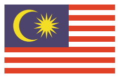
2.7 Malaysia



1 | Country Information

Table 2.7.1 Basic indicators

Land Area (km²)		328,550 (2018)*
Total Population		32.523 million (2019)**
GDP (current USD)		364.7 billion (2019)***
GDP per capita (current USD)		11,415 (2019)***
Average Precipitation (mm/year)		2,420 (2018)****
Total Renewable Water Resources (km^3)		580 (2017)*
Total Annual Freshwater Withdrawals (billion m^3)		6.707 (2017)
Annual Freshwater Withdrawals by Sector	Agriculture	45.7% (2017)
	Industry	29.9% (2017)
	Municipal (including domestic)	24.5%(2017)

(Source: FAO 2020, *World atlas 2018, **DOSM 2020, ***World Bank 2020, ****World weather online 2018)

Figure 2.7.1 Titiwangsa Lake in Kuala Lumpur, Malaysia

2 | State of Water Resources

Malaysia is a rich water resource country thanks to its high rainfall. In 2016, the highest annual rainfall was recorded at Kuching station with 5,423.0 mm, 877.5 mm higher than 2015, and the lowest was recorded at Temerloh station, with 1,397.8 mm (DOSM 2017). In terms of volume, this equates to 972.8 billion m^3. Of this, 495.71 billion m^3 is surface runoff, 64 billion m^3 goes to ground water and the remainder returns to the atmosphere through evapotranspiration (ASM 2014). The weather in Malaysia is characterized by two monsoon regimes – the Southwest Monsoon from late May to September, and the Northeast Monsoon from November to March. The Northeast Monsoon brings heavy rainfall, particularly to the east coast states of peninsular Malaysia and western Sarawak, whereas the Southwest Monsoon normally signifies relatively drier weather (MoSTI 2010). Malaysia depends heavily on surface water, mainly rivers, lakes, wetlands and reservoirs for water supply, which presently constitute 98% of total water supply for domestic, industrial and agricultural use. The remaining 2% comes from groundwater. About 80% of the water withdrawn from river systems is used for irrigation. Percentages of water withdrawn from surface water sources for domestic and industrial uses are expected to rise in the future. Potable water supply extends mostly throughout the country except for a few isolated spots where supply is challenged due to physical or geographical factors, for which wells or rural water supply scheme systems are provided.

According to ASM (2014), current water consumption is about 12.5 billion m^3/year, or less than 3% of the available runoff, but is expected to increase at about 5% annually due to rapidly rising populations and industrial growth to around 30.4 billion m^3/year by 2020, 60.8 billion m^3/year by 2040, and 121.6 billion m^3/year by 2060. Irrigation will continue to be the largest water user but its share is expected to be outpaced by domestic and industrial consumption.

3 | State of Ambient Water Quality

3.1 Rivers

The Water Quality Index (WQI) is used to evaluate the status of river water quality and the corresponding suitability in terms of water uses according to the National Water Quality Standards for Malaysia (NWQS). To assess river water quality, samples from all 638 rivers were investigated between 2010 to 2018. A total of 8,118 water samples were collected from 1,353 manually monitored stations, 1,252 stations designated for ambient and baseline studies, 55 upstream water intake stations, and 35 stations from the River of life project. The WQI for river water quality is calculated based on six parameters: DO, BOD, COD, NH_3-N (Ammoniacal nitrogen), SS, and pH (DOE 2018), and classified into three categories according to the index: clean, slightly polluted, and polluted. Results indicate that 357 rivers (i.e., 56%), 231 rivers (36%) and 50 rivers (8%) fall under clean, slightly polluted and polluted categories, respectively during the 10-year period (2008–2018) of analysis (DoE 2018), as shown in Figure 2.7.2. Figures 2.7.3 and 2.7.4 specifically show trends in river water quality based on BOD and NH_3-N sub-index, respectively (2008–2018). Based on Figure 2.7.3, river water quality exhibited a deteriorating trend from 2008 to 2017, but in 2018 showed signs of recovery owing to strict water quality regulation and management efforts. For 2017, of the 477 river waters analyzed, none fell into the clean category, 141 rivers (29.6%) were slightly polluted while the remaining 336 rivers (70.4%) were polluted. However, for 2018, 110 (17.2%) rivers were categorized as clean, and 271 (42.5%) and 257 (40.3%) rivers as slightly polluted and polluted, respectively. Regarding NH_3-N as shown in Figure 2.7.4, it can be seen that the number of rivers falling under the clean category improved although the total percentage shown in the figure is a lower number because of the increase in total number of rivers being investigated. Another water quality temporal trend (2008–2018) can be seen in Figure 2.7.5, showing SS. This indicates that in general water quality was improving from 2008 to 2015, but in 2016 and 2017 showed a declining trend. Again, for 2018, water quality improved despite additional rivers being included in the monitoring network. Heavy metals were also analyzed in terms of Mercury (Hg), Arsenic (As), Cadmium (Cd), Chromium (Cr), Lead (Pb), and Zinc (Zn). The results indicate that all water samples exhibited concentrations within the Class II limit for Cd, Pb, and Zn. About 99.87%, 99.45% and 98.63% of water samples were in Class II for Cr, Hg and As, respectively (DOE 2015).

River pollution is still a major issue in Malaysia despite substantial investment in and effort taken to improve and maintain river quality. Both point and non-point pollution sources are significant contributors to water pollution, and levels of BOD, NH_3-N and SS in the monitoring samples were high. High BOD is attributed to inadequate treatment of sewage or effluent from agro-based and manufacturing industries. Meanwhile, the major sources of NH_3-N were assumed to be animal farming and domestic sewage, and main sources of SS were improper earthworks and land clearing activities. The future scenario is predicted to be even more challenging in managing water pollution due to the presence of micro-pollutants and new emerging pollutants (NEPs) resulting from excessive use of pharmaceutical and personal care products, some of which are endocrine disruptors.

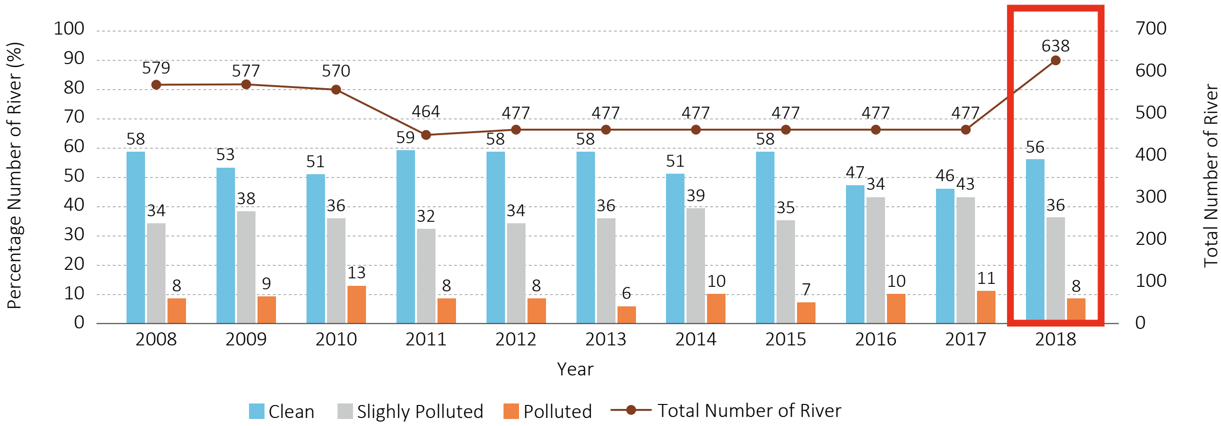


Figure 2.7.2 Trend in river water quality in Malaysia (2008–2018) (Source: DOE 2018)

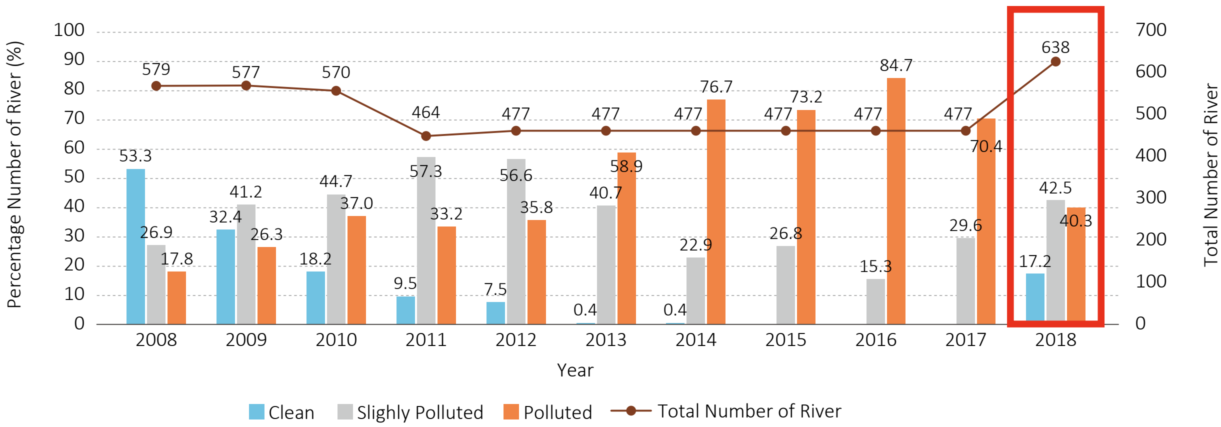


Figure 2.7.3 Trend in river water quality in Malaysia based on BOD sub-index (2008–2018) (Source: DOE 2018)

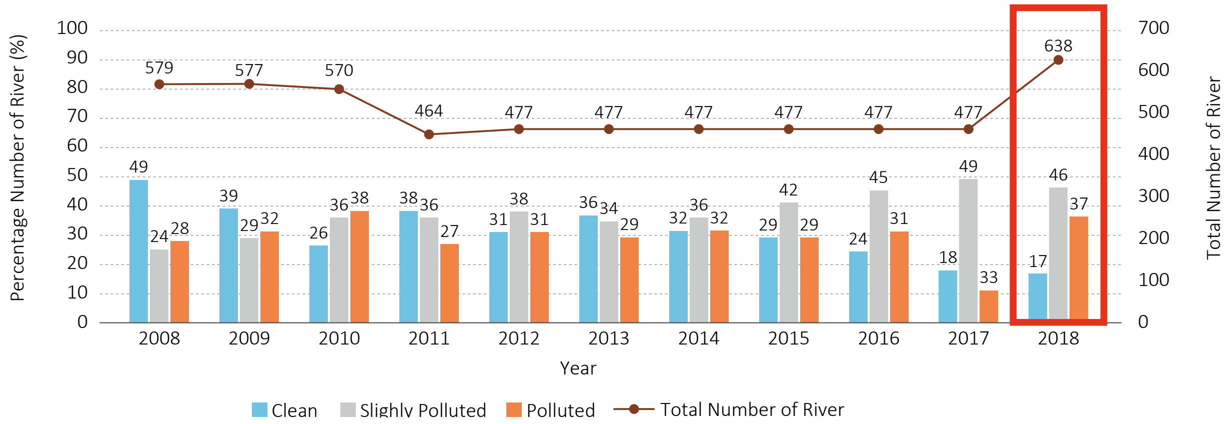


Figure 2.7.4 Trend in river water quality in Malaysia based on NH_3-N sub-index (2008–2018) (Source: DOE 2018)

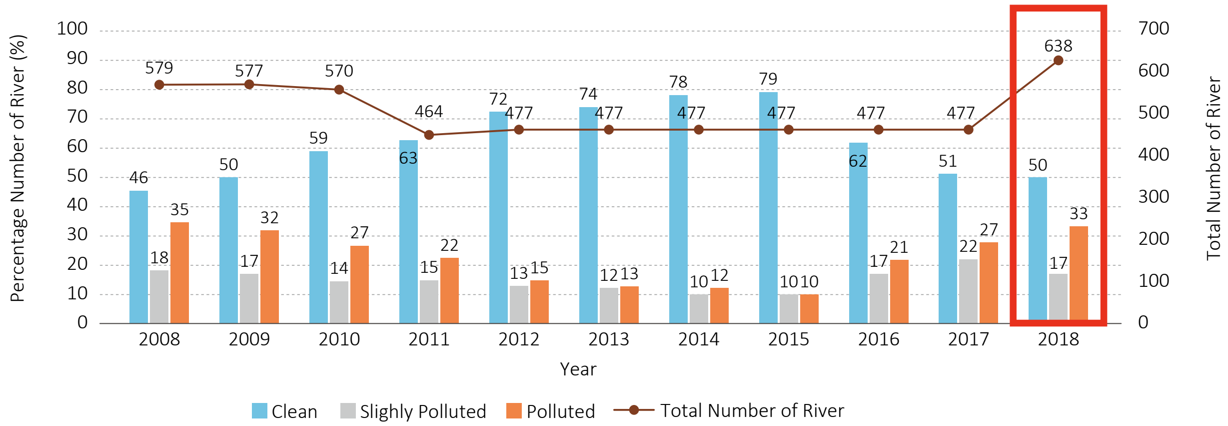


Figure 2.7.5 Trend in river water quality in Malaysia based on suspended solids (2008–2018) (Source: DOE 2018)

3.2 Lakes and Reservoirs

Since lakes and reservoirs are managed by different authorities, owners and operators, comprehensive water quality monitoring has not been conducted by the DoE and no water quality inventories exist for either water bodies. However, a study by the Institute of Environment and Water Resource Management and Teknologi Malaysia shows 62% of water bodies comprised of lakes and reservoirs to be eutrophic (Sharifuddin 2011).

3.3 Coastal Water

In 2015, monitoring was conducted from a total of 151 coastal, 76 estuary and 90 island stations, providing 590, 401, 353, samples, respectively, which were analyzed and reported based on the Marine Water Quality Index (MWQI). The index was developed based on seven main parameters: DO, Nitrate (NO_3), Phosphate (PO_4), Unionized Ammonia (NH_3), Faecal Coliform, Oil and Grease and Total Suspended Solids (TSS), and provides a score on a scale of 0–100 to determine the category of marine water quality, ranging from Excellent to Poor. The monitoring results showed water was Excellent at nine stations (6%), Good at 54 stations (36%), Moderate at 86 stations (57%) and Poor at two stations (1%). The trend in terms of Marine Water Quality Index (MWQI) for 2013 to 2015 is given in Figure 2.7.6, from which it can be seen that numbers of Good, Moderate and Poor water quality stations had increased in 2015, while Excellent stations had decreased compared to the previous year.

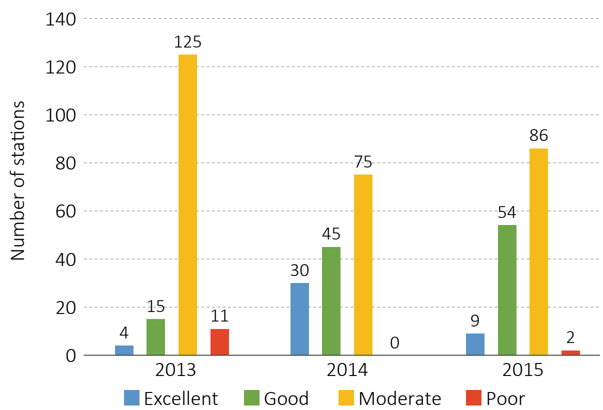


Figure 2.7.6 Trend in marine water status for coastal areas in Malaysia (2013–2015) (Source: DOE 2015)

3.4 Groundwater

According to ASM (2014), the groundwater resource is currently still underused owing to relatively higher exploration costs, and groundwater use is concentrated in the State of Kelantan. In Sarawak, a number of villages, especially along the coast, obtain water from groundwater due to the low cost-efficacy of laying pipes from central facilities to these isolated areas. Groundwater is also an important source of water supply in many small islands and is used in conjunction with surface runoff and rainwater.

The status of groundwater quality was evaluated using the National Guidelines for Drinking Water Quality (NGDWQ) 2000 from the Ministry of Health (revised in December 2000) as a benchmark. In 2015, 390 water samples were taken from 105 monitoring wells and analyzed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, total hardness, Total Dissolved Solids (TDS), pH, temperature, conductivity and DO. Results showed that all stations were within the NGDWQ values except for As, iron (Fe), manganese (Mn), total coliform and phenol.

4 | State of Wastewater Treatment

Wastewater and major pollutants

Concerning the different key pollutants (BOD, SS and NH_3-N) of water bodies, all the sources can be divided into five main categories as reported by DOE (2018): manufacturing industries, agriculture-based industries, wet market, sewage treatment plants and piggeries. In terms daily quantities of these pollutants released, from highest, the sources are sewage treatment plants, piggeries, agriculture-based industries, manufacturing industries, then wet markets for most of the key pollutants except for suspended solids, as shown in Table 2.7.2.

Table 2.7.2 Summary of sectoral load of key pollutants

Water Pollution Sources	BOD Load (Ton/Day)	SS Load (Ton/Day)	NH_3-N Load (Ton/Day)
Manufacturing Industries	55	35	5
Agriculture-based Industries	133	39	11
Wet Market	6	8	0.3
Sewage Treatment Plant	242	303	162
Piggery	217	450	27

(Source: DOE 2018)

Facilities and situation of wastewater treatment

Wastewater management and sludge collection and treatment were assigned to Indah Water Konsortium (IWK), a specialized organization. To improve operation and maintenance, IWK gradually took over sewerage systems of various sizes and types. From 1994 to 2008, over 8,800 became public systems and come under IWK's control, while over 3,000 systems remained under direct management of the owners and, thus, are classified as private systems. On average IWK took over 300 treatment facilities and 1,000 km of sewer network per year. However, in areas without large-scale sewerage systems, private developers continued to construct small-scale sewerage systems.

IWK, although not the owner of the public facilities, had the right to collect sewerage charges as it operated and maintained them. However, the charging system it introduced for individuals and enterprises subsequently received complaints from citizens and resulted in three reductions in charges (JSC 2011), which then led IWK into financial difficulties. as the charges could not cover the business expenses and collection of charges proved difficult. To avoid insolvency, which would have affected sewerage services, IWK was therefore placed under governmental control in 2000 and has since been managed as a private company with the government, under the Ministry of Finance, controlling capital expenditure. The role of implementing agency managing sewerage construction was then transferred to Sewage Service Department (SSD), supplementing its current role as sewerage industry regulator.

In 2006, the Malaysian Parliament passed the Water Service Industry Act (WSIA), which replaced the Sewerage Service Act. Under the previous legal arrangement, IWK had no right to oblige users to pay desludging costs and sewerage charges or to impose fines. As the new Act also integrates drinking water and sewerage services, it provides a level of holistic management to water supply since supply can be cut for users who default on paying charges. The new framework also reinforced SSD's roles and provided by law a new regulator, SPAN (*Suruhanjaya Perkhidmatan Air Negara* or National Water Services Commission).

SSD then became a project implementation agency, in charge of defining plans for new construction and upgrades of sewers and wastewater treatment plants. As was performed by IWK, SPAN thus handles monitoring and regulation of sewerage services. SPAN also aims to improve the quality of new systems constructed by the private sector through providing guidelines to ensure they are both built according to set standards and meet effluent quality requirements as determined by the Department of Environment. Accordingly, developers are obliged to select only those systems approved by SPAN.

According to IWK, in 2018, the company's service area is 88,741 km^2, and it operates and maintains 6,745 wastewater treatment plants, 1,188 pumping stations, and 19,134 km of sewer network, supporting the lives of approximately 25 million people.

Table 2.7.3 shows the status of wastewater treatment facilities in Malaysia. According to SPAN statistics, there were 10,773 public and private sewage treatment plants, while still a significant number of communal septic tanks, individual septic tanks and other sewage treatment system exists. This means that more than 12 million people are still using such facilities.

Table 2.7.3 Status of domestic wastewater treatment facilities (2018)

Sewage Facilities	Quantity	Population Equivalent (PE)
Public Sewage Treatment Plant (a+b)	6,932	26,128,858
a. multipoint Plant	6,830	17,513,195
b. regional Plant	102	8,615,663
Private Sewage Treatment Plant	3,841	4,010,610
Communal Septic Tank	4,231	515,527
Individual Septic Tank	1,357,553	6,998,919
Traditional System (Pour Flush)	1,185,032	5,925,160

(Source: SPAN 2018)

5 | Framework for Water Environmental Management

5.1 Legislation

The ultimate objective of Malaysia's environmental management (including water quality management) is to improve living standards and ensure a sustainable quality of life for its citizens. The National Policy on the Environment approved in 2002 states, "the nation shall implement environmentally sound and sustainable development for the continuous economic, social and cultural progress and enhancement of the quality of life of Malaysia" (MoSTE 2002). In line with this policy, the national policy set eight principles to integrate the economy and environment, namely stewardship of the environment; conservation of nature's vitality and diversity; continuous improvement in the quality of the environment; sustainable use of natural resources; integrated decision making; role of the private sector commitment and accountability; and active participation in the international community.

The Environmental Quality Act (EQA) 1974 (Amendments 2012) relates to the prevention, abatement and control of pollution, and enhancement of the environment. The Act ordains that the minister, after consultation with the Environmental Quality Council, may elaborate regulations for prescribing ambient water quality and discharge standards, and specifying the maximum permissible loads that may be discharged by any source into inland waters, with reference either generally or specifically to the body of waters concerned.

Over time, several amendments or additions were made to this Act. Some of the key subsidiary legislations related to water environment are as follows:

a. Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977
b. Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978
c. Environmental Quality (Scheduled Wastes) Regulations 2005
d. Environmental Quality (Sewage) Regulations 2009
e. Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009
f. Environmental Quality (Industrial Effluent) Regulations 2009
g. Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015

Other laws and regulations are also shown in Figure 2.7.7.

There are some other important policies related to water Environmental Management. One of them is the National Water Resources Policy (NWRP), which was launched in March 2012 for the period from 2010 to 2050. It is aimed at determining the future direction of the water resources sector based on a review of the national water resources. NWRP for Malaysia provides clear directions and strategies in water resources management to ensure water security and sustainability for both humankind and nature.

Conservation of Water Quality

General

- Environmental Quality Act
- Environmental Quality Standards for Surface Water
- Effluent Discharge Standards

Specific Area

- Selangor Waters Management Authority Enactment (1999)
- Kedah Water Resources Enactment (2007)
- Sabah Conservation of the Environment Enactment
- Sabah Water Resources Enactment (1998)
- National resources and Environment Ordinance Sarawak

Specific Sector

Peninsular Malaysia

1. Agriculture
   Irrigation Areas Act (1953)
   Drainage Works Acts (1954)
2. Forestry
   National Forestry Act (1984)
3. Control of Rivers
   Water Acts (1920), Reviewed (1989)
   River Rights Enactment of Perak
   Kelantan River Traffic Enactment (1955)
   Pahang River Launches Enactment 6/49
4. Land Management
   National Land Code (1965)
   Land Conservation Act (1960)
   Earthwork by laws
5. Domestic Water Supply
   Water Service Indutry Act
6. Mining
   Mining Enctment (1936)
7. Local and Regional Planning
   Town and Country Planning Act (1976)
8. Fishery
   Fisheries Act (1963)
9. Others
   Local Government Act (1976)
   Street Drainage Building By law (1974, 1994-R)
   Geological Survey Act
   Ministerial Function Act (1969)

State of Sabah and Sarawak

1. Agriculture
   Drainage and Irrigation, Sabah Ordinace (15/1956)
   Drainage Works Ordinance Sarawak (1966)
2. Forestry
   Sabah Forest Enactment (1965)
   Forest Ordinance Sarawak, Cap126
3. Control of Rivers
   Sarawak Water Ordinance,
   Sarawak Riverine Transport Bill (1993)
4. Land Management
   Sabah Land Ordinance (1930)
   Sarawak Land Code (1958)
5. Domestic Water Supply
   Water Services Industry Act
6. Mining
   Mining Enactment (1960 Sabah)
   Mining Enactment (1949 Sarawak)
7. Local and Regional Planning
   Town and Country Planning
   Enactment Sabah Cap 141
   Town and Country Planning Sarawak Cap 87
8. Others
   Local Authority Enactment, Sabah Ordinance (11/1961)
   Local Authority Ordinance Sarawak Cap 117

Figure 2.7.7 Legislative chart for water quality management (Source: MOEJ 2009)

5.2 Institutional Arrangement

The Department of Environment (DOE) was originally created as the Environment Division, which was established in 1975 under the Ministry of Local Government and Environment. It has been reorganized several times due to the realignments of government ministries and agencies, and it is now under the Ministry of Environment and Water which newly established in April 2020. DOE is responsible for environmental protection, including water quality management. The mission of the Ministry of Environment and Water is to integrate the functions of water resources and water services, strengthen the management of the country's water ecosystem, and ensure adequate and sustainable water resources and supplies. The quality of drinking water is regulated by the Ministry of Health, and the National Water Commission regulates the entities involved in water supply and sewerage services under the Water Services Industry Act 2006 (Act 655), which came into effect in 2008. Local governments are involved in water resources planning and development.

5.3 Ambient Water Quality Standards

Water quality standards

National Water Quality Standards for Malaysia (NWQS), which applies to surface waters, sets out standard values for 72 parameters in six water use classes (Table 2.7.4.), the goal of which is not to meet the standards of a particular water class in all surface waters, but to improve water quality gradually in order to meet the standards of a water class higher than the current class.

Table 2.7.4 Water quality classes in the National Water Quality Standards

Class	Uses
I	Conservation of natural environment. Water Supply I – Practically no treatment necessary. Fishery I – Very sensitive aquatic species.
IIA	Water Supply II – Conventional treatment required. Fishery II – Sensitive aquatic species.
IIB	Recreational use with body contact.
III	Water Supply III – Extensive treatment required. Fishery III – Common, of economic value and tolerant species; livestock drinking.
IV	Irrigation
V	None of the above.

(Source: DOE 2015)

For marine water quality, the Malaysian Marine Water Quality Index (MWQI) was established with seven sub-indexes.

While groundwater quality standards for Malaysia have not been established, based on the assumption that groundwater can potentially be used as an alternative source of surface water, the National Guidelines for Drinking Water Quality are referred as the benchmark for evaluating groundwater quality monitoring results.

Water quality monitoring framework

The Department of Environment (DOE) is responsible for conducting monitoring programs for rivers, marine waters and groundwater. In 1978 it implemented the National River Water Monitoring Program to determine river water quality status and detect changes over time.

River water quality monitoring

For 2018, 8,118 water samples from 638 rivers were analyzed based on sampling frequencies of 4 to 12 times per year. A total of 30 parameters were monitored and a water quality index was developed with six key indicator species: DO, BOD, COD, NH_3-N, SS and pH (DOE EQR 2018).

Coastal water quality monitoring

For 2018, 368 stations, comprising188 from coastal, 85 from estuaries, 95 from islands and the remaining 79 selected from islands were investigated. A total of 2,208 water samples were taken and analyzed from the 368 stations with sampling frequencies of six times per year. Twenty-nine parameters were monitored including six in-situ and 23 in laboratory. The Marine Water Quality Index (MWQI) was developed based on seven parameters: DO, NO_3, PO_4, NH_3, Faecal coliform, Oil and Grease, TSS.

Groundwater monitoring

For 2018, 109 tube wells were monitored based on specific land use: Agricultural (13), Urban & Suburban (12), Industrial Sites (19), Solid Waste Landfills (23), Golf Courses (7), Rural Areas (4), Ex-mining Area (Gold Mines) (3), Municipal Water Supply (5), Animal Burial Areas (14), Aquaculture Farms (7), Radioactive Landfills (1) and Resorts (1). A total of 17 parameters were analyzed in-situ (6 parameters) and Laboratory analysis (11 parameters). Various types of advanced sampling equipment such as hydro lift pumps, HDPE tubing, water depth sensors, generators, sampling bottles/preservative kits, coolboxes and multiprobes were used for increased accuracy. The Malaysia Groundwater Quality Index (MGQI) was developed to represent the groundwater quality status and categories, based on a scale of 0–100, which represents from Very Poor to Excellent. Parameters used for MGQI were pH, Fe, TDS, NO_3, *E. coli*, phenol and sulphate.

5.4 Effluent Standards

Effluent standards

The National Environmental Quality Act 1974 states that "no person shall, unless licensed, emit, discharge or deposit any environmentally hazardous substances, pollutants or wastes into any inland waters in contravention of the acceptable conditions specified under Section 21" (Section 25, National Environmental Quality Act 1974).

Effluent inspection procedure

Monitoring of effluent, as well as recording and maintenance of the monitoring results are obligations that all premises are required to fulfill under the environmental regulations on sewage and industrial effluents. Analytical methods and parameters to be monitored are designated. All premises are required to submit monthly effluent discharge reports to the DOE, either by the online reporting system or hard-copy submission. Authorized DOE officials can carry out inspections of all premises, including surprise inspections, to ensure compliance with all provisions in the act, and non-compliance results in immediate penalties to polluters. As a measure to improve effluent quality, industrial effluent treatment systems (IETS) were introduced with the aim of optimizing effluent treatment operations and maintenance by enabling preventive or corrective actions through the monitoring of treatment performance based on certain parameters. Through IETS, companies can benefit from the early identification of deficiencies, identification of proper dosages for chemicals (Keong 2008) and increased opportunities to identify preventive actions (How 2008). The DOE provides technical guidance to promote IETS. The guidance recommends that within each industry a competent person certified by the director-general of the DOE be on duty to supervise IETS. The use of IETS is expected to encourage industry as a whole to be more proactively engaged in pollution control but without invoking the level of enforcement present in the public sector.

The government can be seen to have extended diligent efforts in its monitoring of effluents from both domestic and industrial sectors with the use of key indicator species. Monitoring results for effluent quality in terms of compliance with national standards for both public sewage treatment plants and industrial sectors are shown in Table 2.7.5 and 2.7.6 respectively. Result shows a significant improvement in the rate of compliance in 2018 compared to 2010. In 2018, average rates of compliance of effluent monitoring sites for public sewage treatment plants and industrial sites with ambient guidelines were 97.8% and 99.6% respectively.

Measures against non-compliance

Since 2009, DOE has designed different enforcement measures and tools for maintaining the water environment. A brief snapshot of these, including penalties for defaulters, is shown in Table 2.7.7 (DOE 2018). Non-complying institutions or entities face penalties of up to 100,000 MYR or five year jail terms.

Table 2.7.5 Summary of public sewage treatment plants and status of compliance with Sewage Effluent Standards for 2010–2018

Parameter	Compliance Level (%) (Target>90%)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average
Suspended Solids (SS)	97.8	97.1	97.0	96.9	97.3	98.1	98.5	98.2	97.9	97.6
Biological Oxygen Demand (BOD)	95.2	94.8	93.9	93.7	94.7	96.3	96.2	97.7	95.4	95.3
Chemical Oxygen Demand (COD)	97.7	97.5	97.1	96.9	97.9	98.5	98.6	98.4	98.2	97.9
Oil & Grease	99.1	99.1	99.1	98.6	99.1	99.5	99.6	99.5	99.4	99.2
Ammoniacal Nitrogen (NH_3-N)	99.6	99.4	99.5	99.2	99.1	98.9	99.8	99.9	97.2	99.2
Average	97.9	97.6	97.3	97.1	97.6	98.3	98.5	98.7	97.6	97.8

(Source: SPAN 2018)

Table 2.7.6 Summary of industrial wastewater management and status of compliance with industrial wastewater management guidelines

Industrial effluents regulations				
YEAR	No. of Desktop Inspections	Compliance (%)	No. of Field Inspections	Compliance (%)
2018	4,549	99.6	5,663	99.6
2017	10,280	99.2	5,518	99.2

YEAR	No. Inspections	Compliance (%)
2016	14,995	99.0
2015	11,372	99.0
2014	11,410	99.0
2013	7,201	99.0
2012	6,597	98.1

(Source: DOE Annual report 2012–2018)

Table 2.7.7 Summary of different enforcement instruments and economic tools for water environmental management

S.No	Regulations	Enforcement agency	Enforcement method/Reporting	Penalty
1	EQ (Inustrial Effluent) Regulations 2009 - Industrial Effluent and Mixed Effluent	DOE	1. Self Regulatory Mechanism: a. Section 7: monitor COD and any parameter in Fifth Schedule b. Reporting: Monthly c. Section 9: Perfomance Monitoring of IETS-based on Guidance Document on Performance Monitoring of Industrial Effluent Treatment System d. Online Environmental Reporting (OER) 2. Site Inspection by DOE Officer	Section 32: Penalty- If convicted, maximum penalty of RM 100,000 or/and amximum 5 years jail and further fine of RM 1,000/day for continued offence
2	EQ (sewage) Regulations 2009	DOE	1. Self Regulatory Mechanism: a. Section 10: Monitor concentration of the specified parameters in Second Schedule b. Reporting: Monthly c. Online Environmental Reporting (OER) 2. Site Inspection by DOE Officer	Section 26: Penalty- If Convited, maximum penalty of RM 100,000 or/and maximum 5 years in jail and further fine of RM 1,000/day for continued offence
3	EQ (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	DOE	1. Self Regulatory Mechanism: a. Section 8: Monitor concentration of ammoniacal nitrogen from landfill on a continuous basis using online instrumentation system linked to DOE b. Section 8: Monitor concentration of the specified parameters in Second Schedule (limits) c. Section 11: Conduct performance monitoring of leachate treatment system d. Online Environmental Reporting (OER)	Section 29: Penalty- If Convited, maximum penalty of RM 100,000 or/and maximum 5 years in jail and further fine of RM 1,000/day for continued offence

5.5 Other Policies on Water Environmental Management

In order to manage the complex, interwoven issues of water environment, the Malaysia government has introduced several legislations and guidelines in terms of new standards, as well as revised existing standards as follows (DOE 2018):

a. Malaysian Groundwater Quality Standards and Index (2019) – Developed by DOE
b. National Lake Water Quality Criteria and Standards (2015) – Developed by NAHRIM (Approved by National Water Resources Council in 2015)
c. National Standard for Drinking Water Quality (2000) – Developed by Ministry of Health (MOH)
d. National Standard for Natural Recreational Water Quality and Guidelines for Natural Recreational Water Quality Monitoring (Marine and Fresh Water) (2017) – Developed by MOH
e. Guidelines for Packaging, Labelling and Storage of Scheduled Waste in Malaysia (2014) – DOE, NRE
f. Guidelines for Green Industry Practice: Juice Production Industry (2014) – DOE, NRE (Malay version)
g. Guidelines for Green Industry Practice: Printing Industry (2014) – DOE, NRE (Malay version)
h. Guidelines on the Disposal of Chemical Wastes from Laboratories (2015) – DOE, NRE
i. Guidelines of the Effluent Treatment System for Dairy Cattle, Beef Cattle and Buffalo Breeders (2016) – DOE, NRE (Malay version)
j. Guidelines on the Effluent Treatment System for Pig Breeders (2016) – DOE, NRE (Malay version)
k. Guidelines for Green Industry Practice: Food sector for Slaughtering and Processing of Poultry (2017) – DOE, NRE (Malay version)
l. Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (2017) – DOE, NRE
m. Environmental Impact Assessment Guidelines for Development in Slope and Hill Areas (2017) – DOE, NRE
n. Environmental Impact Assessment Guidelines for Development in Coastal Areas and Marine Parks (2017) – DOE, NRE

6 | Recent Developments in Water Environmental Management

The Eleventh Malaysia Plan 2016–2020 is seen as the final part toward achieving Vision 2020. Launched in 1991 by the government, Vision 2020 is an aspirational target aimed at Malaysia becoming a fully developed country economically, politically, socially, spiritually, psychologically, and culturally by 2020. The theme of the Eleventh Plan, "anchoring growth on people" has six 'strategic thrusts' and six 'game-changers' intended to reach the goals set out in Vision 2020 and create an inclusive nation with an advanced economy. In terms of water environment management, two of the core strategies are relevant here: 1) "Pursuing green growth for sustainability and resilience", expected to increase the quality of growth, strengthen food, water and energy security, lower environmental risks and ecological scarcities, and ultimately improve wellbeing and quality of life, and 2) "Strengthening infrastructure to support economic expansion", with a focus on (i) raising the financial sustainability of the water services industry by strengthening the tariff system and implementing joint billing for water and sewerage; (ii) expanding the network and treatment plant capacity through infrastructure investment and use of efficient technology through developing new treatment plants, increasing clean and treated water coverage and expanding connected water and sewerage services in rural areas; (iii) increasing efficiency and productivity of water and sewerage services through implementation of the Non-Revenue Water Reduction Programme and by rationalizing and upgrading sewage treatment plants; and (iv) strengthening the regulatory framework of the water services industry with the National Sewerage Master Plan, a water demand management master plan and promotion of waste to wealth initiatives.

7 | Challenges and Future Plans

The Environmental Quality Act 1974 was somewhat successful in reducing pollution through control of point and non-point sources, and continuous monitoring and assessment of the water environment. However, many challenges still remain. The new direction of water environmental management has been incorporated in the Eleventh Malaysian Plan and the new Environmental Protection Act draft. The following elements are also proposed by DOE to improve the nation's future water environment (Majid 2016): (i) Shifting the responsibility for pollution control to industry by incorporating regulation elements (new approach taken by the Department in the formulation of the new regulation for pollution control); (ii) re-strategize the enforcement programs and continuously improve compliance monitoring to secure better solutions for pollution prevention and control; (iii) increase use of ICT to reduce costs of enforcement to cover more pollution sources; promote self-regulation approaches to pollution control by identifying groundwater potential for areas where surface water is limited or unavailable; achieve better management of lakes and reservoirs by clarifying the roles and responsibility of relevant stakeholders; and carry out further studies and proper data management to fulfill this target.

Some of the additional challenges are as follows:

a. Illegal dumping of wastes into watercourses
b. Point source and non-point source pollution
c. Inability of Environmental Quality Act 1974 (Discharge control based on pollutant concentration) to deal with shrinking river carrying capacity; Inability of EQA 1974 to control pollution entering rivers
d. Lack of regulations or standards for wet market effluent, car washes, and laundry

For the way forward, the following key actions have been initiated:

a. Amendment of Environmental Quality Act 1974 – to be tabled in the Parliament in 2020
b. Amendment of Water Services Industry Act 2006
c. Water Resource Bill to be tabled in Parliament in 2020
d. Review of the River Water Quality Criteria and Standard for Malaysia – Inception Report (September 2019) – in progress
e. Malaysian Marine Water Quality Standards and Index – Revised and published
f. Malaysian Groundwater Quality Standards and Index – Study completed in 2017 – Published in 2019