

## **LLDA THEMATIC PAPER (FIRST DRAFT)**

### **TENTATIVE TITLE: WATER QUALITY MANAGEMENT FOR THE LAGUNA DE BAY REGION**

#### **1. Introduction**

Laguna de Bay is the largest and one of the most vital inland bodies of water in the Philippines. It is one of the largest in Southeast Asia. With a total surface area of about 90,000 hectares, the lake bears significant political, economic and socio-cultural significance.

#### **Quick Facts about Laguna de Bay**

Of the more than 100 rivers and streams that flow into the lake, there are 21 major tributary rivers traversing the 292,000 hectare watershed, which is subdivided into 24 sub-basins. The lake and its watershed are collectively defined as the Laguna de Bay Region. This encompasses a total of 66 Local Government Units consisting of 5 provinces, 12 cities and 49 municipalities including 11 within Metro Manila. The lake watershed is home to over 10 million Filipinos 25% of whom, or over 3 million live along the lakeshore. The lake itself supports a host of beneficial uses including fisheries, irrigation, power generation, industrial cooling, recreation, transport and navigation, but the biggest potentials lie in using the lake as raw water source for domestic use including drinking water. The lake's only outlet is the Napindan Channel that controls the flow into the 27-km. Pasig River that discharges to Manila Bay.

However, unprecedented economic growth over the last 30 years resulting to rapid industrialization and urbanization of the region threatens the living lake. The lake region contributes about PhP101.3 billion or 12.8% to the country's gross domestic product. However, the last decade has brought massive changes in the lake basin, thus affecting the quality of the lake and river waters. This paper therefore aims to describe the water quality status for the last ten years, the role of the RBO (the Laguna Lake Development Authority) in water quality management, the difficult issues and current/proposed measures (policies and project interventions including infrastructures) in relation to IWRM,

## **2. Water Quality in the Surface Waters**

### **2.1 Role of the LLDA**

Republic Act 48850 as amended brought the entire Laguna de Bay and its watershed under the integrated management of the LLDA since 1969. It is responsible for the management and protection of the Laguna de Bay Region. As an apex body, the LLDA facilitates the sustainable development and balanced growth of the Region and coordinates with key players, both government and private, in pursuing its IWRM.

Under its water quality monitoring program, the LLDA uses a number of parameters to accurately assess the impacts of development activities on the lake and river systems and their suitability for beneficial uses. These include BOD, DO, phosphate, nitrate, chloride, transparency, net primary productivity, TCC and heavy metals. Evaluation of the water quality of the river systems and the lake is based on the water quality for Class C water, good for fishery, prescribed by the Department of Environment and Natural Resources (DENR). The water quality monitoring program forms a vital part of the environmental management program. It is also used to gauge the effectiveness of the different regulatory tools and economic instruments to improve water quality.

The results/ findings of the LLDA Water Quality Monitoring Program are published annually in the Laguna de Bay Environment Monitor which is also accessible through the LLDA website. On a month-to-month basis, water quality data are posted in the Water Mondriaan, a schematic presentation of the water quality status of the lake and its various tributary rivers to stakeholders through the website.

### **2.2 Status of Water Quality**

Based on the last 10-year data for the different water quality parameters, Class C which is good for fishery has been generally maintained in Laguna de Bay. BOD concentration in all the five lake stations consistently met the 10 mg/L criterion. The increasing trend on BOD concentration in 2000-2004, still within the criterion, was due to the Pasig River backflow in 2004. River backflows happen when seawater from Manila Bay flows back to Laguna de Bay through the Pasig River. The northern part of the lake under

Class D is characterized by high density population due to concentration of industries and high population density.

However in terms of the tributary river systems, 4 out of 15 (27%) river systems monitored are highly polluted, having consistently failed to comply with the BOD, DO and TCC criteria for Class C water in the last 10 years. These include the rivers of Mangagate, Marikina and Tunasan in Metro Manila, San Pedro in Laguna, and Sapang Baho in Rizal. In terms of TCC, all the 15 river systems failed to meet the Class C criterion. In addition to the four rivers, these include Cabuyao, San Cristobal, San Juan, Bay, Sta. Cruz, Pagsanjan (mouth), Pangil and Siniloan Rivers in Laguna; Tanay and Morong Rivers in Rizal. These “water quality hot spots” are located in western portion where rapid industrialization and urbanization take place and high population density is exhibited, two critical factors that directly contribute to water quality degradation.

### **3. Population and Economic Activities: Trends and Impacts on Water Quality**

Population growth and rapidly expanding economic activities continue to pose grave threats to sustainable development of the Laguna de Bay Region. The strategic location of the Region in the heart of the National Capital Region and Southern Tagalog, half of whose combined population in 2000 of 21 million live in the Laguna de Bay watershed. A more dense population particularly in the western shore is expected in the next 30 years.

From the actual number of small to large establishments of 207,891 as of 2003, the figure is expected to increase by at least 100,000 by 2030.

Using its Decision Support System (an integrated set of mathematical models and supporting softwares), developed with the assistance of the Netherlands Government in 2001-2003, results of the model simulation indicate the poorest water quality could be found at the industrializing northwestern and western sides of the West Bay. If no intervention is introduced in the next 25 years, the model predicts that 40% of the present total lake area suitable for Class C (fishery) will deteriorate to Class D (irrigation) for a year without salt intrusion from Manila Bay thru the Pasig River.

Waste load model run results show that about 70% of BOD load in Laguna de Bay came from households and only 19% from industries, 11% from land run-off. This scenario has significant impact on lake fisheries since excessive BOD levels lead to oxygen depletion, and in turn leads to fishkills.

### **Difficult Issues on Water Quality Management in Relation to IWRM**

**Increasing pollution load from domestic sources.** A significant pressure on the water quality of the lake and its tributaries is the discharge of domestic and industrial wastewater, with households accounting for about 70% of the total organic loading. The water quality problem is linked with solid waste management problems, primarily from households due to dumping of garbage into waterways.

**Encroachment of the buffer zone along the 220-km perimeter of the lake.** The impact of population growth, urbanization and industrialization is mostly being felt and seen in the uncontrolled human settlement along river banks and lakeshore areas. This causes severe stress on the lake and river environment. This is exacerbated by the illegal open dumping of waste in spite of the passage of the Ecological Solid Waste Management Act.

**Decline in natural resources of the watershed.** Rapid denudation of forest areas and indiscriminate land conversion aggravate the problem of soil erosion and siltation. The lake has become shallower from an average of 3 meters to 2.5 meters. Flash floods and mud slides have become frequent in recent times. Moreover, illegal fishing practices is causing decline in fishery production. Add to this, biological pollution due to an alarming population of Janitor Fish, *Hypostomus plecostomus*, has been observed in the lake and tributary rivers.

**Weak watershed-based environmental planning and implementation at the local levels.** There is basically lack of structures and capacities through which micro-watershed level environmental issues could be addressed beyond the political boundaries of local government units.

## **4. Sustainable Development – the Way Forward**

LLDA has introduced a number of measures in terms of regulation and enforcement, conflict resolution measures, regulatory tools and market-based instruments, institutional arrangements and networking/ partnerships.

For the last 36 years, gains have been achieved to address declining water quality from its Shoreland Management Program, Environmental User Fee System, Fishery Zoning and Management Plan, River Rehabilitation Program, among the key interventions anchored upon IWRM approach. These were presented during the first General Meeting of the NARBO as well as during the various training, seminars/workshops conducted by the Network since 2004.

### **Laguna de Bay Institutional Strengthening and Community Participation Project (LISCOP)**

In April 2004, the LLDA started to implement the LISCOP Project. It aims to improve the overall environmental quality in the region and ensure effective development and environmental governance to sustainably manage Laguna de Bay and its watershed. Consistent with the goals of IWRM, this is carried out through Co-managed Investments for Watershed Development (Component 1) and Strengthening Institutions and Instruments (Component 2). LLDA through World Bank financing supports demand-driven, Local Government-led environmental enhancement sub-projects. Joint stewardship of sub-projects capacitate stakeholders in protecting the lake and its watershed. At the outset, the LLDA employs a micro-watershed focused, participatory and structured environmental action planning process to collectively identify and prioritize watershed interventions.

Stakeholder empowerment is the goal of Component 2 given the need to strengthen the LLDA itself as an apex environmental agency in the Region and engage stakeholders in watershed protection and conservation. Further, this is also where the regulatory tools and economic-instruments of the LLDA will be enhanced and expanded: added pollutant parameters, and EUF for households under the Environmental User Fee System; application of water quality trading; Public disclosure Program, upgrading permitting, monitoring and enforcement capabilities, application of Decision Support System and development of Shoreland/watershed Information System.

Parallel with LISCOP, the LLDA is working out development of Clean Development Mechanism projects and will be financing small-scale carbon emission reducing environmental sub-projects through the World Bank/ Japan-funded Laguna de Bay Community Carbon Finance Project. This involves carbon trading through the Community Development Carbon Fund and Biocarbon Fund of the World Bank.

## **6. Infrastructure Policies**

In view of the lack of investments in environmental infrastructures among LGUs and other watershed users, LLDA has introduced mechanisms so that revenues from regulatory fees are shared with stakeholders, especially LGUs. This has become a window of opportunity to leverage with them and encourage them to rechannel such funds or portions thereof to infrastructures for watershed conservation and protection.

In the future, LLDA intends to bring private sector participation in medium to large-scale infrastructure investments through innovative financing schemes.

## **7. Summary and Conclusion**

The gains that LLDA achieved in its over 30 years of experience in IWRM of the Laguna de Bay Region have shown that more needs to be done. But given the trends and scenario in the next 25 years without additional interventions, the status of water quality will further deteriorate.

In the next 5 to 20 years, the LLDA needs to act on at least three fronts: reduce pollution load and enhance environmental compliance; strengthen institutions and increase stakeholder awareness and their engagement in lake and watershed management.