2.3 Indonesia

1 | Country Information

Table 2.3.1 Basic indicators

Land area (km²)		1,900,000 (2013)*
Total population		275.8 million (2022)*
GDP (current USD*)		1,371 billion (2023)**
Per capita GDP (current USD)		4,940 (2023)**
Average annual rainfall (mm/year)		2,898 (2022)*
Total renewable rater resources (billion m³)		2,018 (2021)***
Total annual freshwater withdrawals (billion m³)		222.6 (2021)***
Annual freshwater withdrawal by sector	Agriculture	85.2% (2021)***
	Industry	4.1% (2021)***
	Municipal (including domestic)	10.7% (2021)***

(Source: *BPS-Statistics Indonesia 2023a, **World Bank 2024, ***FAO 2021)



Figure 2.3.1 Lake Toba, Sumatra, Indonesia

2 | State of Water Resources

Water resources in Indonesia account for about 4.7% of the world's water resources, or about 20% of the total water resources in the Asia-Pacific region. The total renewable internal freshwater resources in 2021 was estimated at 2,018.7 billion m³, whereas the total withdrawal was 222.63 billion m³ (FAO 2021). While water resources are abundant, their distribution is not even across the provinces, and rainfall amounts also vary (see Table 2.3.2).

Indonesia is the world's largest archipelagic state, with 17,504 islands and a freshwater availability that differs from region to region (BPS-Statistics Indonesia 2023a, 50). There are 3,137 watersheds in the National Strategic River Region and 304 watersheds in the Cross-Country River Region (BPS-Statistics Indonesia 2023a).

Water stress in the country's dry season is expected to increase by 2045 (World Bank 2021), and water storage per capita is 71 m³, which is relatively low compared to neighboring countries. According to the government, many areas of Java and Bali are classified as water scarce areas, and such area are estimated to increase from 6% in 2000 to nearly 9.6% by 2045 (Republic of Indonesia 2020). The government has made efforts to address the water shortage issue by increasing the storage capacity (World Bank 2021).

Table 2.3.2 Population, precipitation, and spatial distribution of surface water by Island

Island	Population (thousand) (2022)	Precipitation (mm/year) (2022)	Total water volume (million m³) of rivers with area over 100 km² (2021)	Total volume of lakes (million m³) (2023)	Total volume of dam(s) (million m³) (2023)
Java	154,282	17,384	51,271	440	406,483
Sumatra	59,977	32,036	28,519	29,888	2,127
Sulawesi	20,304	16,234	49,539	834	594
Kalimantan	17,052	14,417	-	480	71
Bali and Nusa Tenggara	15,355	7,667	899	1,060	31,482
Maluku	3,201	6,680	-	-	-
Papua	5,602	4,125	-	3,089	-

(Source: BPS-Statistics Indonesia 2023a and 2023b)

3 | State of Ambient Water Quality

(1) Rivers

The water quality of surface water in major cities has been affected by anthropogenic activities, and many rivers are polluted due to untreated effluent from industrial and residential areas. Changes in the status of surface water quality compliance compared to the national standards in selected rivers are shown in Fig. 2.3.2 From 2017 to 2020, rivers in most provinces were heavily polluted, and none met the ambient water quality standards. However, in 2021 and 2022, water quality significantly improved, and a few met the standards, which has been attributed to the dampened economic activities during the COVID-19 pandemic in 2020, which affected the water quality of rivers nationwide.

Province	River	2017	2018	2019	2020	2021	2022
Pollution level		Heavily polluted	Moderately-heavily polluted	Moderately polluted	Slightly-moderately polluted	Slightly polluted	Meet the standards
Aceh	Krueng Tamiang						
Sumatera Utara	Batahan						
Sumatera Barat	Batanghari						
Riau	Siak						
Jambi	Batanghari						
Sumatera Selatan	Musi						
Bengkulu	Musi						
Lampung	Mesuji						
Kepulauan Bangka Belitung	Baturusa						
Kepulauan Riau	Dam Duriangkang						
DKI Jakarta	Ciliwung						
Jawa Barat	Citarum						
Jawa Tengah	Citanduy						
DI Yogyakarta	Progo						
Jawa Timur	Bengawan Solo						
Banten	-	-	-	-	-	-	-
Bali	Tukad Ayung						
Nusa Tenggara Barat	Moyo						
Nusa Tenggara Timur	Noelmina						
Kalimantan Barat	Kapuas						
Kalimantan Tengah	Barito						
Kalimantan Selatan	Barito						
Kalimantan Timur	Mahakam						
Kalimantan Utara	Sesayap	-	-				
Sulawesi Utara	Talawan						
Sulawesi Tengah	Lariang	-	-				
Sulawesi Selatan	Jeneberang						
Sulawesi Tenggara	Lalindu						
Gorontalo	Randangan						
Sulawesi Barat	Lariang						
Maluku	Batu Gajah						
Maluku Utara	Tabobo						
Papua Barat	Remu						
Papua	Bian						

Figure 2.3.2 Status of water quality of selected rivers in Indonesia
(Source: BPS-Statistics Indonesia 2023a, Table 1.58 Status of river water quality, 2017–2022)

Figure 2.3.3 presents the annual average concentrations of dissolved oxygen (DO) and biochemical oxygen demand (BOD) of drinking source rivers in the provincial capitals. Data for Jawa Barat and Papua are missing. Of the 32 provinces, rivers in six provinces met the water quality standard for BOD. The water quality standards for fecal coliform and total coliform for raw drinking water are 100 MPN/ml and 1,000 MPN/mL, respectively. In 2022, 18 rivers did not meet the fecal coliform standard, and in 2022 the figure for average fecal coliform in the Ciliwung River in DKI Jakarta was 4,842,500 MPN/mL (BPS-Statistics Indonesia 2023a, Table 1.57).

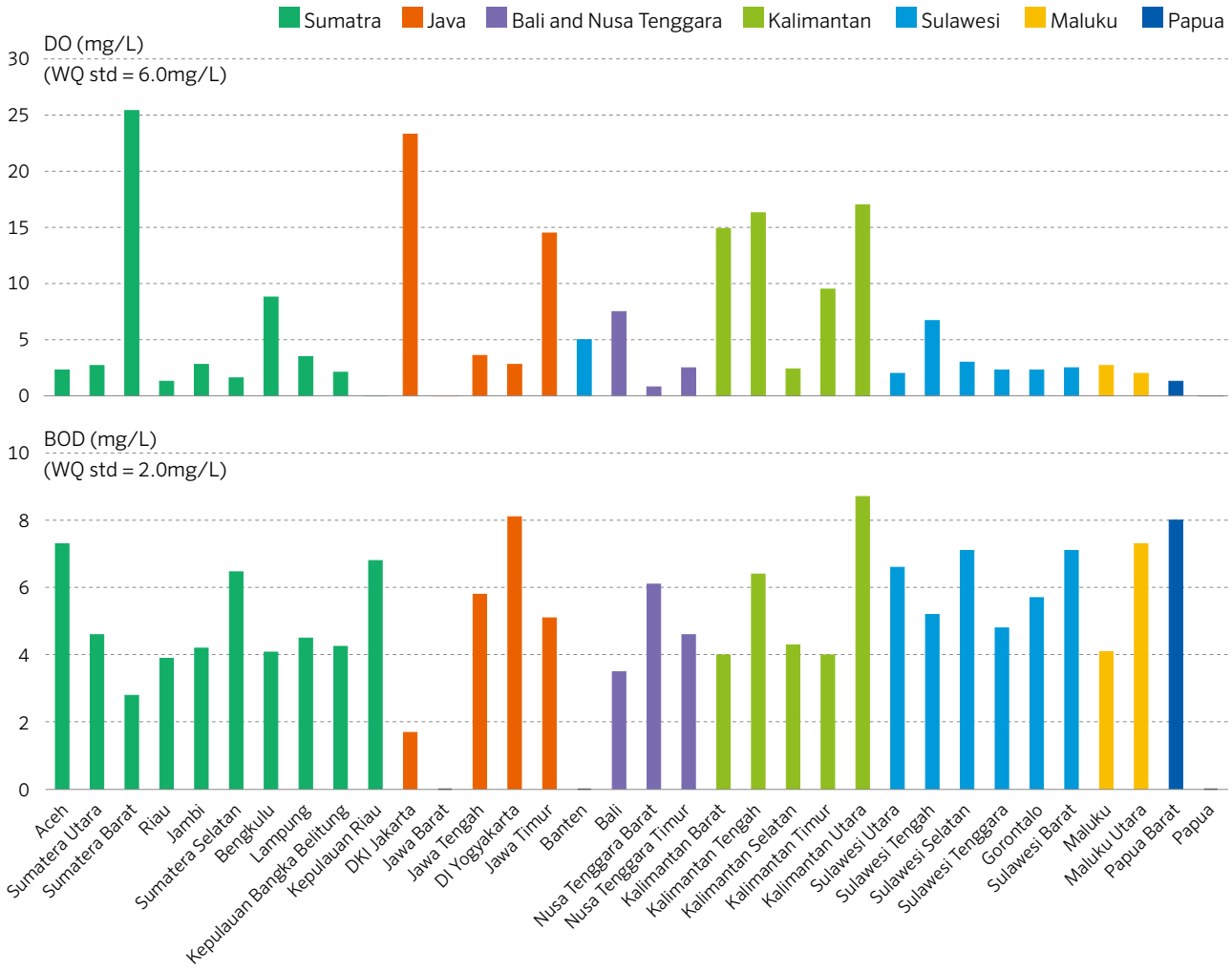


Figure 2.3.3 Water quality of drinking source rivers in provincial capitals in 2022

(Source: BPS-Statistics Indonesia 2023a, Table 1.57)

The Ministry of Environment and Forestry, Indonesia (MOEF) selected the following river basins as priority basins for restoration in the Medium-Term Development Plan (RPJMN) 2020–2024: 1. Asahan River and Toba Lake in North Sumatera, 2. Siak River in Riau, 3. Musi River in South Sumatera, 4. Citarum, Cisadane and Ciliwung Rivers in West Java and Jakarta, 5. Serayu and Bangawas Solo Rivers in Central Java, 6. Brantas River in East Java, 7. Kapuas River in West and Central Kalimantan, 8. Saddang River in West and Central Sulawesi, 9. Moyo River in West Nusa Tenggara, and 10. Limboto Lake dan Bone Bolango River in North Sulawesi (MOEF 2024).

(2) Lakes and reservoirs

Lakes are other waterbodies heavily affected by anthropogenic activities. MOEF designated the following 15 lakes as national priority lakes for restoration and conservation: Danau Toba, Danau Maninjau, Danau Singkarak, Danau Kerinci, Danau Rawa Danau, Danau Rawa Pening, Danau Batur, Danau Sentarum, Danau Kaskade Mahakam (Semayang-Melintang-Jeumpang), Danau Tondano, Danau Limboto, Danau Poso, Danau Tempe, Danau Matano, and Danau Sentani (Republic of Indonesia 2020, II.24).

(3) Coastal water

Indonesia is the largest archipelago on Earth, with more than 17,000 islands, about 290,000 km^2 of territorial sea waters, and 108,000 km of coastline (BPS-Statistics Indonesia 2023a, 50). The coastal water environment is thus of high importance for the nation, and conserving the coastal ecosystems is critical for sustainable economic growth and the population's well-being. Figure 2.3.4 presents the sea water quality index by province from 2019 to 2022. The index scores (I score) are classified as: very good (100 ≥ I score ≥ 90), good (90 > I score ≥ 80), good enough (80 > I score ≥ 70), medium (70 > I score ≥ 50), marginal (50 > I score ≥ 35), and bad (35 ≥ I score) (Damayanti et al. 2021). The water quality has been better than the water quality of drinking source rivers in provinces, and the score further improved in 2021.

WQ Criteria	Medium	Good enough	Good	Very good
Province	2019	2020	2021	2022
Aceh				
Sumatera Utara				
Sumatera Barat				
Riau				
Jambi				
Sumatera Selatan				
Bengkulu				
Lampung				
Kepulauan Bangka Belitung				
Kepulauan Riau				
DKI Jakarta				
Jawa Barat				
Jawa Tengah				
DI Yogyakarta				
Jawa Timur				
Banten				
Bali				
Nusa Tenggara Barat				
Nusa Tenggara Timur				
Kalimantan Barat				
Kalimantan Tengah				
Kalimantan Selatan				
Kalimantan Timur				
Kalimantan Utara				
Sulawesi Utara				
Sulawesi Tengah				
Sulawesi Selatan				
Sulawesi Tenggara				
Gorontalo				
Sulawesi Barat				
Maluku				
Maluku Utara				
Papua Barat				
Papua				

Figure 2.3.4 Sea water quality index by province 2019-2022
(Source: BPS-Statistics Indonesia 2023a, Table 1.63)

(4) Groundwater

Groundwater has been a major source of domestic water as private wells meet about 46% of domestic water demand (World Bank 2021, 50), and the government faces challenges in managing this resource. In places where surface water is not the main source of water, over-extraction of groundwater is a common problem. While groundwater production is 457,400 million m^3, the safe yield for extraction is 137,2000 million m^3 (FAO 2024; USAID/Sustainable Water Partnership 2021). Figure 2.3.5 presents figures for existing wells providing domestic water. Groundwater is utilized on all islands, but more wells are seen on Java, Bali and Nusa Tenggara.

Thus, groundwater is an irreplaceable source of water. However, groundwater pollution is of serious environmental concern for the government as the quality does not meet the standards due to bacteria and chemical contamination (Republic of Indonesia 2020). The government reported that 45% of groundwater in Jakarta is contaminated by E. coli, with about 70% of groundwater pollution caused by leaking septic tanks and septage disposed of into waterways (World Bank 2021). Moreover, large-scale groundwater extraction may have contributed to land subsidence in the country (Republic of Indonesia 2020).

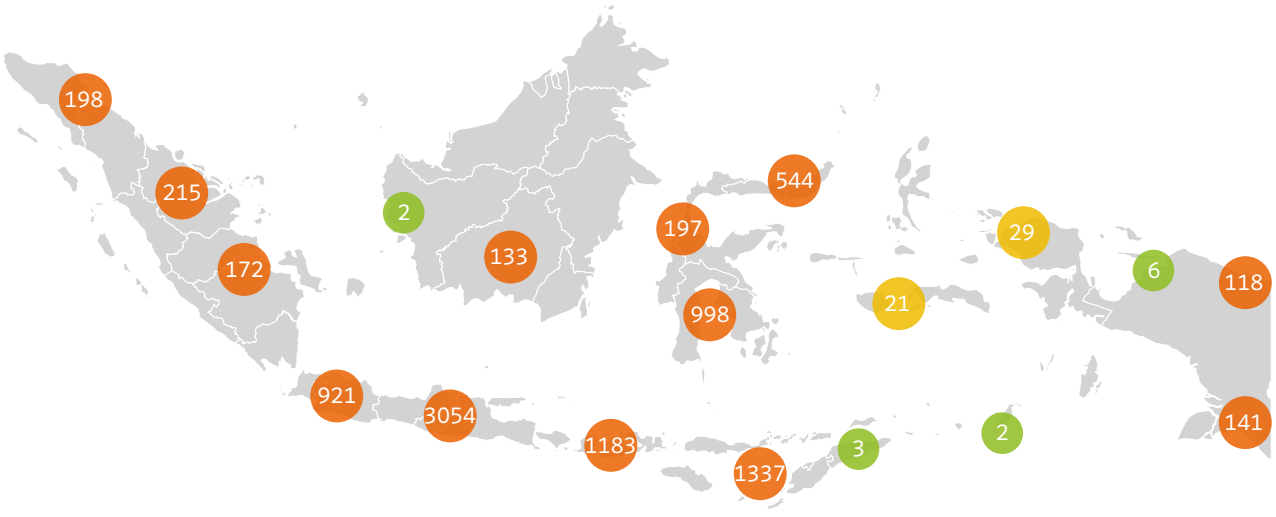


Figure 2.3.5 Distribution of groundwater from drilling wells (Source: Center for Data and Information Technology 2024)

4 | State of Wastewater Treatment

(1) Wastewater and major pollutants

In Indonesia, over 80% of households have a septic tank, but the waste is not properly managed. Furthermore, there are only about 139,000 households connected to centralized wastewater treatment systems. The main pollutant source of public waters is domestic waste (World Water Forum 2024). Further, in urban areas, 3.85% of households still practice open defecation, and 8.52% of households that have toilets do not have septic tanks (Republic of Indonesia 2020). Moreover, enforcing industry to comply with effluent standards is a challenge.

(2) Domestic wastewater

In 2021, while Indonesia's urban and rural populations were 153 million and 117 million, respectively, the country's municipal wastewater treatment capacity was only 0.3 km^3/year. Grey water is directly discharged into public water bodies without any treatment (Widyarani et al., 2022). Only 2% of wastewater in urban areas is correctly treated before being discharged to the water environment, and 92.6% of septage and wastewater is discharged in an unsafe manner (World Bank 2021).

(3) Industrial wastewater

Domestic wastewater is a major source of pollution in many rivers, but pollutants from industry are also a big concern. In the five major rivers, namely, Musi, Citarum, Ciliwung, Brantas, and Cisadane, the ratios of industrial wastewater to the total of pollution sources were 1%, 18%, 6%, 9%, and 20% respectively, indicating significant regional differences (MOEF 2021). Figure 2.3.6 presents the percentage of safely treated industrial effluent across the country, and shows that most industries treated wastewater and safely discharged it at a rate of 91% in 2020, which rate gradually dropped to 75-77% in 2021 and 2022.

The MOEF currently regulates wastewater discharged from industry based on Decree No. 5 of 2014, amended in 2018 and 2019. The following industries and facilities are regulated under the decree: a. metal coating and galvanizing industry; b. leather tanning industry; c. palm oil industry; d. rubber industry; e. tapioca industry; f. monosodium glutamate and inosine monophosphate industry; g. plywood industry; h. milk processing industry; i. soft drink industry; j. soap, detergent and vegetable oil industry; k. beer industry; l. lead acid battery industry; m. fruit and/or vegetable processing industry; n. fishery product processing industry; o. seaweed processing industry; p. coconut processing industry; q. meat processing industry; r. soybean processing industry; s. traditional medicine or herbal medicine processing industry; t. cattle and pig farming industries; u. cooking oil with wet and/or dry processes industry; v. sugar industry; w. cigarette and/or cigar industry; x. electronics industry; y. coffee processing industry; z. refined sugar industry; aa. upstream petrochemical industry; bb. rayon industry; cc. ceramic industry; dd. terephthalic acid industry; ee. polyethylene terephthalate industry; ff. basic oleochemical industry; gg. caustic soda/chlorine industry; hh. pulp and paper industry; ii. ethanol industry; jj. dry battery industry; kk. paint industry; ll. pharmaceutical industry; mm. pesticide industry; nn. fertilizer industry; oo. textile industry; pp. hospitality; qq. health service facilities; rr. slaughterhouses; and ss. domestic, which includes: 1. residential areas, area offices, commercial areas, and apartments; 2. restaurants with building areas of more than 1,000 m^2; and 3. dormitories for 100 (one hundred) persons or more (MOEF 2014, Article 3).

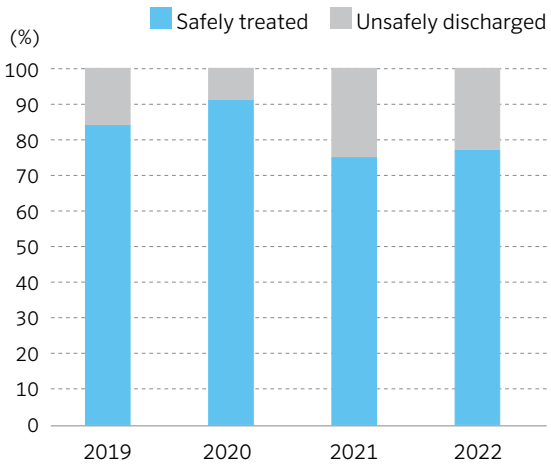


Figure 2.3.6 Percentage of industrial wastewater flows safely treated over 2019-2022

(Source: BPS-Statistics 2024)

5 | Frameworks for Water Environmental Management

(1) Legislation

In Indonesia, the basic environmental laws and regulations are Law No. 32 of 2009 on Environmental Protection and Management, Law No. 17 of 2019 on Water Resources, and Government Regulation No. 22 of 2021. Law No. 32 states that a good, healthy environment is a human right for all Indonesian citizens as mandated in Article 28H of the Constitution of the Republic of Indonesia, and Law No. 17 aims to establish sustainable water uses.

Ambient water quality standards were set in regulation No. 22 of 2021, and effluent standards were set in Ministry Decree No. 15 of 2014 and No. 68 of 2016 (MOEF 2024). Regulation No. 22 covers: 1) environmental approval; 2) water quality protection and management; 3) air quality protection and management; 4) sea water quality protection and management; 5) environmental damage control; 6) waste management; 7) guarantee fund for environmental function restoration; 8) environmental information system; 9) guidance and supervision; and 10) administrative sanctions and transitional provisions (MOEF 2024; Republic of Indonesia 2021).

Several other laws and regulations also cover water environment conservation, such as Government Guideline No. 06 of 2006 on water resources and No. 43 of 2008 on Groundwater, Presidential Regulation No. 12 of 2008 on Water Resources Council, and Regulation of the State Minister of Living Environment No. 1 of 2010 on the water pollution control system (USAID/Sustainable Water Partnership 2021, Table 2).

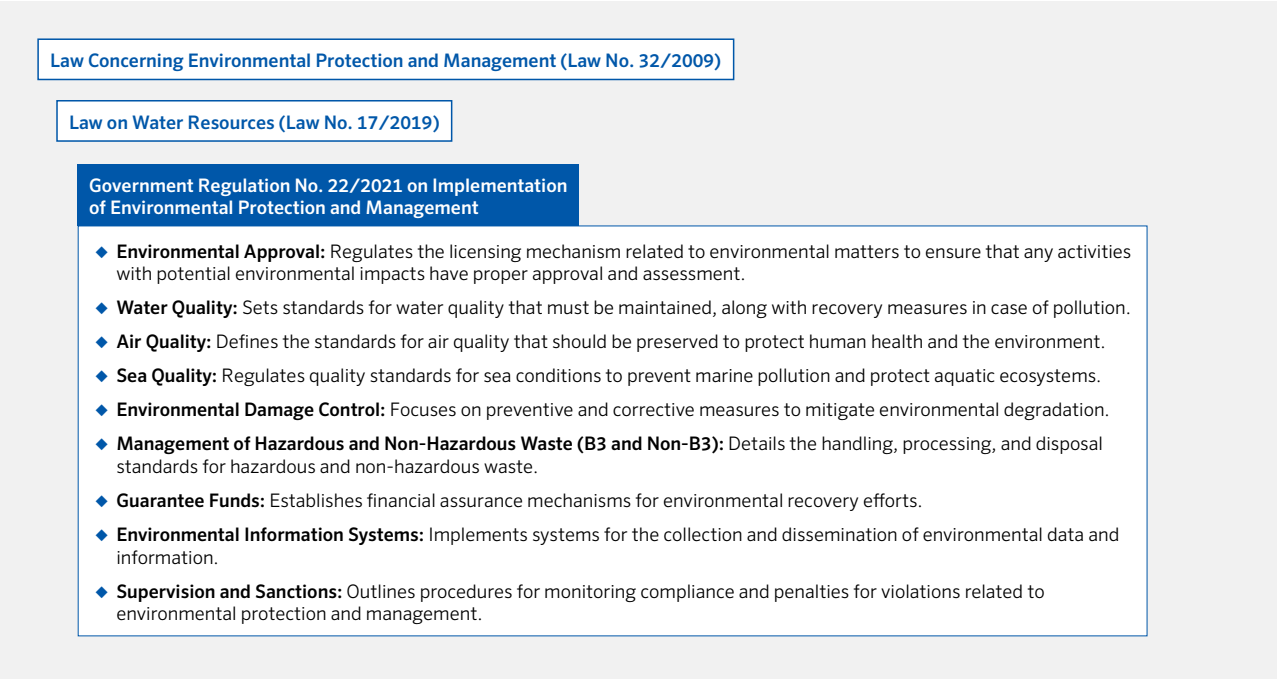
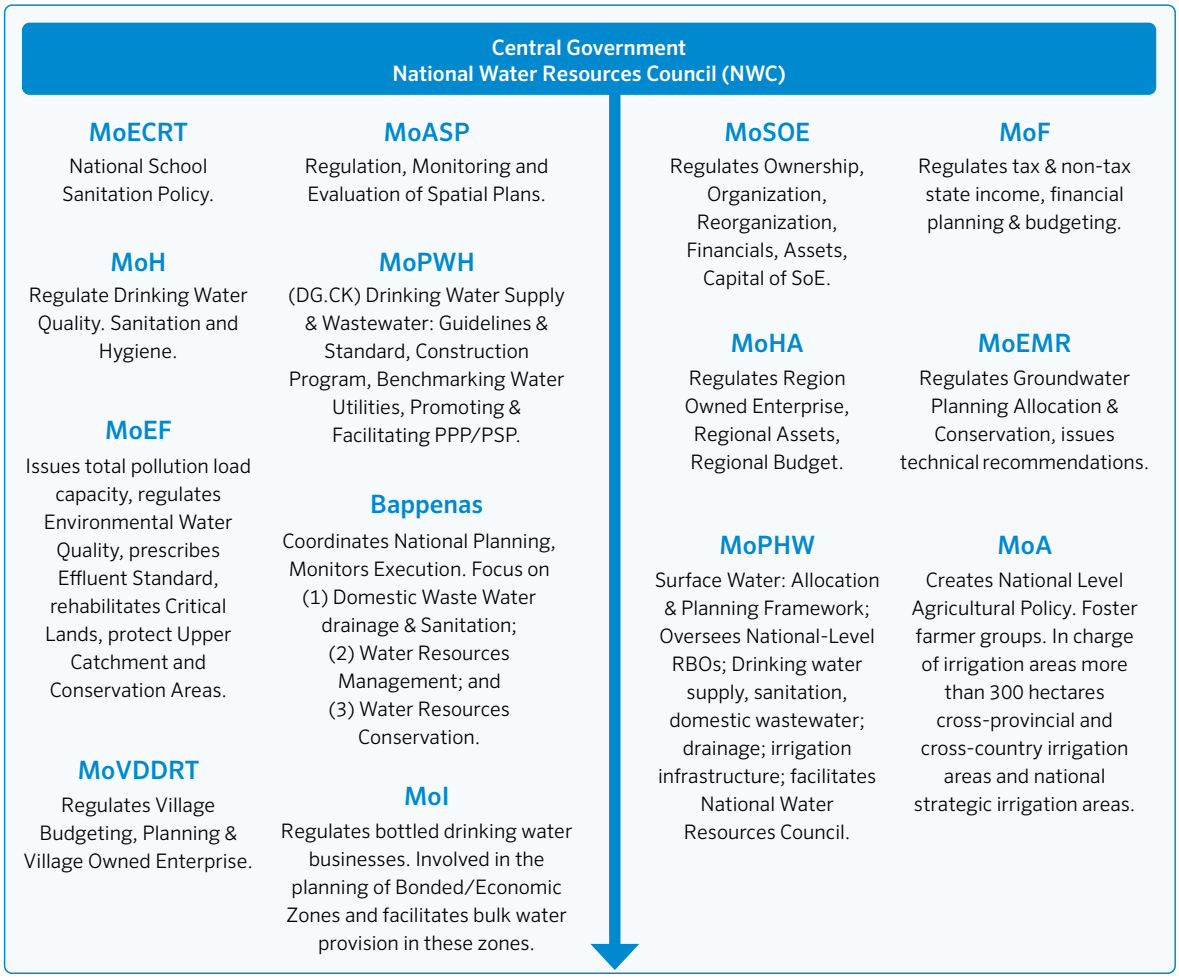


Figure 2.3.7 Basic legislative structure for water environment management

(2) Institutional arrangement

The Long-Term Development Plan 2005-2025 stipulates the role of government as facilitator, regulator, and development catalyzer to increase the effectiveness of public services (ADB 2016). In Indonesia, several ministries handle water management, including the Ministry of Environment and Forestry (MOEF), Ministry of Public Works and Housing (MOPWH) and State Ministry of National Development Planning (BAPPENAS). MOEF is responsible for water quality management and pollution, MOPWH handles water resource management with a focus on quantity and water uses, and BAPPENAS is responsible for the overall national development.



MoECRT: Ministry of Education, Culture, Research, and Technology
MoPWH: Ministry of Public Work and Housing (DG CK: Directorate General of Human Settlements)
MoVDDRT: Ministry of Village, Development of Disadvantaged Regions and Transmigration
MoASP: Ministry of Agrarian Affairs and Spatial Planning
MoEF: Ministry of Environment and Forestry
MoI: Ministry of Industry
MoH: Ministry of Health
Bappenas: National Development Planning
MoSOE: Ministry of State Owned Enterprises
MoEMR: Ministry of Energy and Mineral Resources
MoF: Ministry of Finance
MoHA: Ministry of Home Affairs
MoA: Ministry of Agriculture

Figure 2.3.8 Government agencies involved in water resources management (Source: Haneda Sri Mulyanto 2022)

(3) Ambient water quality standards

The ambient water quality standards for intended water use criteria are set in APPENDIX VI of Government Regulation No. 22, 2021. These are the minimum standards set by the national government and can be arbitrarily superseded by local governments if necessary, such as setting stricter standards or adding parameters in accordance with local settings.

To date, water quality standards are set for surface inland water bodies such as rivers and lakes (approved in 2001) and coastal waters (approved in 2004). Regarding groundwater, rather than setting a fixed standard, the Government has set water quality standards based on the water use, such as for drinking, hygiene and sanitation, swimming pools, spa, bathing, and recreation. Groundwater meeting the criteria can be used without processing (Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2023). Water use is further classified into one of four categories (see Table 2.3.3). However, as rivers have not been fully categorized into classes, the state of water quality in the country is evaluated based on the values for Class 2.

The government minister as well as provincial governors can set stricter standards for the purpose of restoring the water environment (Government Regulation No. 22 of 2021 Article 115).

Table 2.3.3 Water use criteria

Water use classification	Purpose
1	Drinking water and other purposes classified in 2-4
2	Water recreation, and other purposes classified in 3-4
3	Fish farming, livestock, irrigating plants and other purposes classified in 4
4	Irrigating crops

(Source: Government Regulation No.22 of 2021, APPENDIX VI)

Table 2.3.4 River and lake water quality standards

Parameter	Unit	Rivers				Lakes			
		Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3	Class 4
Temperature	°C	3	3	3	3	3	3	3	3
Total dissolved solids	mg/L	1,000	1,000	1,000	2,000	1,000	1,000	1,000	1,000
Total suspended solid	mg/L	40	50	100	400	25	50	100	400
Transparency	M	-	-	-	-	10	4	2.5	-
Colour	Pt-Co	15	50	100	-	15	50	100	-
pH	-	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
BOD	mg/L	2	3	6	12	2	3	6	12
COD	mg/L	10	25	40	80	10	25	40	80
DO	mg/L	6	4	3	1	6	4	3	1
Sulfate	mg/L	300	300	300	400	300	300	300	400
Chloride	mg/L	300	300	300	600	300	300	300	600
Nitrate	mg/L	10	10	20	20	-	-	-	-
Nitrite	mg/L	0.06	0.06	0.06	-	-	-	-	-
Ammonia	mg/L	0.10	0.20	0.50	-	-	-	-	-
Total nitrogen	mg/L	15	15	25	-	0.65	0.75	1.90	-
Total phosphorus	mg/L	0.20	0.20	1.00	-	0.01	0.03	0.10	-
Fluoride	mg/L	1.00	1.50	1.50	-	1.0	1.5	1.5	-
Sulfur	mg/L	0.002	0.002	0.002	-	0.002	0.002	0.002	-
Cyanide	mg/L	0.02	0.02	0.02	-	0.02	0.02	0.02	-
Free chlorine	mg/L	0.03	0.03	0.03	-	0.03	0.03	0.03	-
Dissolved barium	mg/L	1.00	-	-	-	1.00	-	-	-
Boron	mg/L	1.00	1.00	1.00	1.00	1.0	1.0	1.0	1.0
Mercury	mg/L	0.001	0.002	0.002	0.005	0.001	0.002	0.002	0.005
Arsenic	mg/L	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.10
Selenium	mg/L	0.01	0.05	0.05	0.05	0.01	0.05	0.05	0.05
Dissolved Iron	mg/L	0.30	-	-	-	0.3	-	-	-
Cadmium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cobalt	mg/L	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Manganese	mg/L	0.1	-	-	-	0.4	0.4	0.5	1.0
Nickel	mg/L	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.1
Zinc	mg/L	0.05	0.05	0.05	2.00	0.05	0.05	0.05	2.00
Copper	mg/L	0.02	0.02	0.02	0.2	0.02	0.02	0.02	0.2
Lead	mg/L	0.03	0.03	0.5	0.5	0.03	0.03	0.5	0.5
Hexavalent chromium	mg/L	0.05	0.05	0.05	1.00	0.05	0.05	0.05	1.00
Oil and grease	mg/L	1	1	1	10	1	1	1	10
Total detergent	mg/L	0.2	0.2	0.2	-	0.2	0.2	0.2	-
Phenol	mg/L	0.002	0.005	0.01	0.02	0.002	0.005	0.01	0.02
Aldrin/dieldrin	µg/L	17	-	-	-	17	-	-	-
Benzene hexachloride	µg/L	210	210	210	-	210	210	210	-
Chlordane	µg/L	3	-	-	-	3	-	-	-
DDT	µg/L	2	2	2	2	2	2	2	2
Endrin	µg/L	1	4	4	-	1	4	4	-
Heptachlor	µg/L	18	-	-	-	18	-	-	-
Lindane	µg/L	56	-	-	-	56	-	-	-
Methoxychlor	µg/L	35	-	-	-	35	-	-	-
Toxapan	µg/L	5	-	-	-	5	-	-	-
Fecal coliform	MPN/100 mL	100	1,000	2,000	2,000	100	1,000	2,000	2,000
Total coliform	MPN/100 mL	1,000	5,000	10,000	10,000	1,000	5,000	10,000	10,000
Waste	-	nil	nil	nil	nil	nil	nil	nil	nil
Gross α radiation	Bq/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Gross β radiation	Bq/L	1	1	1	1	1	1	1	1

(Source: Government Regulation No. 22 of 2021, APPENDIX VI)

Regarding sea water, the decree on the Standard Quality of Sea Water (MOE Decree No. 51 of 2004) stipulates the water quality standards for ports and harbors, marine recreation, and marine ecosystems. Standards for marine ecosystems are set separately for coral, mangrove, and sea grass; see Table 2.3.5, below.

Table 2.3.5 Coastal water quality standards for marine ecosystems

Parameter	Unit	Ports and harbours	Marine recreation	Marine ecosystem (coral)	Marine ecosystem (mangrove)	Marine ecosystem (sea grass)
Colour	Pt-Co	-	30	-	-	-
Odour	-	Odourless	Odourless	Normal*	Normal*	Normal*
Clarity	M	>3	>6	>5	-	>3
Turbidity	NTU	-	5	<5	<5	<5
TSS	mg/L	80	20	20	80	20
Temperature	℃	Normal*	Normal*	28-30	28-32	28-30
Refuse	-	nil	nil	nil	nil	nil
Oil film	-	nil	nil	nil	nil	nil
pH	-	6.5-8.5	6.5-8.5	7-8.5	7-8.5	7-8.5
Salinity	‰	Normal	Normal	33-34	34	33-34
DO	mg/L	-	>5	>5	>5	>5
BOD	mg/L	-	20	20	20	20
Total ammonia	mg/L	-	0.3	0.3	0.3	0.3
Orthophosphate	mg/L	-	0.015	0.015	0.015	0.015
Nitrate nitrogen	mg/L	-	0.008	0.008	0.008	0.008
Cyanide	mg/L	-	0.5	0.5	0.5	0.5
Sulphides	mg/L	-	0.01	0.01	0.01	0.01
Phenols	mg/L	-	0.002	0.002	0.002	0.002
PAHs	mg/L	-	0.003	0.003	0.003	0.003
PCB	µg/L	-	0.01	0.01	0.01	0.01
Surfactants	mg/L	1	1	1	1	1
Oil and grease	mg/L	5	5	1	1	1
Tributyltin	µg/L	0.01	-	0.01	0.01	0.01
Pesticides	mg/L	-	-	0.01	0.01	0.01
Mercury	mg/L	0.003	0.002	0.001	0.001	0.001
Hexavalent chromium	mg/L	-	0.002	0.005	0.005	0.005
Arsenic	mg/L	-	0.025	0.012	0.012	0.012
Cadmium	mg/L	0.01	0.002	0.001	0.001	0.001
Copper	mg/L	0.05	0.05	0.008	0.008	0.008
Lead	mg/L	0.05	0.005	0.008	0.008	0.008
Zinc	mg/L	0.1	0.095	0.05	0.05	0.05
Nickel	mg/L	-	0.075	0.05	0.05	0.05
Fecal coliform	MPN/100 mL	-	200	-	-	-
Total coliform	MPN/100 mL	1,000	1,000	1,000	1,000	1,000
Pathogens	sel/100 mL	-	-	nil	nil	nil
Plankton	sel/100 mL	-	-	Not excessive	Not excessive	Not excessive
Substances of unknown composition (radioactive)	Bq/L	-	4	4	4	4

* Normal: normal condition of an environment, varying at all times (day, night and season)

(Source: Decree of the State Minister of the Environment No. 51 of 2004)

a. Water quality monitoring framework

Government Regulation No. 22 of 2021 Article 122 stipulates the monitoring framework, in which water quality monitoring is carried out by the MOEF, provincial government or municipal government through manual and/or automatic means. The results are integrated into the environmental information system, and are used for determining the water quality status (Republic of Indonesia 2021). There are 2,397 rivers in Indonesia, with a total length 84,678 km, the quality of which is monitored by MOEF at 15,065 points through collaboration with local governments. In 2023, the monitoring results from 812 points (MOEF) and 5,157 points (local governments) provided an overview of the water environment condition (Republic of Indonesia 2024).

In 2022, while the target water quality index was 55.3, the average index across 13,956 monitoring data from 6,442 monitoring points was 53.88. According to the annual WQI, Papua Barat was the province with the highest WQI while DI Yogyakarta had the lowest (MOEF 2022).

The MOEF established an automated, continuous and online water quality monitoring system (ONLIMO), and put into place related equipment at 127 points over 2015-2022 with the aim of acquiring accurate information for public disclosure (MOEF 2022 and 2024). The monitoring data is used to determine the water quality status and to help with water pollution control policy as well as an early warning system. By 2023, ONLIMO had been installed in 194 locations. While manual monitoring parameters are pH, DO, COD, TSS, NO_3-N, T-P, and fecal coliform in rivers and pH, DO BOD, COD, TSS, T-N, T-P, transparency, Chl-a, and fecal coliform in lakes, ONLIMO measures temperature, electrical conductivity, TDS, DO, pH, turbidity, depth, nitrate, ammonia, TSS, COD and BOD (MOEF 2024).



Figure 2.3.9 ONLIMO system for public disclosure

(Source: https://ppkl.menlhk.go.id/onlimo-2022/)

(4) Effluent standards

a. Effluent standards

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

General industrial effluent standards were first established through Government Regulation No. 20/1990. Under the Decree of Ministry of Environment No. 3 of 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. These Decrees were subsequently merged into the Decree of Ministry of Environment and Forestry No. 5 of 2014. Currently, the quality-related aspects of effluent are applied to the industries and facilities specified in 4) (3). Local governments such as in DKI Jakarta, West Java and Jogjakarta have established tighter wastewater quality standards than the national government.

b. Effluent inspection procedure

All industries are required to submit wastewater samples to registered laboratories once a month or more frequently depending on their activities, and submit analysis reports 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.

Among 3,200 industries inspected in 2021–2022, 2,389 met the effluent standards, while 751 did not (see Fig. 2.3.10). The compliance rate was 76%.

Inspections at 36 domestic wastewater treatment plants (WWTP) and four leachate final processing (LFPS) sites were also carried out; the results are shown in Fig. 2.3.11. All plants met the effluent standards for oil and grease and TSS, but over 60% failed to meet the standards for ammonia and total coliform.

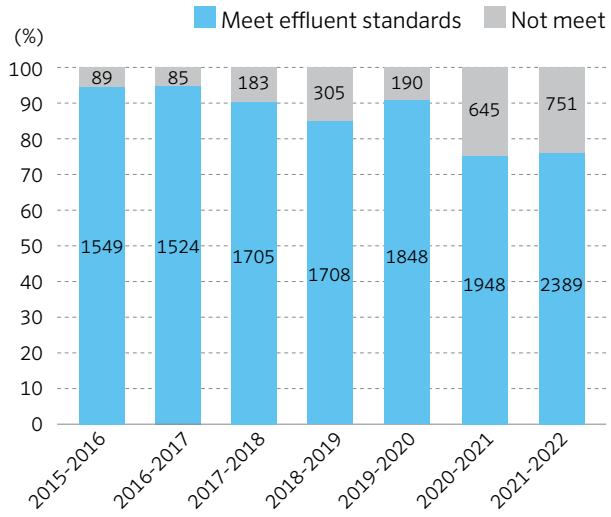


Figure 2.3.10 Results of effluent standard inspection (industries) (Source: MOEF 2022)

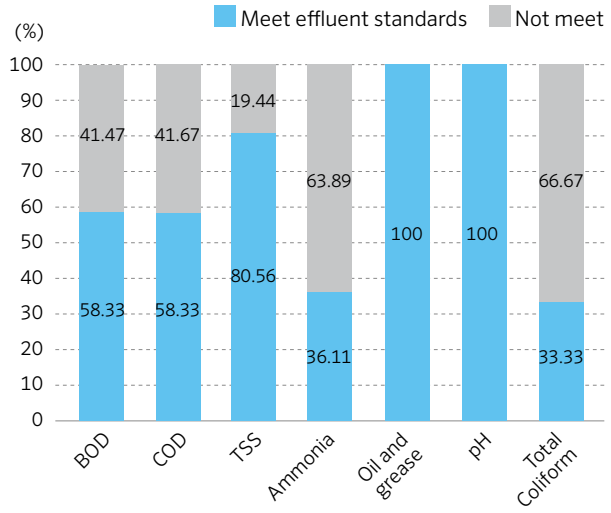


Figure 2.3.11 Results of effluent standard inspection (WWTP and LFPS) (Source: MOEF 2022)

c. 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, for which either the Environment Agency of local and provincial government or MOEF manage inspections in accordance with permits issued.

While each industrial site 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 of 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:

i. Written warning
ii. Government order
iii. Freezing of environmental permit
iv. Revocation of environmental permit

Although an enforcement regulation previously existed, the Minister of Environment and Forestry introduced a new aspect of effluent quality monitoring that stipulates it be performed automatically, continuously and online, under Decree of the Minister of Environment and Forestry No. 93 of 2018.

d. Compliance management

To raise awareness of environmental management and increase compliance by the private sector, MOEF instigated an initiative named Program for Pollution Control, Evaluation, and Rating (PROPER) in 1996. PROPER is aimed at meeting the demands for transparency and public involvement in environmental management and creating incentives for the private sector to comply with regulations (PROPER, 2019).

PROPER primarily targets companies considered to have impacts on the environment (water, air, and waste). In addition to submitting self-monitoring data, participating companies are directly supervised by environmental monitoring officers. Based on the information gathered and other evaluation processes, the performance of companies is ranked and disclosed to the public (ibid). Participants are classified into the following five classes (PROPER 2024, 16):

- **Gold:** consistently demonstrates environmental excellence in production and service processes, and carries out ethical and responsible business for society
- **Green:** carries out environmental management beyond that required in regulations through implementing an environmental management system and utilizing resources efficiently and carries out social responsibilities well
- **Blue:** carries out environmental management efforts as required in accordance with applicable statutory provisions or regulations

- **Red:** carries out environmental management efforts but is not yet in compliance with the requirements as regulated under legislation
- **Black:** deliberately commits acts or negligence that results in environmental pollution or damage, as well as violates applicable laws and regulations and/or fails to carry out administrative sanctions

The numbers of participating companies increased from 1,895 in 2016 to 3,694 in 2023 (see Table 2.3.6).

Table 2.3.6 PROPER rating trends

Performance level	Number of companies in 2016	Number of companies in 2023
Gold	12 (1%)	79 (2%)
Green	172 (9%)	196 (5%)
Blue	1,422 (75%)	2,131 (58%)
Red	284 (15%)	1,077 (29%)
Black	5 (0%)	211 (6%)
Total participants	1,895	3,694

(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
- Increased community involvement in watershed management through community development
- Establishment of flood management schemes in 33 river basins
- Improved water quality in 15 lakes and five rivers
- Establishment of plantation forests, community forests, village forests; development of ecotourism and non-timber forest products; rehabilitation of 3 million ha and construction of 1 million ha of irrigation networks

Analyses of watershed status, water source protection and restoration are 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, civil society organizations, philanthropy, 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.

Indonesia's specific response to achieving 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.

Table 2.3.7 Country's response to achieve SDG 6 targets

Responses	Yes	No	If yes, please provide short description
Mapping of agencies for SDG targets 6.2 and 6.3	√		Ministry Public Work and Housing and Ministry of Environment and Forestry
Setup/ 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 ceasing 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 6.3	√		Central Bureau of Statistics (BPS): National Socio-Economic Survey (Susenas) health and housing modules. Ministry of Public Works and Settlements: Annual Report.

a. Major flagship program for improvement of water environment

After assessment by the MOEF, the following actions were determined as necessary: a. more intensive socialisation in regions; b. facilitation to coordinate relevant agencies; c. improvement of the action program strategy and implementation of water pollution control; d. construction of WWTP and domestic WWTP for small-scale businesses including EKORIPARIAN (see below); e. addition of monitoring points and frequency representing the upstream-downstream-middle of the administrative area; f. additional budget to conduct water quality monitoring and water pollution control; and g. community empowerment in order to improve the quality of river water (MOEF 2022).

The EKORIPARIAN program is a program aimed at improving water quality and restoring the ecological and socio-cultural functions of water bodies. Its goals are as follows:

i. Maintaining the quantities and continuity of water and preventing flooding
ii. Improving water quality and restoring aquatic ecosystems
iii. Revitalizing environmentally friendly river-based culture
iv. Empowering local communities in water protection and management
v. Implementing regulations that strengthen water quality management and control water pollution

Figure 2.3.12 shows the basic structure of EKORIPARIAN, and Figure. 2.3.13 shows the locations of WWTPs and EKORIPARIAN sites. Currently, there are 11 EKORIPARIAN programs in Java Barat and one in Sumber.

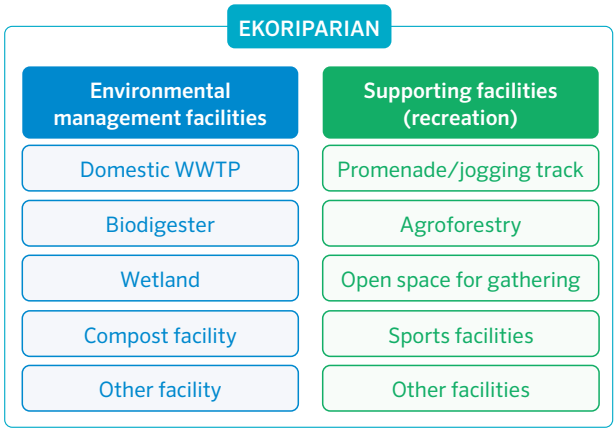


Figure 2.3.12 Structure of EKORIPARIAN

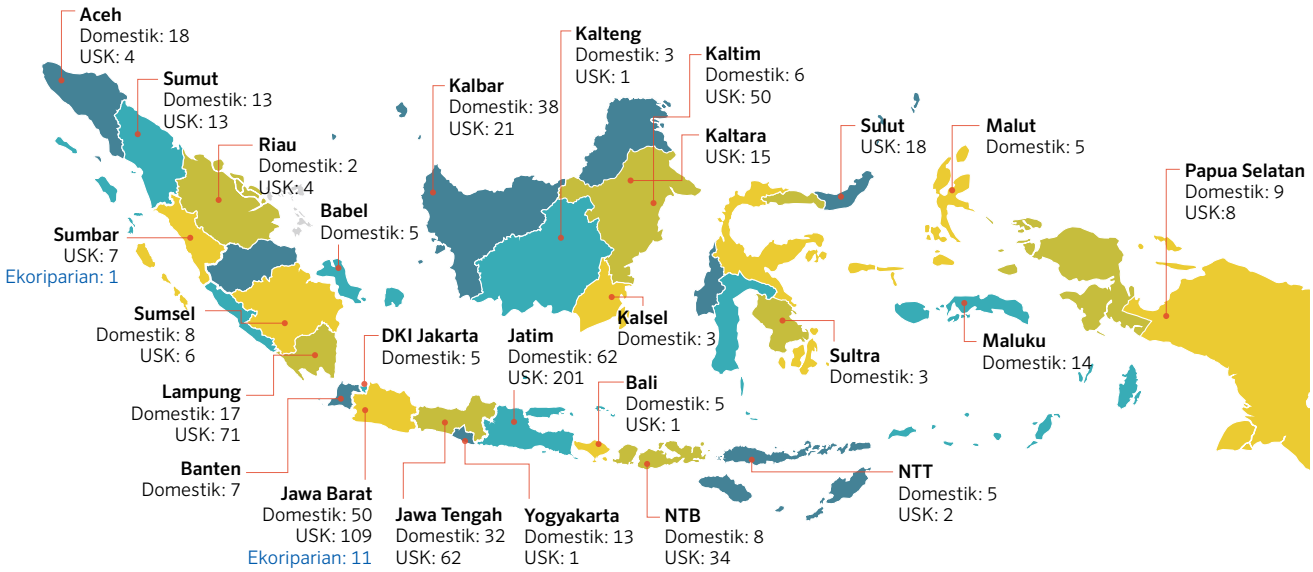


Figure 2.3.13 Locations of domestic WWTPs for domestic and small-scale businesses and EKORIPARIAN projects carried out between 2015 and 2023

7 | Challenges and Future Plans

Challenges: Key challenges are basically divided into the following four categories:

- Institutional challenges: Facilitation to coordinate with related agencies and outreach for local government are needed
- Enforcement challenges: More monitoring points are needed together with higher monitoring frequency, as well as improved action strategies and implementation of water pollution control
- Resource and financial challenges: Commitment to increase the budget for monitoring and controlling water pollution as well as resources at the community level for patrolling and cleaning rivers
- Technical challenges: The need to develop more WWTP (domestic and small-scale businesses)

Note: In Indonesia, the Ministry of Environment and Forestry was reorganized in October 2024 into the Ministry of Environment and the Ministry of Forestry. This chapter was drafted based on information available as of September, 2024.

Table 2.3.8 Necessary actions to address the above-mentioned challenges

Challenges	Actions necessary
Institutional challenges	i. Build an effective system in implementing joint programs and actions between related ministries and institutions and the community
Enforcement challenges	i. Increase 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. Increase the capacity of local governments with guidance and budgetary assistance ii. Implement an effective incentive and disincentive system for local government
Technical challenges	i. Increase collaboration between researchers and managers in the development and application of science and technology ii. Increase the technical capacity of staff and managers in industry and government agencies in water protection and management