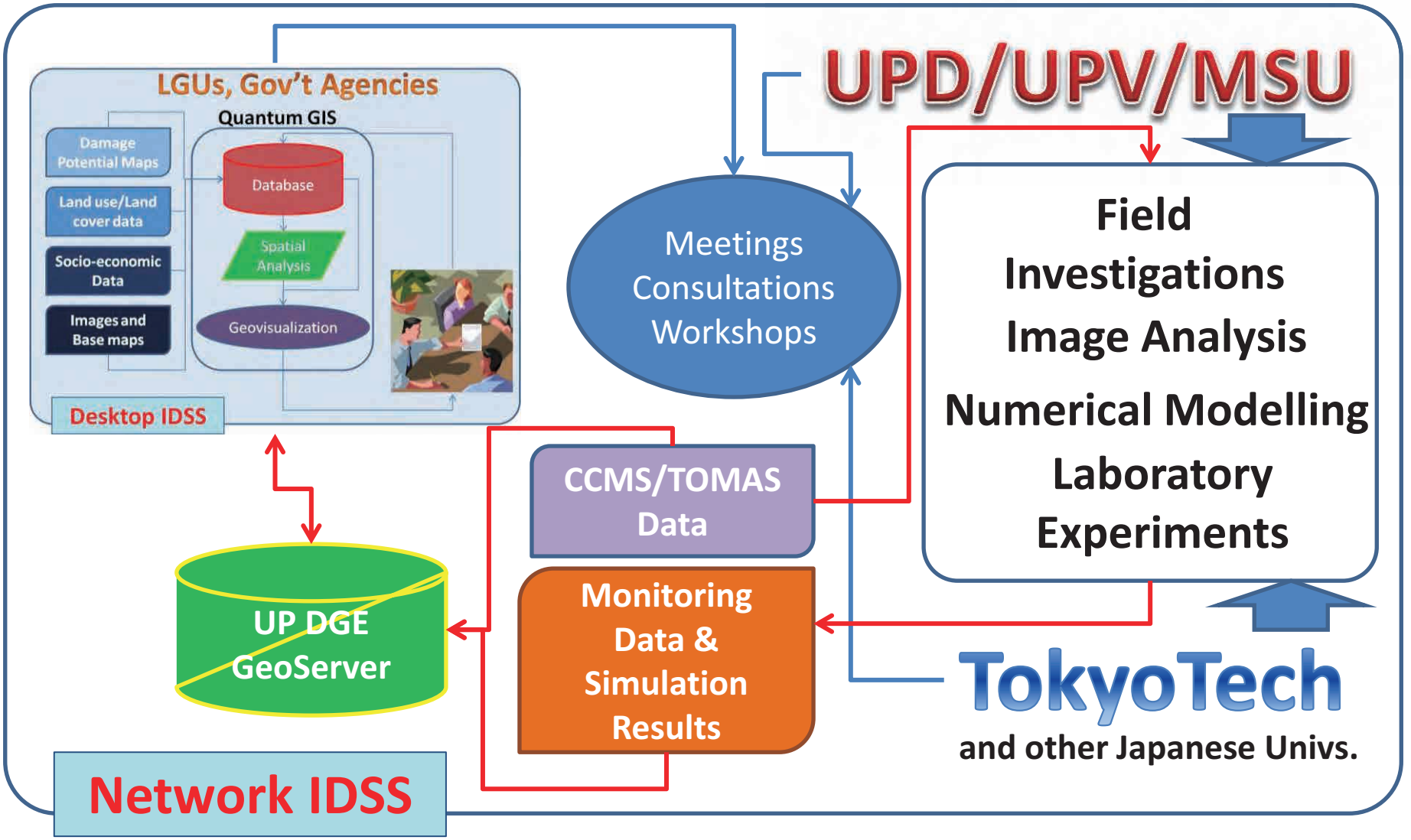
- Mitigating climate change impacts
  - Increased temperature Sea level rise
  - Typhoons
  - Storm surges
  - Seawater intrusion

Changes in water quality
Degradation/destruction of coastal habitats

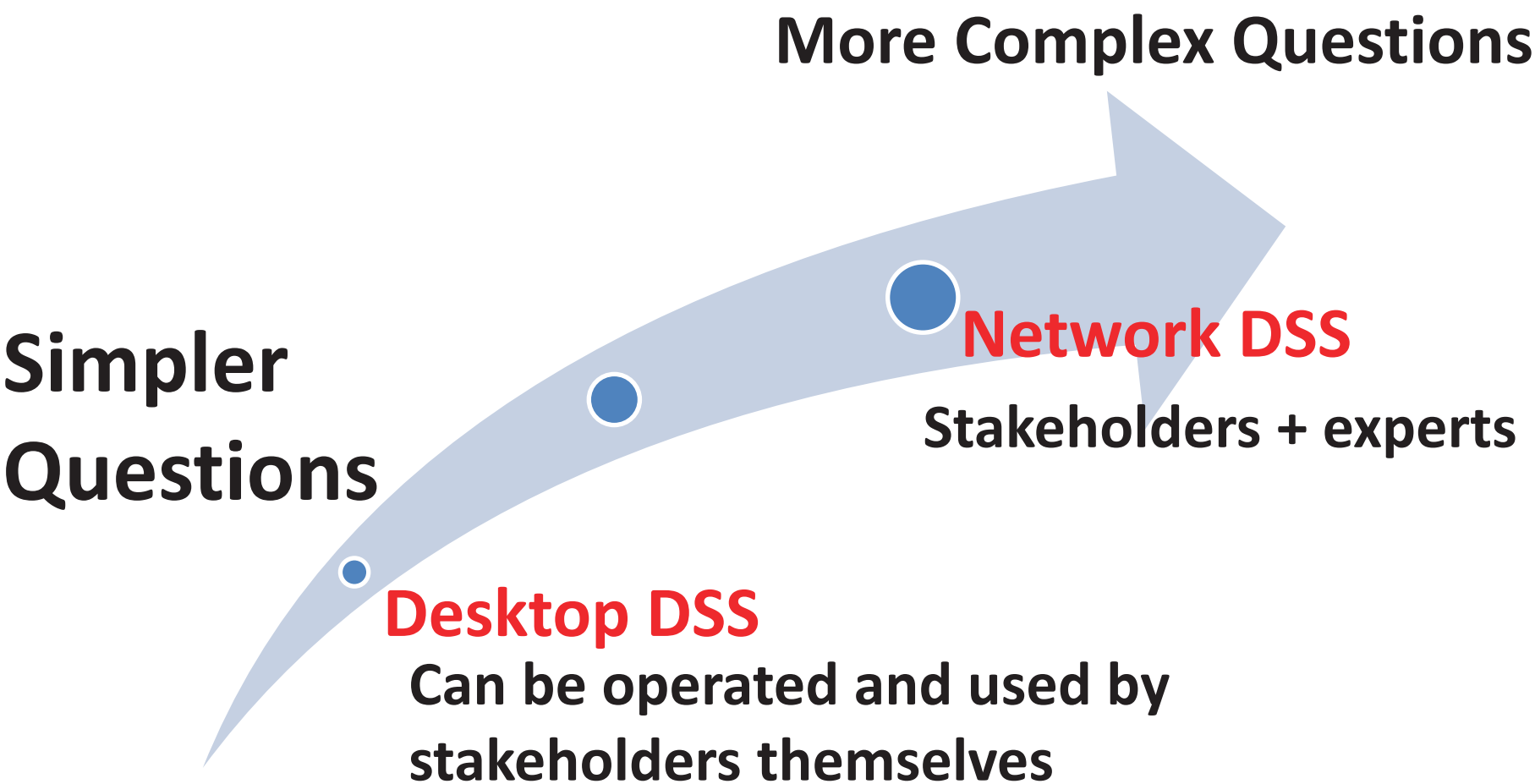
The CECAM IDSS Concept (Desktop)



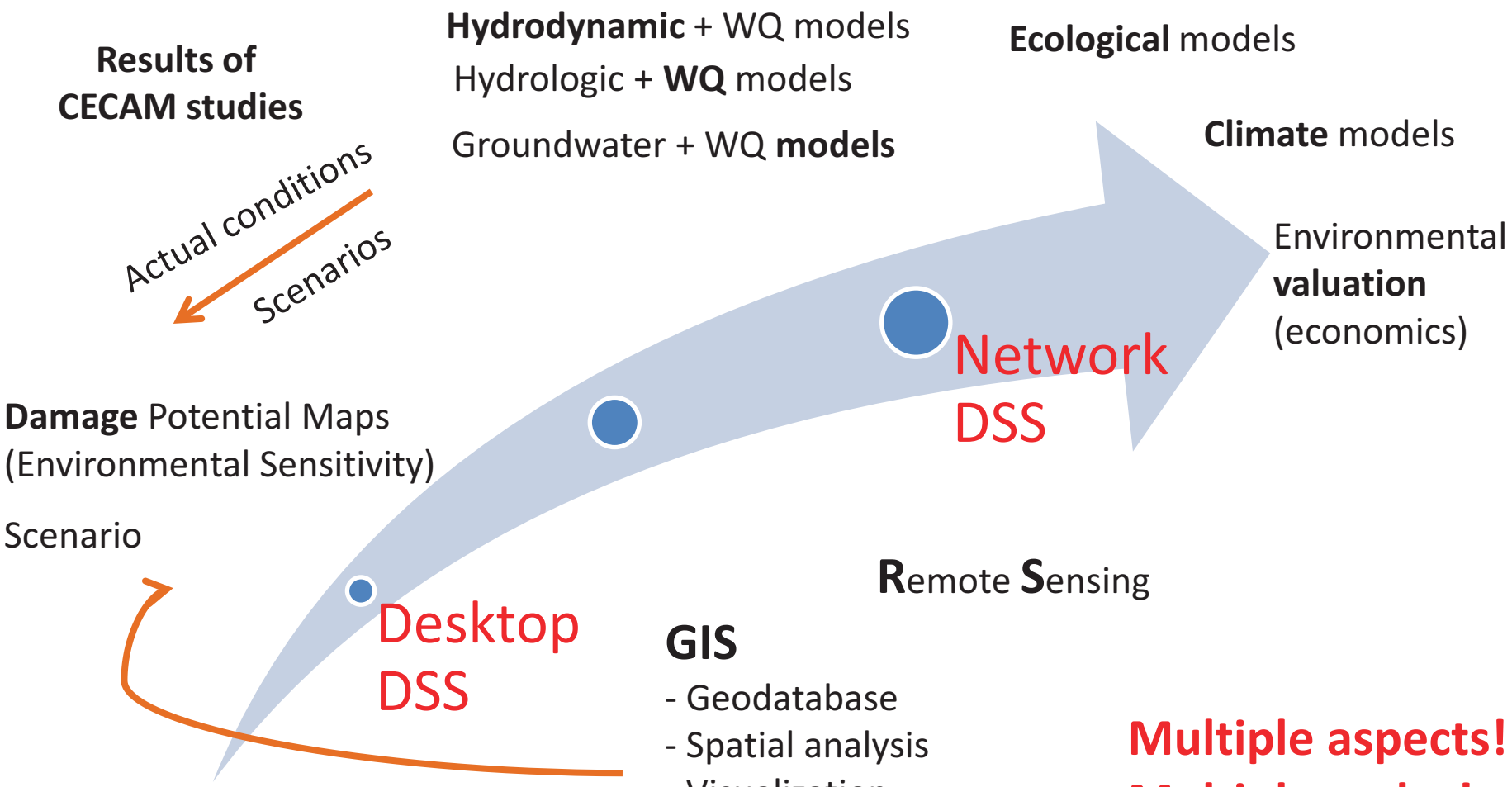
The CECAM IDSS Concept (Network)



Questions and DSS Modes?



IDSS Modes and Tools



*Consider also the case of minimal data availability

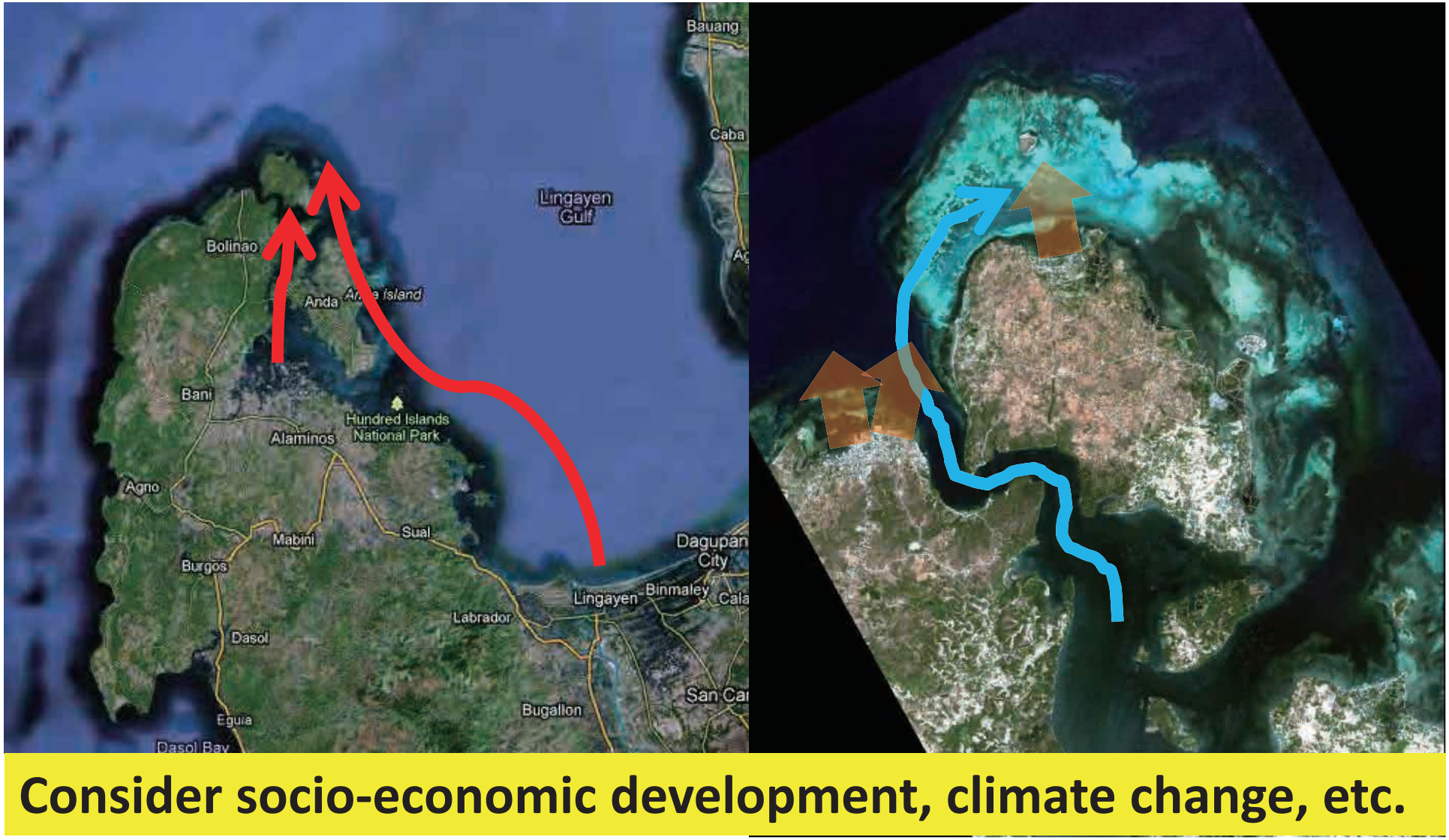
How to effectively reduce these?

Terrestrial sediments

Effluents from mariculture

Nutrients from built up areas

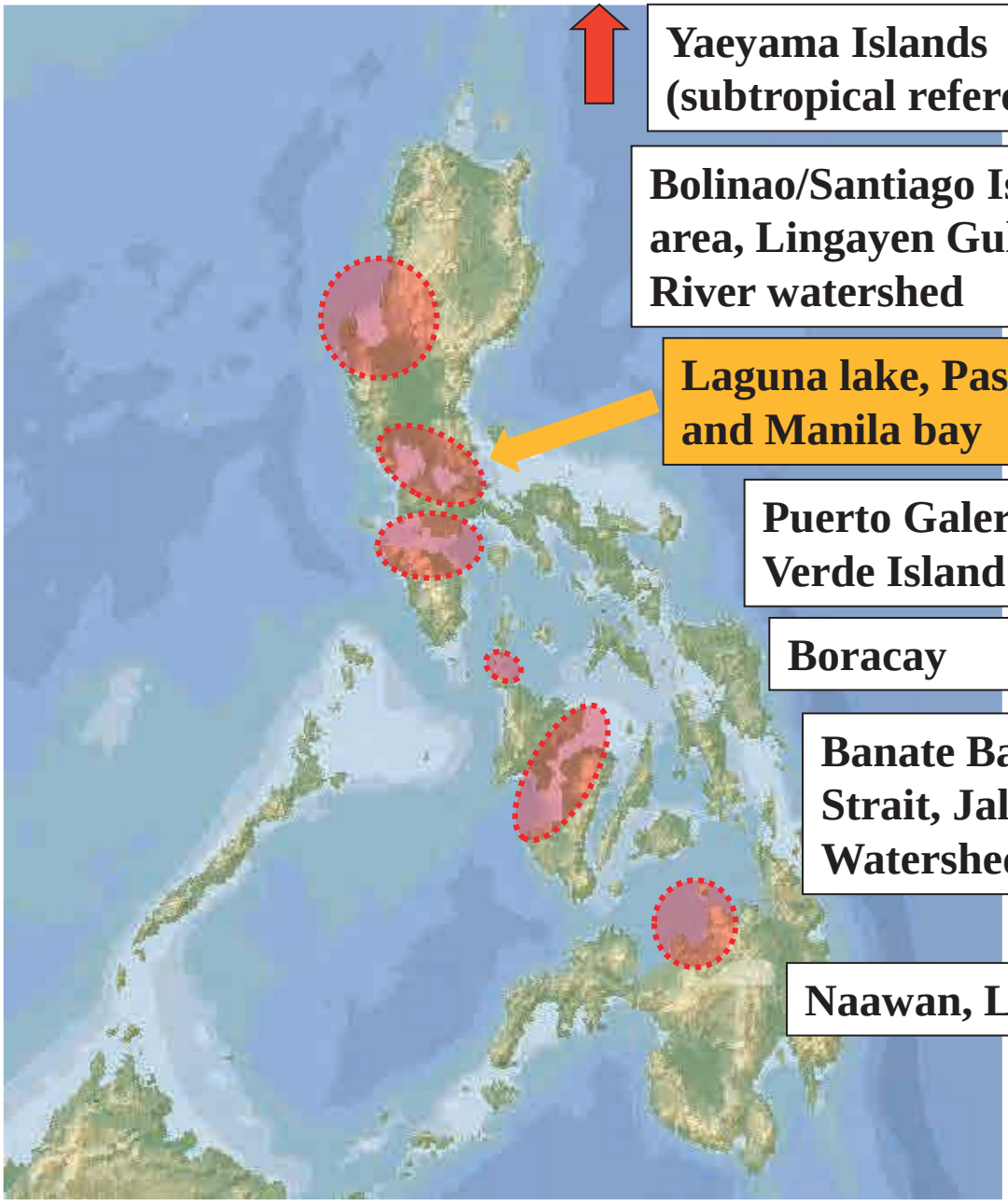
Bolinao IDSS



Consider socio-economic development, climate change, etc.

Modeling and assessment Subgroup

Study Sites



Yaeyama Islands (subtropical reference sites)

Bolinao/Santiago Island area, Lingayen Gulf, Agno River watershed

Laguna lake, Pasig river and Manila bay

Puerto Galera and Verde Island Passage

Boracay

Banate Bay, Guimaras Strait, Jalaur River Watershed

Naawan, Laguindingan

Target environmental issues to be addressed:

- High water temperature
- Sedimentation
- Groundwater discharge

- Aquacultures
- Hypoxia
- River discharge
- Groundwater discharge

- Urbanization
- Aquaculture
- Flooding
- Eutrophication
- Larval connectivity
- Beach erosion

- Beach erosion

- Multiple terrestrial stress connectivity
- Environmental stress gradient

- Prestine (Control sites)

Laguna Lake IDSS Numerical Modeling Analysis

Numerical simulation using Delft-3D

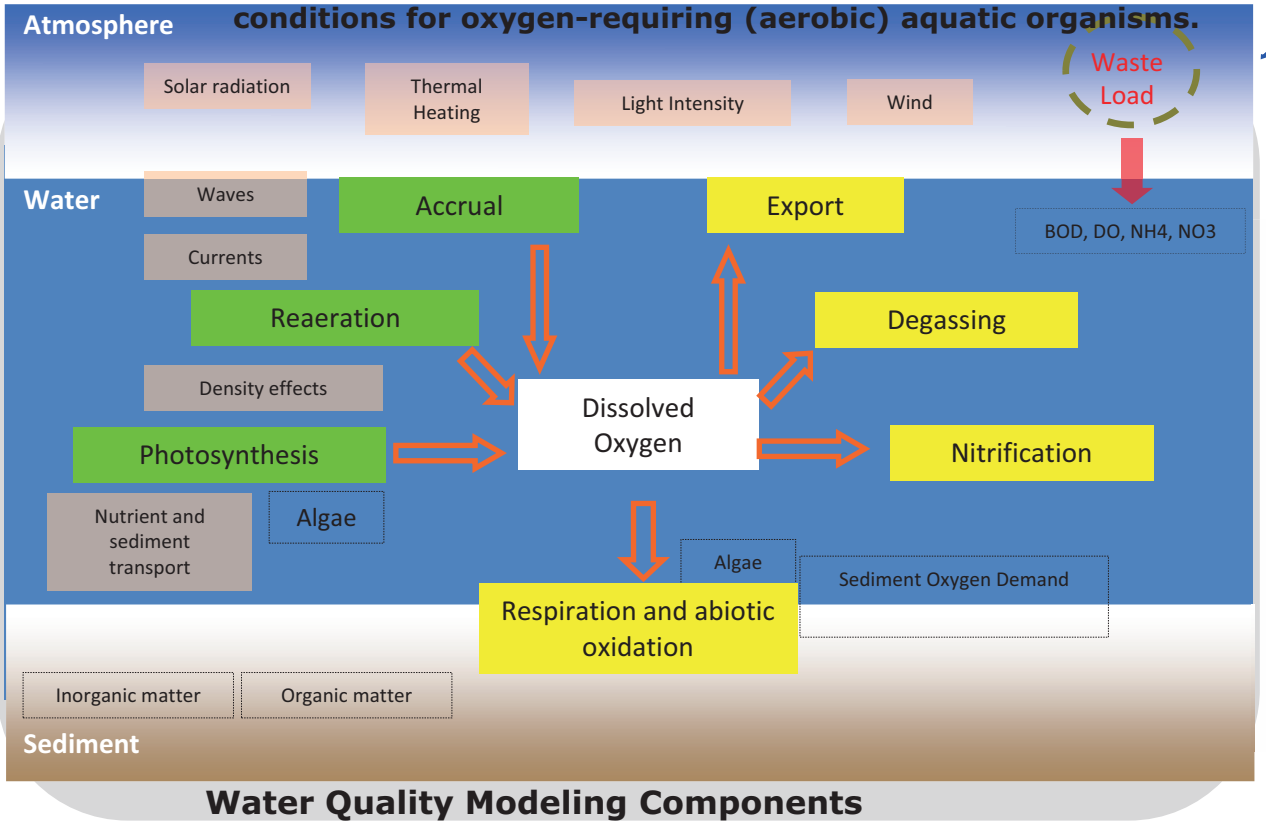
Hydrodynamics → Water quality

Dissolved Oxygen : Primary indicator of the carrying capacity of a water body

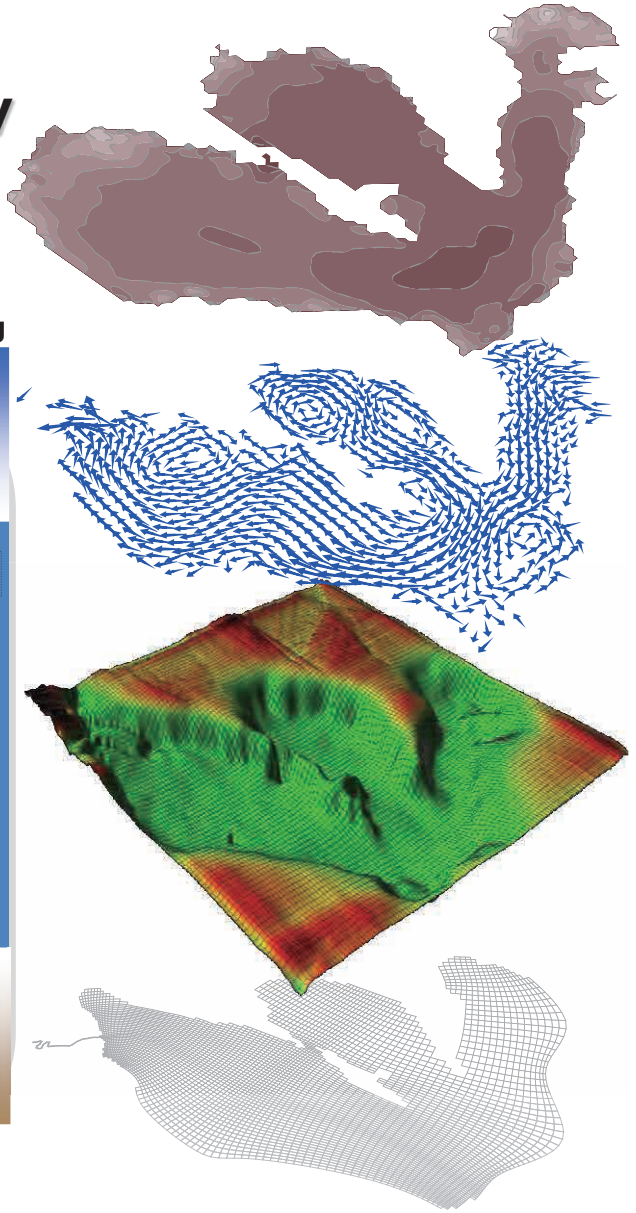
Hydrodynamics : simulation of the non-steady flow and transport phenomenon resulting from tidal and meteorological forcing.

→ **Circulation characteristics of the lake resulting from morphology and various forcing factors**

The amount of oxygen contained in the water and defines the living conditions for oxygen-requiring (aerobic) aquatic organisms.

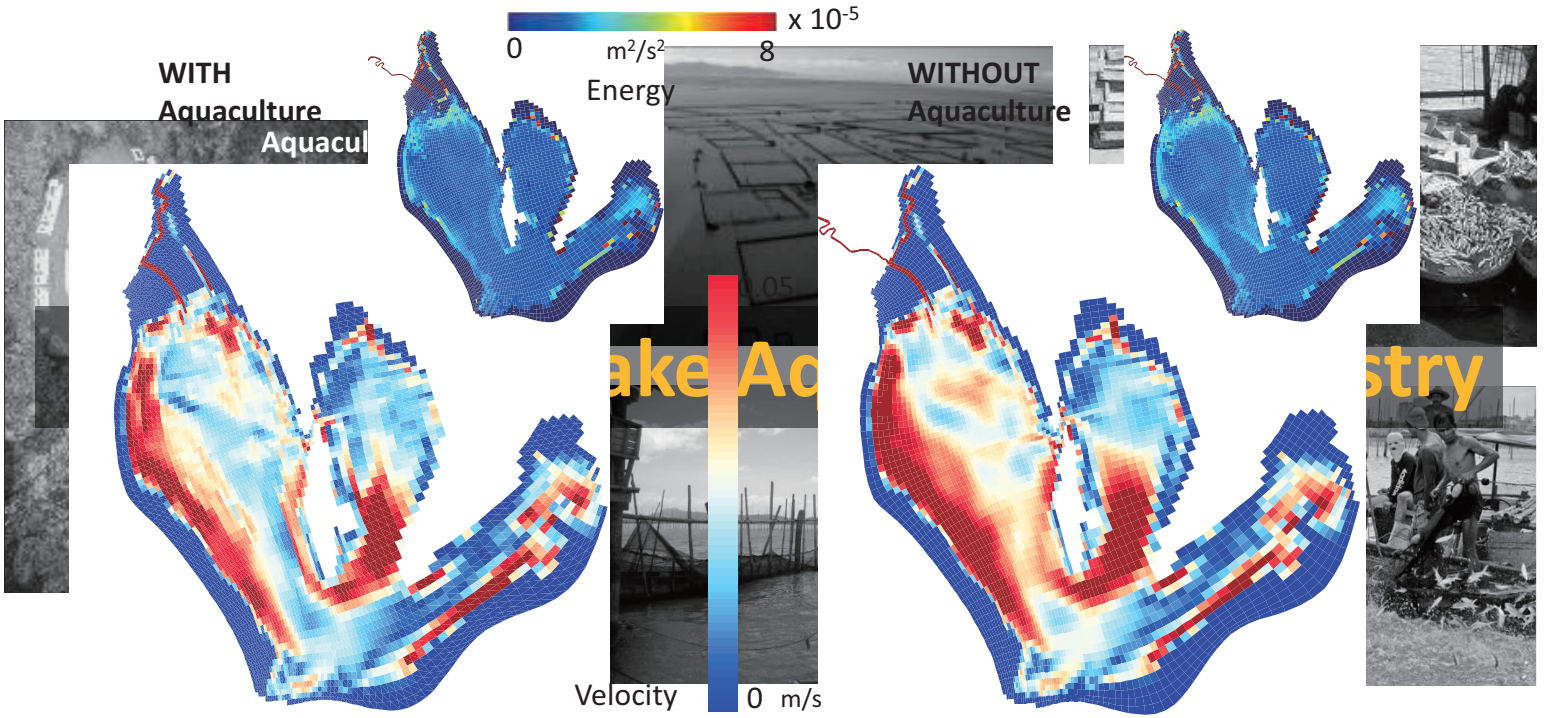


Water Quality Modeling Components



Laguna Lake Water Balance Components

Impact of Aquaculture Structures



- Laguna Lake aquaculture industry accounts for approximately 40% of the total fish production through aquaculture in Philippines.
- Aquaculture structures occupy nearly 150 km^2 (17%) of the total area of the Laguna Lake.
- Aquaculture operations significantly affect lake hydrodynamics (flow resistance) and metabolism (detritus matter and grazing).

Impact of Water Resource Use

Management Scenario: 400 mld Domestic Water Supply Project

"Metro Manila is bound to experience water crisis unless the government finds more sources of raw water soon.." (Manila Times)

Metro Manila water demand already exceeded current capacity for supply!

Other dam water sources will be available only in year 2016!

Solution???

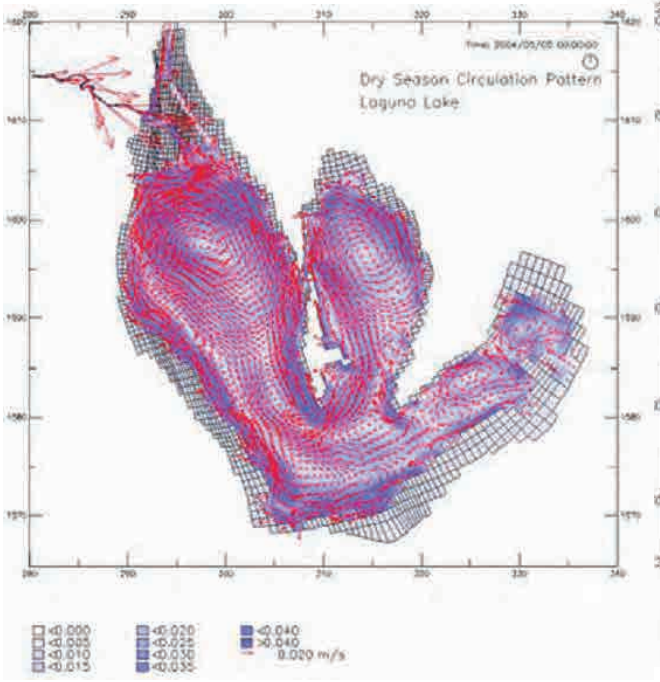
LAGUNA LAKE

400 mld Domestic Water Supply Project

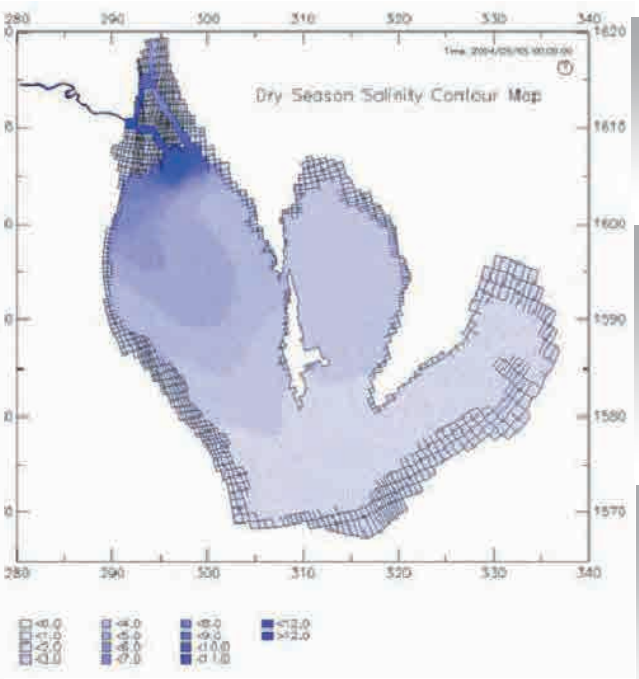
How FEASIBLE???

Management Scenario: 400 MLD Domestic Water Supply Project

Impact on Current Circulation



Impact on Seawater Intrusion



For every 400 million liters per day abstraction rate:

- Lake water depth is expected to drop by 2-3 centimeters.
- Lake current magnitude is expected to increase by 1 cm/s with sustained flow pattern.
- 30% increase in backflow rate (seawater intrusion) and a 3% drop in Pasig River outflow.
- Lake residence time is 9 days longer.

Conservation Scenario Simulation

Conservation Scenario: 25% reduction and 100% increase in waste load

Fish kills have become pronounced over the recent years causing severe losses in the fish pen industry!!!

Laguna Lake has long served as a receptacle of both solid and liquid waste of Metro Manila!

Competing and conflicting demands for water use have worsen the problem!

Solution???

Waste water projects and strict policies for lake conservation

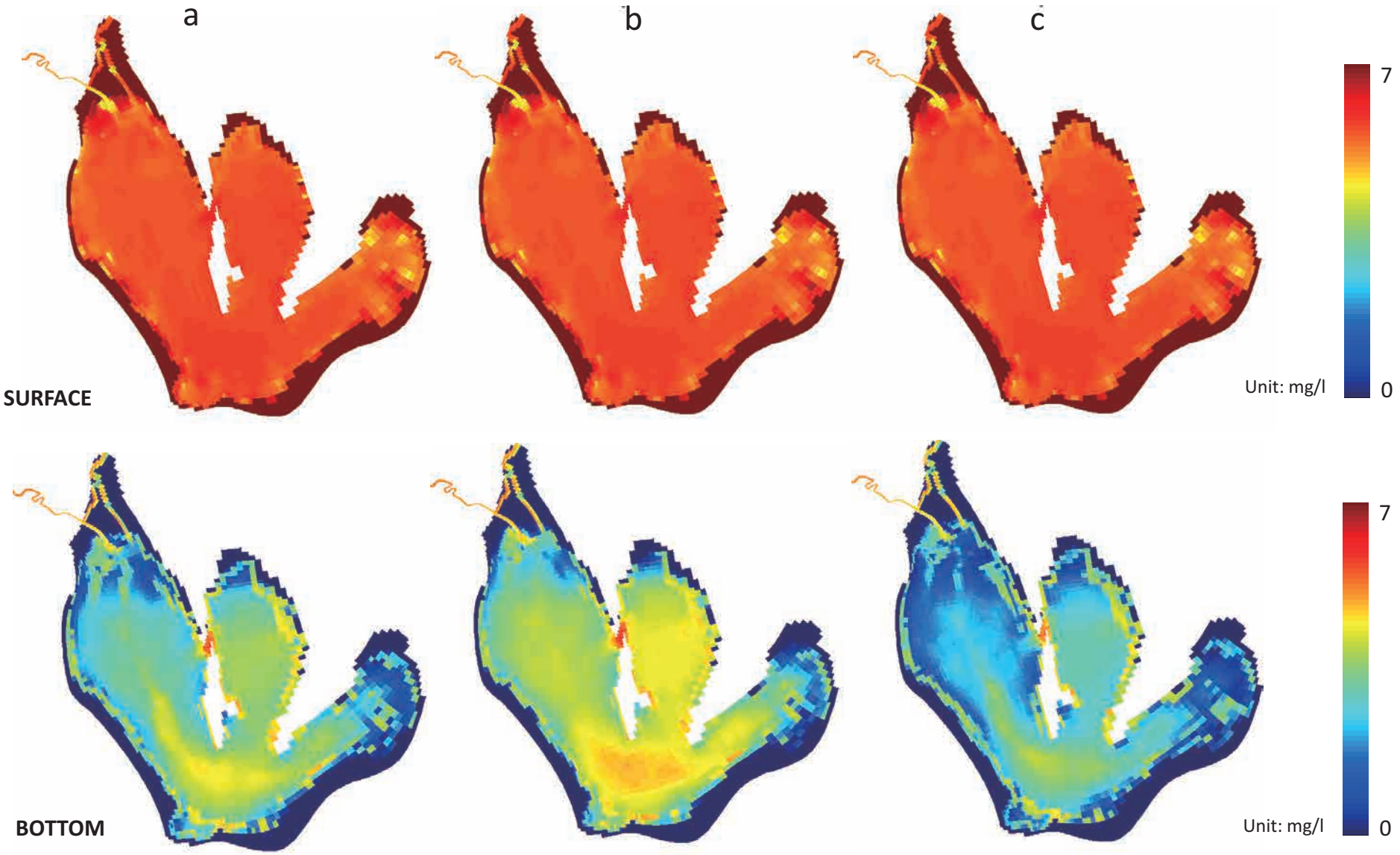
25% reduction/100% increase in waste load

How Effective?
How Serious???

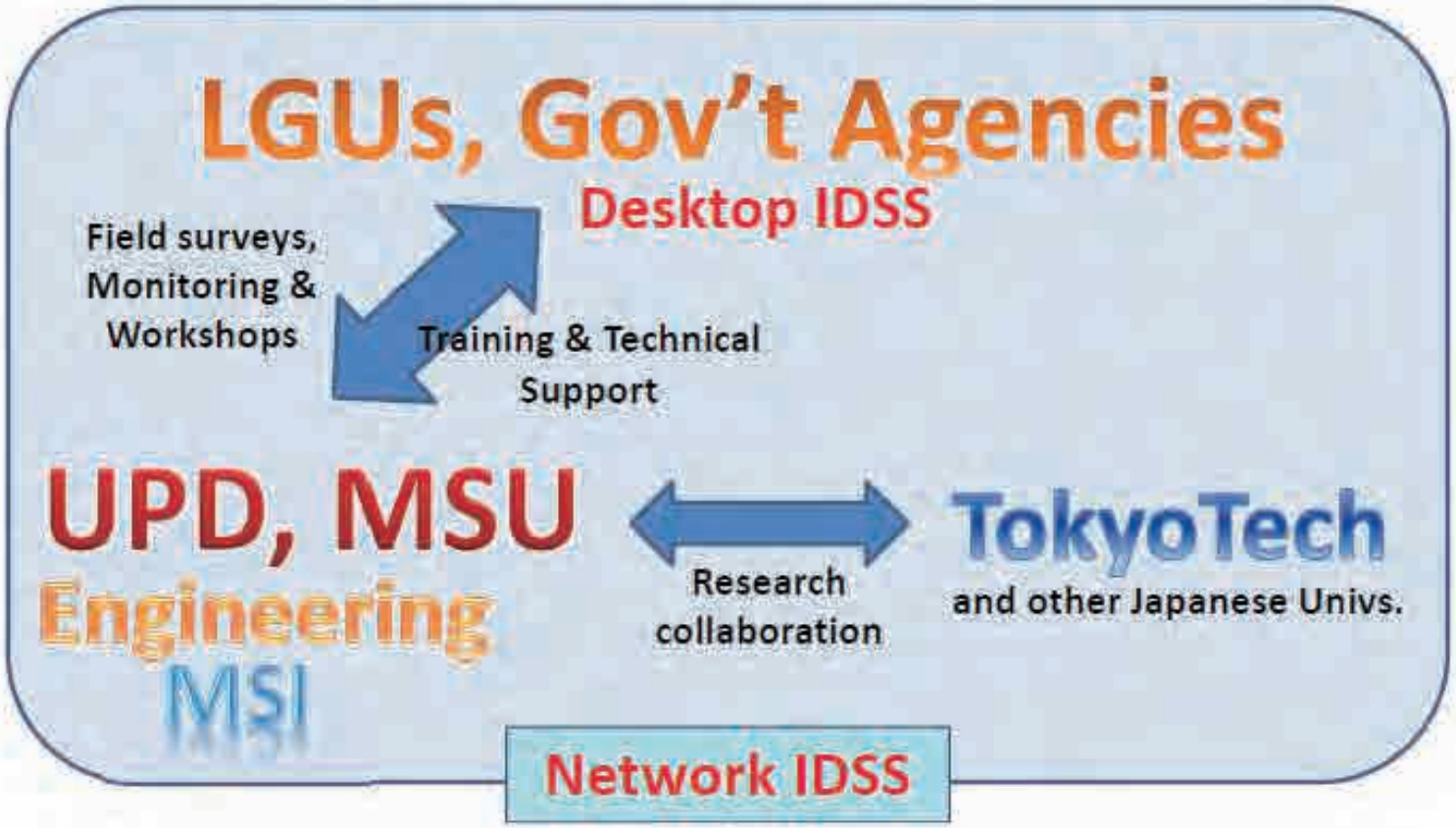
Conservation Scenario Simulation

Comparison of water quality simulation results for dissolved oxygen for different scenario configurations

(a) existing condition **(b) 25% reduction in waste load** **(c) doubled waste load input.**



Operationalizing CECAM IDSS



CECAM Training on IDSS Utilization to be held in 2014.

Thank you