Policy Brief

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Sustainable Development and Management of Manila Bay: A Focus on Water Quality

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Multiple uses of Manila Bay and its resources

Summary of Use Values for Manila Bay (more than Php 8 Billion/Year)

Reference: Initial Valuation of Selected Uses and Habitats and Damage Assessment of Manila Bay (2005).

Manila Bay: What is the Value?

Manila Bay is an important historical, cultural and economic resource of the Philippines. Around 30 percent of the country's population resides in the Manila Bay watershed area, and contributes as much as 52.5 percent of the national GDP.

An economic valuation study (2005) of the uses of Manila Bay's resources (i.e., fisheries, aquaculture, tourism and shipping), as well as the benefits derived from key habitats (i.e., mangroves, mudflats and coral reefs), revealed a total value of more than PhP8 billion per year. This amount represents a partial assessment of the total economic value of Manila Bay. The actual total economic value is, to all accounts, larger.

Such information provides assurance that the Bay is a valuable resource that must be protected and managed sustainably. It is also a warning of what could be lost if concerted actions are not taken. An initial valuation of damages to the ecosystems of Manila Bay, and the resulting social and economic impacts, also completed in the 2005 study, were of the order of PhP4 billion per year, about half of the total use value, primarily as a consequence of human activities in the coastal and watershed areas.

Major environmental problems identified in Manila Bay include: deterioration of water quality; coastal erosion and siltation; overexploitation of fishery resources; degradation of habitats; and loss of biodiversity. The health of Manila Bay is significantly affected by the rivers that discharge into it. Most of the pollution is due to land-based human activities, including the discharge of municipal, industrial and agricultural wastes, land runoff and atmospheric deposition. About 21 percent of the organic pollution load to Manila Bay comes from the Pasig River basin, with 70 percent of this load derived from households.

The poor water quality of the rivers can be attributed to the inadequacy of existing sewerage systems in the Metro Manila area and untreated wastewater discharged from domestic, agricultural, commercial and industrial sources in the watershed areas that ultimately drain into Manila Bay.

The adverse impacts of poor water quality are evident, affecting public health, the sustainable supply of natural goods and services, economic development, and employment. It is further evident that the poor, a substantial number of whom live in the coastal areas and along the rivers in the Manila Bay region, suffer the most as a consequence of pollution, destruction and degradation of natural resources, and contamination of drinking water and food supply.

Summary of Valued Damages for Manila Bay

DAMAGES	Value
1. Morbidity Costs of Water Pollution (income loss due to diarrhea, typhoid, hepatitis and poliomyelitis)	15,751, 134
2. Mortality Costs of Water Pollution (income loss arising from premature death due to water-borne diseases)	309,475,860
3. Over Extraction of Ground Water	
a. Mortality Costs of Salt Water Intrusion (associated with renal diseases)	81,253,334
b. Decline in the Value of Irrigation Water (effect of high salt content of irrigation water on agricultural productivity)	365,379
4. Mangrove Loss (yearly depreciation from 1995-2005)	18,588,244
5. Harmful Algal Bloom/ PSP (i.e., Red Tide incidents)	
a. Morbidity Costs due to PSP-related illnesses in 1988-1998	1,935,397
b. Morbidity Costs due to PSP-related deaths in 1988-1998	884,599
c. Loss in Exports (losses of Ameibi and fresh shrimp exports from 1988-1998)	1,614,319,043
d. Government Costs (emergency fund released during 1992 Red Tide incident)	15,000,000
e. Loss in Income of Fishermen (during 1992 Red Tide incident)	1,920,000,000
TOTAL ANNUAL AVERAGE	PhP 4 Billion

What are the major concerns regarding water quality in Manila Bay?

The Manila Bay Refined Risk Assessment (MB-RRA) was completed in 2004 by a team of scientists from government agencies and research institutions.

The study concluded that the following parameters were of priority concern across the entire Manila Bay:

1. Nutrients — Too much of a good thing!

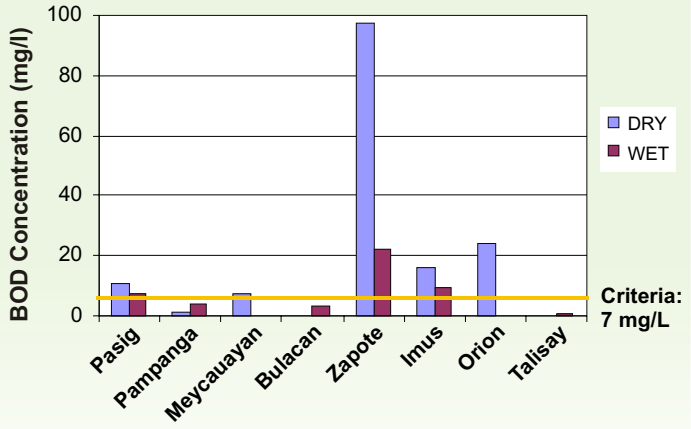
Phosphorus and nitrogen are key elements necessary for the growth of marine plants and animals. They are taken up by plants directly from the water. However, if there is an excessive amount of nutrients, algae and aquatic plants will grow wildly (i.e., algal blooms), block sunlight and use up large amounts of oxygen when they die and decompose. Without sunlight, underwater grasses and other habitats for aquatic life cannot grow. Without oxygen, fish and other aquatic animals cannot survive. As underwater habitats die off, aquatic populations decline and larger fish have fewer food sources. Each small part of the Bay ecosystem is connected. If one part is out of balance, the entire system suffers.

In Manila Bay, the nutrient phosphate is considered a significant environmental stressor. **Phosphate in the water column in all areas of the Bay exceeded recognized marine water quality criteria for a healthy ecosystem of 0.015 mg/L by almost twofold. The highest phosphate levels were found near Manila.**

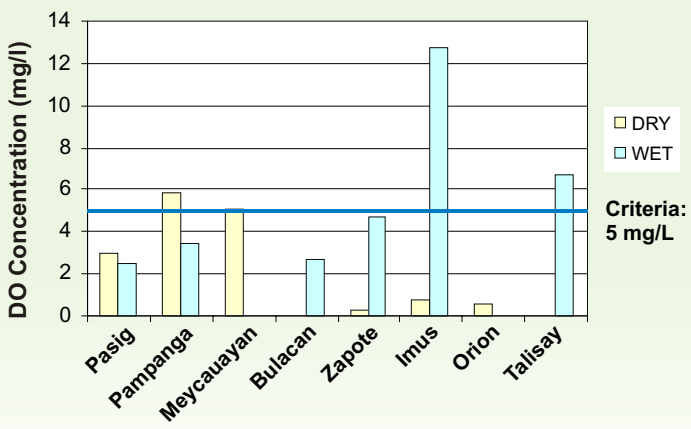
The source of phosphate includes untreated or partially-treated domestic sewage, which contains phosphate-rich detergents, as well as runoff from agricultural land, urban areas and green areas (i.e., fertilizer residues).

Reduction in the levels of phosphate is a priority concern in restoring and conserving ecosystems within Manila Bay. Finding innovative ways to stem the tide of phosphates and other pollutants entering into the Bay is a challenge that requires the participation and

BOD Concentrations in Major Rivers Draining into Manila Bay



DO Concentrations in Major Rivers Draining into Manila Bay



*For **BOD, values above 7 mg/L** fail the criteria; for **DO, values below 5 mg/L** fail the criteria*

cooperation of government, industry, the private sector and the general public, including:

- production and utilization of phosphate-free detergents
- wastewater treatment plant construction/upgrades including biological nutrient removal — the process whereby nutrients are removed from wastewater in addition to the organic content
- elimination of direct discharges of household sewage and septic tank effluents to surface drains, esteros, rivers and coastal waters
- nutrient management in the agricultural sector, including best management practices in the use of commercial fertilizers, and in the handling, storage, transport and utilization of animal waste, compost and other materials as fertilizer on croplands
- nutrient management in the aquaculture sector, including best management practices in the handling and utilization of feedstock in aquaculture areas
- erosion and sediment controls in areas under development
- stormwater controls in urban areas

2. Dissolved oxygen — Fish need to breathe too!

Like humans, aquatic organisms in Manila Bay need oxygen to survive — from the worms that inhabit its muddy bottom, to the fish and shellfish that swim and live in the Bay's waters.

Scientists believe that a dissolved oxygen (DO) concentration of 5.0 mg/L or greater allows the Bay's aquatic resources to thrive. However, DO needs vary from species to species. As DO levels fall below 5 mg/L, living conditions for many of the Bay's inhabitants become increasingly stressful. Although some species are more tolerant than others, at times DO levels in Manila Bay can decrease to the point where fish cannot survive and fish kills result.

DO levels fluctuate throughout the year in Manila Bay's waters. In fact, this fluctuation is normal in a healthy ecosystem. However, due to human impacts, the variations in DO levels have been thrown out of balance, and conditions in Manila Bay can sometimes be harmful to the Bay's living resources.

Results from the MB-RRA (2004) indicated that levels of DO at the surface are at or better than the 5 mg/L level, while more than 50 percent of the data for DO at the bottom layer of the water column ranged from less than 1 mg/L to 3 mg/L. This is not good news for the many fish and shellfish that live and feed near the sediment-water interface of the Bay.

The main cause of reduced DO is the oxygen demand from the decomposition of organic materials in the Bay. Organics come from continuous discharges of untreated or partially treated sewage and industrial wastes, illegal dumping of septic tank sludge, tank-cleaning or operational discharges from ships, urban and rural land runoff, and algae blooms (see discussion on nutrients).

Controlling organic loadings to the Manila Bay means preventing and managing the generation and disposal of organic wastes. This entails putting in place adequate sewage treatment and disposal facilities, eliminating the uncontrolled disposal of septic tank sludges, reducing/recycling organic byproducts from industrial processes, controlling discharges from ships, treating industrial and commercial wastewaters, improving erosion and sediment control measures and controlling stormwater runoff from urban areas. Solutions should be developed and applied, which factor in double benefits to the Manila Bay ecosystem, i.e., reduction of both nutrient and organic loadings to the Bay's waters.

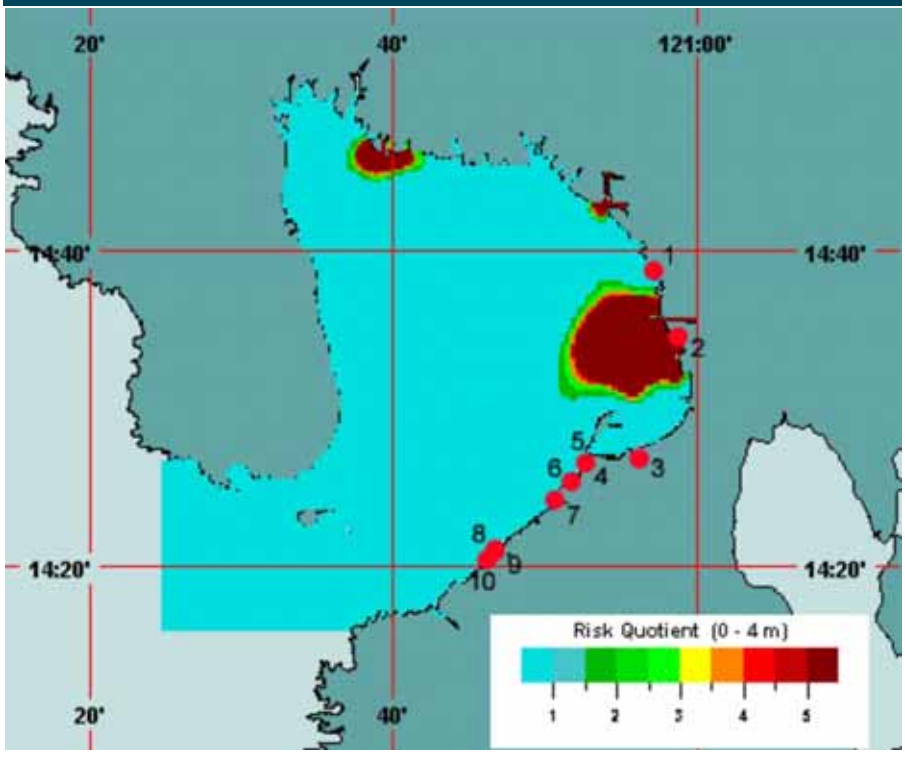
Coastal cleanup with students from the Polytechnic University of the Philippines, DENR, Manila Bay Environmental Management Project, PEMSEA, Philippine Coast Guard Auxiliary 106th Squadron, Manila Bay Yacht Club, Galing Pinoy Movement, Rotary Club of Intramuros, Philippine Information Agency and the City of Manila.

3. Coliform bacteria — The good news–bad news messengers!

Coliform bacteria live in soil, water and the digestive tracts of animals, including humans. Fecal coliform bacteria, which belong to this group, are present in large numbers in the feces and intestinal tracts of humans and other warm-blooded animals, and enter water bodies via discharges of untreated or partially treated sewage and animal waste.

Fecal coliforms by themselves will not usually make a person sick. They are referred to as indicator organisms. They are a means by which scientists determine if the water is being contaminated by sewage. Sewage contains bacteria, viruses and other organisms (collectively referred to as pathogens) that can cause disease in humans.

Fecal Coliform Dispersion Model, Manila Bay (PEMSEA)



Drinking, swimming or consuming fish and shellfish from waters with high levels of coliform and fecal coliform bacteria increases the risk of developing illness from pathogens that enter the body through the nose, ears, mouth or cuts in the skin. Diseases and illnesses that can be contracted in water contaminated with sewage or animal waste range from eye and ear infections to typhoid fever, hepatitis, gastroenteritis and dysentery.

Scientists have defined acceptable levels of coliform and fecal coliform in freshwater and marine waters — the rationale being that below certain concentrations of coliform, the likelihood of getting sick is reduced. For swimming in the Bay, levels have been identified as 1000 MPN/100 mL and 200 MPN/100 mL for total and fecal coliforms, respectively. For non-contact recreation (e.g., boating), the acceptable total coliform level has been identified as 5,000 MPN/100 mL.

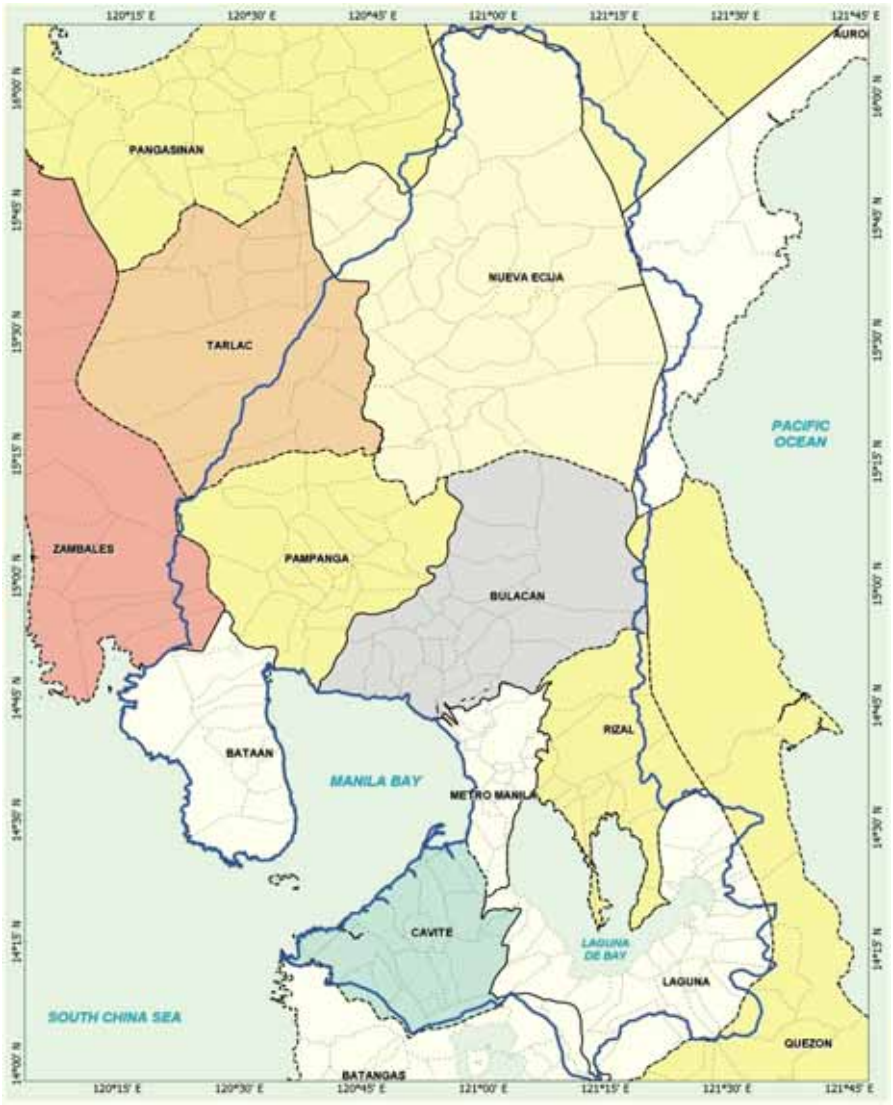
From the MB-RRA (2004), **the fecal coliform measurements in all stations at the eastern part of the Bay exceeded the criteria for swimming by almost 900 times. The total coliform measurements in the same stations exceeded the criteria for non-contact recreation by almost 150 times**.

In shellfish-growing areas (i.e., oyster- and mussel-growing areas), **fecal coliform in shellfish collected from Bulacan, Bacoor, Kawit, Naic, and Parañaque exceeded the European Union guideline of 300 MPN/100g shellfish by 1.3 to 2,667 times (52 times, on average)**. In the Philippines, water quality criteria for fecal coliform levels in areas used for commercial shellfish propagation and harvesting is stated as "nil" (i.e., extremely low value and not detectable by existing equipment). Based on the results of MB-RRA (2004), **it is highly unlikely that shellfish-growing areas are able to meet the designated water quality criterion**.

The high total coliform and fecal coliform levels in rivers and coastal waters of Manila Bay can be attributed to the voluminous sewage and domestic wastes being discharged directly to the environment from households, hospitals and other institutions, commercial facilities and industrial establishments. Septic tanks are not effective in reducing or destroying pathogens.

The development and implementation of adequate sewage treatment and disposal practices is required in order to address this hazard.

Manila Bay and its Watershed Area



More recent measurements produced during an interagency environmental monitoring program for Manila Bay (2004–2005) have confirmed that:

- Phosphate concentrations in the Bay waters showed some improvement, although these data should be treated with caution, considering that it is a single data set taken during the dry season when contaminant concentrations are generally lower;
- Fecal coliform levels in the eastern side of the Bay failed to meet the 'swimmable' water criteria; stations at the western side occasionally also failed the criteria although values were much lower than those at the eastern side;
- Total coliform in shellfish tissue exceeded the European Union standard of 60 MPN/100g shellfish
- Bay-wide, only DO concentrations from surface to 5 m depth passed the criteria of 5 mg/L; near bottom and bottom DO concentrations were generally below 5 mg/L. Values approaching zero were observed at two monitoring stations.

Setting the stage for National Policy

A number of studies across East Asian countries conducted in recent years have generally pointed to policy and institutional overlaps as barriers to effective implementation of environmental laws and environmental investments. More than the overlaps themselves, it is the lack of adequate coordination mechanisms to better harmonize interrelated mandates and functions that cause operational problems. For example, different agencies and levels of government have their own 'master plan' for development and management of coastal areas or resources, without realizing the linkages and impacts across sectors. Furthermore, investments in sewerage and sanitation facilities and services (or lack thereof) are focused primarily on short-term economic factors, rather than the value-for-money analysis of social, environmental and economic conditions that accrue over the longer term from investments in environmental infrastructure.

The Manila Bay Environmental Management Project (2000–2006) has taken initial steps to strengthen interagency and multisectoral partnership approaches to sustainable development.

The following are key recommendations for action that may serve as a guide in the formulation of policies and programs to enhance the implementation of the Manila Bay Coastal Strategy, as well as to limit redundancy, improve efficiency, and enhance communication and support among sectoral stakeholders in the Bay region:

1. **Establishing an interagency, multi-sectoral mechanism to oversee the implementation of the Manila Bay Coastal Strategy, to consolidate existing sectoral plans into an integrated land and sea-use master plan for Manila Bay and its surrounding watershed areas, including the Laguna de Bay-Pasig River-Manila Bay watershed, and to facilitate investments in environmental infrastructure.**

   Manila Bay has not been officially classified, but supports multiple uses that range from Class SA (e.g., propagation, survival and harvesting of shellfish for commercial purposes) to Class SD (e.g., navigation and industrial cooling water). Zoning of the Bay and its watershed areas and subsequent classification should be among the immediate priority actions, along with identifying and managing the sources and levels of pollutants.

2. **Designating Manila Bay and all water bodies within the Manila Bay watershed as a non-attainment area for phosphate, dissolved oxygen and fecal coliform, under the legal framework of the Clean Water Act.**

   This action would kick-start a concerted effort with the tools provided by the Clean Water Act to plan and implement measures to meet the water quality requirements in accordance with the designated uses of the Bay and associated water bodies.

3. **Implementing action plans formulated under the Manila Bay Coastal Strategy**, as part of the economic and social development plans and programs of relevant government agencies, including the National Economic Development Authority (NEDA), Department of Environment and Natural Resources (DENR), Department of the Interior and Local Government (DILG), Department of Agriculture (DA), Department of Tourism (DOT), Department of Transportation and Communication (DOTC), Department of Public Works and Highways (DPWH), Department of Health (DOH), Metropolitan Manila Development Authority (MMDA) and Metropolitan Waterworks and Sewerage System (MWSS), as well as local governments.

4. **Supporting integrated coastal management (ICM) programs among local governments**, by extending the existing coverage from ongoing ICM programs in the Provinces of Bataan and Cavite, to the entire coastline of Manila Bay.

   Priority issues in the first cycle of ICM programs could be geared toward improved waste management and strengthen the capacities and commitments of the local governments and the private sector for investments in environmental infrastructure.

Region	Population	Number of Households	Population Density (persons per km^2)	Population Growth Rate (%) 1995-2000
National Capital Region (NCR)	9,932,560	2,132,989	15,617	1.06
Region 3*	7,403,143	1,281,932	441	3.2
Region 4*	5,736,251	1,203,343	251	3.72
TOTAL	23,071,854	4,618,264	1,357	

* includes only provinces within the Manila Bay area
Source: National Statistics Office (2001).

5. **Demonstrating innovative approaches to reversing trends in water quality deterioration in priority locations of the Manila Bay.**

   Working in partnership with concerned national agencies, local governments, the private sector, investors, donors, and local communities, initiatives could focus on inventive measures to solving pollution problems of a local nature, which ultimately impact on Manila Bay. The selected projects would serve as working models for national agencies, financial institutions, local governments and the private sector, while providing communities with affordable and sustainable facilities and services.

6. **Monitoring, evaluating and reporting the progress and effectiveness of programs and activities related to the implementation of the Manila Bay Coastal Strategy**, with regard to agreed targets, schedules and indicators.

   Results could be reported during a Manila Bay Summit, an annual or biennial event focused on sharing knowledge and experience on changes and trends observed in the ecosystem, and serving as a venue for renewing commitments among government and non-government partners to the shared vision of the Manila Bay Coastal Strategy.

7. **Implementing public awareness and education programs aimed at changing attitudes and behavior toward the environment, and to Manila Bay in particular**, fostering ownership and participation among communities, corporate and business sectors, scientific institutions, people's organizations and individuals to change the future of the Bay.

Confronting the Challenges in Manila Bay

While important advances have been made over the past five years with the implementation of the Manila Bay Environmental Management Project, in understanding the Bay and formulating pollution reduction and restoration programs, the real work is just beginning. The population in the Manila Bay watershed grows by 300,000 to 400,000 persons each year. Difficult decisions should be faced now, not later. Governments at all levels need to decide on how to stem the flow of nutrients and other pollutants into the Bay as their populations grow and the demand for economic development, housing and infrastructure continues to rise.

The Manila Bay watershed is a complex, sensitive and dynamic ecosystem. As a result it is impossible to define the current state of the Bay in short, simple terms. No single parameter tells the whole story. But it is evident that there is a need to change the current situation in Manila Bay…and that means starting somewhere. Nutrients, DO and fecal coliform contamination are currently the most significant indicators of the threats to the Manila Bay ecosystem, including the people who reside in, work in or visit the area. Understanding and realizing the full effects of management actions addressing these three parameters, and others, will take many years. A dedicated, long-term partnership among government and non-government stakeholders needs to be realized if this challenge is to be met.

For comments and suggestions, please contact:

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