

2.3 Indonesia



1 | Country Information

Table 2.3.1 Basic indicators

Land Area (km ²)	1,904,569 (2017)*	
Total Population	267.7 million (2018)**	
GDP (current USD)	970 billion (2019)**	
GDP per capita (current USD)	4,200 (2019)**	
Average Precipitation (mm/year)	2,702 (2020)***	
Total Renewable Water Resources (km ³)	2,019 (2011)	
Total Annual Freshwater Withdrawals (billion m ³)	222.6 (2019)****	
Annual Freshwater Withdrawals by Sector	Agriculture	85.2% (2017)
	Industry	4.1% (2017)
	Municipal (including domestic)	10.7% (2017)

(Source: FAO 2020, *World Atlas 2017, **World Bank 2018, ***World data atlas 2020, ****Ministry of Public Works and Housing 2019a)



Figure 2.3.1 Citarum River in Bandung, Indonesia

2 | State of Water Resources

Water resources in Indonesia account for about 6% of the world's water resources or about 21% of total water resources in the Asia-Pacific region. Total water availability is estimated at 690 billion m³/year whereas total demand is 175 billion m³/year. However, the available water is unevenly distributed spatially and temporally (Table 2.3.2).

Table 2.3.2 Spatial distribution of water availability

Island	million m ³ /year
Java	164,000
Sumatera	840,737
Sulawesi	299,218
Kalimantan	1,314,021
Bali and Nusa Tenggara	49,620
Maluku	176,726
Papua	1,062,154
Total	3,906,476

(Source: ADB 2016)

As of 2014, the total reservoir capacity was 12.6 billion m³, or 49.2 m³ per capita, which is half the capacity prior to 1945 (105.5 m³ per capita) (ADB 2016). To enhance water security, the government planned to build 49 new reservoirs with total capacity of 3 billion m³ between 2015 and 2019 (Government of Indonesia 2015).

Indonesia has almost 8,000 watersheds (*Daerah Aliran Sungai* [DAS]), which are managed in 131 river basins. Five river basins (304 DAS) cross international boundaries (Malaysia, Timor-Leste, and Papua New Guinea), 29 basins (859 DAS) cross provincial boundaries, and 37 basins are considered as having national strategic importance (ADB 2016).

3 | State of Ambient Water Quality

3.1 Rivers

There are 5,590 major watersheds in Indonesia, divided into 131 river basin territories. Status of surface water quality compliance against the national guidelines and its provincial distribution in Indonesia are shown in figures 2.3.2 and 2.3.3, respectively. The percentage of heavily polluted rivers, as defined by Class II Water Quality Criteria in Government Regulation No. 22/2021, exceeded 70% in 2016. As a result of monitoring 44 large rivers across Indonesia, it was found that only four met Class II standards throughout the year (ADB 2016). A recent research by the Indonesian Ministry of Environment and Forestry showed that at present 75% of rivers in the country are seriously polluted, 52 of which are categorized as heavily polluted, and 118 watersheds out of 450 monitored watersheds are critically polluted.

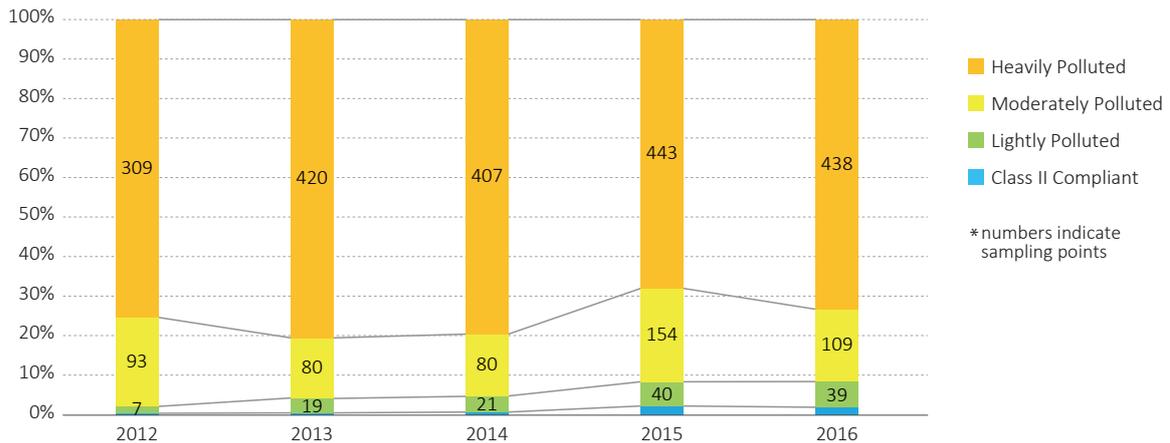


Figure 2.3.2 Status of compliance with water quality in Indonesia (Source: created by WEPA based on data from MOEF 2017)

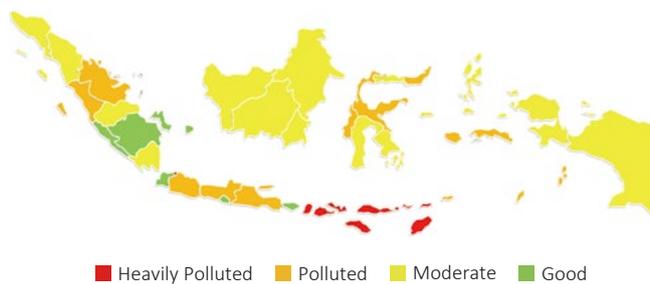


Figure 2.3.3 Provincial distribution of surface water quality (Source: ADB 2016)

Water quality data covering five key indicators for the majority of river bodies in Indonesia for 2019 is shown in Figure 2.3.4 (PUPR 2019b). It can be seen that most of the rivers are moderately to severely polluted, especially in terms of *E.coli*.

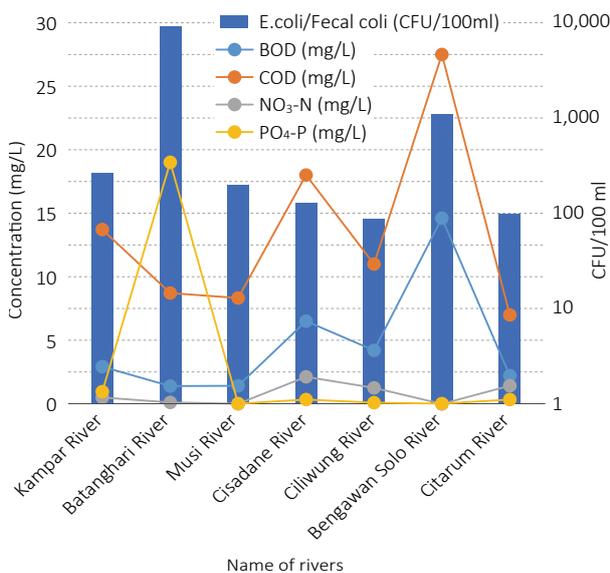


Figure 2.3.4 Water quality of major rivers in 2019 in Indonesia (Source: PUPR 2019b)

3.2 Lakes and Reservoirs

Similarly, with conditions in rivers, there is significant pressure on water quality in lakes from various sources, such as domestic activities, agriculture, livestock, forestry and industry. Water quality monitoring of 15 lakes on the government’s priority list revealed that most fell into the hyper-eutrophic category (ADB 2016).

3.3 Coastal Water

Indonesia is the largest archipelago in the world, with 13,466 islands, about 5.8 million km² of sea area and 81,000 km of coastline. Pollution threatens the Indonesian seas.

3.4 Groundwater

Groundwater is an important water source and the potential of groundwater basins is promising on several islands, with a total area of 907,615 km² and total basin capacity of about 520 billion m³/year (Table 2.3.3).

Table 2.3.3 Regional distribution of groundwater potential

Region	Number of basins	Area (km ²)	Volume (million m ³ /year)	
			Unconfined	Confined
Sumatera	65	272,843	123,528	6,551
Java and Madura	80	81,147	38,851	2,046
Kalimantan	22	181,362	67,963	1,102
Sulawesi	91	37,778	19,694	550
Bali	8	4,381	1,577	21
West Nusa Tenggara	9	9,475	1,908	107
East Nusa Tenggara	38	31,929	8,229	200
Maluku	68	2,583	11,943	1,231
Papua	40	26,287	222,524	9,098
Total	421	907,615	496,217	20,906

(Source: ADB 2016)

Indonesian Ministry of Health Regulation with Decree No. 416/1990 aimed at water quality monitoring looks for different provisions and controls which stipulates groundwater quality standards. In Jakarta, 45% of groundwater shows contamination by faecal coliform and 80% by *E. coli*. Major sources of contamination include septic tank leakage, discharge of untreated domestic wastewater, landfill leachate, and industrial effluent contamination. Saltwater intrusion due to overexploitation is common in coastal aquifers (ADB 2016).

4 | State of Wastewater Treatment

Wastewater and major pollutants

Domestic wastewater contains large amounts of chemical oxygen demand (COD), nutrients, and faecal coliform, and is the largest contributor to surface water pollution in Indonesia. Agricultural wastewater contains COD, nutrients, fertilizer such as urea and triple superphosphate, and pesticides, and is a non-point source of pollution. Industrial wastewater contains a wide variety of pollutants depending on industrial activity (e.g., Chromium (Cr) in tanning, Mercury (Hg) in illegal mining, color in textiles). The practice of using wastewater in fishponds previously was widespread but is now declining due to health concerns. Using wastewater to produce fish feed, like duckweed, offers a safer alternative (UNESCO 2017).

Domestic wastewater

In urban areas (population 110 million), about 1% of the wastewater is safely collected and treated, whereas in rural areas (population 130 million) wastewater is neither collected nor treated (ADB 2016).

Industrial wastewater

There are about 24 thousand large- or medium-scale industries and about 3.5 million small-scale industries in Indonesia, employing a total workforce of 14.8 million. Food and beverage, textile, vehicle, and petrochemical industries have all seen positive growth rates based on GDP in recent years. Industries including cement, pulp and paper (capacity over 300,000 t-pulp/year), upstream petrochemicals, industrial estates, shipyards with graving docks, explosives, and smelting are obligated to obtain an Environmental Impact Assessment (AMDAL) permit to conduct business according to the Decree of Ministry of Environment concerning Type of Business Plan/Activity Required Environmental Impact (MOE Decree No. 5/2012).

There are various frameworks to assist green industries, such as the government-based soft loan program, which supports investment in waste reduction and management. This program targets small and medium-sized enterprises (assets less than 10 billion Indonesian Rp) with maximum loans of 5 billion Indonesian Rp.

Green Industry Standards have been laid out in Law on Industrial Affairs (Law No. 3/2014). Eight industries have individual standards under this law: cement, pulp and paper, ceramic tiles, textile dyeing, milk powder, crumb rubber, ribbed smoked sheet rubber, and inorganic fertilizer.

5 | Frameworks for Water Environmental Management

5.1 Legislation

For water environmental management, there are two primary regulations: Law on Water Resources (Law No. 17/2019) and Government Regulation concerning the Management of Water Quality and Control of Water Pollution (Government Regulation No. 82/2001). The purpose of the former is holistic water resource management (both quality and quantity) in line with the SDGs, whereas the latter's is to focus on water quality management and pollution control – specifically strict implementation of water quality standards, effluent standards and TMDLs. To improve implementation of these guidelines and regulations in the field, some new elements have since been introduced through Law No. 17/2009, such as establishment of a water resource information system for more comprehensive monitoring, and licensing and empowerment for authorities engaged in water resource supervision and management.

The objective of environmental management in Indonesia is to enable environmentally sustainable development, and the basic legislative structure for water environment management is shown in Figure 2.3.5. Integral water resources management is regulated by Law No. 17/2009. The main subjects regulated in this Law on Water Resources include state control and people's rights to water; the authorities and responsibilities of the Central Government and Regional Governments in the management of water resources, water resources management, water resources utilization permits, water resources information system, empowerment and supervision, funding, rights and obligations, society participation, and coordination. Apart from that, it also regulates the provisions regarding criminal investigation and provisions for violations of the provisions of this Law.

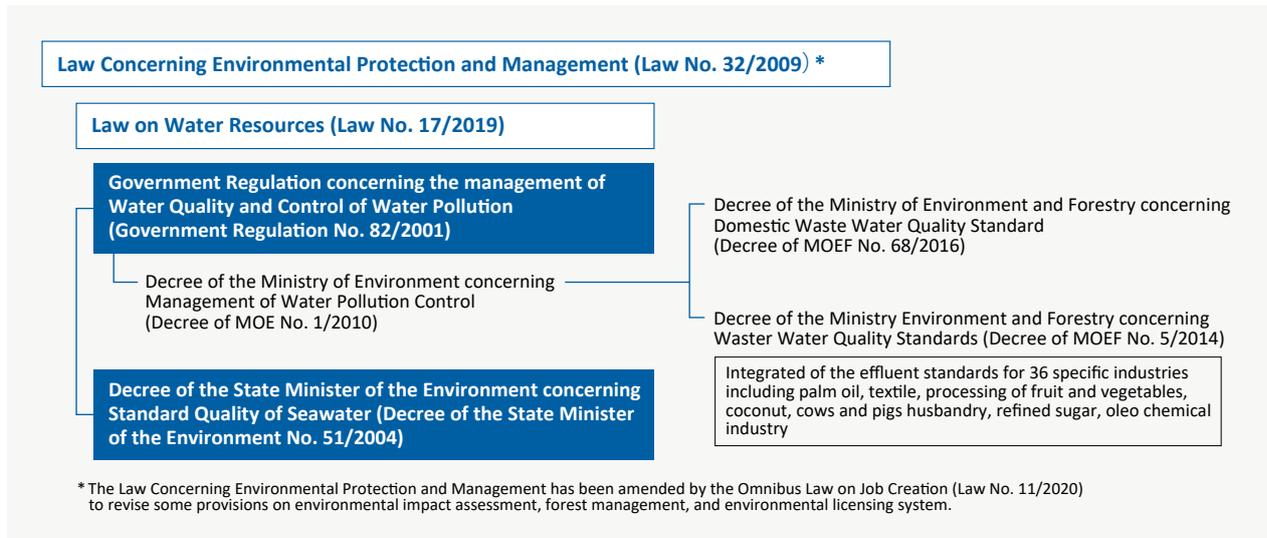


Figure 2.3.5 Basic legislative structure for water environment management

The Government Regulation No. 22/2021 strives to regulate the inventory of water bodies which consists of the identification and characterization of water bodies, including surface water and groundwater and different pollutants (point as well as non-point source). It also regulates economic instruments for water pollution control.

5.2 Institutional Arrangement

The Long-Term Development Plan 2005–2025 (RPJPN: Law No. 17/2007) stipulates the role of government as facilitator, regulator, and development catalyzer to increase the effectiveness of public services (ADB 2016).

In Indonesia, several ministries deal with water management, such as the Ministry of Environment and Forestry (MOEF), Ministry of Public Works and Housing (PUPR) and State Ministry of National Development Planning (BAPPENAS). MOEF is responsible for water quality management and pollution, PUPR deals with water resource management especially focusing on quantity and water uses, and BAPPENAS is responsible for the overall national development.

5.3 Ambient Water Quality Standards

Water quality criteria (WQC) are set as the benchmarks for water quality conservation under the Government Regulation No. 22/2021. These criteria are the minimum standards set by the national government, though local governments are free to set their own, which may be even stricter and include additional parameters in accordance with local settings.

To date, water quality standards have been developed for surface inland water bodies such as rivers, lakes (approved in 2001) and coastal waters (approved in 2004), though no standards have been developed and approved for groundwater, which is a matter of concern. Nationally, river water quality is presently monitored through 510 water quality monitoring sites, and for lakes there are 10.

WQC sets standard values for different parameters in four classes, which are determined based on the type of water usage (Table 2.3.4). However, as rivers have not been fully categorized into classes, the state of water quality in the country is evaluated based upon compliance of values with Class II. The Decree of the State Minister of the Environment concerning Standard Quality of Sea

Table 2.3.4 Classes of inland water quality

Class	Designation	Standard (mg/L)					
		BOD	COD	Cl ₂	Phenol	Total Coliform	<i>E. coli</i>
I	Drinking water	2	10	0.03	0.001	1000	100
II	Water recreation facilities	3	25	0.03	0.001	5,000	1,000
III	Freshwater for fish, farming and husbandry	6	50	0.03	0.001	10,000	2,000
IV	Crops irrigation	12	100	0.03	0.001	10,000	2,000

(Source: Purwati et al. 2019)

Water (MOE Decree No. 51/2004) stipulated three sets of standards for coastal water quality: Marine water quality standards for ports and harbours (Annex I in MoE Decree 51/2004), standards for marine recreation (Annex II) and standards for marine ecosystems (Annex III). Water quality standards for marine ecosystems, notably, are subdivided further into clarity, TSS, temperature and salinity for coral, mangrove, and sea grass (lamun) (Table 2.3.5).

As with water criteria for surface water, local governments can set stricter standards, such as the Regulation of the Governor of DKI Jakarta Province No.93/2006, which applies stricter standards for capitals of provinces and the special region of Jakarta (DKI Jakarta Province).

Water quality monitoring framework

Water quality monitoring schemes are determined under the Management of Water Quality and Control over Water Pollution Government Regulation as follows:

1. Monitoring of water sources in the regency/municipal region is carried out by the regency/municipal government.
2. Monitoring of water sources in two or more regency/municipal regions within one province is coordinated by the provincial government and carried out by each regency/municipal government.
3. Monitoring of water sources in two or more provincial regions and/or water sources on borders with other countries is observed by the national government.

Water quality observations are carried out at least once in six months and results are submitted to the ministry of environment and forest. The mechanisms and procedures for water quality monitoring are stipulated further in detail through ministerial decree.

5.4 Effluent Standards

Effluent standards

National wastewater quality standards are specified by governmental regulation after due consideration of suggestions from related government agencies (Government Regulation No. 22/2021). As with water quality standards, provincial governments can specify similar or tighter wastewater quality standards than the national wastewater quality standard.

Table 2.3.5 Coastal water quality standards for marine ecosystems

No.	Parameter	Unit	Standard value		
			Coral	Mangrove	Sea grass
Physical parameters					
1	Clarity	m	>5	-	>3
2	Odor	-	Normal		
3	Turbidity	NTU	<5		
4	TSS	mg/L	20	80	20
5	Refuse	-	undetected		
6	Temperature	°C	28–30	28–32	28–30
7	Oil film	-	undetected		
Chemical parameters					
1	pH	-	7.0-8.5		
2	Salinity	‰	33–34	34	33–34
3	DO	mg/L	>5		
4	BOD	mg/L	20		
5	Free ammonia (NH ₄ -N)	mg/L	0.3		
6	Orthophosphate (PO ₄ -P)	mg/L	0.015		
7	Nitrate nitrogen (NO ₃ -N)	mg/L	0.008		
8	Cyanide (CN)	mg/L	0.5		
9	Sulphides	mg/L	0.01		
10	PAHs	mg/L	0.003		
11	Phenols	mg/L	0.002		
12	PCB	µg/L	0.01		
13	Surfactants (MBAS)	mg/L	1		
14	Oil and grease	mg/L	1		
15	Pesticides	mg/L	0.01		
16	Tributyltin (TBT)	µg/L	0.01		
Dissolved metals					
1	Hg	mg/L	0.001		
2	Cr ⁶⁺	mg/L	0.005		
3	As	mg/L	0.012		
4	Cd	mg/L	0.001		
5	Cu	mg/L	0.008		
6	Pb	mg/L	0.008		
7	Zn	mg/L	0.05		
8	Ni	mg/L	0.05		
Organic parameters					
1	Total coliform	MPN/100mL	1,000		
2	Pathogens	nb/100mL	undetected		
3	Plankton	-	No abnormal blooms		
Radioactive parameters					
1	Radioactive substances	Bq/L	4		

General industrial effluent standards were first created in Government Regulation No. 20/1990. Under the Decree of Ministry of Environment No. 3/1991 (no. KEP-03/MENKLH/II/1991), specific effluent standards were first identified for 14 industrial activities, which then increased to 21 by the Decree of Ministry of Environment No. 51/1995. However, these Decrees were merged into the Decree of Ministry of Environment and Forestry No. 5/2014, which integrated the effluent standards of 36 industries in those Decrees. Local governments such as in DKI Jakarta, West Java and Jogjakarta have established tighter wastewater quality standards than the national government.

Effluent inspection procedure

All industries are required to send wastewater samples to registered laboratories once a month or more frequently depending on their activities, with the analysis reports then submitted every six months to local authorities and the MOEF. Local and national authorities have the right of access and sampling of effluent at any time.

Measures against non-compliance

In the absence of any economic tools or concrete plans for water quality management and enforcement of regulations, Indonesia has some judicial and non-judicial measures for managing non-compliance with effluent water quality standards. In order to enforce the water management guidelines, effluent standards for industrial and domestic sectors were approved in 2014 and 2016 respectively, with either the Environmental Agency of Local and Provincial government or MOEF managing inspections in accordance with to the permit issued.

While each industry has an obligation to monitor the quality of effluent once a month, rates of effluent discharge and pH are monitored daily. Reporting is done every three months, inspections for which involve a three-step process: a) on-site inspection, b) submittal of effluent quality report by the industry, and c) online report submission.

Based on Article 76 of Law No. 32/2009 on Environmental Protection and Management, the Minister, Governor, Regent, or Mayor can impose administrative sanctions on business actors in accordance with the degree of violation of environmental permits (e.g., effluent quality), which include:

- Written warning
- Government coercion
- Freezing of environmental permits
- Revocation of environmental permit

Although an enforcement regulation previously existed, the Minister of Environment and Forestry introduced a new aspect of monitoring of effluent quality, which stipulates it be performed automatically, continuously and online, under Decree of the Minister of Environment and Forestry No. 93/2018 (No. P.93/MENLHK/SETJEN/KUM.1/8/2018).

Compliance management

The Program for Pollution Control Evaluation and Rating PROPER: *Program Penilaian Peringkat Kinerja Perusahaan* is executed to encourage compliance of companies with applicable rules and regulations, and the results are published as information reflecting the reputation of companies in respect of environmental management. In 2016, 1,895 companies were rated under the PROPER program (Table 2.3.6).

Table 2.3.6 PROPER evaluation levels

Performance level	Category	Number of companies in 2016
Gold	Zero emissions	12
Green	Beyond compliance	172
Blue	Compliance	1,422
Red	Failure to reach requirements	284
Black	Non-compliance, and insignificant efforts at improvement	5
Total		1,895

(Source: MoE 2017)

5.5 Major Policies on Water Environmental Management

The Long-Term Development Plan 2005–2025 (RPJPN) presents the main policies and strategies, which in turn sets the direction for the National Medium-Term Development Plan (RPJMN) 2015–2019, which includes the following targets regarding conservation of the water environment:

- Rehabilitation of 5.5 million ha of Indonesian Forest
- Increase community involvement in watershed management through development of Community Plantation Forest, Community Forest, Village Forest, development of ecotourism and development of non-timber forest products
- Rehabilitate 3 million ha and construct 1 million ha of irrigation networks

- Establish flood management schemes in 33 river basins
- Improve water quality in 15 lakes and 5 rivers

Analysis of watershed status, water source protection and restoration is to be carried out in four priority watersheds (Ciliwung, Citarum, Kapuas and Siak) and vegetation management is to be conducted in 26 sub-priority watersheds.

Presidential Decree No. 33/2011 lays out the national policy of water resource management from 2011 to 2030.

6 | Recent Developments in Water Environmental Management

Regarding the Sustainable Development Goals (SDGs), the Ministry of National Development Planning (Bappenas) is assigned to coordinate the entire process of planning, implementation, monitoring as well as evaluation and reporting by involving all stakeholders.

Indonesia maintains a working relationship based on mutual trust between all stakeholders, consisting of the government, CSO, philanthropy and business, and academics. Active engagement of all stakeholders is encouraged and enhanced by their involvement and representation in the Implementing Team and Working Group within the SDGs National Coordinating Team. All stakeholders are not only involved in the implementation, but also in determining the direction of SDG implementation.

The national medium-term development plan (RPJMN) 2015–2019 targets universal access to water and sanitation by 2019. Since 2019, WEPA started implementing a WEPA Action Program in Indonesia,

providing technical support to the Indonesian Ministry of Environment and Forestry of Indonesia (MOEF) to develop a "Guidelines on Implementation of Total Maximum Daily Load (TMDL) as Water Quality Management Approach". The introduction and implementation of the Guidelines is expected to address water pollution caused by domestic and industrial wastewater, which has been a longstanding issue in Indonesia. The final draft of the Guidelines is going to be finalized by the MOEF, in collaboration with the Institute of Technology Bandung (ITB) and the WEPA Secretariat.

Indonesia's specific response to achieve its SDG targets on water quality (SDG targets 6.2, 6.3 and SDG target 6.A specifically) is described in Table 2.3.7.

Major flagship program for improvement of water environment

Indonesia has developed and implemented the Eco-riparian Program, a water body restoration program that aims to improve water quality and restore ecological and socio-cultural functions of water bodies. The Program includes:

1. Maintaining quantity and continuity of water and prevent flooding
2. Improving water quality and restore aquatic ecosystems
3. Revitalizing environmentally friendly river-based culture
4. Empowering local communities in water protection and management
5. Implementing regulations that strengthen water quality management and control water pollution

Table 2.3.7 Country's response to achieving SDG 6

Response	Yes	No	If yes, please provide short description
Mapping of agencies for SDG targets 6.2 and 6.3	✓		- Ministry Public work and Settlement and Ministry of Environment and Forestry
Set up/revision of country's indicator on SDG targets 6.2 and 6.3	✓		- By 2030, achieving access to improved sanitation and hygiene adequate and equitable for all, and stop the practice of defecation in open spaces, paying special attention to the needs of women and vulnerable groups of people.
Available datasets to measure progress of SDG targets 6.2 and SDG targets 6.3	✓		- Central Bureau of Statistics (BPS): National Socio-Economic Survey (Susenas) health and housing modules. - Ministry of Public Works and Settlements: Annual Report.

7 | Challenges and Future Plans

Challenges: Overall, key challenges are divided into the following four categories:

- **Institutional Challenges:** Challenges in coordination and integration at the implementation level
- **Enforcement challenges:** Limited number of environmental inspectors at the local level
- **Resource and financial challenges:** Limited budgetary allocation to control water pollution and limited number and quality of human resources that handle water protection and management at the local level
- **Technical challenges:** The necessary of increasing the capacity of innovation in developing and applying science and technology related to water protection and management

Table 2.3.8 Necessary actions to address the above mentioned challenges

Challenges	Necessary actions to be taken
Institutional Challenges	i. Need to build an effective system in implementing joint programs and actions between related ministries and institutions and communities
Enforcement Challenges	i. Increasing the number of inspectors and training on inspection and enforcement of environmental law ii. Encourage policy makers at the local level to empower environmental inspectors
Resource and financial Challenges	i. Increasing the capacity of local governments with guidance and budgetary assistance ii. Implement an effective incentive and disincentive system for local government
Technical Challenges	i. Increased collaboration between researchers and managers in the development and application of science and technology ii. Increasing the technical capacity of staff and managers in industry and government agencies in water protection and management