2.10 Philippines

1 | Country Information

Table 2.10.1 Basic indicators

Land Area (km²)		300,000 (2020)*
Total Population		104.9 million (2017)*
GDP (current USD)		376.8 billion (2019)**
GDP per capita (current USD)		3,512 (2019)**
Average Precipitation (mm/year)		2,348 (2017)***
Total Renewable Water Resources (km³)		479 (2017)***
Total Annual Freshwater Withdrawals (billion m³)		92.75 (2017)***
Annual Freshwater Withdrawals by Sector	Agriculture	73.28% (2017)***
	Industry	17.09% (2017)***
	Municipal (including domestic)	9.63% (2017)***

*Estimated (Sources: **BSP 2020, ***FAO AQUASTAT 2020)

Figure 2.10.1 Anilao River in Ormoc City, Philippines

2 | State of Water Resources

The Philippines is an archipelagic country with a tropical and monsoon climate endowed with coastal bays, rivers, lakes, and groundwater. It has abundant water resources with water availability of 5,302 m³/year/capita, which varies according to topography and season. River basins are classified according to size, by the National Water Resources Board (NWRB). Around 421 have catchment areas of over 40 km². There are 18 with areas over 1,400 km² (typologically classified as major river basins), occupying over a third (i.e., 108,923 km²) of total land area, as shown in Table 2.10.2. Owing to their significance for water sources for industry, agriculture and domestic uses, and ecological stability, the government considers protection and conservation of these rivers a high priority for overall socio-economic development and sustainability.

Table 2.10.2 Major River basins in the Philippines

Name of River Basin	Catchment Area (km²)	River Length (km)
Cagayan	25,649	505
Mindanao	23,169	373
Agusan	10,921	350
Pampanga	9,759	260
Agno	5,952	206
Abra	5,125	178
Pasig-Laguna de Bay	4,678	78
Bicol	3,771	136
Abulug	3,372	175
Tagum-Libuganon	3,064	89
Ilog-Hilabangan	1,945	124
Panay	1,843	132
Agus	1,890	36
Tagoloan	1,704	106
Davao	1,623	150
Cagayan de Oro	1,521	90
Jalaur	1,503	123
Buayan-Malungon	1,434	60
Total	**108,923**	

(Source: NWRB)

According to a report from the Bureau of Fisheries and Aquatic Resources (BFAR) of the Department of Agriculture (DA), there are 79 natural lakes in the Philippines, which are utilized for fish production. Ten of the lakes are considered as major hosts for aquaculture production, including the Laguna Lake (Laguna de Bay), which the largest inland freshwater body in the Philippines. Since the country consists of numerous islands, the marine waters cover an area of about 266,000 km², with a coastline length of 36,289 km. Around 70% of municipalities are located in coastal areas.

Surface water is the main water source for the country. Another important source of water for domestic

supply, irrigation, and industrial uses is in the form of an extensive groundwater reservoir.

3 | State of Ambient Water Quality

The rapid increase in population, urbanization, and industrial development has led to water quality degradation and deterioration. Figure 2.10.2 shows the four key sources of water pollution. Water classification or reclassification based on the water quality criteria serves as the benchmark for maintaining or improving the state of water quality management in the Philippines. In 2019, the Environmental Management Bureau (EMB) completed its classification of 898 water bodies based on the uses (such as public water supply, agricultural, aquacultural, commercial, industrial, navigational, recreational, wildlife conservation and aesthetic purposes) and water quality to be maintained (EMB 2019).

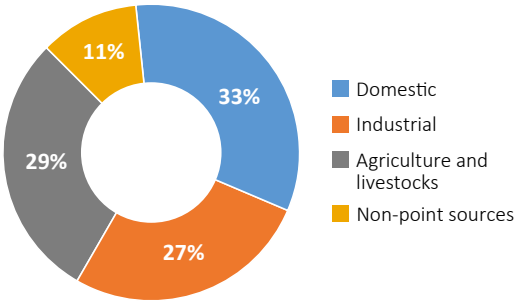

Figure 2.10.2 Major sources of water pollution in the Philippines based on BOD loading (Source: EMB 2014)

3.1 Rivers

There are 321 classified principal rivers with drainage areas of 40 km^2 or more for monitoring, accounting for 76% of the country's 421 Principal Rivers identified by NWRB (EMB 2019). The objective of monitoring principal rivers is to improve water quality and comply with the DENR Administrative Order No. 2016-08 or the Water Quality Guidelines and General Effluent Standards of 2016. Of the 421 Principal Rivers, 180 suffer from water pollution, mainly due to domestic wastes (fecal coliform) and industrial and agricultural wastes. Monthly water quality monitoring conducted in 46 Priority Rivers during 2019 found that 34 rivers were within the BOD criteria and 37 were within the DO criteria. An additional 180 rivers were monitored throughout the Philippines for DO, of which 82% were within the water quality guideline value.

With the intention of reducing floating garbage, which is noticeable in some waterways and creeks, the country implemented the Adopt-an-Estero Waterbody Program. The measures implemented include increased frequency of dredging and de-clogging activities, improved waste collection efficiency, faster flooding abatement, complementary local policies and programs and employment for some communities along the adopted waterbodies. After an extensive clean-up carried out by 29,391 individuals from partner adopters, LGUs and communities within the adopted waterbodies, 2,065.3 tons of mixed solid waste were recovered. Of the 407 esteros or waterbodies monitored in 2019, 153 exhibited significant improvement in BOD and 147 showed improvements in DO level.

3.2 Lakes and Reservoirs

Deterioration of water quality is one of the core management issues regarding the Laguna Lake (Laguna de Bay). Pollution of the lake mainly derives from domestic (77%), agriculture (11%), industry (11%) and forestry (1%) sources. Table 2.10.3 summarizes the water quality from lakes and of tributaries feeding into the Laguna Lake (Laguna de Bay). While there have been improvements in the water quality of the lake for several parameters, that of the tributaries is of Class D or Failed status.

Table 2.10.3 Observed water quality in the Laguna Lake (Laguna de Bay) and its tributaries in 2018

		Class A	Class B	Class C	Class D	Failed
DO	mg/L	>5	>5	>5	2–5	<2
	% of monitoring points	100% (43%)*			(19%)	(38%)
BOD	mg/L	<3	3–5	5–7	7–15	>15
	% of monitoring points	100% (24%)	(19%)	(11%)	(3%)	(43%)
NO_3^-	mg/L	≤7	≤7	≤7	7–15	>15
	% of monitoring points	100% (100%)				
PO_4^{3-}	mg/L	≤0.5	≤0.5	≤0.5	0.5–5	>5
	% of monitoring points	100% (47%)			(50%)	(3%)
Fecal coliform	MPN/100 ml	<1.1	1.1–100	100–200	200–400	>400
	% of monitoring points	(N/A)	100% (N/A)	(N/A)	(N/A)	(N/A)

Note: There were a total of nine monitoring points in the lake and 35 along the tributaries; *figures in parentheses refer to tributaries

(Source: LLDA 2018)

3.3 Coastal Water

In 2019 the EMB monitored 39 priority recreational waters (bathing beaches) for Fecal Coliform and found that 64% of beaches were within the water quality guideline value. Similarly, pH was monitored in 33 recreational waters, 97% of which had values within the criteria. In addition to priority bathing beaches, 174 bathing beaches were monitored for Fecal Coliform and 157 for pH, 97 of which passed the water quality criteria for Class SB waters for Fecal Coliform and 151 passed the water quality standard for pH. Table 2.10.4 shows the water quality state in the Manila Bay bathing beaches.

Table 2.10.4 Average Dissolved Oxygen (DO), Phosphate (PO_4^{3-}), and Nitrate (NO_3^-) in the Manila Bay Beaches (National Capital Region), 2018

Manila Bay Bathing Beaches Monitoring Station	DO	Phosphate (PO_4^{3-})	Nitrate (NO_3^-)
Navotas	2.59	0.2	0.33
Luneta	3.9	0.16	0.38
Cultural Center of the Philippines (CCP)	2.8	0.33	0.36
Mall of Asia (MOA)	0.9	0.51	0.33
PEATC	4.9	0.25	0.33
Water Quality Guidelines Class "SB" DAO 2016–08	*6*	*0.5*	*10*

(Source: EMB 2019)

3.4 Groundwater

The status of groundwater quality is assessed through the Philippine National Standard for Drinking Water under the Tap Watch Program of the EMB, which monitors 88 shallow wells in the country. Under the program, it was found that nearly 58% of groundwater samples in selected sampling sites were contaminated with coliform, meaning treatment is required. The increased level of salinity in groundwater is another concern, especially near coastal areas of major cities such as Metro Manila and Metro Cebu, the cause of which is assumed to be over-abstraction of groundwater.

4 | State of Wastewater Treatment

Domestic wastewater

Only 10% of domestic wastewater is treated, while only 5% of the total population is connected to a sewer network. Those not connected rely on septic tanks, pit latrines, or practice open defecation, while the vast majority use flush toilets connected to septic tanks while.

In Metro Manila, 43 sewage treatment plants (STPs) and septage treatment plants (SpTPs) serve over a million residents (around 9%) of the population. An average 9.4 million kg of BOD was removed per year over the most recent four-year period. The highest pollution load reduction was attained in 2012 with 9.5 million kg of BOD removed.

There are ongoing and planned wastewater treatment projects to treat domestic wastewater in major cities or under certain housing schemes.

Industrial wastewater

As of October 2017, there were 379 operating special economic zones in the Philippines; 261 Information Technology Parks, 74 Manufacturing Economic Zones, 22 Agro-Industrial Economic Zones, 20 Tourism Economic Zones and 2 Medical Tourism Centers. Four zones are owned by the Philippine Economic Zone Authority (PEZA) while the remaining are privately owned. The majority of manufacturing industries in the Philippines are located in the National Capital Region (30%), Region 4A- Calabarzon (17%), and Region 3- Central Luzon (11%).

Industries that are known to generate large amounts of wastewater are food and dairy manufacturing, pulp and paper, and textiles, though very little related data exists. Volumes generated by each industry depend mainly on the level of technical processing and production rates, as shown in Table 2.10.5.

Table 2.10.5 Estimated wastewater generation rates of selected industry types in the Philippines

Industry	Wastewater volume from industrial use ('process wastewater') (m^3/day)
Poultry processing plant	1,750
Meat and meat products	75–380
Mining	67,500
Pharmaceuticals manufacturing	50–200
Milk manufacturing	960
Ethanol manufacturing	3,100
Sugarcane milling	100,000
Beverage manufacturing	13,000
Packaging	60
Food processing	500
Pineapple processing	6,540

(Source: ARCOWA 2018)

Industrial wastewater generally contains high BOD loads and other kinds of pollutants, depending on the type of manufacturing process. Table 2.10.6 shows the indicative wastewater quality of selected industry types.

Individual companies have obligations to manage their wastewater either as stand-alone entities or as part

Table 2.10.6 Indicative wastewater quality of selected industry types in the Philippines

Industry	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	Temp. (°C)	pH
Sugarcane milling	2,000–3,500	6,000	800–1,000	–	6.5–8.0
Ethanol manufacturing	60,000	110,000	6,000	48–50	4–4.5
Fish product canning	30,000	45000	10,700	25	6.5–7.5
Beverage manufacturing	900	1,500	250	25	44,147
Meat processing	1,000–1,500	2,000	250	-	7
Copper cathode	-	-	43	30.4	8.15
Swine farms	2,000–4,200	4,000–5,429	1,600–5,380	-	-
Bottling services	400	1,647.05	90	32.2	8.35
Desiccated coconut manufacturing	6,000–10,000	17,000–20,000	2,000–4,000	-	5.0–6.3
Pineapple processing	10,200	20,000	585	40–50	4.5–6.5

(Source: ARCOWA 2018)

of an industrial park. Ideally, the process wastewater and other non-domestic wastewater are pre-treated by industries before discharging the effluent into the sewerage system of the industrial park. Many industrial parks operate their own, however, these are still required to comply with pre-treatment effluent standards established by the industrial park before discharge into the centralized wastewater treatment facility (CWTF) of the park. The CWTF within the industrial park shall further treat the effluent from industries before discharging it into bodies of water or reuse for landscaping, irrigation or other purposes. Recent regulations on nutrients have been a challenge for CWTF operators as existing treatment systems are not designed to remove nutrients such as nitrates and phosphates to the levels required.

For industries not located within an industrial park, effluent must comply with the Philippine Effluent Standards, DAO 2016-08. However, some industries find managing wastewater challenging as they have to develop their own expertise to comply with effluent standards set either by the special economic zone or with general effluent standards.

Individual companies generally collect and report their wastewater volume data as required by the regulations, though there is no national database collating all these data. Individual industrial facilities, outside of special economic zones, need to acquire a wastewater discharge permit and are responsible for the quality of their discharge to surface waters. From the monitoring conducted by the EMB, rivers of the regions had “unsatisfactory ratings” for their water quality criteria. In areas of regulation, in the Manila Bay Area alone, 5,228 out of 10,168 industries were served with Notices of Violation (NOV) for failure to acquire permits to discharge treated wastewater.

The wastewater charge formula was established in 2005 (DAO 2005-10) on the basis of payment to the government for discharging wastewater into water bodies in all water management areas. The concept behind this was to incentivize those who discharge pollutants to reduce their pollution loads, such as through improved production processes and investment in pollution control technologies. DENR also issues discharge permits for wastewater, which include the allowable values of both quantity and quality of effluents, compliance schedule and monitoring requirements.

5 | Frameworks for Water Environmental Management

5.1 Legislation

The Philippines has an extensive body of water-related legislation that provides the legal basis for policies and regulations concerning water resource management of the country. The Philippine Clean Water Act of 2004 (Republic Act No. 9275 (RA 9275)) provides a comprehensive and Integrated strategy to prevent and minimize pollution through a multi-sectoral and participatory approach involving all the stakeholders. The Act aims to protect the country's water bodies from pollution from land-based sources (industries and commercial establishments, agriculture, and community/household activities). The Act applies to water quality management in all water bodies, abatement and control of pollution from land-based sources, and enforcement of water quality standards, regulations and penalties.

Under Section 5 of RA 9275, Department of Environment and Natural Resources (DENR) in coordination with the National Water Resources Board (NWRB) designates Water Quality Management Areas (WQMA) using appropriate physiographic units such as

watershed, river basins or water resources regions. As such, WQMA have similar hydrological, hydrogeological, meteorological or geographic conditions which affect the physiochemical, biological and bacteriological reactions and diffusions of pollutants in the water bodies or otherwise share common interest or face similar development programs, prospects or problems. Governing boards, composed of relevant stakeholders in each WQMA and chaired by DENR regional offices, are responsible for the development of strategies to coordinate policies, regulations/local legislation, and other measures necessary to effectively implement the Clean Water Act.

The Water Quality Guidelines and General Effluent Standards of 2016 (DAO 2016-08) provide guidelines for the classification of water bodies in the country, determination of time trends and the evaluation of stages of deterioration/enhancement in water quality, and evaluation of the need for taking actions in preventing, controlling, or abating water pollution.

Other legislations related to water environmental conservation are the Philippines Environmental Policy (PD 1151) and the Solid Waste Management Act (RA 9003). EMB is the governmental agency responsible for water conservation and protection.

5.2 Institutional Arrangement

The lead agency for water resource management is the Department of Environment and Natural Resources (DENR). Its mandates are to formulate, integrate, coordinate, supervise, and implement all policies, plans, programs, projects and activities relative to the prevention and control of pollution as well as management and enhancement of environment. The responsibility for planning and managing water resources in the Philippines is shared among several government departments, bureaus and agencies (Table 2.10.7). In addition, local government units (LGUs) are required to provide water supply systems, communal irrigation facilities, implement social forestry and local flood control projects under the supervision and control of DENR (SEPO 2011). A number of institutions and agencies are involved in overseeing water governance at all levels.

5.3 Ambient Water Quality Standards

Ambient water quality standards

The Philippines uses its Water Quality Guidelines and General Effluent Standards (GES) of 2016 by DENR Administrative Order No. 2016-08 (DAO 2016-08) (an amendment of DAO 1990-35). DAO 2016-08 has a provision for the water classification of water bodies for the purpose of maintaining the quality of water based on beneficial usage (Table 2.10.8).

The water quality guidelines (WQG) are to be maintained for each water body classification, the parameters of which are categorized as primary or secondary. Primary parameters are the required minimum water quality parameters to be monitored for each water body. Secondary parameters are those used in baseline assessments as part of an environmental impact assessment or other water quality monitoring purposes.

Water quality monitoring framework

Regional offices of EMB conduct regular water quality monitoring throughout the country based on the parameters indicated in DAO 2016-08. From 2001 to 2016, 238 water bodies were monitored either for classification or for regular water quality monitoring, and depending on the resources, monitoring is carried out monthly or quarterly in accordance with the DENR-EMB Water Quality Monitoring manual (2009).

5.4 Effluent Standards

Effluent standards

DAO 2016-08 states that discharges from any point source shall at all times meet the effluent standards, and Section 7 of the same states that discharges from any point sources shall at all times meet the effluent standards set forth to maintain the required water quality per water body classification. The GES is to be used regardless of the industry category and volume of discharge. Effluent used for agricultural purposes shall conform to DAO 2007-26 and shall at all times meet the effluent standards.

Effluent inspection procedure

Monitoring in the industry is conducted at different levels (Table 2.10.9), and can only be carried out by the subjects needing to comply with effluent standards themselves, in principle. The documents to be submitted include monitoring reports (self-monitoring), plans, required permits (discharge permits) or other proof of compliance or implementation. Field monitoring for verification involves actual plant inspection, effluent sampling and validation of submitted reports.

Table 2.10.7 Key institutions involved in water governance in the Philippines

Name of the agency	Mandates of the agency
Department of Environment and Natural Resources (DENR)	The primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources.
National Water Resources Board (NWRB)	To administer/enforce the Water code and serve as the lead coordinator for water resources management programs.
Environmental Management Bureau (EMB)	To formulate, integrate, coordinate, supervise, and implement all policies, plans, programs, projects, and activities related to the prevention and control of pollution as well as management and enhancement of the environment.
Forest Management Bureau (FMB)	To formulate/implement policies and programs for the protection, development, occupancy management, and conservation of forest lands and watershed areas.
Department of Agriculture	
National Irrigation Administration (NIA)	To undertake water resource projects for agricultural irrigation and other purposes, such as flood control and drainage.
Bureau of Soil and Water Management (BSWM)	To formulate/implement policies and programs for the protection of existing and potential sources of soil and water for agricultural development.
Bureau of Fisheries and Aquatic Resources (BFAR)	To establish plans for the proper protection and management of the country's fisheries and aquatics resources.
Department of Health (DOH)	Administers compliance of the country's National Standard for Drinking Water Program.
Department of Interior and Local Government (DILG)	Administers implementation of the country's National Water Supply and Sanitation Program; mandated to oversee attainment of the country's SDG goal on access to safe drinking water by all.
Water Supply and Sanitation Unit	To provide capacity building programs for Local; Government Units (LGUs) in preparing local water supply and sanitation plans as well as providing information on available sector programs, and facilitating access to financing for water supply and sanitation projects.
Department of Public Works and Highways (DPWH)	Primary agency for implementing the country's national Sewerage and Septage Management.
National Economic and Development Authority (NEDA)	To coordinate the preparation of national/regional/sectorial development policies and investment programs, including those on sanitation.
National Power Corporation (NPC)	To develop and manage electric generation facilities including (but not limited to) hydroelectric dams and undertakes other activities related to watershed management.
Metro Manila Development Authority (MMDA)	Administers governance of MM area development such as infrastructure development, law enforcement of environmental laws - solid waste management, Clean Water Act, Water Code of the Philippines, Clean Air Act, etc.
Metropolitan Waterworks and Sewerage System (MWSS)	To regulate water concessionaires' rates and services standards in Metro Manila and maintain existing assets and infrastructures.
Pasig River Rehabilitation Commission (PRRC)	Coordinate and integrate, and monitor the implementation of all Government Agencies plans, and programs for the rehabilitation of Pasig river.
Laguna Lake Development Authority (LLDA)	To formulate, regulate and implement all policies, plans, programs, projects and activities related to the prevention and control of pollution as well as management and enhancement of environment in the Laguna Lake Region.
Local Water Utilities Administration (LWUA)	To promote, finance, and regulate the operation and construction of local water utilities outside Metro Manila.
Local Government Units (LGUs)	Administration/management of rivers within the jurisdiction of the LGUs and implementation of Ecological Solid Waste Management Act within its area of political and jurisdictional responsibility.

Table 2.10.8 Classification of water bodies according to intended beneficial use

Classification	Intended Beneficial Use
Class AA	Public Water Supply Class I – Intended primarily for waters having watersheds, which are uninhabited and otherwise protected, and which require only approved disinfection to meet the Philippine National Standards for Drinking Water (PNSDW)
Class A	Public Water Supply Class II – For sources of water supply requiring conventional treatment (coagulation, sedimentation, filtration and disinfection) to meet the latest PNSDW
Class B	Recreational Water Class I – Intended for primary contact recreation (bathing, swimming, skin diving, etc.)
Class C	Fishery Water for the propagation and growth of fish and other aquatic resources. Recreational Water Class II (Boating, fishing or similar activities). For agriculture, irrigation, and livestock watering)

Table 2.10.9 Monitoring of industries

Level	Responsible Person/Office	Report Requirement
Project Proponent/Company	Pollution Control Officer	Self-Monitoring Report (SMR) and/or (CMR) Compliance Monitoring Report
Multi-Partite Monitoring (MMT) or Third Party Monitoring	Team headed by the company composed of various Stakeholders (LGUs, Non-Government Organizations (NGOs) and other sectors)	Audit Report/CMR
Regulating body	EMB Central Office/EMB-Regional Offices	Compliance Evaluation Report

Measures against non-compliance

The Clean Water Act requires owners or operators of facilities that discharge regulated effluents to obtain a discharge permit, which is a legal authorization granted by the DENR to discharge wastewater. The permit specifies items such as quantity and quality of effluent, compliance schedule and monitoring requirements, and can be suspended or revoked if business entities fall out of compliance with the rules and regulations and/or permit conditions.

A number of industries and commercial establishments are still unable to comply with the effluent standards despite the availability of technology to treat wastewater. As shown in Table 2.10.10, about 54% or 4,930 of the 9,060 monitored firms nationwide were found to have violated effluent standards in 2019. There are still micro-, small and medium-sized enterprises which do not invest in facilities to treat their wastewater prior to discharge to water bodies resulting in the degradation of rivers, lakes and marine waters.

Table 2.10.10 Percentage of compliance of firms in 2018 and 2019

Details	2018	2019
Discharge permits issued	6,010	5,929
Monitored firms	9,554	9,060
Notices of violation issued	4,959	4,930
Percentage of compliance	48%	46%

(Source: EMB 2019)

Those who violate the GES are referred to the Pollution Adjudication Board (PAB) for issuance of a "Cease and Desist Order" (CDO). Upon recommendation of the PAB, anyone who commits any of the prohibited acts or violates any of the provisions of this Act and its Implementing Rules and Regulations (IRR) may be fined not less than 10,000 PHP but not more than 200,000 PHP for every day of violation. Failure to undertake clean-up operations, willfully or through gross negligence, can lead to imprisonment of not less than two but not more than four years, in addition to a fine of not less than 50,000 PHP but not more than 100,000 PHP per day of violation. In cases where such failure or refusal to clean-up results in serious injury or loss of life or irreversible water contamination, imprisonment of not less than six years (but not more than 12 years) and a fine of 500,000 PHP per day for each violation will be applied.

On the other hand, rewards are provided to individuals, private organizations and other entities from the National Water Quality Management Fund for outstanding and innovative projects, technologies, processes and techniques, and activities. Incentives for industries are also provided, such as tax and duty exemptions for industrial wastewater treatment/ collection facilities.

6 | Recent Developments in Water Environmental Management

One development is DAO 2019-15, which has designated the Boracay Island Water Quality Management and Conservation Area (WQMACA) as well as creation of its Governing Board, the objective of which is to protect and continuously improve water quality and sustain livelihood opportunities in the island. Under a clean-up initiative of Boracay Beach areas, several notices of violation (NOVs) and cease and desist orders (CDOs) have been issued to various commercial establishments in Boracay Beach areas (prime tourist destination), Province of Aklan, regarding violations of the Clean Water Act. Various establishments were also demolished, due to violations of the easement rule under the Water Code of the Philippines.

Another is DAO 2018-12, which has designated two Water Quality Management Areas and their Governing Boards, for the Upper and Lower Amburayan River System (UARS/LARS). This DAO aims to ensure water quality of the UARS and its tributaries to make it a sustainable resource for the people of the municipalities of Atok, Bakun, Buguias, Kapangan, Kibungan and Tublay and their communities. In LARS, improvement in water quality is expected to contribute to enhancement as a source of water irrigation and other agricultural uses in the Provinces of La Union and Ilocos Sur.

Regarding Manila Bay, an ongoing large-scale ground inspection/rehabilitation is underway, involving issuance of NOVs and CDOs to violating commercial establishments/hotels for failure to establish STPs/ wastewater treatment plants. Part of the clean-up activities of the bay area and its tributaries undertaken by the DENR-NCR MBSCMO under KRA 2 include Installation of trash traps at Baseco Lagoon, fabrication of two trash collector rafts with capacity of 552 kg loads, inspection of rivers and esteros, coordination meetings with concerned stakeholders, and launching of the Manila Bay Watch Bike Patrollers. Over 1.2 million kg of solid wastes were collected and removed from Manila Bay area and its tributaries.

Clean-up drives are also active in other major beach areas of prime tourist destinations in the Mimaropa region, namely: Coron, El Nido and San Vicente, in Palawan, and Puerto Galera in Oriental Mindoro, San

Jose in Occidental Mindoro; Panglao, Bohol and Siargao, Agusan Del Norte. NOVs and CDOs have been issued to various commercial establishments in violation of the Clean Water Act, and various establishments were demolished in violation of the easement rule under the Water Code of the Philippines.

7 | Challenges and Future Plans

With the foundation for sustainable water quality management already laid out, the main challenge now lies in the continuation of existing water quality management policies and programs to rehabilitate and preserve the quality of the country's water bodies, and ultimately, achieve and sustain quality of life for future generations. Weak water use regulations and fragmentation in the water agencies cause coordination issues and weak enforcement. Other challenges include maintaining water quality against drivers and pressures, such as high water demand and limited supply, indiscriminate land use and development, increasing volumes of solid wastes, pollutants, and hazardous wastes, and inadequate treatment facilities. Science-based data and information is needed for efficient and effective planning and decision making to improve water quality governance. For that, it is important to increase access to the new knowledge and technologies generated from international R&D standards.

The major responses planned or undertaken to overcome the challenges include:

- Meetings with concerned agencies to tackle issues and concerns as well as take appropriate actions
- Review, reorganize, reevaluate, and update legal and institutional framework for effective and proper handling of water management
- Study and implementation of participatory water governance model
- Improve planning and decision-making processes
- Create a cost-effective long-term plan/framework to help address issues in water management, especially in reducing long-term costs, potential increases in waste, and implications resulting from the lack of available clean water
- Conduct trainings and seminars to inform, educate and properly disseminate information regarding water management and water environment governance
- Conduct workshops on various technologies used in water resources management