EFFECTS AND ECONOMIC LOSSES

EFFECTS

Untreated wastewater threatens the health of people and the environment. Unsightly color, reduced clarity, and obnoxious odor of the receiving waters also make it unfit for recreation and other productive uses.

Effects On Human Health

Untreated wastewater discharges affect human health through the spread of disease-causing bacteria and viruses. Some known examples of diseases that may be spread through wastewater discharge are gastro-enteritis, diarrhea, typhoid, cholera, dysentery, hepatitis, and, recently, Severe Acute Respiratory Syndrome (SARS) (see Box 8).

Effects On Aquatic Ecosystem

As organic wastes are added into the receiving waters, the bacteria reproduce rapidly and may use the entire supply of oxygen, leading to the death of fish and other living organisms. When there are excessive nutrients such as nitrogen and phosphorus, aquatic plants and algae proliferate triggering euthrophication, especially in closed bodies of water. Waste discharges may also contain toxic substances such as lead, mercury, cadmium, and chromium or cyanide, which may affect the use of the receiving water for domestic use or for aquatic life. In addition, paralytic shellfish poisoning occurs during the "red tide" phenomenon when there are toxic phytoplankton blooms (Box 2).

Effects On Aesthetics

Large amounts of solids from inadequately treated domestic and other wastewater containing organic material accumulate on the banks of the receiving waters, settle at the bottom to form sludge deposits, or float on the surface to form scum. Sludge deposits and scum are not only unsightly but may also cause oxygen depletion and are sources of foul odors and gases.

When the DO level of the receiving waters drops to zero due to aerobic bacteria activity, anaerobic bacteria take over and decompose the organic load by producing odorous gases and methane.

ECONOMIC LOSSES

Adverse effects of water pollution lead to economic losses that could be avoided. Studies and research show that improving water quality results in improved health, agricultural productivity, and high-quality tourism. However, not all economic losses or benefits can be quantified.

Box 8 SARS Outbreak in Hong Kong: A Case of Sewage Contamination

In March 2003, an outbreak of an unknown disease, later identified as Severe Acute Respiratory Syndrome (SARS), captured the attention of the world. In less than a month, there were 321 cases among residents of the Amoy Gardens housing estate block in Hong Kong.

The findings of the Government's investigation indicated that the outbreak was likely due to a combination of factors, including contamination and transmission of a virus via the sewage system. Laboratory studies and scientific evidence have shown that many SARS-infected patients excrete the corona virus in their feces, where it may survive for longer periods in the presence of organic materials.

In the case of the Amoy outbreak, the bathroom floor drains provided a way in which the residents came into contact with the virus. Small droplets, containing highly infectious virus from contaminated sewage, formed and were on the bathroom floor due to improper functioning of the drainage outlets and cracked sewer vent pipes.

Although the outbreak has been contained, economic losses in the retail sector, airlines, hotels and restaurants ranged from an estimated HK$33 billion to HK$46 billion or PhP235 billion to PhP328 billion (at PhP7.12=HK$1).

Sources: http://www.info.gov.hk *and* http://www.mft.govt.nz.

Costs to Health

Improved health of the population is a critical factor in high productivity. Keeping the workforce and society healthy would eliminate income losses due to sickness and medical expenses. One of the most prevalent causes of health decline of a population is contaminated drinking water.

Estimates of water-borne diseases with reported cases of diarrhea, cholera, typhoid and paratyphoid, and hepatitis A were made by DOH. More than 500,000 morbidity cases and 4,200 mortality cases are very significant (see Table 9). Avoidable health costs due to losses in direct income and medical expenses for in-patients and outpatients are estimated at PhP 3.3 billion in a year (Tables 9 and 10; GDP was used to estimate per capita income).

Costs to Fishery Production

When water is polluted, fish and other aquatic resources can perish, which leads to a decline in fisheries production. Erosion from degraded uplands and pollution from silt and sedimentation, as well as untreated sewerage, cause productivity losses in fisheries dependent on coral reefs. The ENRAP report showed a decline in yields of municipal and commercial fisheries, due to sedimentation and silt pollution, by 30 and 5 percent, respectively[13]. Other causes of fish habitat destruction include dynamite fishing, use of cyanide and "muro-ami", etc.

Commercial fishing grounds are now located beyond 15 km from shore. Municipal fishing waters are within 15 km from the shore but local governments may allow commercial fishing in municipal waters. Although production is increasing, the annual rate of increase is declining over time. The value of fisheries production would have been higher than the present levels if water pollution had been contained. Silt and sedimentation are major causes for losses in fishery production.

The Philippine economy loses an average of PhP 17 billion annually due to the degradation of the fisheries environment (see Tables 11 and 12).

Table 9 Direct Income Losses

Water-Related Diseases	Morbidity Cases (15-65 years old) 1/	Mortality Cases (15-65 years old) 1/	Losses in GDP (PhP million)
Diarrhea	512,527	2,978	1,649.23
Cholera	179	-	0.04
Typhoid and Paratyphoid	7,710	663	348.53
Hepatitis A	-	571	296.01
Total			**2,293.81**

1/ Dept. of Health, 2000.
GDP per annum/ capita (2000 prices): PhP 43,167 NEDA, 2000.
GDP per day/ capita (2000 prices): PhP 69 NEDA, 2000.
Morbidity cases: 10 days for typhoid and 3 days for other water-borne diseases
Final Report, First Stage Priority Projects for Sanitation and Sewerage, Gen. Santos City, Philippines, DMJM International, December 1995.
Mortality cases: income loss to economy estimated at 12 years.

[13] DENR-USAID, ENRAP-Phase II, 1994.

Table 10 Medical Expenses and Hospitalization Costs

Particulars	Diarrheal Diseases	Typhoid Fever	Total
Reported Cases 1/	871,446	14,154	885,600
Medical Expenses (Out-Patient) per reported case 2/	632	-	632
Medical Expenses (Out-Patient) (PhP million)	440	-	440
Cost of Hospitalization per reported case (In-Patient) 2/	3,284	12,436	15,720
Cost of Hospitalization (In-Patient) (PhP million)	572	35	607
Total Costs (PhP million)3/	**1,012**	**35**	**1,047**

1/ Dept. of Health, 2000. Diarrheal disease include Enteritis and others.
2/ Final Report, First Stage Priority Projects for Sanitation and Sewerage, Gen.Santos City, Philippines, DMJM International, December 1995.
3/ Assumptions used in the Final Report of 20% hospitalized and 80% mild cases/ non-hospitalized were adopted. Estimates in constant 2000 prices.

Table 11 Economic Cost to Municipal Fishery Production, 1997-2004

Year	Prod'n (in MT) 1/	Change In Prod'n (%)	change (%)	Ave. Unit Prod'n Value P/MT 1/	Prod'n Value (PhP B)	Losses (PhPB) 1/
1997	924,466	-	-	29,631	27.4	11.7
1998	891,146	-3.6	-	32,504	29.0	12.4
1999	924,693	3.8	204	33,561	31.0	13.3
2000	945,945	2.3	-39	34,459	32.6	14.0
2001	969,535	2.5	9	35,297	34.2	4.7
2002	988,938	2.0	-20	36,432	36.0	15.4
2003	998,665	1.0	-51	37,807	37.8	16.2
2004	1,015,202	1.7	68	38,895	39.5	17.0
Ave.	924,466	1.4	-	34,298	31.7	14.7

Source: BFAR, Philippine Fisheries Profile, 2002.

Table 12 Cost to Commercial Fishery Production, 1997-2004

Yr	Prod'n (in MT) 1/	Change In Prod'n (%)	Direction of change (%)	Ave. Unit Prod'n Value P/MT 1/	Prod'n Value (PhP B)	Losses (PhP B) 2/
1997	884,651	-	-	29,317	25.9	1.4
1998	940,533	6.3		31,617	29.7	1.6
1999	948,754	0.9	-86	33,984	32.2	1.7
2000	946,485	-0.2	-127	35,795	33.9	1.8
2001	976,539	3.2	1428	36,956	36.1	1.9
2002	1,041,360	6.6	109	37,366	38.9	2.0
2003	1,045,316	0.4	-94	39,563	41.4	2.2
2004	1,070,725	2.4	540	40,908	43.8	2.3
Ave.	956,387	2.8		34,295	32.8	2.0

1/ BFAR, Philippine Fisheries Profile, 2002.
2/ Losses: due to siltation and sedimentation. Municipal: 30%; Commercial: 5%.

Costs to Tourism

Tourism increases the country's income receipts, generates employment, and creates business opportunities. A clean and healthy environment is a prerequisite to tourism. The Philippines, an archipelago, has a long coastline endowed with beautiful beaches, which are the main tourist attraction. Yet, there is more to attracting tourism than just the recreational use of beaches. Other activities that draw tourists are coral reef diving and whale watching. Good coastal zone water quality is important to the health of bathers, as well as coral reefs and other living species in the coastal waters.

The key words for Philippine tourism promotion are: crystal-clear waters free from pollution. Tourism has been generally promoted with "three S's" - sun, sea, and sand. Recently a more disturbing and possibly dangerous "S" has emerged that can make or break the tourism industry in an area - sewage. Sewage released directly into the sea, carried via rivers and gullies, or drains into groundwater from septic tanks and pit latrines, which then flows into the sea through sand and limestone, would degrade the water quality of the coastal waters[14].

In 1997, the pristine waters of Boracay Island, an international tourist destination in Region VI and the "world's most beautiful beach," experienced a 60 percent decline in occupancy rate because of the news of high levels of coliform (see Box 9).

Most islands in the Philippines are less than 50,000 hectares, which is considered by the DENR as ecologically fragile. The DOT prioritizes tourist destinations that are 50,000 hectares or less, including Bohol, Camiguin, Samal, Boracay (1,000 hectares), among others. The Boracay experience, where the negative effects of untreated sewage on the beaches caused a decline in tourism, could easily be replicated in these other equally fragile islands of the country.

Table 13 Cost to the Tourism Industry, 2001-2004

Year	Tourist (M)[1/]	Tourist Receipts (PhP B)[1/]	Employment (M)[2/]	Losses in Receipts (PhP B)	Losses in Wages (PhPB)[2/]
2001	8.7	422	4.7	5.1	2.3
2002	8.5	411	4.9	4.9	2.4
2003	9.3	451	5.3	5.4	2.6
2004	10.2	495	5.8	5.9	2.8

[1/] Sources: Department of Tourism for 2001 and 2002 data for Regions I, IV to XI and CARAGA; average growth rate of 5.8% from 1992-2002 for 2003-2004 estimates.

[2/] Phil. Statistical Yearbook, 2002 for base data (2001) and growth rate for estimates. Considered only 20% of total labor force for Regions I, IV to XI and CARAGA. Estimated at average legislated non-agricultural in daily wage rate of P183/ day Regions I, IV to XI and CARAGA.

In 2002, tourism in the Philippines reached 8.5 million visitors, generated PhP 411 million tourist receipts, and employed 4.9 million people. A study on the contribution of tourism to the economy revealed that a significant number of people are employed in tourism-related businesses. An estimated 20 percent of the total labor force (4.9 million people) and 22 percent (6.2 million people) were employed in 1994 and 1998, respectively[15].

Box 9 The Boracay Island Coliform Controversy and the Impacts of Public Disclosure

A 1997 DENR water quality monitoring report showing high levels of coliform in the waters of the Boracay Island was the basis for declaring the resort island unsafe for recreational activities. This disclosure caused a drastic drop in tourism and drew the outrage of the locals. In response, a Boracay Task Force was formed comprising congressional and local government officials, the DENR, DOT, and the private sector. The Task Force concluded that the DENR disclosure with three months data was premature because a minimum of one year of monitoring should be required. Four independent tests conducted later showed that Boracay waters were safe.

Public disclosure of beach water quality can attract attention and mobilize people. After the controversy stakeholders joined hands in cleaning Boracay and also implemented a PhP450 million project through DOT/PTA, to provide potable water, sewerage, and solid waste management.

Source: Department of Tourism, 2003.

[14] Global Coral Reef Alliance, Water Quality and Coral Reef Health in Boracay, El Nido, Isla Verde, and Balicasag, Philippines, 1997.
[15] Dept. of Tourism, Invest Tourism Brochure, 2001.

Tourist receipts and tourist-related employment were used as the bases to estimate economic losses due to polluted beach waters. The tourist receipt per visitor is estimated at PhP 45,000 (US$900), based on the DOT's figures on visitor arrivals and receipts for 2002. This is multiplied by the number of foreign and domestic travelers and overseas Filipinos who travel to Regions I, IV to XI, and CARAGA, which are all coastal tourist destinations that are promoted. The decline in occupancy rate experienced during the coliform scare in Boracay is used as the opportunity loss factor for benefits lost, multiplied by the market share of Region VI where the scare occurred.

Benefits generated from employment in tourism are estimated by multiplying the average daily wage rate of selected regional tourist destinations by 20 percent of the total labor force employed in the service sector. Pollution of beach waters was estimated as the cause of annual losses of PhP 5.3 billion from direct tourist receipts, as well as an additional PhP 2.5 billion from tourism-related activities (see Table 13).

Another way of estimating the avoidable cost to tourism is as follows: 8.5 million tourists annually at an average US$900 would generate potential revenue of US$7.65 billion. Assuming an estimated income multiplier effect of 20 percent and probable cancellation of tourists due to water pollution-related causes, losses could be approximately US $0.92 billion (12 percent of the total revenue). At PhP 51.60 per US Dollar (year 2002 exchange rate), this amounts to PhP 47 billion per year.

In summary, economic losses due to water pollution amount to an annual average of PhP 3 billion for avoidable health costs, PhP 17 billion for avoidable costs to fisheries production, and up to PhP 47 billion for avoidable losses to tourism.

Other Economic Losses

Economic losses due to damage to the environment may be quantified in terms of damage claims. Damage claims were estimated to compensate for the losses experienced by affected communities, particularly for losses in income and livelihood (see Box 10).

Economic losses to family income due to the desire for safe bottled water are not insignificant. According to the Water Quality Association of the Philippines (WQAP), almost 45 percent of people in Metro Manila (or 4.8 million people) are willing to buy bottled water. The cost for bottled water is PhP 50 for 5 gallons (or PhP 2,642 per m^3), yet the average tap water provided by MWSS is PhP 10 to 19 per m^3, which is more than 100 times cheaper[16].

At one liter of drinking water per person per day, 4.8 million people are spending about PhP 2.6 per day per capita or a total of approximately PhP 12.7 million per day (or PhP 4.6 billion per year) in Metro Manila. People are willing to pay this high cost for bottled water to ensure safe drinking water despite the drain of savings to pay for it.

Box 10 Examples of Damage Claims
Oil Spill Incident in Bolinao

On its way to deliver coal to the Sual Power Plant in 2001, the cargo vessel M/V Nol Schedar ran around on Bolinao's Pudoc reef spilling, some 10,000 liters of bunker oil in Bolinao waters. The assessment of the accident site at Pudoc reef and the sea grass beds revealed that: (a) a 90m long by 30m wide area of coral reef was damaged; (b) a 12-ha mangrove reforestation project in Brgy. Pilar with 12,000-16,000 mangrove stands of one to three years growth was heavily covered by bunker oil; (c) a pilot sea urchin grow-out culture in Victory with approximately 3,000 sea urchins was destroyed; and (d) fish pens with milkfish grow-out culture were damaged.

The Philippine Government valued damages at PhP 165 million (about US$3.2 million), which included damages to reforested areas and fishing grounds, foregone income (fishing and gleaning), and private claims. The shipping line valued the damages at PhP 442,573 (about US$9,000), which covered only foregone fishing revenues. More than two years after the incident nothing has been resolved on the suits filed by the Philippine LGU and Coast Guard against the owner.

Marinduque Island Mining Disaster

In 1996, an accident at the mining operation site of Tapian Drain Tunnel released 1.6 million cubic meters of mine tailings into the Makulapnit and Boac Rivers. (About 703,228 m^3 of tailings still remain in these rivers, of which 526,000 m^3 are deposited in the dredge channel and 177,228 m^3 are scattered throughout the river.) The incident destroyed crops, clogged irrigation waterways, damaged roads, dislodged communities, and disrupted livelihoods. Marcopper Mining Corporation (MMC) has paid PhP 61 million as damage compensation to 6,930 claimants. Yet remaining claims of PhP 41 million are still under deliberation and other claims filed from 1999-2001 are still being processed.

Sources: DENR-MGB, 2003; DENR-EMB, SEECCTA Project Report, March 2003.

[16] Source: http://wpep.org, 2002.