

Water Quality Issues Linked to Fish Production

DISCUSSION POINTS

- Aquaculture – marine, brackish, inland water
- Practice, environmental problems
- Management
- Way forward

Aquaculture

- ✓ More than 50% of the total fish production in the country comes from aquaculture (marine, brackish, inland water)
- ✓ Fish is a cheaper source of protein
- ✓ Substantial contribution of aquaculture to the economy

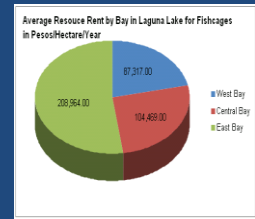
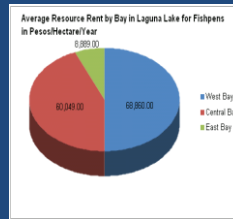
Fish production as natural capital;
Aquaculture sites as natural capital

WAVES – Wealth Accounting and Valuation of Ecosystem Services

- a global partnership led by the World Bank
- only two sites in the Philippines – Laguna de Bay and Southern Palawan (2014-2017)
- aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts and thus guide policy makers to better manage natural resources

“The wealth of the Philippines needs to be expressed not just in terms of GDP but also in terms of its Natural Capital.”

Pilot Laguna de Bay Ecosystem Account Resource Rent



The Degrading Trend of the World's Lakes

Lake Basin	In-lake				Basin origin				Regional/Global					
	Atmospheric deposition from upwind	Urban/industrial effluents	Agriculture/forestry	Other	Urban/industrial effluents	Agriculture/forestry	Other	Urban/industrial effluents	Agriculture/forestry	Other	Urban/industrial effluents	Agriculture/forestry	Other	
Aral Sea														
Baikal														
Bering														
Bigby Wetland														
Bira														
Chad														
Changjiang														
Chilka Lagoon														
Coclebole/Nicaragua														
Comstane														
Dianchi														
Great Lakes (N.Am.)														
Issyk-Kul														
Kariba Reservoir														
Laguna de Bay														
Makroei/Plyana														
Nepancho														
Nikunja														
Obid														
Papusi/Churhikoo														
Sevan														
Tanganyika														
Titocaca														
Toda														
Tonle Sap														
Tuzart Reservoir														
Victoria														
Singhai/Khanka														
Total	12	11	3	9	4	11	21	16	12	11	23	12	4	7

- Legend:
- - the problem is not improving significantly
 - - It has improved somewhat
 - - there has been significant improvement

International Lake Environment Committee Foundation (ILEC), 2005

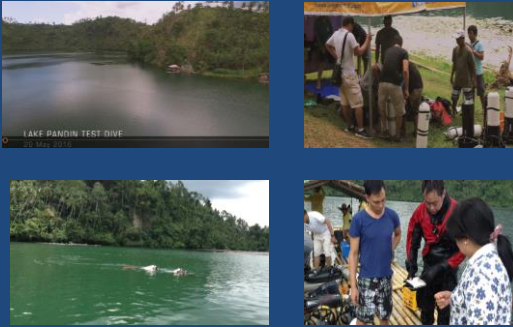


Presence of harmful Cyanobacteria were detected in Laguna de Bay and Pasig River

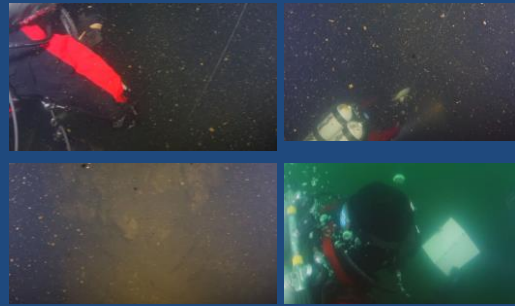
- Toxigenic microcystis
- 2-MIB (methylisoborneol) producing genes
- Geosmin

From the investigation done in 2016 by Prof. Delia B. Senoro, Mapua Institute of Technology and Prof. Tsair-Fuh Lin, National Cheng Kung University, Taiwan

First underwater exploration in Pandin Lake, San Pablo Laguna



Under the fishcage area



RA 8550 – The Philippine Fisheries Code

Section 51 of RA 8550 states that not over 10% of the suitable water surface area of all lakes and rivers shall be allotted for aquaculture purposes and the stocking density and feeding requirement shall be controlled and determined by its **carrying capacity**.

Precautionary Principle

Carrying Capacity for Aquaculture

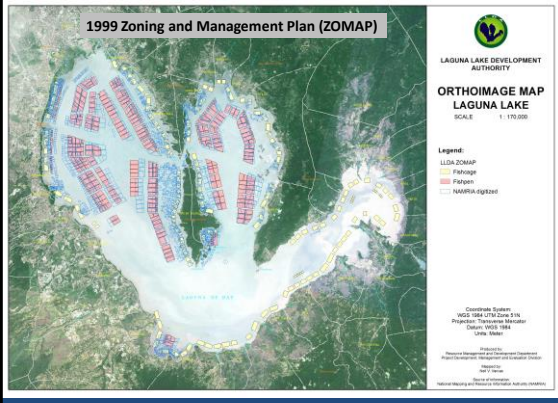
Laguna de Bay

- Lake Primary Productivity (artificial feeding is seldom practiced in the lake)
- Converted into fish production potential, then into allowable area for aquaculture
- 1996 – 15,000 hectares
- 2017 – 9,200 hectares ; guided by Academician Emil Q. Javier and Academician Rafael D. Guerrero III

Validation – fish production potential is close to the actual harvest (1980s, LLDA's fishpen off Cardona Rizal)

Challenge – difficulty in getting reliable data on actual harvest from fish pen and Fish cage owners

1999 Zoning and Management Plan (ZOMAP)



Carrying Capacity for Aquaculture

Bolinao and Anda

- In terms of number of fishpens and fishcages – 544 units

WHY DO ALGAL BLOOMS AND FISH KILLS STILL OCCUR EVEN IF THE CARRYING CAPACITY IS FOLLOWED?

Carrying Capacity for Aquaculture

Improved methodology – hydrodynamics, modeling, etc.

Hydrodynamics – guide in the layout of fishpen belt and fishcage belt

How about a guidebook in determining the carrying capacity for aquaculture?

How frequent?

Environmental Impact Assessment

The revised guidelines for the Philippine Environmental Impact Statement System under PD 1151 and PD 1586 provides that Environmental Compliance Certificates (ECCs) are required for fishery/aquaculture projects using freshwater and brackishwater above one hectare.

LLDA Board Resolution 518, 2017



LAGUNA LAKE DEVELOPMENT AUTHORITY



Tadalac Lake in the eighties with over-crowded fishcages.

A.C Santos-Borja et al., 2004



Tadalac Lake in the new millenium without the fishcages.

"Laguna de Bay shall be transformed into a vibrant economic zone showcasing ecotourism by addressing the negative impact of the watershed destruction, land conversion and pollution".

"... fish pen and fish cage operators have to reduce their areas of occupation.....and that poor fishermen shall have priority in its entitlement"

President Duterte – SONA 2016

Maraming Salamat Po

Adelina (Lennie) C. Santos-Borja

Department Manager III
Laguna Lake Development Authority
National Ecology Center Compound, East Avenue, Q.C.
www.llda.gov.ph
Email: lennieborja@llda.gov.ph