LAPORAN KUALITI ALAM SEKELILING 2017

ENVIRONMENTAL QUALITY REPORT

JABATAN ALAM SEKITAR
Kementerian Tenaga, Sains, Teknologi, Alam Sekitar & Perubahan Iklim

DEPARTMENT OF ENVIRONMENT
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"Alam Sekitar, Tanggungjawab Bersama"

DATO' DR. AHMAD KAMARULNAJUIB CHE IBRAHIM
Ketua Pengarah Kualiti Alam Sekeliling Malaysia
Director-General of Environmental Quality Malaysia

PRAKATA

Saya amat berbesar hati untuk membentangkan Laporan Kualiti Alam Sekeliling 2017 seperti yang dikehendaki di bawah Seksyen 3(1)(i) Akta Kualiti Alam Sekeliling 1974.

Pada tahun 2017, Malaysia tidak mengalami episod jerebu seperti tahun-tahun sebelumnya yang berpunca daripada jerebu setempat dan jerebu merentas sempadan. Ini adalah kerana wilayah rantau Asia Tenggara telah mengalami keadaan cuaca lembap sepanjang tahun termasuk negara Malaysia dan Indonesia. Jumlah taburan titik panas di selatan Asia Tenggara juga adalah terendah bagi tahun 2017 sejak dari tahun 2011.

Berdasarkan Indeks Pencemar Udara (IPU), kualiti udara keseluruhan bagi Malaysia pada tahun 2017 adalah berstatus baik dan sederhana pada kebanyakan masa dan terdapat pengurangan bilangan hari yang tidak sihat dicatatkan pada tahun 2017.

Bagi pengawasan kualiti air sungai, terdapat sedikit penurunan kualiti air sungai pada tahun 2017. Daripada 477 sungai yang diawasi, sejumlah 219 sungai menunjukkan indeks kualiti air bersih berbanding dengan 224 sungai pada tahun 2016 manakala bilangan sungai yang menunjukkan indeks kualiti air tercemar meningkat daripada 46 sungai pada tahun 2016 kepada 51 sungai pada tahun 2017. Walau bagaimanapun, kualiti persekitaran kawasan pantai, muara dan pulau menunjukkan peningkatan pada tahun 2017.

JAS akan terus mengukuhkan dan melaksanakan strategi, program dan aktivitinya dengan berkesan dalam menguruskan alam sekitar secara mampan.

Alam Sekitar, Tanggungjawab Bersama

FOREWORD

It is my pleasure to present the Environmental Quality Report 2017 as required under Section 3(1)(i) of the Environmental Quality Act 1974.

In 2017, there was no haze episode in Malaysia compared to the past years that was mainly due to local and trans boundary haze. This is due to the wetter weather conditions experienced in the Southeast Asia including Malaysia and Indonesia throughout the year. The annual hotspot counts showed tremendous decrease hotspots in Southeast Asia with the year 2017 having the lowest hotspots since 2011.

Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2017 was between good to moderate levels most of the time and there was a reduction in terms of number of unhealthy days recorded in 2017.

For river water quality monitoring, there was a slight decrease in river water quality in 2017. Out of 477 rivers monitored, 219 rivers were found to be clean compared to 224 rivers in 2016 while the number of polluted rivers increased from 46 rivers in 2016 to 51 rivers in 2017. However, the quality of marine environmental with respect to the coastal, estuaries and island has increased in 2017.

DOE will continue to strengthen and implement its strategies, programs and activities effectively in managing the environment sustainably.

Environment, Our Shared Responsibility

DATO' DR. AHMAD KAMARULNAJUIB CHE IBRAHIM

Ketua Pengarah Kualiti Alam Sekeliling Malaysia
Director-General of Environmental Quality Malaysia

Kualiti Udara

Air Quality

KUALITI UDARA
AIR QUALITY

PENGAWASAN KUALITI UDARA

Pengawasan status kualiti udara dilaksanakan oleh Jabatan Alam Sekitar (JAS) melalui 52 stesen pengawasan kualiti udara yang ditempatkan di seluruh Negara. Bermula pada pertengahan April 2017, JAS telah menaiktaraf rangkaian pengawasan kualiti udara di seluruh negara dengan pertambahan kepada 65 stesen pengawasan kualiti udara automatik di bawah Program Pengawasan Kualiti Alam Sekitar (EQMP) yang baharu. Stesen-stesen pengawasan kualiti udara tersebut ditempatkan di lokasi yang strategik iaitu di kawasan bandar, sub-bandar dan perindustrian bertujuan untuk mengesan sebarang perubahan ketara ke atas kualiti udara yang mungkin memberi kesan berbahaya kepada kesihatan dan alam sekitar.

AIR QUALITY MONITORING

The Department of Environment (DOE) monitors ambient air quality throughout the country at 52 continuous monitoring stations. Starting in mid-April 2017, DOE has upgraded air quality monitoring network with the increase of 65 continuous monitoring stations under new Environmental Quality Monitoring Programme (EQMP). These monitoring stations are strategically located in urban, sub-urban and industrial areas to detect any significant change in the air quality which may be harmful to human health and the environment.

Status kualiti udara dilaporkan dalam bentuk Indeks Pencemar Udara (IPU). IPU adalah dikira berdasarkan kepekatan lima bahan pencemar utama iaitu ozon di permukaan bumi (O_3), karbon monoksida (CO), nitrogen dioksida (NO_2), sulfur dioksida (SO_2) dan habuk halus bersaiz kurang dari 10 mikron (PM_{10}). IPU ini dikategorikan sebagai baik , sederhana , tidak sihat, sangat tidak sihat dan berbahaya seperti yang dinyatakan dalam **Jadual 1.1**.

*The air quality status is reported in terms of Air Pollution Index (API). The API is calculated based on concentration of five major pollutants which are ground level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter of less than 10 microns in size (PM_{10}). The API is categorized as good, moderate, unhealthy, very unhealthy and hazardous as presented in **Table 1.1**.*

Jadual 1.1 Malaysia : Status Kualiti Udara (IPU)
Table 1.1 Malaysia : Air Pollutant Index (API)

API/IPU	AIR QUALITY STATUS/ *STATUS KUALITI UDARA*
0 – 50	Baik/ *Good*
51 – 100	Sederhana/ *Moderate*
101 – 200	Tidak Sihat/ *Unhealthy*
201 – 300	Sangat Tidak Sihat/ *Very Unhealthy*
> 300	Berbahaya/ *Hazardous*

STATUS KUALITI UDARA

Berdasarkan Indeks Pencemar Udara (IPU), kualiti udara keseluruhan bagi Malaysia pada tahun 2017 adalah berstatus baik dan sederhana pada kebanyakan masa dan terdapat pengurangan bilangan hari yang tidak sihat dicatatkan pada tahun 2017 dibandingkan tahun 2016.

AIR QUALITY STATUS

Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2017 was between good to moderate levels most of the time and there was a reduction in terms of number of unhealthy days recorded in 2017 compared to 2016.

Pada tahun 2017 , Malaysia tidak mengalami episod jerebu seperti tahun-tahun sebelum ini yang berpunca daripada jerebu setempat dan jerebu

In 2017, there was no haze episode in Malaysia compared to the past years that was mainly due to local and transboundary haze. This is due to wetter

merentas sempadan. Ini adalah kerana wilayah rantau Asia Tenggara telah mengalami keadaan cuaca lembap sepanjang tahun termasuk negara Malaysia dan Indonesia. Jumlah taburan titik panas di selatan Asia Tenggara juga adalah yang terendah bagi tahun 2017 sejak dari tahun 2011 seperti yang ditunjukkan di dalam **Jadual 1.2**.

*weather conditions experienced in the Southeast Asia including Malaysia and Indonesia throughout the year. The annual hotspot counts based on NOAA satellite showed tremendous decrease hotspots in South East Asia with the year 2017 having the lowest hotspots since 2011 as shown in **Table 1.2.***

Walau bagaimanapun, terdapat beberapa kejadian kebakaran hutan dan belukar setempat yang menyebabkan kualiti udara di dalam negara sedikit merosot tetapi tidak berpanjangan akibat faktor cuaca yang lembap sepanjang tahun. Keadaan ini juga memberi kesan kepada kejadian kebakaran hutan dan belukar di Indonesia di mana tidak berlaku jerebu merentas sempadan walaupun masih ada kebakaran yang dilaporkan.

However, there were numbers of forest and bush fires that slightly deteriorated local air quality in the country but were not prolong due to the humid weather all year round. This situation also affected the forest and bush fires in Indonesia where transboundary haze did not occur although there were fire occurrences reported.

Tren kualiti udara di kawasan Lembah Klang pada tahun 2017 meningkat lebih baik berbanding pada tahun 2016. Ini seperti yang ditunjukkan di dalam **Rajah 1.1(a)**. Walau bagaimanapun, habuk halus bersaiz kurang dari 10 mikron, PM_{10} masih merupakan pencemar utama apabila berlakunya kebakaran hutan dan tanah gambut. **Rajah 1.1(b)** menunjukkan kepekatan harian PM_{10} bagi ketiga-tiga jenis kategori stesen terpilih di kawasan bandar, sub-bandar dan luar bandar menunjukkan paras yang lebih rendah daripada standard kualiti udara ambien.

*There had been a significant improvement in the overall trend of air quality in Klang Valley in 2017 compared to year 2016. This is shown in **Figure 1.1(a)**. However, particulate matter, PM_{10} remained the predominant pollutant that had caused unhealthy conditions due to forest and peatland fires. **Figure 1.1(b)** shows the daily concentrations of PM_{10} for all three categories selected stations in urban, sub-urban and rural areas in the country which normally recorded lower levels of PM_{10} than ambient air quality standards.*

Selain pencemar PM_{10}, ozon di permukaan bumi (O_3) merupakan pencemar udara yang menjadi perhatian. Ia terhasil akibat tindak balas sebatian-sebatian organik meruap (Volatile Organic Compounds, VOCs) dan oksid-oksid nitrogen (NOx) dengan kehadiran cahaya matahari. Cuaca panas terik menggalakkan lagi pembentukan pencemar O_3. Punca utama VOCs dan NOx adalah dari pelepasan industri dan ekzos kenderaan bermotor terutama di bandar-bandar besar. Ini menyebabkan berlakunya beberapa hari yang tidak sihat di beberapa lokasi di Lembah Klang, Perak dan Negeri Sembilan.

Besides PM_{10}, ground level ozone (O_3) remained the pollutant of concern. O_3 pollutant was formed as a result of chemical reaction between Volatile Organic Compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight. Formation of O_3 enhanced during hot and sunny day. Major sources of VOCs and NOx emissions were from industries and motor vehicles particularly in urban areas. These resulted in several unhealthy days recorded at various locations in the Klang Valley and in the States of Perak and Negeri Sembilan.

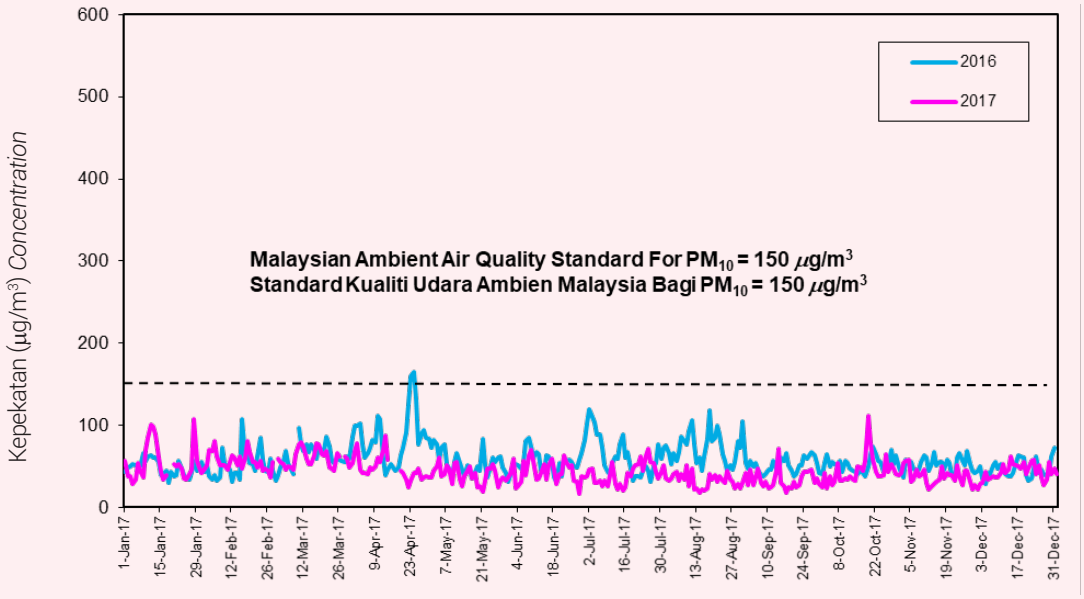
Kadangkala terdapat kepekatan maksimum harian bagi parameter O_3 dalam tempoh 1 jam adalah melebihi Garis Panduan Kualiti Udara Ambien Malaysia terutamanya di beberapa kawasan di Lembah Klang, Negeri Perak dan Negeri Sembilan seperti ditunjukkan dalam **Rajah 1.1(c)**, **Rajah 1.1 (d)** dan **Rajah 1.1 (e)**. Keadaan ini menyebabkan beberapa hari yang tidak sihat dicatatkan terutama di kawasan-kawasan pusat perniagaan yang tinggi dan berkepadatan trafik.

*Occasionally, the daily maximum 1-hour concentration of O_3 exceeded the Malaysian Ambient Air Quality Guidelines at several stations in the Klang Valley, Perak and Negeri Sembilan as shown in **Figure 1.1(c)**, **Figure 1.1(d)** and **Figure 1.1(e)**. These conditions led to a number of unhealthy days recorded in some areas especially those of central business with heavy traffic volumes.*

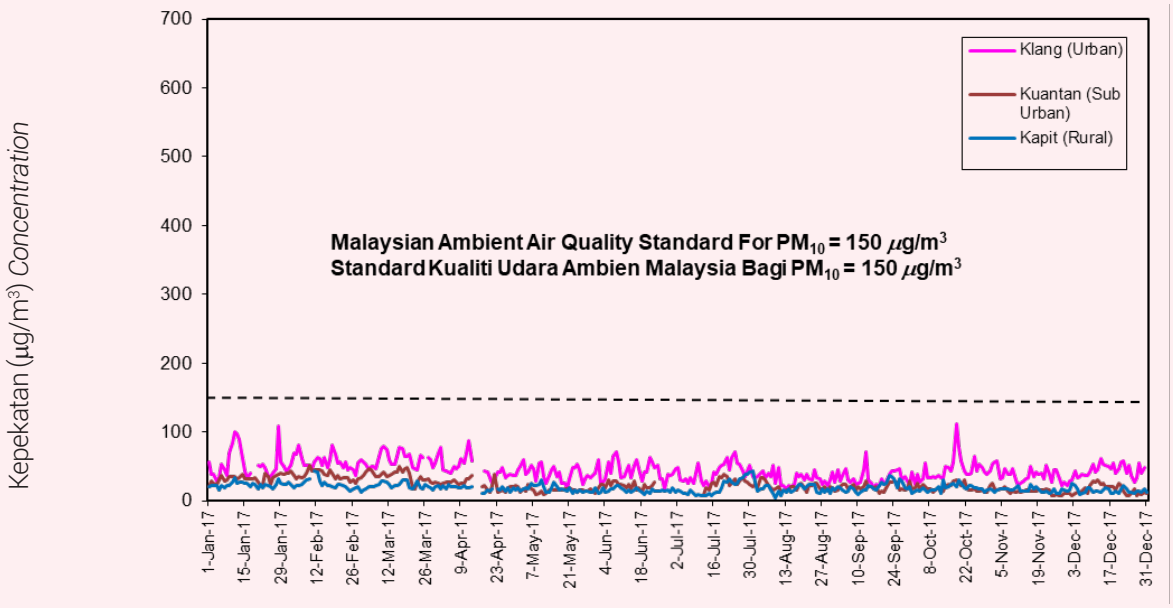
Jadual 1.2 Jumlah Titik Panas Tahunan Berdasarkan Imej NOAA-Siri Satelit
Table 1.2 Annual Hotspot Counts based on NOAA-Serial Satellite Image

TAHUN *YEAR*	2011	2012	2013	2014	2015	2016	2017
Selatan Asia Tenggara South of South East Asia	27 605	35 113	20 995	32 880	22 153	5 338	2 374

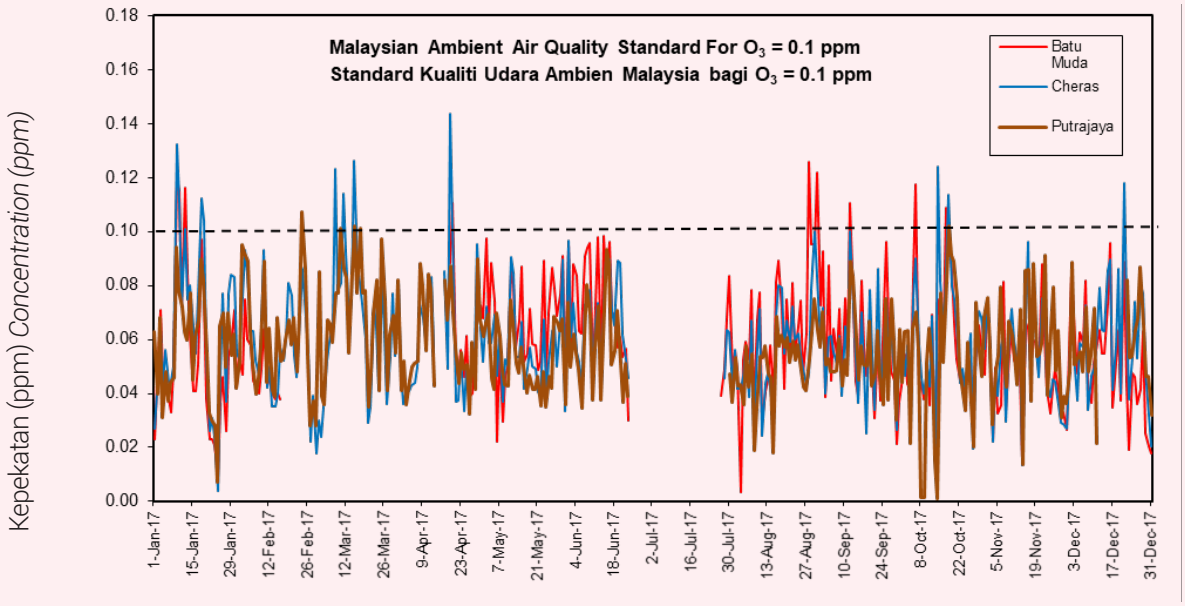
(ASEAN Specialised Meteorological Centre, Feb 2018)



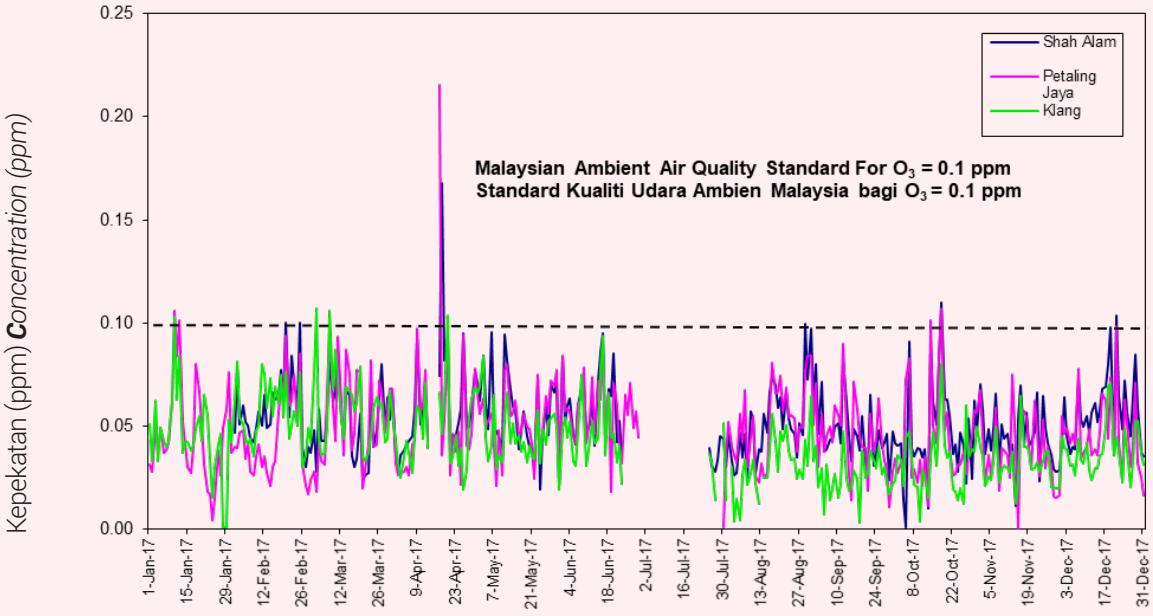
Rajah 1.1 (a) Malaysia: Tren Kepekatan 24 jam bagi Pepejal Terampai (PM_{10}), Klang, 2016 dan 2017
Figure 1.1 (a) Malaysia: Trend of 24-hour Concentration of Particulate Matter (PM_{10}), Klang, 2016 and 2017



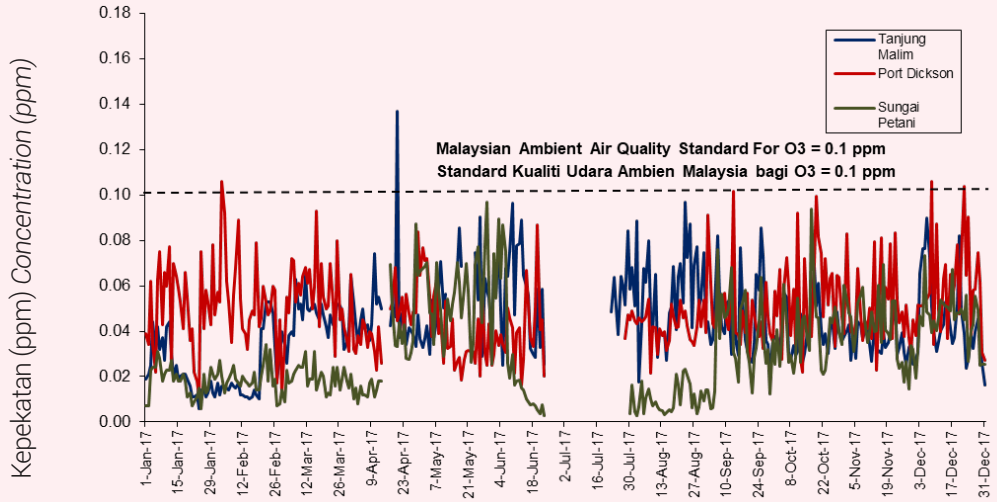
Rajah 1.1 (b) Malaysia: Tren Kepekatan 24 jam bagi Pepejal Terampai (PM_{10}), Malaysia, 2017
Figure 1.1 (b) Malaysia: Trend of 24 Hours Concentration of Particulate Matter (PM_{10}), Malaysia, 2017



Rajah 1.1 (c) Malaysia: Tren Kepekatan Maksimum Harian Ozon (O_3)1 Jam, Lembah Klang, 2017
Figure 1.1 (c) Malaysia: Trend of Daily Maximum 1-hour Concentration of Ozone (O_3), Klang Valley, 2017



Rajah 1.1 (d) Malaysia: Tren Kepekatan Maksimum Harian Ozon (O_3)1 Jam, Lembah Klang, 2017
Figure 1.1 (d) Malaysia: Trend of Daily Maximum 1-hour Concentration of Ozone (O_3), Klang Valley, 2017



Rajah 1.1 (e) Malaysia: Tren Kepekatan Maksimum Harian Ozon (O_3)1 Jam, Malaysia, 2017
Figure 1.1 (e) Malaysia: Trend of Daily Maximum 1-hour Concentration of Ozone (O_3), Malaysia, 2017

Status Kualiti Udara di Pantai Barat

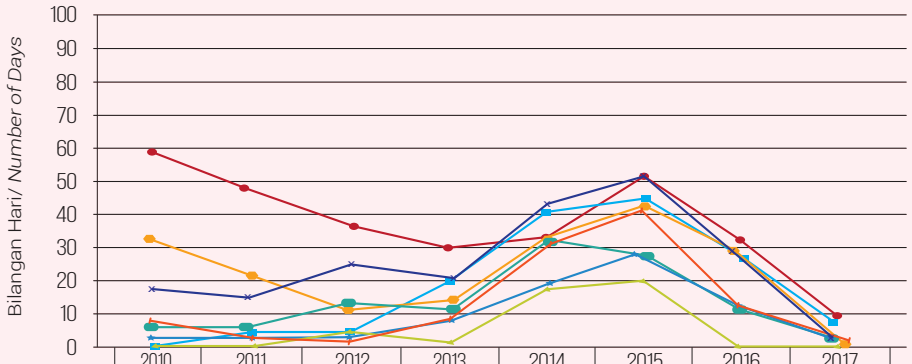
Lembah Klang

Pada tahun 2017, status kualiti udara di Lembah Klang mencatatkan 74 peratus baik, 25 peratus sederhana dan satu (1) peratus tidak sihat. Bilangan hari di mana status kualiti udara mencatatkan paras tidak sihat yang tertinggi adalah di Cheras, Kuala Lumpur (9 hari) **(Rajah 1.2)**. Status kualiti udara tidak sihat yang dicatatkan adalah kebanyakannya disebabkan oleh pencemar O_3 dan PM_{10}. Status kualiti udara di Lembah Klang secara keseluruhannya ditunjukkan seperti di **Rajah 1.3**.

Air Quality Status in the West Coast

Klang Valley

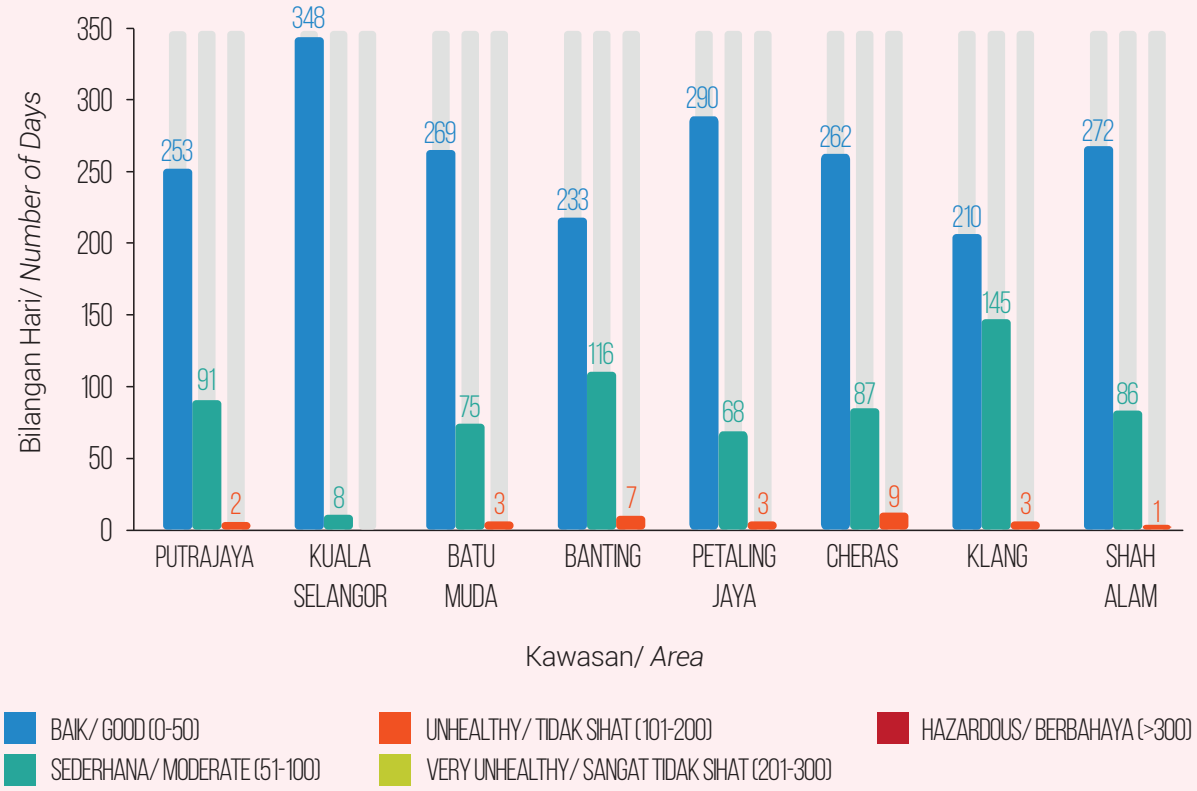
In 2017, the air quality in the Klang Valley was good 74 percent of the time, moderate 25 percent and one (1) percent at an unhealthy level. The highest number of unhealthy days was recorded in Cheras, Kuala Lumpur (9 days) ***(Figure 1.2)****. The unhealthy days recorded were mainly due to O_3 and PM_{10}. The overall air quality status in Klang Valley is shown in* ***Figure 1.3****.*



	2010	2011	2012	2013	2014	2015	2016	2017
BANTING	0	5	5	20	41	45	27	7
SHAH ALAM	32	22	11	15	33	43	29	1
CHERAS	59	48	37	30	34	52	33	9
KLANG	6	6	13	11	34	28	11	3
PETALING JAYA	3	3	4	8	19	27	12	3
KUALA SELANGOR	0	0	5	2	16	20	0	0
PUTRAJAYA	8	3	2	9	31	41	14	2
BATU MUDA	17	15	25	21	43	51	29	3

Rajah 1.2 Malaysia: Bilangan Hari Tidak Sihat, Lembah Klang, 2010-2017
Figure 1.2 Malaysia: Number of Unhealthy Days, Klang Valley, 2010 - 2017

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API



Rajah 1.3 Malaysia: Lembah Klang, Status Kualiti Udara, 2017
Figure 1.3 Malaysia: Klang Valley Air Quality Status, 2017

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API

Wilayah Utara

Secara keseluruhan, status kualiti udara di utara Pantai Barat Semenanjung Malaysia yang meliputi Negeri Perlis, Negeri Kedah, Negeri Pulau Pinang dan Negeri Perak adalah baik dan sederhana sepanjang masa. Stesen yang mencatatkan status kualiti udara tidak sihat adalah Tanjung Malim (1 hari) yang disebabkan oleh pencemar O_3.

Rajah 1.4 menunjukkan status kualiti udara keseluruhan bagi wilayah utara di Pantai Barat Semenanjung Malaysia.

Wilayah Selatan

Kualiti udara di Wilayah Selatan Pantai Barat Semenanjung Malaysia (Negeri Sembilan, Negeri Melaka dan Negeri Johor) adalah baik dan sederhana pada kebanyakan masa. Stesen-stesen yang mencatatkan kualiti udara yang tidak sihat adalah Nilai (3), Seremban (1) dan Port Dickson (1). Status kualiti udara tidak sihat di kawasan-kawasan berkenaan adalah disebabkan oleh PM_{10} dan O_3. **Rajah 1.5** menunjukkan status kualiti udara secara keseluruhan bagi wilayah selatan di Pantai Barat Semenanjung Malaysia.

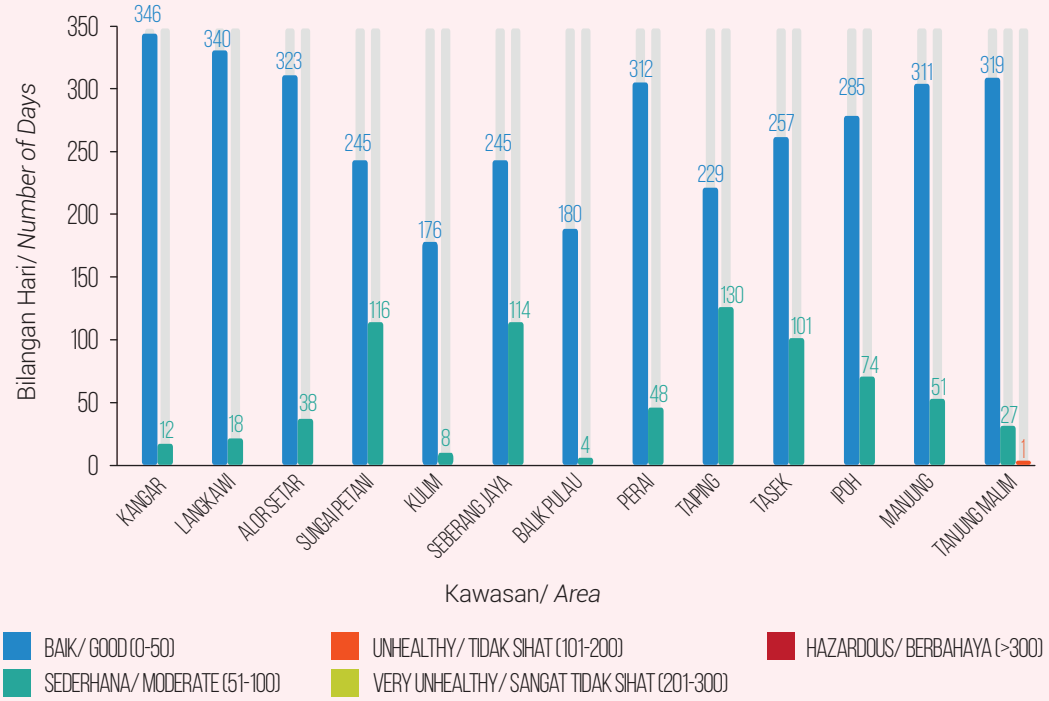
Northern Region

The overall air quality status of the northern region of the West Coast of Peninsular Malaysia covering Perlis, Kedah, Pulau Pinang and Perak, was between good to moderate most of the time. The unhealthy day was recorded in Tanjung Malim (1 day) due to O_3 pollutants.

***Figure 1.4** shows the overall air quality status for the northern region of the West Coast of Peninsular Malaysia.*

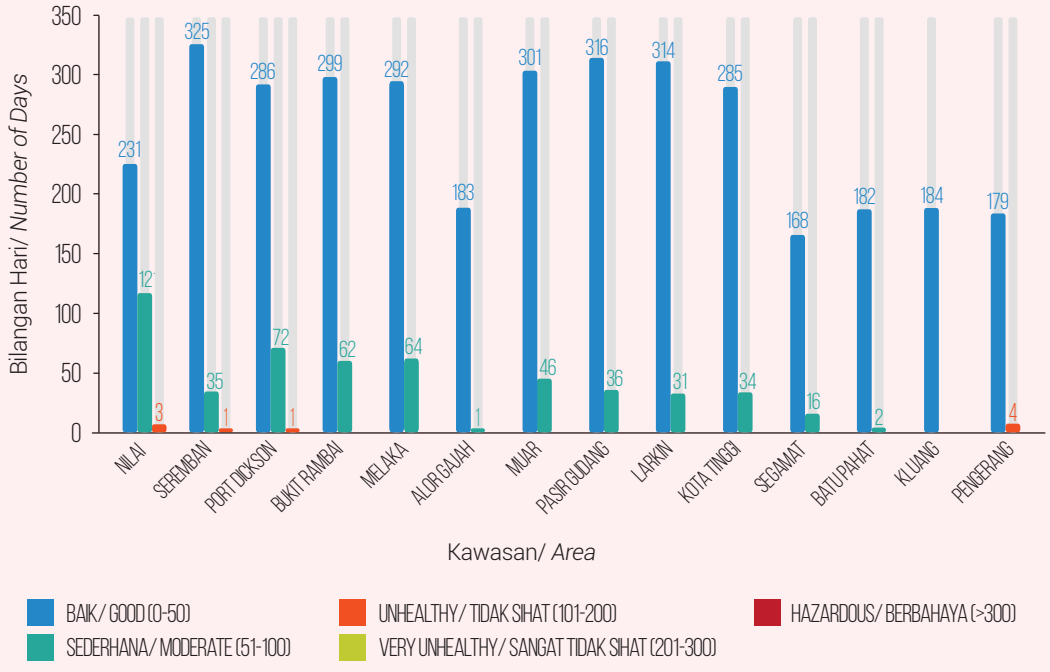
Southern Region

*In the southern region of the West Coast of Peninsular Malaysia (Negeri Sembilan, Melaka and Johor) the air quality was also between good to moderate most of the time. The stations recorded unhealthy days were Nilai (3), Seremban and Port Dickson (1). Unhealthy days recorded at those areas were mainly due to PM_{10} and O_3 pollutants. **Figure 1.5** shows the overall air quality status for southern region of the West Coast of Peninsular Malaysia.*



Rajah 1.4 Malaysia: Status Kualiti Udara, Wilayah Utara Pantai Barat Semenanjung Malaysia, 2017
Figure 1.4 Malaysia: Air Quality Status, Northern Region of The West Coast Peninsular Malaysia, 2017

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API



Rajah 1.5 Malaysia: Status Kualiti Udara, Wilayah Selatan Pantai Barat Semenanjung Malaysia, 2017
Figure 1.5 Malaysia: Air Quality Status, Southern Region of The West Coast Peninsular Malaysia, 2017

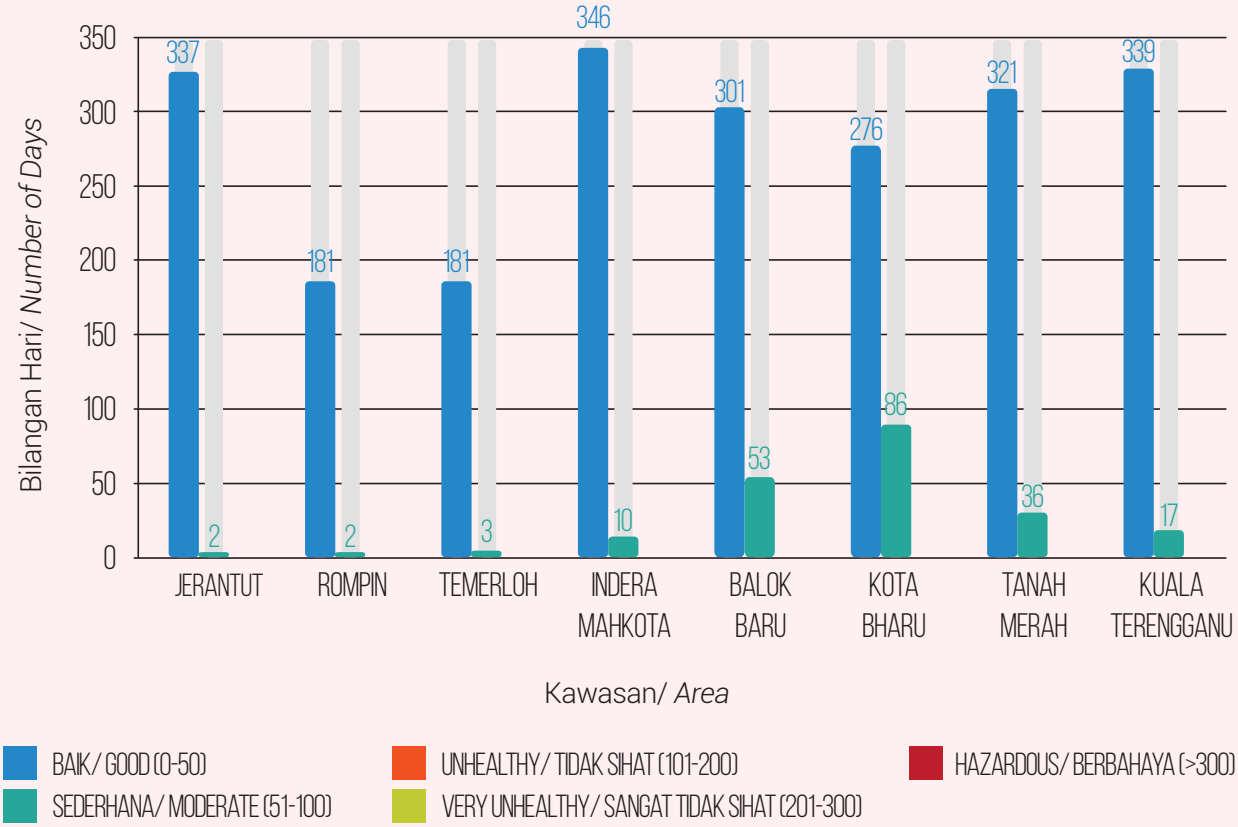
Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API

Status Kualiti Udara di Pantai Timur

Kualiti udara di Pantai Timur Semenanjung Malaysia (Negeri Pahang, Negeri Terengganu, Negeri Kelantan dan timur Negeri Johor) kekal berstatus baik dan sederhana pada kebanyakan masa, dan tiada kawasan yang mencatatkan status kualiti udara tidak sihat sepanjang tahun 2017. Status kualiti udara di Pantai Timur Semenanjung Malaysia secara keseluruhan adalah seperti di **Rajah 1.6.**

Air Quality Status in the East Coast

In the East Coast of Peninsular Malaysia (Pahang, Terengganu, Kelantan and East Johor) the air quality remained between good to moderate levels most of the time, and no area recorded unhealthy days in year 2017. The overall air quality status in the East Coast of Peninsular Malaysia is shown in ***Figure 1.6****.*



Rajah 1.6 Malaysia: Status Kualiti Udara, Pantai Timur Semenanjung Malaysia, 2017
Figure 1.6 Malaysia: Air Quality Status, East Coast Peninsular Malaysia, 2017

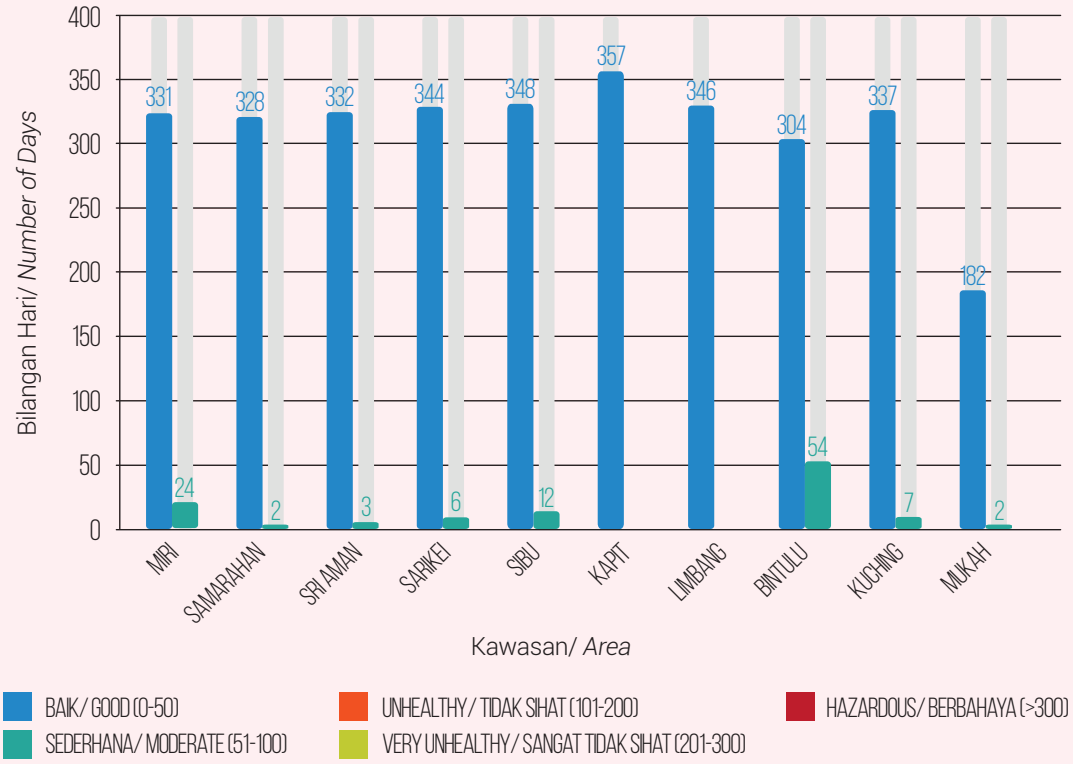
Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API

Status Kualiti Udara di Sabah, Labuan dan Sarawak

Kualiti udara di Sabah, Labuan dan Sarawak adalah baik dan sederhana di kebanyakan masa dan tiada kawasan yang mencatatkan bacaan hari yang tidak sihat. Status kualiti udara di Sarawak secara keseluruhan ditunjukkan dalam **Rajah 1.7** dan di Sabah dan Labuan ditunjukkan dalam **Rajah 1.8**.

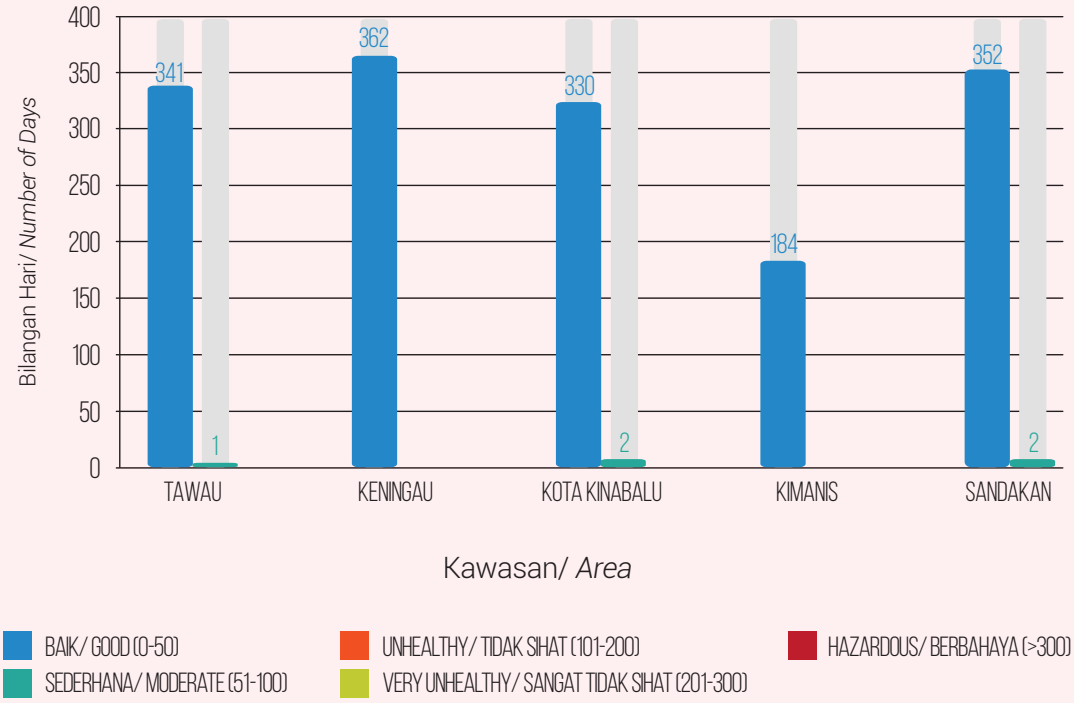
Air Quality Status in Sabah, Labuan and Sarawak

The air quality in Sabah, Labuan and Sarawak remained between good to moderate levels most of the time and no area recorded unhealthy day. The overall air quality status in Sarawak is shown in ***Figure 1.7*** *and* ***Figure 1.8*** *shows the overall air quality in Sabah and Labuan.*



Rajah 1.7 Malaysia: Status Kualiti Udara Sarawak, 2017
Figure 1.7 Malaysia: Air Quality Status Sarawak, 2017

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API



Rajah 1.8 Malaysia: Status Kualiti Udara Sabah dan Labuan, 2017
Figure 1.8 Malaysia: Air Quality Status Sabah and Labuan, 2017

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API

TREN KUALITI UDARA

Lima (5) pencemar udara iaitu kumin pepejal (PM_{10}), ozon permukaan bumi (O_3), sulfur dioksida (SO_2), nitrogen dioksida (NO_2) dan karbon monoksida (CO) dipantau secara berterusan di 65 buah lokasi. Tren kualiti udara dari tahun 2010 hingga 2017 ditentukan dengan mengambilkira purata data kualiti udara tahunan daripada stesen-stesen pengawasan dan merujuk kepada Standard Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Jadual 1.2.**

AIR QUALITY TREND

*Five (5) air pollutants which are Particulate Matter (PM_{10}), Ground Level Ozone (O_3), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), and Carbon Monoxide (CO) been monitored continuously in 65 locations. Air quality trend from 2010 to 2017 been specified by taking into account the air quality average data from monitoring stations and referred to the Malaysia Ambient Air Quality Standard as per **Table 1.2**.*

Jadual 1.2 Malaysia: Standard Kualiti Udara Ambien Malaysia
Table 1.2 Malaysia: Ambient Air Quality Standard

PARAMETER/ *PARAMETER*	PURATA MASA/ *AVERAGING TIME*	UNIT/ *UNIT*	GARIS PANDUAN SEDIA ADA *EXISTING GUIDELINES*	STANDARD KUALITI UDARA AMBIEN MALAYSIA *MALAYSIA AMBIENT AIR QUALITY STANDARD*		
				IT-1 (2015)	IT-2 (2018)	STANDARD (2020)
PM_{10}	1 TAHUN	µg/m³	50	50	45	40
	24 JAM	µg/m³	150	150	120	100
$PM_{2.5}$	1 TAHUN	µg/m³	-	35	25	15
	24 JAM	µg/m³	-	75	50	35
SO_2	1 JAM	µg/m³	350	350	300	250
		ppm	0.135	0.135	0.115	0.095
	24 JAM	µg/m³	105	105	90	80
		ppm	0.040	0.040	0.035	0.030
*CO	1 JAM	mg/m³	35	35	35	30
		ppm	30.6	30.6	30.6	26.2
	8 JAM	mg/m³	10	10	10	10
		ppm	8.75	8.75	8.75	8.75
NO_2	1 JAM	µg/m³	320	320	300	280
		ppm	0.170	0.170	0.160	0.150
	24 JAM	µg/m³	75	75	75	70
		ppm	0.040	0.040	0.040	0.037
O_3	1 JAM	µg/m³	200	200	200	180
		ppm	0.100	0.100	0.100	0.090
	8 JAM	µg/m³	120	120	120	100
		ppm	0.060	0.060	0.060	0.050

Nota: *mg/m3 IT-Interim Tier (tahun)

Kumin Pepejal (PM_{10})

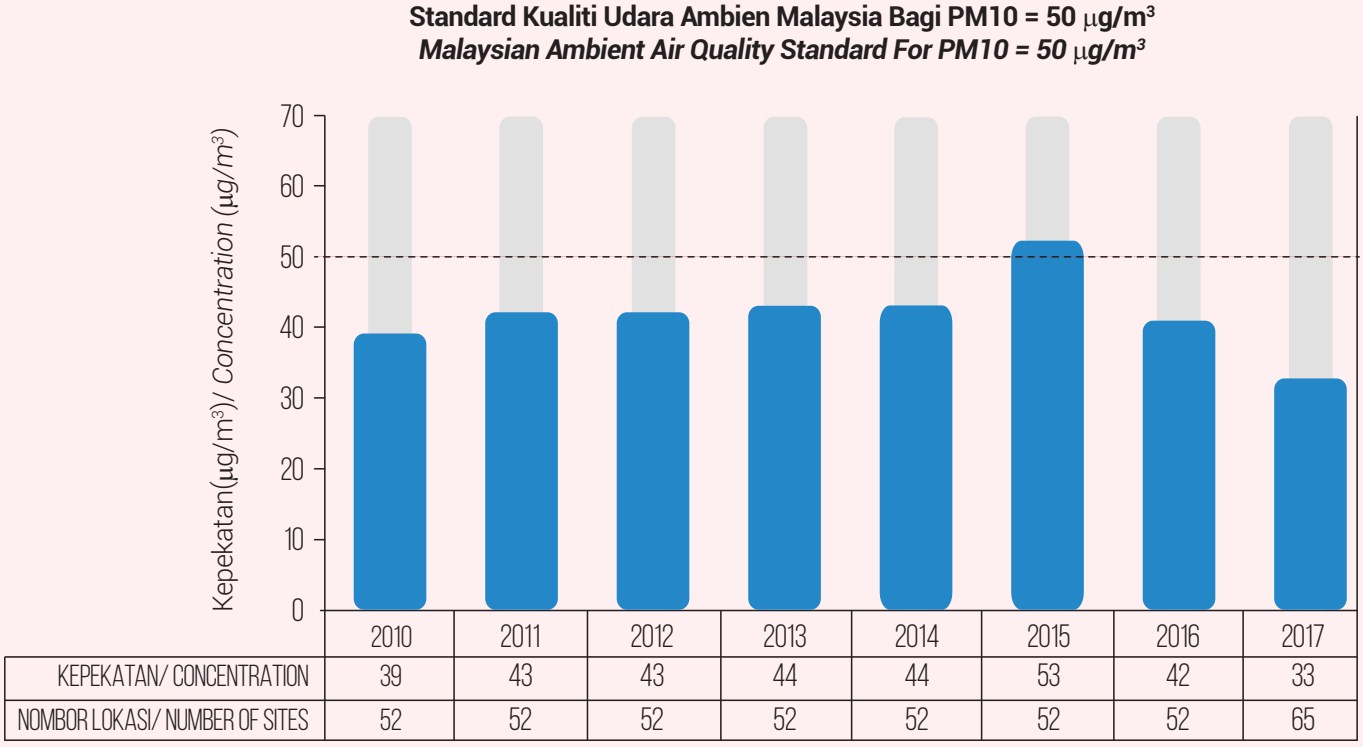
Pada tahun 2017, nilai purata tahunan PM_{10} dalam udara ambien adalah 33 µg/m³ iaitu masih belum melebihi had yang ditetapkan dalam Garis Panduan Kualiti Udara Ambien Malaysia iaitu sebanyak 50 µg/m³. Ini merupakan pengurangan yang paling rendah bagi PM_{10} yang pernah dicatatkan semenjak dari tahun 2010. Keadaan ini dipengaruhi oleh keadaan cuaca yang lembap sepanjang tahun di Malaysia dan Indonesia dan tiada berlaku kejadian jerebu setempat dan merentas sempadan.

Tren purata tahunan kepekatan PM_{10} dalam udara ambien bagi tahun 2017 didapati mematuhi Garis Panduan Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Rajah 1.9**. Berdasarkan kategori guna tanah, nilai kepekatan PM_{10} adalah mematuhi Standard Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Rajah 1.9 (a)**.

Particulate Matter (PM_{10})

In 2017, the annual average value of PM_{10} in the ambient air was 33 µg/m³ which lower from the Malaysian Ambient Air Quality Guidelines value of 50 µg/m³. There was the lowest of PM_{10} concentration recorded from year 2010 due to wetter weather conditions throughout the year and no big fire occurrence that caused localised and transboundary haze in Malaysia.

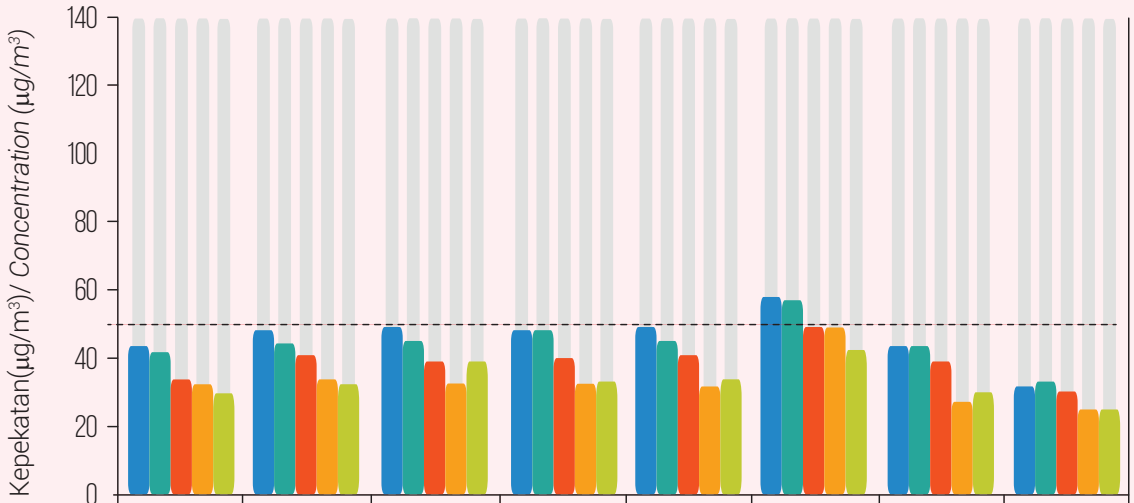
*The trend of the annual average levels of PM_{10} concentration in the ambient air for 2017 complied with the Malaysian Ambient Air Quality Standard as shown in **Figure 1.9**. Based on land use categories, PM_{10} concentration was in compliance with Malaysia Ambient Air Quality Standard as shown in **Figure 1.9(a)**.*



	2010	2011	2012	2013	2014	2015	2016	2017
KEPEKATAN/ CONCENTRATION	39	43	43	44	44	53	42	33
NOMBOR LOKASI/ NUMBER OF SITES	52	52	52	52	52	52	52	65

Rajah 1.9 Malaysia: Purata Kepekatan Tahunan Kumin Pepejal (PM_{10}), 2010 - 2017
Figure 1.9 Malaysia: Annual Average Concentration of Particulate Matter (PM_{10}), 2010 - 2017

Standard Kualiti Udara Ambien Malaysia Bagi PM10 = 50 μg/m³
Malaysian Ambient Air Quality Standard For PM10 = 50 μg/m³



	2010	2011	2012	2013	2014	2015	2016	2017
INDUSTRI/ INDUSTRIAL	44	48	49	48	49	58	44	33
URBAN/ BANDAR	42	45	46	48	46	57	44	35
LUAR BANDAR/ SUB URBAN	36	41	39	40	41	49	39	31
BACKGROUND	34	36	34	34	33	49	29	25
RURAL	30	34	39	35	36	43	32	25

Rajah 1.9 (a) Malaysia: Purata Kepekatan Tahunan Kumin Pepejal (PM_{10}) Mengikut Guna Tanah, 2010 - 2017
Figure 1.9 (a) Malaysia: Annual Average Concentration of Particulate Matter (PM_{10}) by Land Use, 2010 - 2017

Ozon Permukaan Bumi (O_3)

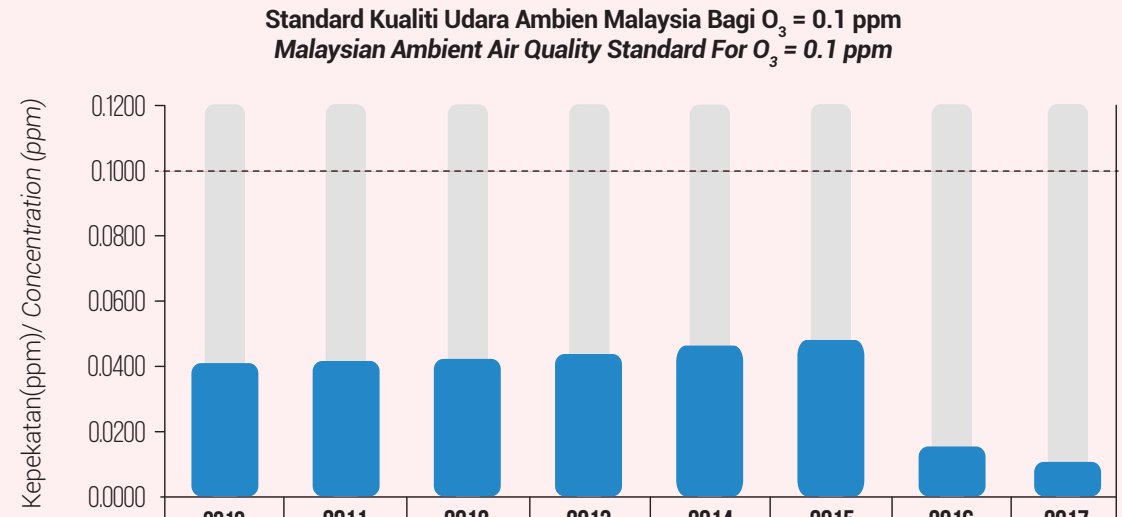
Pada tahun 2017, purata tahunan kepekatan maksimum harian ozon didapati paling rendah berbanding dengan tahun-tahun sebelumnya. Secara keseluruhannya, tren purata tahunan kepekatan maksimum ozon dalam udara ambien dari tahun 2010 hingga 2017 adalah mematuhi had sebanyak 0.1 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia dan tren tersebut adalah seperti yang ditunjukkan dalam **Rajah 1.10**.

Rajah 1.10(a) menunjukkan kepekatan ozon aras bumi untuk pelbagai kategori guna tanah dari tahun 2010 hingga 2017. Kawasan bandar mencatatkan bacaan ozon lebih tinggi disebabkan oleh jumlah trafik yang lebih tinggi dan keadaan atmosfera yang kondusif menyebabkan pembentukan ozon. Pencemaran ozon aras bumi juga ketara di beberapa kawasan sub-bandar dan pedalaman disebabkan oleh pergerakan angin yang membawa pencetus pencemar ozon aras bumi iaitu oksida-oksid nitrogen (NOx) dan sebatian organik meruap (VOC) yang kebanyakannya dilepaskan daripada kenderaan bermotor dan industri.

Ground Level Ozone (O_3)

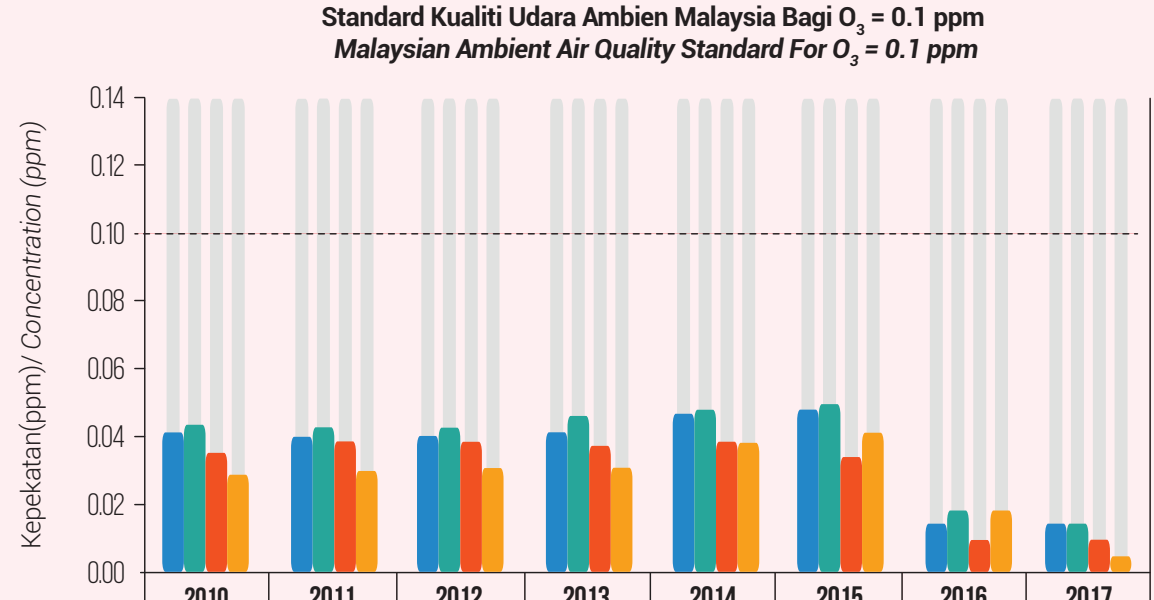
*In 2017, the lowest concentration in annual average daily maximum one-hour ozone concentrations achieved as compared to the previous years. The overall trend on the annual average daily maximum one-hour ozone concentrations in ambient air from 2010 to 2017 were well below the limit of 0.1 ppm as stipulated in the Malaysia Ambient Quality Standard and the trend is as shown in **Figure 1.10**.*

***Figure 1.10(a)** shows the ground level ozone concentration for various land use categories between 2010 and 2017. Urban areas recorded higher levels of ground level ozone due to higher traffic volume and a conducive atmospheric condition resulting in its formation. Ground level ozone pollution was also dominant in some sub urban and rural areas due to downwind effect transporting ground level ozone pollutant precursors namely nitrogen oxides (NOx) and volatile organic compound (VOC) emitted mainly from motor vehicles and industries.*



	2010	2011	2012	2013	2014	2015	2016	2017
KEPEKATAN/ CONCENTRATION	0.0406	0.0408	0.0409	0.0413	0.0429	0.0435	0.0180	0.0158
NOMBOR LOKASI/ NUMBER OF SITES	41	41	41	41	41	41	41	45

Rajah 1.10 Malaysia: Purata Kepekatan Tahunan Ozon (O_3), 2010 - 2017
Figure 1.10 Malaysia: Annual Average Concentration of Ozone (O_3), 2010 - 2017



	2010	2011	2012	2013	2014	2015	2016	2017
INDUSTRI/ INDUSTRIAL	0.0412	0.0402	0.0407	0.0417	0.0431	0.0463	0.0170	0.0175
URBAN/ BANDAR	0.0453	0.0447	0.0441	0.0457	0.0469	0.0489	0.0192	0.0176
LUAR BANDAR/ SUB URBAN	0.0364	0.0383	0.0386	0.0370	0.0388	0.0354	0.0159	0.0155
BACKGROUND	0.0287	0.0309	0.0327	0.0335	0.0378	0.0416	0.0190	0.0127

Rajah 1.10 (a) Malaysia: Purata Kepekatan Tahunan Ozon (O_3) Mengikut Guna Tanah, 2010 - 2017
Figure 1.10 (a) Malaysia: Annual Average Concentration of Ozone (O_3) by Land Use, 2010- 2017

Sulfur Dioksida (SO_2)

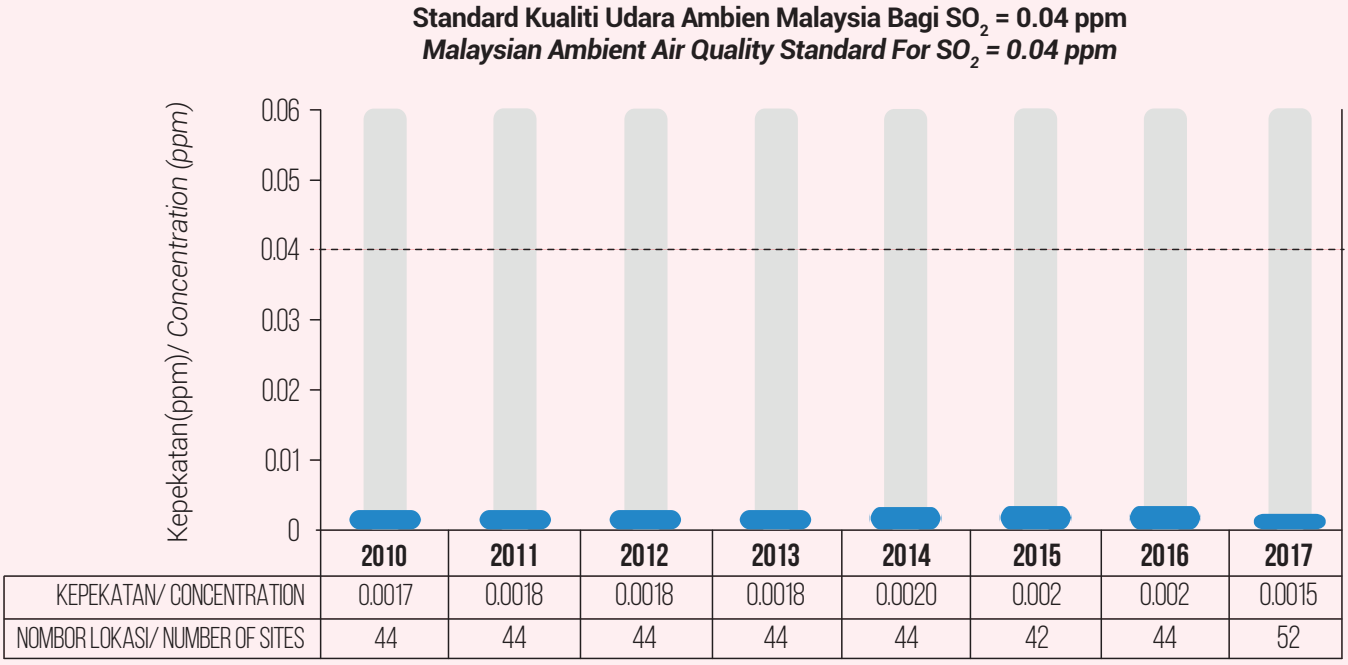
Secara umumnya, purata kepekatan tahunan SO_2 menunjukkan tren penurunan dari tahun 2010 hingga 2017 (**Rajah 1.11**) dan ia adalah jauh di bawah had sebanyak 0.04 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia. Ini adalah disebabkan oleh penggunaan bahan api berkualiti EURO2M yang lebih baik di negara ini bermula dari bulan September 2009 dan penguatkuasaan yang lebih ketat oleh JAS serta penggunaan gas asli secara meluas dalam proses industri dan kegunaan kenderaan. Mulai 1 September 2015, EURO4M RON97 telah dilaksanakan dan November 2015, EURO5 Diesel yang mengandungi kandungan sulfur kurang dari 10 mg/l pula telah diperkenalkan di pasaran.

Walaupun jumlah kenderaan yang menggunakan bahan api tersebut adalah kurang dari penggunaan EURO2M, sedikit sebanyak ia mempengaruhi tren pelepasan SO_2 di kawasan industri dan bandar yang menunjukkan pengurangan pelepasan SO_2. **Rajah 1.11 (a)** menunjukkan kepekatan purata tahunan bagi sulfur dioksida mengikut kategori guna tanah. Berdasarkan kepada rajah tersebut, keadaan menunjukkan bahawa terdapat sedikit peningkatan kepekatan SO_2 di kawasan luar bandar berbanding kawasan-kawasan yang lain. Ini kemungkinan disebabkan oleh pembangunan yang pesat di kawasan luar bandar di Malaysia yang menyebabkan peningkatan bilangan kenderaan dan kesesakan trafik.

Sulphur Dioxide (SO_2)

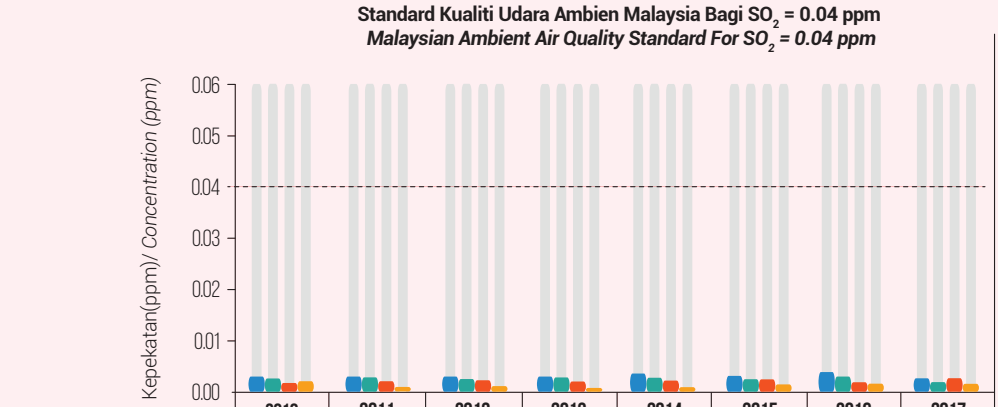
*Generally, the annual average SO_2 concentration shows a declining trend between 2000 and 2016 (**Figure 1.11**) and it is well below the limit of 0.04 ppm as stipulated in the Malaysian Ambient Air Quality Standard. This was attributed by the use of better fuel quality EURO2M in this country starting from September 2009 and also stricter enforcement by the DOE as well as widely use of natural gas for industrial combustion process and vehicles. Starting from 1st September 2015, petrol EURO4M RON 97 had been implemented and EURO5 Diesel with the sulfur content less than 10 mg/l had been introduced in the market in November 2015.*

*Though lower number of vehicles used both types of fuels compared to EURO2M vehicles but it was shown that the trend of SO_2 has decreased in urban and industrial areas. **Figure 1.11 (a)** shows the annual average concentrations of sulphur dioxide from different categories of land use. From the figure, it was shown that a slight increase in SO_2 concentration in suburban area as compared to other areas. This could be due to rapid development in suburban area in Malaysia that results in high volume of vehicles and massive traffics.*



	2010	2011	2012	2013	2014	2015	2016	2017
KEPEKATAN/ CONCENTRATION	0.0017	0.0018	0.0018	0.0018	0.0020	0.002	0.002	0.0015
NOMBOR LOKASI/ NUMBER OF SITES	44	44	44	44	44	42	44	52

Rajah 1.11 Malaysia: Purata Kepekatan Tahunan Sulfur Dioksida (SO_2), 2010 - 2017
Figure 1.11 Malaysia: Annual Average Concentration of Sulphur Dioxide (SO_2), 2010 - 2017



	2010	2011	2012	2013	2014	2015	2016	2017
INDUSTRI/ INDUSTRIAL	0.0022	0.0022	0.0022	0.0022	0.0026	0.0024	0.0028	0.0019
URBAN/ BANDAR	0.0019	0.0020	0.0018	0.0020	0.0020	0.0018	0.0023	0.0013
LUAR BANDAR/ SUB URBAN	0.0012	0.0014	0.0015	0.0013	0.0015	0.0017	0.0013	0.0019
BACKGROUND	0.0014	0.0007	0.0009	0.0005	0.0006	0.0009	0.0010	0.0010

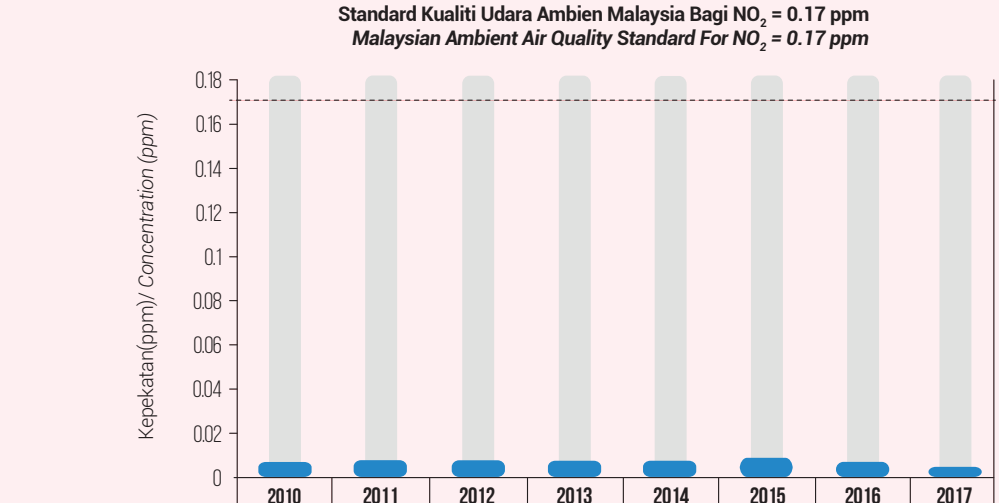
Rajah 1.11 (a) Malaysia: Purata Kepekatan Tahunan Sulfur Dioksida Mengikut Guna Tanah (SO_2), 2010 - 2017
Figure 1.11 (a) Malaysia: Annual Average Concentration of Sulphur Dioxide (SO_2) by Land Use, 2010 - 2017

Nitrogen Dioksida (NO_2)

Pada tahun 2017, terdapat sedikit penurunan bagi kepekatan NO_2 berbanding tahun 2016. Kepekatan NO_2 kekal tinggi di kawasan bandar disebabkan oleh peningkatan yang ketara dalam bilangan kenderaan bermotor dan proses pembakaran. Anggaran beban pelepasan NO_2 menunjukkan sebanyak 66 peratus adalah daripada industri, 26 peratus daripada pelepasan kenderaan bermotor, 7 peratus daripada loji janakuasa dan 1 peratus daripada lain-lain sumber. Kepekatan purata tahunan NO_2 dalam udara ambien dari tahun 2010 hingga 2017 adalah stabil dan jauh berada di bawah had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia. **Rajah 1.12 dan Rajah 1.12 (a)**.

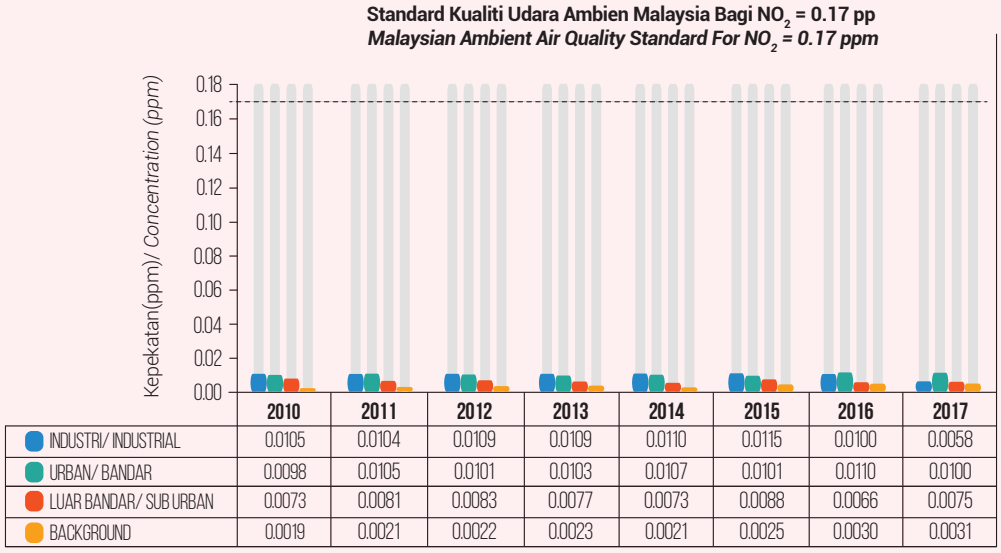
Nitrogen Dioxide (NO_2)

In 2017, there was slightly decrease of NO_2 concentration compared to the 2016 level. The NO_2 concentrations remained high in urban and industrial areas mainly due to a significant increase in the number of motor vehicles and combustion processes. Estimation on NO_2 emission load indicated that 66 percent was from industries while 26 percent from motor vehicles, 7 percent from power plants and 1 percent from other sources. The annual average concentration of NO_2 in the ambient air from 2010 to 2017 remained almost constant and well below the Malaysia Ambient Air Quality Standard. ***Figure 1.12 and Figure 1.12 (a)***



	2010	2011	2012	2013	2014	2015	2016	2017
KEPEKATAN/ CONCENTRATION	0.0089	0.0094	0.0095	0.0094	0.0094	0.0098	0.009	0.007
NOMBOR LOKASI/ NUMBER OF SITES	44	44	44	44	44	44	44	52

Rajah 1.12 Malaysia: Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2), 2010- 2017
Figure 1.12 Malaysia: Annual Average Concentration of Nitrogen Dioxide (NO_2), 2010 - 2017



	2010	2011	2012	2013	2014	2015	2016	2017
INDUSTRI/ INDUSTRIAL	0.0105	0.0104	0.0109	0.0109	0.0110	0.0115	0.0100	0.0058
URBAN/ BANDAR	0.0098	0.0105	0.0101	0.0103	0.0107	0.0101	0.0110	0.0100
LUAR BANDAR/ SUB URBAN	0.0073	0.0081	0.0083	0.0077	0.0073	0.0088	0.0066	0.0075
BACKGROUND	0.0019	0.0021	0.0022	0.0023	0.0021	0.0025	0.0030	0.0031

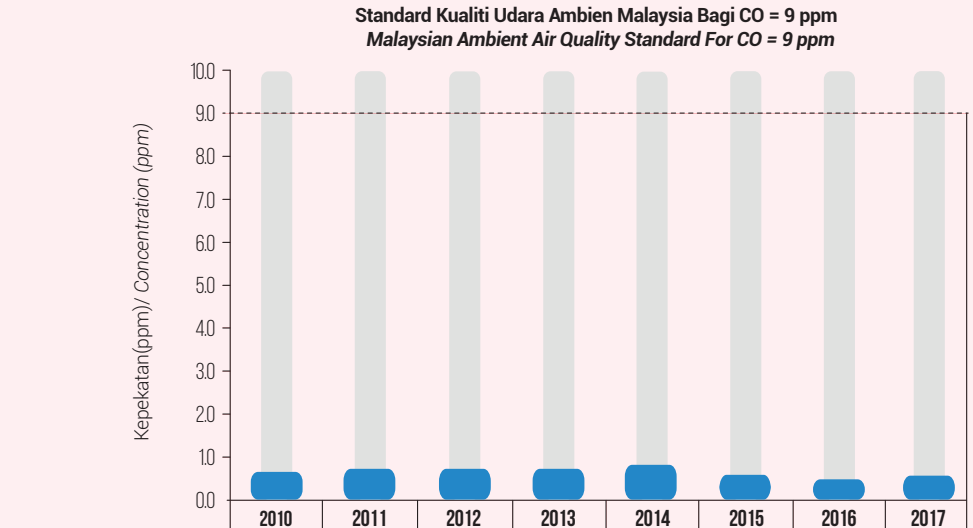
Rajah 1.12 (a) Malaysia: Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2) Mengikut Guna Tanah, 2010 - 2017
Figure 1.12 (a) Malaysia: Annual Average Concentration of Nitrogen Dioxide (NO_2) by Land Use, 2010 - 2017

Karbon Monoksida (CO)

Kepekatan CO pada tahun 2017 tidak menunjukkan perbezaan ketara berbanding tahun 2016. Walau bagaimanapun, tren kepekatan CO dari tahun 2010 hingga 2017 adalah stabil. Tahap kepekatan yang dicatatkan juga mematuhi Standard Kualiti Udara Ambien Malaysia (**Rajah 1.13**). Di kawasan bandar, kepekatan CO adalah lebih tinggi yang berpunca daripada pelepasan kenderaan bermotor dengan menyumbang sebanyak 95 peratus daripada beban pelepasan CO pada tahun 2017. **Rajah 1.13 (a)** menunjukkan kepekatan CO untuk pelbagai kategori guna tanah.

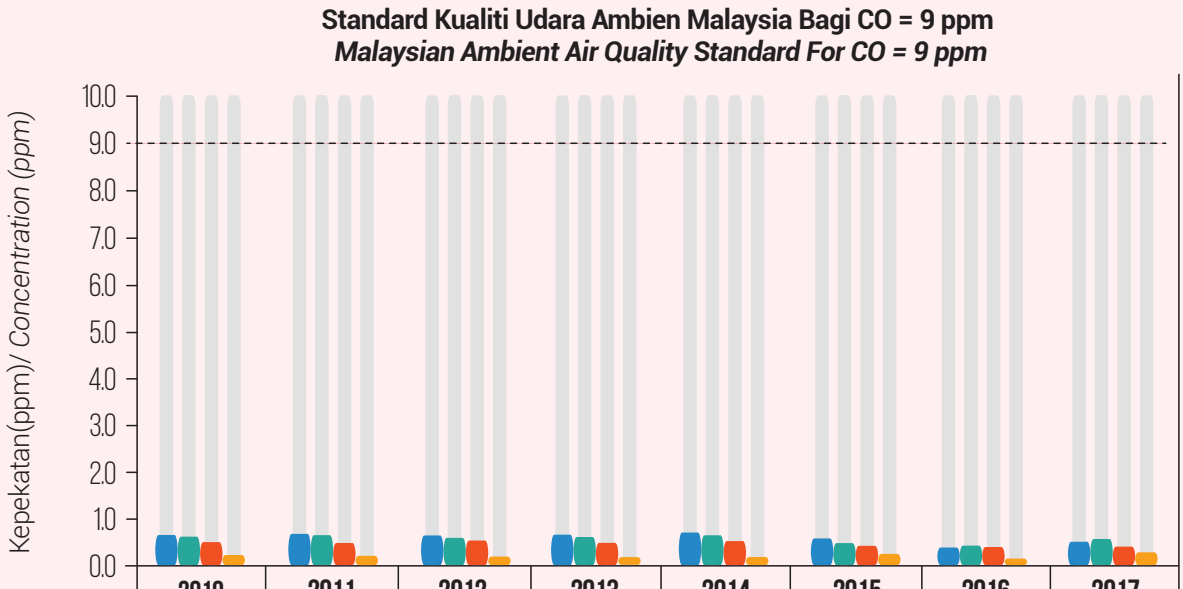
Carbon Monoxide (CO)

*There was no significant change of CO level in 2017 compared to 2017. However the trend of CO concentration from 2010 to 2017 remains almost constant. The levels recorded were well in compliance to the Malaysian Ambient Air Quality Standard (**Figure 1.13**). In urban areas, the concentration of CO was higher where the main source of emission was from motor vehicles that contributed to 95 percent of CO emission load in 2017. **Figure 1.12(a)** shows CO concentrations for various categories of land use.*



	2010	2011	2012	2013	2014	2015	2016	2017
KEPEKATAN/ CONCENTRATION	0.6510	0.6809	0.06827	0.6855	0.7238	0.6184	0.5588	0.5819
NOMBOR LOKASI/ NUMBER OF SITES	41	41	41	41	41	41	41	45

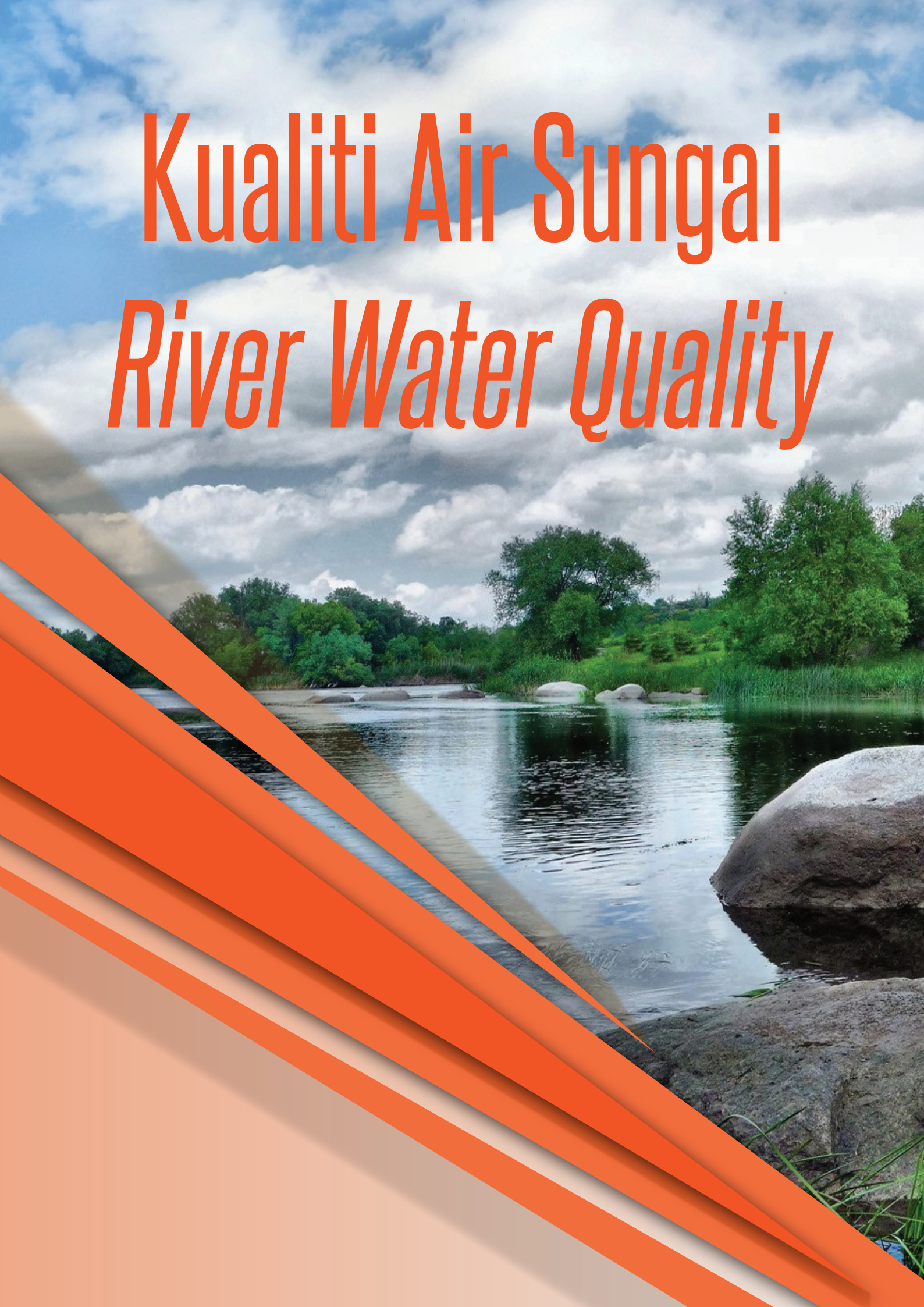
Rajah 1.13 Malaysia: Purata Kepekatan Tahunan Karbon Dioksida (CO), 2010 - 2017
Figure 1.13 Malaysia: Annual Average Concentration of Carbon Monoxide (CO), 2010 - 2017



	2010	2011	2012	2013	2014	2015	2016	2017
INDUSTRI/ INDUSTRIAL	0.7439	0.7662	0.7576	0.7670	0.8116	0.7050	0.5527	0.6303
URBAN/ BANDAR	0.6933	0.7221	0.7004	0.7418	0.7923	0.6219	0.5784	0.6745
LUAR BANDAR/ SUB URBAN	0.6541	0.6146	0.6447	0.6012	0.6258	0.5840	0.5637	0.5889
BACKGROUND	0.3357	0.3123	0.2932	0.2899	0.2886	0.3357	0.2680	0.4340

Rajah 1.13 (a) Malaysia: Purata Kepekatan Tahunan Karbon Dioksida (CO) Mengikut Guna Tanah, 2010- 2017
Figure 1.13 (a) Malaysia: Annual Average Concentration of Carbon Monoxide (CO) by Land Use, 2010 - 2017

Kualiti Air Sungai
River Water Quality



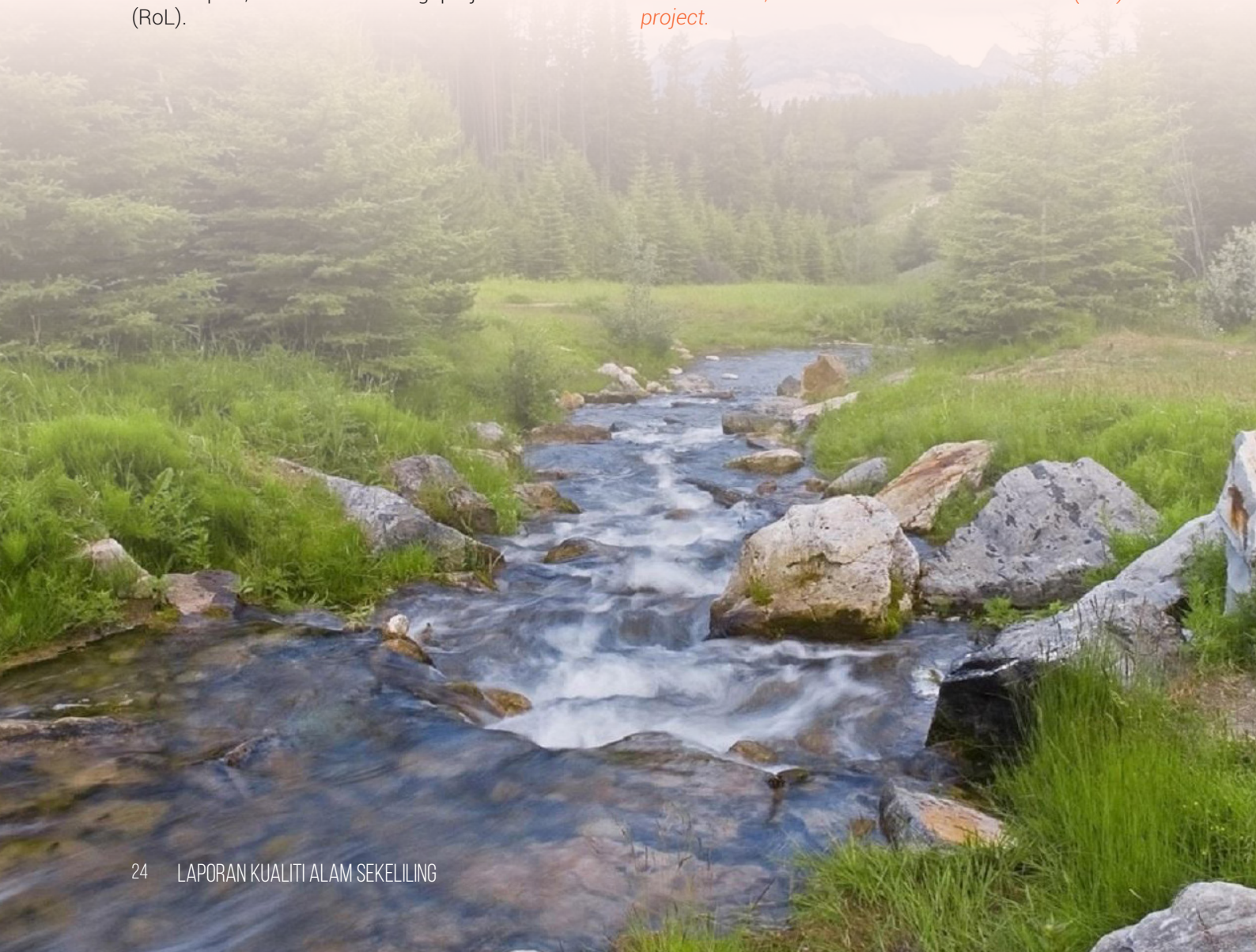
KUALITI AIR SUNGAI
RIVER WATER QUALITY

PENGAWASAN KUALITI AIR SUNGAI

Pengawasan Kualiti Air Sungai Jabatan Alam Sekitar (JAS) meneruskan program pengawasan kualiti air sungai pada tahun 2017 bagi menentukan kualiti air sungai dan mengesan perubahan ke atas kualiti air sungai. Sampel-sampel air sungai diambil daripada stesen-stesen yang telah ditetapkan dan diukur kualitinya secara *in-situ* serta dihantar ke makmal untuk dianalisis bertujuan menentukan kriteria dari segi fizik-kimia dan biologi. Indeks Kualiti Air (IKA) digunakan untuk mengukur tahap pencemaran dan kesesuaian jenis guna air seperti yang digariskan oleh Standard Kualiti Air Negara (**ANNEX**). IKA telah mengambilkira parameter Oksigen Terlarut, Keperluan Oksigen Biokimia, Keperluan Oksigen Kimia, Ammonia Nitrogen, Pepejal Terampai dan pH. Pada tahun 2017, kualiti air sungai telah dinilai berdasarkan sejumlah 5,697 sampel air sungai yang telah diambil daripada sejumlah 891 stesen pengawasan manual yang merangkumi 477 sungai. Stesen-stesen tersebut adalah terdiri daripada 801 stesen ambien dan baseline, 55 stesen di hulu muka sauk terpilih, dan 35 stesen bagi projek *River of Life* (RoL).

RIVER WATER QUALITY MONITORING

*The Department of Environment (DOE) continues the river water quality monitoring programme in 2017 to determine the status of river water quality and to detect changes in river water quality. Water samples were collected at regular intervals from designated stations for in-situ and laboratory analysis to determine its physic-chemical and biological characteristics. The Water Quality Index (WQI) is used to indicate the level of pollution and the corresponding suitability in terms of water uses according to the National Water Quality Standards for Malaysia (NWQS) (**ANNEX**). The WQI takes into consideration parameters including Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Ammoniacal Nitrogen (NH3-N), Suspended Solids (SS) and pH. In 2017, river water quality was assessed based on a total of 5,697 samples taken from a total of 891 manual monitoring stations covering 477 rivers. The stations comprised of 801 ambient and baseline stations, 55 stations located at upstream of selected water intakes, and 35 stations for River of Life (RoL) project.*



STATUS KUALITI AIR SUNGAI

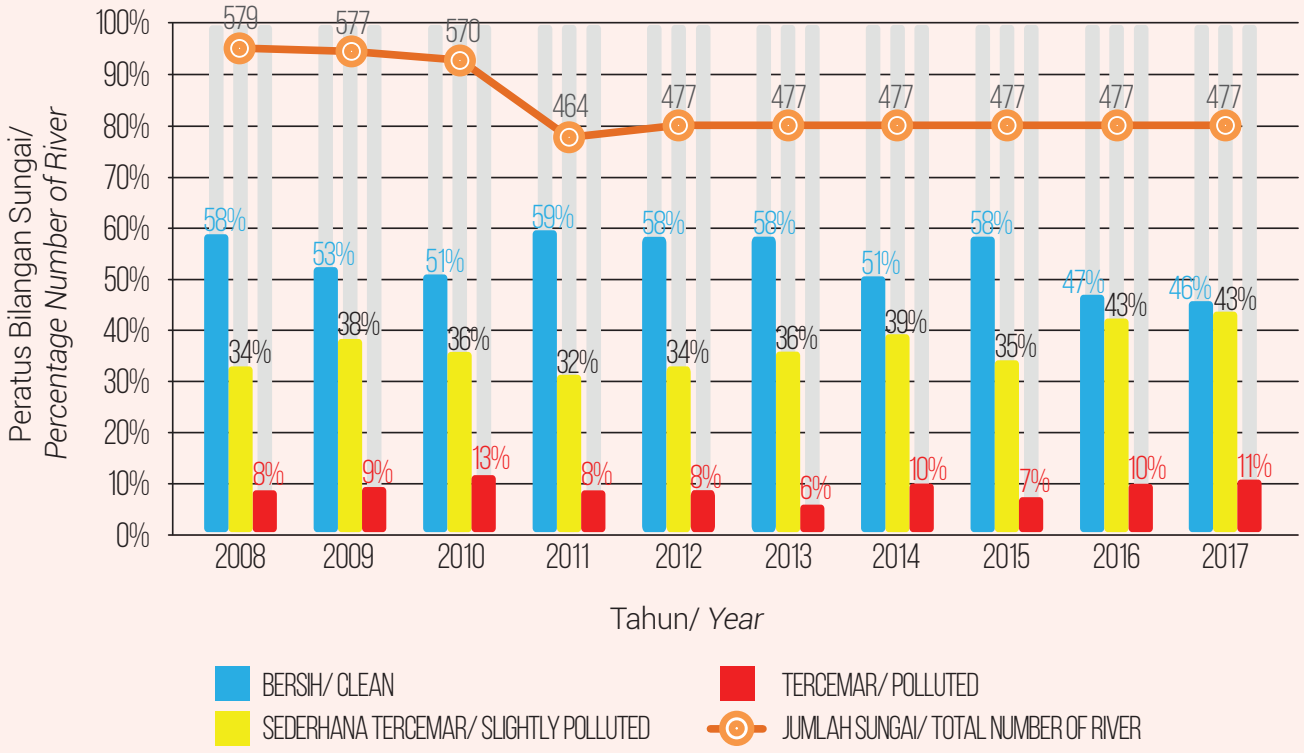
Sejumlah 219 (46%) sungai daripada 477 sungai yang diawasi telah menunjukkan indeks kualiti air bersih, 207 (43%) adalah sederhana tercemar dan 51 (11%) adalah tercemar (**Rajah 2.1**). Status kualiti air bagi sungai-sungai yang diawasi adalah seperti dalam **Jadual 2.1**, **Jadual 2.2** dan **Jadual 2.3**.

Keperluan Oksigen Biokimia (BOD), Ammonia Nitrogen (NH3-N) dan Pepejal Terampai (SS) masih menjadi punca kepada pencemaran sungai. BOD yang tinggi kerap kali dikaitkan dengan pengolahan sisa kumbahan yang tidak mencukupi, atau akibat pelepasan effluen daripada industri-industri pengilangan dan berasaskan pertanian. Punca utama NH3-N pula boleh dikaitkan dengan aktiviti penternakan dan kumbahan domestik manakala punca utama SS adalah kerja-kerja tanah yang tidak teratur dan aktiviti pembukaan tanah.

RIVER WATER QUALITY STATUS

*Out of the 477 rivers monitored, 219 (46%) were found to be clean, 207 (43%) slightly polluted while 51 (11%) polluted (**Figure 2.1**). The monitored rivers and their overall quality status are as in **Tables 2.1**, **Table 2.2** and **Table 2.3**.*

Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH3-N) and Suspended Solids (SS) remained to be significant in terms of river pollution. High BOD can be attributed to inadequate treatment of sewage or effluent from agro-based and manufacturing industries. The main sources of NH3-N were animal farming and domestic sewage. While the sources for SS were mainly due to improper earthworks and land clearing activities.



Rajah 2.1 Malaysia: Tren Kualiti Air Sungai, 2008-2017
Figure 2.1 Malaysia: River Water Quality Trend, 2008-2017

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Perlis	Sg. Perlis	Sg. Wang Kelian	1	89	B/C	II	89	B/C	II
		Sg. Jarum	1	82	B/C	II	81	B/C	II
		Sg. Pelarit	1	88	B/C	II	89	B/C	II
		Sg. Jernih	1	82	B/C	II	82	B/C	II
Kedah (Langkawi)	Sg. Kisap	Sg. Kisap	1	90	B/C	II	91	B/C	II
	Sg. Melaka	Sg. Melaka	5	78	ST/SP	II	81	B/C	II
		Sg. Petang	1	91	B/C	II	92	B/C	II
Kedah	Sg. Kedah	Sg. Janing	1	91	B/C	II	91	B/C	II
		Sg. Pedu	1	88	B/C	II	88	B/C	II
		Sg. Padang Terap	3	84	B/C	II	84	B/C	II
	Sg. Merbok	Sg. Tupah	1	91	B/C	II	91	B/C	II
Kedah/ P.Pinang	Sg. Muda	Sg. Chepir	1	89	B/C	II	86	B/C	II
		Sg. Karangan	1	84	B/C	II	81	B/C	II
		Sg. Muda	4	84	B/C	II	81	B/C	II
		Sg. Ketil	2	85	B/C	II	83	B/C	II
		Sg. Sedim	1	78	ST/SP	II	81	B/C	II
		Sg. Pegang	1	76	ST/SP	III	81	B/C	II
P.Pinang	Sg. Pinang	Sg. Air Terjun	1	89	B/C	II	92	B/C	II
P.Pinang/ Kedah/ Perak	Sg. Kerian	Sg. Kechil	1	86	B/C	II	84	B/C	II
		Sg. Kerian	4	81	B/C	II	81	B/C	II
Perak	Sg. Bruas	Sg. Rotan	1	89	B/C	II	87	B/C	II
		Sg. Bruas	3	82	B/C	II	83	B/C	II
		Sg. Dandang	1	87	B/C	II	88	B/C	II
	Sg. Kurau	Sg. Ara	2	89	B/C	II	88	B/C	II
	Sg. Perak	Sg. Chepor	1	90	B/C	II	90	B/C	II
		Sg. Chenderiang	1	87	B/C	II	87	B/C	II
		Sg. Kuang	1	79	ST/SP	II	83	B/C	II
		Sg. Klah	1	86	B/C	II	89	B/C	II
		Sg. Kinjang	1	90	B/C	II	92	B/C	II
		Sg. Kampar	2	85	B/C	II	86	B/C	II
		Sg. Batang Padang	3	82	B/C	II	82	B/C	II
		Sg. Kangsar	1	73	ST/SP	III	81	B/C	II
		Sg. Sungkai	2	86	B/C	II	85	B/C	II
		Sg. Bidor	3	85	B/C	II	82	B/C	II
		Sg. Raia	2	81	B/C	II	81	B/C	II
		Sg. Perak	8	82	B/C	II	85	B/C	II
	Sg. Raja Hitam	Sg. Nyior	1	92	B/C	II	93	B/C	I

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Perak	Sg. Sepetang	Sg. Jana	1	93	B/C	I	84	B/C	II
		Sg. Limau	1	87	B/C	II	86	B/C	II
	Sg. Sepetang	Sg. Trong	1	86	B/C	II	89	B/C	II
		Sg. Batu Tegoh	3	85	B/C	II	83	B/C	II
Perak	Sg. Wangi	Sg. Temerloh	2	87	B/C	II	89	B/C	II
Selangor/ Perak	Sg. Bernam	Sg. Inki	1	90	B/C	II	91	B/C	II
		Sg. Bernam	4	84	B/C	II	82	B/C	II
		Sg. Slim	2	86	B/C	II	85	B/C	II
		Sg. Trolak	1	88	B/C	II	88	B/C	II
Selangor	Sg. Selangor	Sg. Kerling	1	89	B/C	II	86	B/C	II
		Sg. Kanching	1	88	B/C	II	85	B/C	II
		Sg. Serendah	1	87	B/C	II	86	B/C	II
		Sg. Batang Kali	1	84	B/C	II	82	B/C	II
Selangor/ WPKL	Sg. Klang	Sg. Penchala	1	85	B/C	II	82	B/C	II
Selangor/ Putrajaya/ N.Sembilan	Sg. Langat	Sg. Lui	1	89	B/C	II	89	B/C	II
		Sg. Chuau	2	86	B/C	II	87	B/C	II
Melaka/N. Sembilan	Sg. Melaka	Sg. Tampin	1	89	B/C	II	86	B/C	II
		Sg. Batang Melaka	2	81	B/C	II	81	B/C	II
		Sg. Dusun	1	80	ST/SP	II	86	B/C	II
		Sg. Kemunting	1	81	B/C	II	85	B/C	II
	Sg. Linggi	Sg. Batang Penar	1	89	B/C	II	82	B/C	II
		Sg. Kundur Besar	1	86	B/C	II	86	B/C	II
		Sg. Pedas	1	87	B/C	II	84	B/C	II
		Sg. Rembau	2	86	B/C	II	85	B/C	II
		Sg. Chembong	1	83	B/C	II	82	B/C	II
Melaka	Sg. Kesang	Sg. Chohong	2	86	B/C	II	84	B/C	II
	Sg. Duyong	Sg. Gapam	1	84	B/C	II	82	B/C	II
Johor	Sg. Batu Pahat	Sg. Bantang	1	92	B/C	II	92	B/C	II
		Sg. Chaah	1	82	B/C	II	81	B/C	II
	Sg. Johor	Sg. Pelepah	2	89	B/C	II	89	B/C	II
		Sg. Telor	1	88	B/C	II	86	B/C	II
		Sg. Johor	4	83	B/C	II	81	B/C	II
		Sg. Linggiu	1	85	B/C	II	84	B/C	II
		Sg. Layang	1	87	B/C	II	87	B/C	II
		Sg. Remis	1	87	B/C	II	85	B/C	II
		Sg. Semangar	1	87	B/C	II	84	B/C	II
		Sg. Sayong	4	84	B/C	II	83	B/C	II

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Johor	Sg. Johor	Sg. Santi	1	80	ST/SP	II	82	B/C	II
		Sg. Layau Kiri	1	83	B/C	II	82	B/C	II
		Sg. Belitong	1	81	B/C	II	81	B/C	II
	Sg. Sedili Besar	Sg. Dohol	1	82	B/C	II	84	B/C	II
Johor/N. Sembilan/ Pahang	Sg. Muar	Sg. Air Panas	1	90	B/C	II	91	B/C	II
		Sg. Juasseh	1	88	B/C	II	90	B/C	II
Pahang/ Johor	Sg. Endau	Sg. Jasin	1	90	B/C	II	91	B/C	II
		Sg. Tamok	1	80	ST/SP	II	82	B/C	II
		Sg. Selai	1	88	B/C	II	88	B/C	II
		Sg. Endau	3	83	B/C	II	84	B/C	II
		Sg. Kahang	1	83	B/C	II	84	B/C	II
Pahang/N. Sembilan	Sg. Pahang	Sg. Teranum	1	91	B/C	II	92	B/C	II
		Sg. Teras	1	90	B/C	II	91	B/C	II
		Sg. Jempol	2	83	B/C	II	83	B/C	II
		Sg. Telang	1	87	B/C	II	87	B/C	II
		Sg. Maran	1	84	B/C	II	85	B/C	II
		Sg. Teris	3	82	B/C	II	82	B/C	II
		Sg. Chini	1	81	B/C	II	81	B/C	II
		Sg. Benus	2	89	B/C	II	89	B/C	II
		Sg. Kelau	1	89	B/C	II	89	B/C	II
		Sg. Lipis	3	88	B/C	II	89	B/C	II
		Sg. Tembeling	1	87	B/C	II	87	B/C	II
		Sg. Perting	1	86	B/C	II	87	B/C	II
		Sg. Tahan	1	86	B/C	II	87	B/C	II
		Sg. Kundang	1	83	B/C	II	82	B/C	II
		Sg. Pahang	8	82	B/C	II	84	B/C	II
		Sg. Tanglir	1	86	B/C	II	85	B/C	II
		Sg. Koyan	1	85	B/C	II	85	B/C	II
		Sg. Lepar	3	85	B/C	II	86	B/C	II
		Sg. Luit	1	85	B/C	II	85	B/C	II
		Sg. Bentong	1	84	B/C	II	82	B/C	II
		Sg. Tasik Chini	1	77	ST/SP	II	87	B/C	II
		Sg. Semantan	4	84	B/C	II	82	B/C	II
		Sg. Tekal	1	84	B/C	II	83	B/C	II
		Sg. Kertam	1	83	B/C	II	81	B/C	II
		Sg. T. Paya Bungor	1	83	B/C	II	84	B/C	II
		Sg. Triang	2	83	B/C	II	82	B/C	II
		Sg. Jelai	2	82	B/C	II	84	B/C	II
		Sg. Berkapor	1	81	B/C	II	81	B/C	II

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Pahang	Sg. Bertam	Sg. Habu	1	87	B/C	II	89	B/C	II
		Sg. Lenggok	1	85	B/C	II	88	B/C	II
		Sg. Burung	1	90	B/C	II	91	B/C	II
		Sg. Ringlet	1	84	B/C	II	82	B/C	II
		Sg. Tringkap	1	87	B/C	II	86	B/C	II
		Sg. Terla	1	83	B/C	II	86	B/C	II
		Sg. Telom	2	82	B/C	II	81	B/C	II
	Sg. Cherating	Sg. Cherating	1	82	B/C	II	82	B/C	II
	Sg. Kuantan	Sg. Kenau	1	82	B/C	II	81	B/C	II
		Sg. Pandan	1	82	B/C	II	83	B/C	II
	Sg. Rompin	Sg. Pukin	1	85	B/C	II	83	B/C	II
		Sg. Pontian	1	85	B/C	II	85	B/C	II
		Sg. Aur	1	80	ST/SP	II	83	B/C	II
Terengganu	Sg. Besut	Sg. Besut	2	86	B/C	II	86	B/C	II
	Sg. Dungun	Sg. Dungun	4	85	B/C	II	85	B/C	II
	Sg. Kemaman	Sg. Cherul	1	81	B/C	II	81	B/C	II
		Sg. Kemaman	2	81	B/C	II	82	B/C	II
	Sg. Setiu	Sg. Setiu	2	82	B/C	II	83	B/C	II
	Sg. Terengganu	Sg. Berang	1	89	B/C	II	88	B/C	II
		Sg. Nerus	1	84	B/C	II	81	B/C	II
		Sg. Pueh	1	87	B/C	II	88	B/C	II
		Sg. Telemong	1	87	B/C	II	88	B/C	II
		Sg. Terengganu	3	84	B/C	II	83	B/C	II
Kelantan	Sg. Golok	Sg. Golok	5	86	B/C	II	88	B/C	II
		Sg. Lanas	1	84	B/C	II	88	B/C	II
	Sg. Kelantan	Sg. Ber	1	91	B/C	II	88	B/C	II
		Sg. Pergau	6	89	B/C	II	90	B/C	II
		Sg. Belatop	2	87	B/C	II	87	B/C	II
		Sg. Tuang	1	88	B/C	II	89	B/C	II
		Sg. Lebir	3	84	B/C	II	83	B/C	II
		Sg. Nenggiri	3	83	B/C	II	84	B/C	II
		Sg. Berok	3	84	B/C	II	85	B/C	II
		Sg. Galas	5	84	B/C	II	85	B/C	II
		Sg. Betis	1	87	B/C	II	88	B/C	II
		Sg. Kerilla	1	84	B/C	II	87	B/C	II
		Sg. Nal	2	83	B/C	II	84	B/C	II
		Sg. Relai	1	82	B/C	II	84	B/C	II
		Sg. Sokor	1	79	ST/SP	II	82	B/C	II
	Sg. Kemasin	Sg. Semerak	2	79	ST/SP	II	81	B/C	II

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Sabah	Sg. Apas	Sg. Apas	1	83	B/C	II	83	B/C	II
	Sg. Balung	Sg. Balung	1	83	B/C	II	83	B/C	II
	Sg. Bongawan	Sg. Bongawan	1	76	ST/SP	III	82	B/C	II
	Sg. Bengkoka	Sg. Bengkoka	2	82	B/C	II	86	B/C	II
	Sg. Bingkongan	Sg. Menggaris	2	86	B/C	II	89	B/C	II
		Sg. Bandau	1	85	B/C	II	88	B/C	II
		Sg. Bingkongan	2	85	B/C	II	88	B/C	II
		Sg. Tandek	1	85	B/C	II	87	B/C	II
	Sg. Kalabakan	Sg. Kalabakan	3	78	ST/SP	II	82	B/C	II
	Sg. Brantian	Sg. Brantian	1	82	B/C	II	85	B/C	II
	Sg. Kedamaian	Sg. Kedamaian	1	88	B/C	II	89	B/C	II
		Sg. Wariu	1	87	B/C	II	88	B/C	II
		Sg. Tempasuk	2	85	B/C	II	87	B/C	II
	Sg. Kinabatangan	Sg. Koyah	1	87	B/C	II	86	B/C	II
		Sg. Menanggul	1	85	B/C	II	83	B/C	II
		Sg. Kinabatangan	3	81	B/C	II	82	B/C	II
		Sg. Karamuak	1	86	B/C	II	89	B/C	II
	Sg. Labok	Sg. Kinipir	2	89	B/C	II	89	B/C	II
		Sg. Liwagu	2	88	B/C	II	89	B/C	II
		Sg. Maliau	1	88	B/C	II	90	B/C	II
		Sg. Labok	1	85	B/C	II	85	B/C	II
		Sg. Tungud	1	84	B/C	II	86	B/C	II
	Sg. Lakutan	Sg. Lakutan	1	86	B/C	II	87	B/C	II
	Sg. Likas	Sg. Menggatal	2	85	B/C	II	85	B/C	II
	Sg. Lingkungan	Sg. Lingkungan	1	84	B/C	II	88	B/C	II
		Sg. Bukau	1	86	B/C	II	88	B/C	II
	Sg. Menggalong	Sg. Menggalong	2	87	B/C	II	88	B/C	II
	Sg. Merotai	Sg. Merotai	3	85	B/C	II	86	B/C	II
	Sg. Mounad	Sg. Mounad	2	86	B/C	II	86	B/C	II
	Sg. Moyog	Sg. Moyog	4	87	B/C	II	88	B/C	II
	Sg. Padas	Sg. Bunsit	1	90	B/C	II	92	B/C	II
		Sg. Liawan	1	88	B/C	II	90	B/C	II
		Sg. Padas	3	78	ST/SP	II	82	B/C	II
		Sg. Pegalan	3	87	B/C	II	88	B/C	II
		Sg. Tandulu	1	87	B/C	II	90	B/C	II
	Sg. Paitan	Sg. Paitan	1	78	ST/SP	II	82	B/C	II
	Sg. Papar	Sg. Papar	3	85	B/C	II	85	B/C	II

Jadual 2.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2017
Table 2.1 Malaysia: Water Quality Status of Clean Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Sabah	Sg. Sapi	Sg. Sapi	3	79	ST/SP	II	81	B/C	II
		Sg. Sualong	1	87	B/C	II	88	B/C	II
	Sg. Segama	Sg. Segama	3	87	B/C	II	85	B/C	II
	Sg. Segaliud	Sg. Segaliud	2	80	ST/SP	II	81	B/C	II
	Sg. Silabukan	Sg. Silabukan	2	87	B/C	II	87	B/C	II
	Sg. Sugut	Sg. Merali	1	92	B/C	II	92	B/C	II
		Sg. Bongkud	1	91	B/C	II	91	B/C	II
		Sg. Lohan	1	91	B/C	II	92	B/C	II
		Sg. Sugut	3	89	B/C	II	89	B/C	II
	Sg. Tawau	Sg. Tawau	4	86	B/C	II	85	B/C	II
	Sg. Tenghilan	Sg. Tenghilan	1	83	B/C	II	87	B/C	II
	Sg. Tingkayu	Sg. Tingkayu	2	86	B/C	II	83	B/C	II
	Sg. Tuaran	Sg. Tuaran	2	87	B/C	II	88	B/C	II
		Sg. Song Sai	1	87	B/C	II	87	B/C	II
		Sg. Damit	2	78	ST/SP	II	82	B/C	II
	Sg. Tungku	Sg. Tungku	2	83	B/C	II	86	B/C	II
Sarawak	Sg. Baram	Sg. Tutuh	1	82	B/C	II	81	B/C	II
	Sg. Lawas	Sg. Lawas	3	82	B/C	II	83	B/C	II
	Sg. Lupar	Sg. Ai	2	87	B/C	II	86	B/C	II
	Sg. Miri	Sg. Padang Liku	1	88	B/C	II	82	B/C	II
	Sg. Rajang	Sg. Binatang	1	85	B/C	II	83	B/C	II
		Sg. Julau	1	79	ST/SP	II	81	B/C	II
		Sg. Kanowit	1	82	B/C	II	82	B/C	II
	Sg. Sarawak	Sg. Semadang	1	88	B/C	II	87	B/C	II
		Sg. Sarawak	6	80	ST/SP	II	81	B/C	II
		Sg. Sarawak Kanan	1	81	B/C	II	81	B/C	II
	Sg. Trusan	Sg. Trusan	1	82	B/C	II	83	B/C	II
	Sg. Semunsam	Sg. Semunsam	1	83	B/C	II	84	B/C	II
	Sg. Limbang	Sg. Limbang	5	81	B/C	II	81	B/C	II
	Sg. Saribas	Sg. Layar	2	84	B/C	II	82	B/C	II

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP: Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Perlis	Sg. Perlis	Sg. Ngulang	1	79	ST/SP	II	79	ST/SP	II
		Sg. Perlis	1	70	ST/SP	III	69	ST/SP	III
Kedah	Sg. Kedah	Sg. Kedah	1	68	ST/SP	III	66	ST/SP	III
		Sg. Tekai	1	77	ST/SP	II	80	ST/SP	II
		Sg. Pendang	1	72	ST/SP	III	74	ST/SP	III
	Sg. Merbok	Sg. Merbok	1	70	ST/SP	III	71	ST/SP	III
		Sg. Tok Pawang	1	88	B/C	II	80	ST/SP	II
		Sg. Petani	1	54	T/P	III	60	ST/SP	III
		Sg. Bongkok	1	68	ST/SP	III	61	ST/SP	III
Kedah/ P.Pinang	Sg. Muda	Sg. Jerong	1	71	ST/SP	III	71	ST/SP	III
P.Pinang	Sg. Bayan Lepas	Sg. Tiram	2	72	ST/SP	III	69	ST/SP	III
		Sg. Bayan Lepas	1	68	ST/SP	III	65	ST/SP	III
	Sg. Jawi	Sg. Machang Bubok	1	77	ST/SP	II	71	ST/SP	III
		Sg. Junjong	1	90	B/C	II	70	ST/SP	III
	Sg. Juru	Sg. Kilang Ubi	4	69	ST/SP	III	63	ST/SP	III
		Sg. Pasir	1	63	ST/SP	III	62	ST/SP	III
	Sg. Kluang	Sg. Relau	1	67	ST/SP	III	69	ST/SP	III
		Sg. Ara	2	84	B/C	II	80	ST/SP	II
P.Pinang/ Kedah	Sg. Pinang	Sg. Dondang	1	69	ST/SP	III	69	ST/SP	III
		Sg. Air Itam	5	65	ST/SP	III	67	ST/SP	III
P.Pinang/ Kedah/ Perak	Sg. Perai	Sg. Jarak	3	74	ST/SP	III	68	ST/SP	III
		Sg. Kulim	2	79	ST/SP	II	79	ST/SP	II
		Sg. Keladi	1	71	ST/SP	III	70	ST/SP	III
Perak	Sg. Kerian	Sg. Selama	2	76	ST/SP	III	76	ST/SP	III
	Sg. Kurau	Sg. Kurau	4	79	ST/SP	II	80	ST/SP	II
	Sg. Perak	Sg. Pelus	2	72	ST/SP	III	79	ST/SP	II
		Sg. Kerdah	1	78	ST/SP	II	70	ST/SP	III
		Sg. Kinta	6	74	ST/SP	III	74	ST/SP	III
		Sg. Kepayang	2	73	ST/SP	III	72	ST/SP	III
		Sg. Pinji	2	66	ST/SP	III	61	ST/SP	III
		Sg. Pari	1	63	ST/SP	III	66	ST/SP	III
		Sg. Seluang	1	65	ST/SP	III	65	ST/SP	III
		Sg. Tumboh	1	65	ST/SP	III	62	ST/SP	III
	Sg. Raja Hitam	Sg. Manjong	2	71	ST/SP	III	74	ST/SP	III
	Sg. Sepetang	Sg. Sepetang	2	69	ST/SP	III	73	ST/SP	III
	Sg. Wangi	Sg. Deralik	1	71	ST/SP	III	65	ST/SP	III

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Selangor	Sg. Selangor	Sg. Sembah	1	74	ST/SP	III	69	ST/SP	III
		Sg. Selangor	4	83	B/C	II	79	ST/SP	II
	Sg. Tengi	Sg. Tengi	3	74	ST/SP	III	77	ST/SP	II
	Sg. Sepang	Sg. Sepang	2	81	B/C	II	77	ST/SP	II
Selangor/ Putrajaya/ N.Sembilan	Sg. Langat	Sg. Semenyih	1	76	ST/SP	III	76	ST/SP	III
		Sg. Anak Chuau	1	74	ST/SP	III	70	ST/SP	III
		Sg. Jijan	1	76	ST/SP	III	76	ST/SP	III
		Sg. Pajam	1	72	ST/SP	III	67	ST/SP	III
		Sg. Batang Nilai	1	64	ST/SP	III	62	ST/SP	III
		Sg. Langat	7	64	ST/SP	III	64	ST/SP	III
Selangor/ WPKL	Sg. Klang	Sg. Batu	4	75	ST/SP	III	75	ST/SP	III
		Sg. Anak Air Batu	1	74	ST/SP	III	72	ST/SP	III
		Sg. Semelah	1	80	ST/SP	II	80	ST/SP	II
		Sg. Keroh	2	73	ST/SP	III	71	ST/SP	III
		Sg. Gombak	3	72	ST/SP	III	72	ST/SP	III
		Sg. Damansara	2	70	ST/SP	III	64	ST/SP	III
		Sg. Ampang	2	63	ST/SP	III	62	ST/SP	III
		Sg. Jinjang	3	63	ST/SP	III	61	ST/SP	III
		Sg. Klang	8	63	ST/SP	III	60	ST/SP	III
		Sg. Rasau	1	72	ST/SP	III	72	ST/SP	III
		Sg. Toba	1	62	ST/SP	III	61	ST/SP	III
		Sg. Untut	1	61	ST/SP	III	60	ST/SP	III
Melaka	Sg. Duyong	Sg. Duyong	3	67	ST/SP	III	64	ST/SP	III
	Sg. Kesang	Sg. Kesang	3	76	ST/SP	III	75	ST/SP	III
	Sg. Melaka	Sg. Rembia	1	57	T/P	III	61	ST/SP	III
		Sg. Durian Tunggal	1	73	ST/SP	III	73	ST/SP	III
		Sg. Melaka	1	71	ST/SP	III	69	ST/SP	III
Melaka/N. Sembilan	Sg. Linggi	Sg. Kepayong	1	80	ST/SP	II	72	ST/SP	III
		Sg. Siput	1	84	B/C	II	79	ST/SP	II
		Sg. Simin	1	80	ST/SP	II	77	ST/SP	II
		Sg. Linggi	5	76	ST/SP	III	74	ST/SP	III
Johor	Sg. Batu Pahat	Sg. Amran	1	74	ST/SP	III	67	ST/SP	III
		Sg. Bekok	5	73	ST/SP	III	76	ST/SP	III
		Sg. Batu Pahat	1	66	ST/SP	III	61	ST/SP	III
		Sg. Lenik	1	80	ST/SP	II	77	ST/SP	II
		Sg. Merpo	1	64	ST/SP	III	72	ST/SP	III
		Sg. Simpang Kiri	3	66	ST/SP	III	61	ST/SP	III
		Sg. Merek	1	85	B/C	II	79	ST/SP	II
		Sg. Berlian	1	69	ST/SP	III	70	ST/SP	III

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Johor	Sg. Benut	Sg. Ulu Benut	1	72	ST/SP	III	74	ST/SP	III
		Sg. Parit Hj. Yassin	1	71	ST/SP	III	74	ST/SP	III
		Sg. Pinggan	1	64	ST/SP	III	65	ST/SP	III
		Sg. Benut	4	68	ST/SP	III	69	ST/SP	III
	Sg. Air Baloi	Sg. Air Baloi	3	57	T/P	III	61	ST/SP	III
	Sg. Johor	Sg. Anak Sg. Sayong	1	77	ST/SP	II	68	ST/SP	III
		Sg. Seluyut	1	77	ST/SP	II	76	ST/SP	III
		Sg. Tiram	4	73	ST/SP	III	73	ST/SP	III
		Sg. Panti	1	80	ST/SP	II	79	ST/SP	II
		Sg. Penggeli	2	79	ST/SP	II	80	ST/SP	II
		Sg. Lebam	1	71	ST/SP	III	71	ST/SP	III
		Sg. Papan	1	69	ST/SP	III	70	ST/SP	III
		Sg. Bukit Besar	1	89	B/C	II	75	ST/SP	III
		Sg. Sebol	1	69	ST/SP	III	65	ST/SP	III
		Sg. Temoh	1	61	ST/SP	III	62	ST/SP	III
	Sg. Jemaluang	Sg. Jemaluang	2	79	ST/SP	II	77	ST/SP	II
	Sg. Mersing	Sg. Mersing	2	77	ST/SP	II	77	ST/SP	II
	Sg. Pontian Besar	Sg. Air Hitam	1	66	ST/SP	III	64	ST/SP	III
		Sg. Pontian Besar	5	62	ST/SP	III	60	ST/SP	III
	Sg. Pontian Kecil	Sg. Pontian Kecil	2	72	ST/SP	III	72	ST/SP	III
	Sg. Pulai	Sg. Pulai	2	68	ST/SP	III	64	ST/SP	III
	Sg. Paloi	Sg. Paloi	1	84	B/C	II	78	ST/SP	II
	Sg. Rambah	Sg. Rambah	2	65	ST/SP	III	66	ST/SP	III
	Sg. Sedili Besar	Sg. Ambat	1	83	B/C	II	79	ST/SP	II
		Sg. Temubor Kanan	1	81	B/C	II	75	ST/SP	III
		Sg. Pasir Panjang	1	75	ST/SP	III	75	ST/SP	III
		Sg. Sedili Besar	5	75	ST/SP	III	77	ST/SP	II
	Sg. Sedili Kecil	Sg. Sedili Kecil	2	72	ST/SP	III	73	ST/SP	III
		Sg. Bahan	2	67	ST/SP	III	67	ST/SP	III
Johor/N. Sembilan/ Pahang	Sg. Muar	Sg. Labis	1	80	ST/SP	II	79	ST/SP	II
		Sg. Gemencheh	1	80	ST/SP	II	80	ST/SP	II
		Sg. Segamat	1	79	ST/SP	II	79	ST/SP	II
		Sg. Muar	8	81	B/C	II	80	ST/SP	II
		Sg. Meda	1	75	ST/SP	III	77	ST/SP	II

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Pahang	Sg. Anak Endau	Sg. Anak Endau	2	79	ST/SP	II	80	ST/SP	II
	Sg. Balok	Sg. Balok	2	72	ST/SP	III	71	ST/SP	III
		Sg. Panjang	1	71	ST/SP	III	69	ST/SP	III
	Sg. Bebar	Sg. Merba	1	78	ST/SP	II	78	ST/SP	II
		Sg. Bebar	1	75	ST/SP	III	73	ST/SP	III
		Sg. Serai	2	72	ST/SP	III	74	ST/SP	III
	Sg. Bertam	Sg. Bertam	1	74	ST/SP	III	80	ST/SP	II
	Sg. Kuantan	Sg. Talam	1	79	ST/SP	II	79	ST/SP	II
		Sg. Kuantan	5	77	ST/SP	II	79	ST/SP	II
		Sg. Belat	1	77	ST/SP	II	79	ST/SP	II
		Sg. Riau	1	75	ST/SP	III	77	ST/SP	II
	Sg. Merchong	Sg. Merchong	1	82	B/C	II	77	ST/SP	II
Pahang/ Johor	Sg. Rompin	Sg. Keratong	2	82	B/C	II	80	ST/SP	II
		Sg. Rompin	4	79	ST/SP	II	80	ST/SP	II
	Sg. Tonggok	Sg. Tonggok	1	74	ST/SP	III	73	ST/SP	III
	Sg. Endau	Sg. Lenggor	1	80	ST/SP	II	80	ST/SP	II
		Sg. Paloh	1	76	ST/SP	III	76	ST/SP	III
		Sg. Semberong	5	59	T/P	III	77	ST/SP	II
		Sg. Mamai	1	77	ST/SP	II	79	ST/SP	II
		Sg. Singol	1	57	T/P	III	61	ST/SP	III
		Sg. Mengkibol	3	72	ST/SP	III	70	ST/SP	III
		Sg. Pamol	1	66	ST/SP	III	61	ST/SP	III
Pahang/N. Sembilan	Sg. Pahang	Sg. Tasik Bera	1	74	ST/SP	III	78	ST/SP	II
		Sg. Tekam	2	78	ST/SP	II	78	ST/SP	II
		Sg. Mentiga	1	74	ST/SP	III	78	ST/SP	II
		Sg. Jengka	2	80	ST/SP	II	80	ST/SP	II
		Sg. Charu	1	77	ST/SP	II	80	ST/SP	II
		Sg. Bera	2	76	ST/SP	III	79	ST/SP	II
		Sg. Serting	2	76	ST/SP	III	74	ST/SP	III
Terengganu	Sg. Chukai	Sg. Ibok	1	79	ST/SP	II	79	ST/SP	II
		Sg. Chukai	1	77	ST/SP	II	79	ST/SP	II
		Sg. Bungkus	1	75	ST/SP	III	76	ST/SP	III
		Sg. Ruang	1	71	ST/SP	III	71	ST/SP	III
	Sg. Kluang	Sg. Kluang	1	74	ST/SP	III	75	ST/SP	III
	Sg. Merang	Sg. Merang	1	71	ST/SP	III	68	ST/SP	III
	Sg. Merchang	Sg. Merchang	1	70	ST/SP	III	71	ST/SP	III
	Sg. Ibai	Sg. Ibai	3	70	ST/SP	III	70	ST/SP	III
	Sg. Kemaman	Sg. Ransan	1	68	ST/SP	III	68	ST/SP	III

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Terengganu	Sg. Kertih	Sg. Kertih	1	79	ST/SP	II	78	ST/SP	II
	Sg. Marang	Sg. Marang	1	73	ST/SP	III	75	ST/SP	III
	Sg. Paka	Sg. Paka	1	76	ST/SP	III	79	ST/SP	II
		Sg. Rasau	1	73	ST/SP	III	72	ST/SP	III
	Sg. Setiu	Sg. Chalok	2	77	ST/SP	II	79	ST/SP	II
Kelantan	Sg. Kelantan	Sg. Kelantan	3	79	ST/SP	II	79	ST/SP	II
	Sg. Kemasin	Sg. Kemasin	2	73	ST/SP	III	76	ST/SP	III
	Sg. Pengkalan Chepa	Sg. Raja Gali	1	79	ST/SP	II	78	ST/SP	II
		Sg. Pengkalan Chepa	2	76	ST/SP	III	70	ST/SP	III
		Sg. Keladi	1	74	ST/SP	III	76	ST/SP	III
	Sg. Pengkalan Datu	Sg. Pengkalan Datu	3	77	ST/SP	II	77	ST/SP	II
Sabah	Sg. Sembulan	Sg. Sembulan	2	65	ST/SP	III	67	ST/SP	III
	Sg. Membakut	Sg. Membakut	1	80	ST/SP	II	80	ST/SP	II
	Sg. Kalumpang	Sg. Kalumpang	3	81	B/C	II	79	ST/SP	II
	Sg. Padas	Sg. Pangatan	1	73	ST/SP	III	78	ST/SP	II
	Sg. Umas-Umas	Sg. Umas-Umas	1	76	ST/SP	III	80	ST/SP	II
	Sg. Kimanis	Sg. Kimanis	1	73	ST/SP	III	77	ST/SP	II
	Sg. Likas	Sg. Inanam	3	77	ST/SP	II	79	ST/SP	II
		Sg. Likas	2	69	ST/SP	III	72	ST/SP	III
	Sg. Telipok	Sg. Telipok	2	86	B/C	II	79	ST/SP	II
Sarawak	Sg. Balingian	Sg. Balingian	2	80	ST/SP	II	78	ST/SP	II
	Sg. Kayan	Sg. Kayan	3	80	ST/SP	II	79	ST/SP	II
	Sg. Kemena	Sg. Kemena	3	77	ST/SP	II	77	ST/SP	II
		Sg. Sibiu	1	76	ST/SP	III	76	ST/SP	III
	Sg. Kerian	Sg. Kerian	2	80	ST/SP	II	79	ST/SP	II
		Sg. Seblak	1	78	ST/SP	II	79	ST/SP	II
	Sg. Lupar	Sg. Seterap	1	83	B/C	II	80	ST/SP	II
		Sg. Sekerang	1	80	ST/SP	II	80	ST/SP	II
		Sg. Undup	1	77	ST/SP	II	80	ST/SP	II
		Sg. Lupar	3	81	B/C	II	78	ST/SP	II
	Sg. Miri	Sg. Lutong	1	78	ST/SP	II	75	ST/SP	III
		Sg. Miri	2	78	ST/SP	II	75	ST/SP	III
		Sg. Adong	1	77	ST/SP	II	74	ST/SP	III
		Sg. Dalam	1	75	ST/SP	III	75	ST/SP	III
	Sg. Mukah	Sg. Mukah	4	79	ST/SP	II	76	ST/SP	III
	Sg. Niah	Sg. Niah	2	81	B/C	II	80	ST/SP	II
		Sg. Sekaloh	1	74	ST/SP	III	74	ST/SP	III

Jadual 2.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2017
Table 2.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Sarawak	Sg. Oya	Sg. Oya	3	80	ST/SP	II	77	ST/SP	II
	Sg. Rajang	Sg. Rajang	11	78	ST/SP	II	77	ST/SP	II
		Sg. Baloi	1	80	ST/SP	II	79	ST/SP	II
		Sg. Meradong	1	79	ST/SP	II	77	ST/SP	II
		Sg. Sarikei	2	82	B/C	II	80	ST/SP	II
		Sg. Salim	1	73	ST/SP	III	72	ST/SP	III
	Sg. Sarawak	Sg. Semenggoh	1	71	ST/SP	III	68	ST/SP	III
		Sg. Kuap	1	77	ST/SP	II	77	ST/SP	II
		Sg. Sarawak Kiri	1	79	ST/SP	II	80	ST/SP	II
		Sg. Tabuan	1	74	ST/SP	III	73	ST/SP	III
		Sg. Samarahan	2	81	B/C	II	79	ST/SP	II
		Sg. Maong Kiri	1	66	ST/SP	III	64	ST/SP	III
	Sg. Saribas	Sg. Saribas	1	79	ST/SP	II	74	ST/SP	III
	Sg. Sibuti	Sg. Kabuloh	2	68	ST/SP	III	67	ST/SP	III
		Sg. Satap	1	81	B/C	II	78	ST/SP	II
		Sg. Sibuti	2	82	B/C	II	80	ST/SP	II
	Sg. Sadong	Sg. Sadong	4	82	B/C	II	79	ST/SP	II
		Sg. Karangan	2	81	B/C	II	77	ST/SP	II
	Sg. Baram	Sg. Baram	4	79	ST/SP	II	79	ST/SP	II
	Sg. Sibuti	Sg. Kejapil	1	80	ST/SP	II	80	ST/SP	II
	Sg. Tatau	Sg. Tatau	1	81	B/C	II	80	ST/SP	II
	Sg. Similajau	Sg. Similajau	2	78	ST/SP	II	79	ST/SP	II
	Sg. Suai	Sg. Suai	1	77	ST/SP	II	76	ST/SP	III

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP. Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Jadual 2.3 Malaysia: Status Kualiti Air bagi Sungai Tercemar, 2017
Table 2.3 Malaysia: Water Quality Status of Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
P.Pinang	Sg. Jawi	Sg. Jawi	1	47	T/P	IV	44	T/P	IV
	Sg. Juru	Sg. Juru	2	58	T/P	III	53	T/P	III
		Sg. Rambai	1	55	T/P	III	49	T/P	IV
P.Pinang/ Kedah	Sg. Pinang	Sg. Jelutong	1	44	T/P	IV	49	T/P	IV
		Sg. Pinang	1	56	T/P	III	57	T/P	III
	Sg. Perai	Sg. Perai	2	58	T/P	III	57	T/P	III
		Sg. Kereh	2	55	T/P	III	50	T/P	IV
		Sg. Pertama	1	49	T/P	IV	49	T/P	IV
Perak	Sg. Perak	Sg. Nyamok	1	57	T/P	III	55	T/P	III
		Sg. Serokai	1	62	ST/SP	III	58	T/P	III
	Sg. Wangi	Sg. Wangi	1	63	ST/SP	III	56	T/P	III
	Sg. Raja Hitam	Sg. Raja Hitam	2	63	ST/SP	III	49	T/P	III
Selangor/ WPKL	Sg. Klang	Sg. Air Busuk	1	57	T/P	III	56	T/P	III
		Sg. Belongkong	1	56	T/P	III	55	T/P	III
		Sg. Kuyoh	1	50	T/P	IV	48	T/P	III
		Sg. Bunos	3	57	T/P	III	57	T/P	III
		Sg. Kerayong	2	53	T/P	III	52	T/P	III
Selangor	Sg. Buloh	Sg. Buloh	4	61	ST/SP	III	58	T/P	III
Melaka	Sg. Merlimau	Sg. Merlimau	2	60	ST/SP	III	53	T/P	III
	Sg. Seri Melaka	Sg. Seri Melaka	1	58	T/P	III	56	T/P	III
Johor	Sg. Pulai	Sg. Ulu Choh	1	58	T/P	III	49	T/P	IV
	Sg. Batu Pahat	Sg. Simpang Kanan	2	58	T/P	III	56	T/P	III
		Sg. Semberong	2	78	ST/SP	II	59	T/P	III
	Sg. Skudai	Sg. Skudai	9	60	ST/SP	III	59	T/P	III
		Sg. Melana	2	50	T/P	IV	52	T/P	III
	Sg. Johor	Sg. Chemangar	1	64	ST/SP	III	58	T/P	III
		Sg. Semenchu	1	44	T/P	IV	54	T/P	III
	Sg. Danga	Sg. Danga	2	46	T/P	IV	44	T/P	IV
	Kawasan Pasir Gudang	Sg. Latoh	1	57	T/P	III	52	T/P	III
		Sg. Perembi	1	51	T/P	IV	49	T/P	IV
		Sg. Masai	1	48	T/P	IV	48	T/P	IV
		Sg. Buluh	1	35	T/P	IV	34	T/P	IV
		Sg. Tukang Batu	1	33	T/P	IV	30	T/P	V

Jadual 2.3 Malaysia: Status Kualiti Air bagi Sungai Tercemar, 2017
Table 2.3 Malaysia: Water Quality Status of Polluted Rivers, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	BILANGAN STESEN/ *NUMBER OF STATIONS*	2016			2017		
				IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*	IKA/ WQI	KATEGORI/ *CATEGORY*	*KELAS/ CLASS*
Johor	Sg. Kempas	Sg. Kempas	2	47	T/P	IV	47	T/P	IV
	Sg. Kim-Kim	Sg. Kim-Kim	2	58	T/P	III	57	T/P	III
	Sg. Sedili Kecil	Sg. Anak Sedili Kecil	1	69	ST/SP	III	53	T/P	III
	Sg. Muar	Sg. Sarang Buaya	1	55	T/P	III	57	T/P	III
	Sg. Pontian Besar	Sg. Ayer Merah	1	49	T/P	IV	43	T/P	IV
	Sg. Sanglang	Sg. Sanglang	1	54	T/P	III	57	T/P	III
	Sg. Segget	Sg. Segget	5	47	T/P	IV	46	T/P	IV
	Sg. Tebrau	Sg. Bala	1	48	T/P	IV	48	T/P	IV
		Sg. Sebulung	1	48	T/P	IV	49	T/P	IV
		Sg. Plentong	1	46	T/P	IV	46	T/P	III
		Sg. Tebrau	4	35	T/P	IV	41	T/P	IV
		Sg. Pandan	1	44	T/P	IV	42	T/P	IV
		Sg. Tampoi	1	40	T/P	IV	41	T/P	IV
		Sg. Sengkuang	1	39	T/P	IV	40	T/P	IV
Pahang/ Johor	Sg. Endau	Sg. Melatai	1	61	ST/SP	III	58	T/P	III
		Sg. Jebong	1	56	T/P	III	58	T/P	II
Kelantan	Sg. Pengkalan Chepa	Sg. Alor Lintah	1	56	T/P	III	58	T/P	III
		Sg. Alor B	1	50	T/P	IV	52	T/P	III

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP: Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Jadual 2.4 menunjukkan sebanyak 24 daripada 51 sungai tercemar masih tergolong dalam Kelas III, 26 sungai adalah dalam Kelas IV, manakala satu sungai adalah Kelas V. Berdasarkan BOD, satu sungai diklasifikasikan sebagai Kelas III, 24 sungai sebagai Kelas IV manakala 26 adalah Kelas V. Dari segi NH3-N pula, dua sungai tergolong dalam Kelas I, satu sungai dalam Kelas III, 23 sungai Kelas IV, dan 25 sungai adalah Kelas V. Dari segi SS, sebanyak dua sungai telah diklasifikasikan sebagai Kelas I, 24 sungai Kelas II, dan 24 adalah Kelas III manakala satu adalah Kelas IV.

***Table 2.4** shows that out of the 51 polluted rivers, 24 rivers were classified as Class III, while 26 rivers as Class IV, and one river as Class V. In terms of BOD, one river was classified as Class III, 24 rivers were classified as Class IV and 26 rivers as Class V. In terms of NH3-N, two rivers were classified as Class I, one river as Class III, 23 as Class IV and 25 rivers as Class V. In terms of SS, two rivers were classified as Class I, 24 rivers as Class II, 24 rivers as Class III while one rivers as Class IV.*

Jadual 2.4 Malaysia: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2017
Table 2.4 Malaysia: The Polluted Rivers and Classes Based on BOD, AN and SS, 2017

BIL./ *NO.*	NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STATUS 2017		KELAS BERDASARKAN:/ *CLASS BASED ON:*		
				IKA/ WQI	KELAS/ CLASS	BOD	AN	SS
1	P.Pinang	Sg. Jawi	Sg. Jawi	44	IV	V	V	III
		Sg. Juru	Sg. Juru	53	III	IV	V	III
			Sg. Rambai	49	IV	IV	V	II
2	P.Pinang/Kedah	Sg. Pinang	Sg. Pinang	57	III	IV	IV	II
			Sg. Jelutong	49	IV	V	IV	III
		Sg. Perai	Sg. Perai	57	III	IV	IV	III
			Sg. Kereh	50	IV	IV	IV	III
			Sg. Pertama	49	IV	IV	IV	III
3	Perak	Sg. Perak	Sg. Nyamok	55	III	IV	IV	III
			Sg. Serokai	58	III	IV	IV	III
		Sg. Wangi	Sg. Wangi	56	III	IV	IV	II
		Sg. Raja Hitam	Sg. Raja Hitam	49	IV	V	IV	III
4	Selangor/WPKL	Sg. Klang	Sg. Air Busuk	56	III	V	V	III
			Sg. Belongkong	55	III	V	V	II
			Sg. Bonus	57	III	V	V	II
			Sg. Kerayong	52	IV	V	V	II
			Sg. Kuyoh	48	IV	V	V	II
5	Selangor	Sg. Buloh	Sg. Buloh	58	III	IV	IV	II
6	Melaka	Sg. Merlimau	Sg. Merlimau	53	III	IV	IV	II
		Sg. Seri Melaka	Sg. Seri Melaka	56	III	V	V	II
7	Johor	Sg. Batu Pahat	Sg. Simpang Kanan	56	III	III	IV	I
			Sg. Semberong	59	III	IV	IV	I
		Sg. Skudai	Sg. Skudai	59	III	IV	IV	III
			Sg. Melana	52	IV	V	IV	II
		Sg. Pulai	Sg. Ulu Choh	49	IV	V	V	III
		Sg. Danga	Sg. Danga	44	IV	V	V	III

Jadual 2.4 Malaysia: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2017
Table 2.4 Malaysia: The Polluted Rivers and Classes Based on BOD, AN and SS, 2017

BIL./ NO.	NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STATUS 2017		KELAS BERDASARKAN:/ CLASS BASED ON:		
				IKA/ WQI	KELAS/ CLASS	BOD	AN	SS
8	Johor	Kawasan Pasir Gudang	Sg. Latoh	52	IV	IV	V	III
			Sg. Perembi	49	IV	V	V	II
			Sg. Masai	48	IV	IV	V	II
			Sg. Buluh	34	IV	V	V	III
			Sg. Tukang Batu	30	V	V	V	III
		Sg. Endau	Sg. Melatai	58	III	IV	IV	III
			Sg. Jebong	58	III	IV	IV	III
		Sg. Johor	Sg. Semenchu	54	III	V	IV	III
			Sg. Chemangar	58	III	IV	V	II
		Sg. Kempas	Sg. Kempas	47	IV	V	V	III
		Sg. Kim-Kim	Sg. Kim-Kim	57	III	IV	IV	II
		Sg. Pontian Besar	Sg. Ayer Merah	43	IV	V	IV	III
		Sg. Sanglang	Sg. Sanglang	57	III	IV	II	IV
		Sg. Sedili Kecil	Sg. Anak Sedili Kecil	53	III	IV	III	II
		Sg. Segget	Sg. Segget	46	IV	V	V	II
		Sg. Tebrau	Sg. Bala	48	IV	V	V	II
			Sg. Sebulung	49	IV	V	IV	II
			Sg. Pandan	42	IV	V	V	II
			Sg. Plentong	46	IV	IV	V	III
			Sg. Tebrau	41	IV	V	V	III
			Sg. Tampoi	41	IV	V	V	II
			Sg. Sengkuang	40	IV	V	V	II
9	Johor/ N. Sembilan	Sg. Muar	Sg. Sarang Buaya	57	III	V	II	III
10	Kelantan	Sg. Pengkalan Chepa	Sg. Alor Lintah	58	III	IV	IV	II
			Sg. Alor B	52	IV	IV	IV	II

PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

Rajah 2.2 menunjukkan lokasi 10 stesen pengawasan sungai automatik serta takat pengambilan air yang disenaraikan seperti dalam **Jadual 2.5**.

Oksigen terlarut adalah salah satu penunjuk kepada kehadiran BOD yang disebabkan oleh bahan pencemar organik. Berdasarkan oksigen terlarut, 80.4 % daripada bacaan yang direkodkan di stesen automatik di Sg. Perak adalah berada dalam Kelas II, dikuti oleh Sg. Semenyih (51.5%), Sg. Langat (Cheras) (44.3%), Sg. Labu (28.8%), Sg. Selangor (20.5%), Sg. Skudai (18.1%), Sg. Putat (16.6%), Sg. Langat (Dengkil) (15.8 %), Sg. Linggi (13.7%), manakala

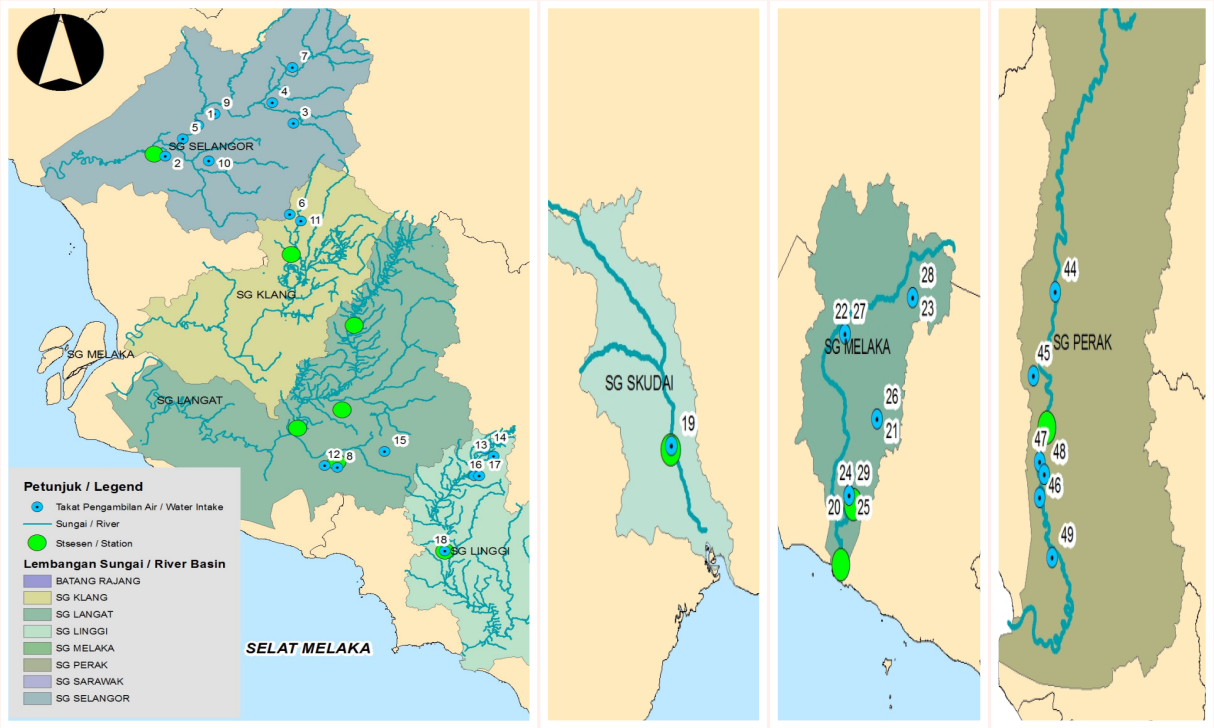
CONTINUOUS RIVER WATER QUALITY MONITORING

***Figure 2.2** shows the location of the 10 continuous river monitoring stations and subsequent water intakes as listed in **Table 2.5**.*

The dissolved oxygen is one of indicators of BOD strength exerted by organic pollutants. In terms of dissolved oxygen level, about 80.4% of the data recorded at Sg. Perak were within the Class II of the NWQS, followed by Sg. Semenyih (51.5%), Sg. Langat (Cheras) (44.3%), Sg. Labu (28.8%), Sg. Selangor (20.5%), Sg. Skudai (18.1%), Sg. Putat (16.6%), Sg. Langat (Dengkil) (15.8 %), Sg. Linggi (13.7%). Meanwhile, only 3.3% of the dissolved oxygen

hanya 3.3% bacaan oksigen terlarut di Sg. Melaka adalah berada dalam Kelas II (**Rajah 2.3**).

*recorded at Sg. Melaka were within the Class II limit (**Figure 2.3**).*



Rajah 2.2: Stesen Pengawasan Kualiti Air Sungai Automatik dan Takat Pengambilan Air
Figure 2.2: Continuous Water Quality Stations and Water Intakes

Jadual 2.5 Senarai Takat Pengambilan Air dalam Kawasan Tadahan Seperti Dalam Rajah 2.2
Table 2.5 Water Intake List within cacthments as in the Figure 2.2

NO	NEGERI/ *STATE*	SUNGAI/ *RIVER*	SKIM PERBEKALAN/ *SUPPLY SCHEME*
1	Selangor	Sungai Selangor	SSP 2, Bukit Badong
		Sungai Selangor	Rantau Panjang
		Sungai Batang Kali	Batang Kali
		Sungai Selangor	Rasa
		Sungai Selangor	SSP 3, Bukit Badong
		Sungai Rangkap	Sungai Rangkap
		Sungai Kubu	Kuala Kubu Bharu
		Sungai Labu	Sungai Labu
		Sungai Tengi	Sungai Tengi
		Sungai Darah	Sungai Buaya
		Empangan Batu	Sungai Batu
		Sungai Labu	Salak Tinggi
2	N. Sembilan	Sg Batang Penar	Pantai
		Sg. Ngoi-Ngoi	Ngoi-ngoi
		Sg Mahang	Mahang
		Sg Batang Penar	Sungai Terip
		Empangan Sg. Terip	Terip
		Sg. Linggi	Sg. Linggi
3	Johor	Sg. Skudai	Johor Bahru

Jadual 2.5 Senarai Takat Pengambilan Air dalam Kawasan Tadahan seperti dalam Rajah 2.2
Table 2.5 Water Intake List within cacthments as in the Figure 2.2

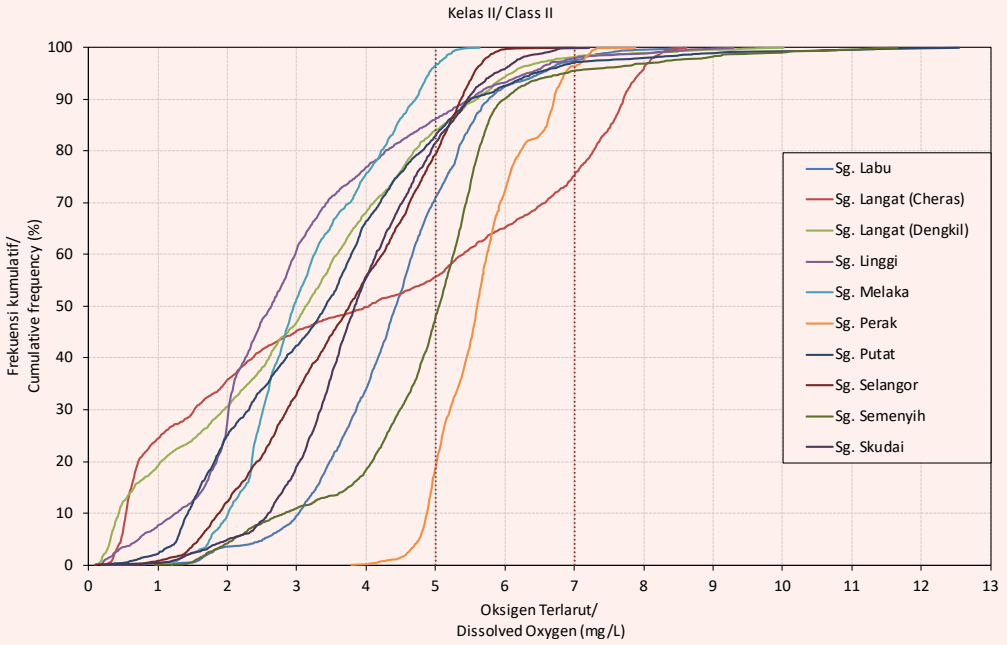
NO	NEGERI/ *STATE*	SUNGAI/ *RIVER*	SKIM PERBEKALAN/ *SUPPLY SCHEME*
4	Melaka	Sg. Melaka	Jasin, Melaka Tengah dan Alor Gajah
		Empangan Durian Tunggal	Melaka Tengah, Alor Gajah dan Jasin
		Sg. Melaka (Bunded Storage)	Melaka Tengah, Alor Gajah dan Jasin
		Sg. Kesang	Jasin dan Merlimau
		Sg. Muar	Melaka Tengah, Alor Gajah dan Jasin
		Sg. Melaka	Jasin, Melaka Tengah dan Alor Gajah
		Empangan Durian Tunggal	Melaka Tengah, Alor Gajah dan Jasin
		Sg. Melaka (Bunded Storage)	Melaka Tengah, Alor Gajah dan Jasin
		Sg. Kesang	Jasin dan Merlimau
		Sg. Muar	Melaka Tengah, Alor Gajah dan Jasin
5	Perak	Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Kota Lama Kiri
		Sg. Guar	Manong
		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Teluk Kepayang
		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Kampung Paloh
		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	BB Seri Iskandar
		Sg. Perak	Kampung Gajah

Ammonium adalah satu bentuk ammonia yang telah terion. Pengukuran ammonium memberi petunjuk kepada potensi kehadiran pencemar ammonia atau ammonia nitrogen dalam air sungai apabila pH dan suhu air berubah. Sebanyak 54.2% daripada bacaan ammonium yang direkodkan di Sg. Perak adalah dalam Kelas II berdasarkan julat ammonia nitrogen diikuti dengan Sg. Langat (Dengkil) (52.6%), Sg. Melaka (17.3%), Sg. Langat (Cheras) (13.5%), Sg. Putat (3.4%), Sg. Selangor (1.4%), manakala tiada bacaan ammonium yang direkodkan di Sg. Skudai, Sg. Labu, Sg. Linggi, dan Sg. Semenyih berada dalam Kelas II tersebut (**Rajah 2.4**).

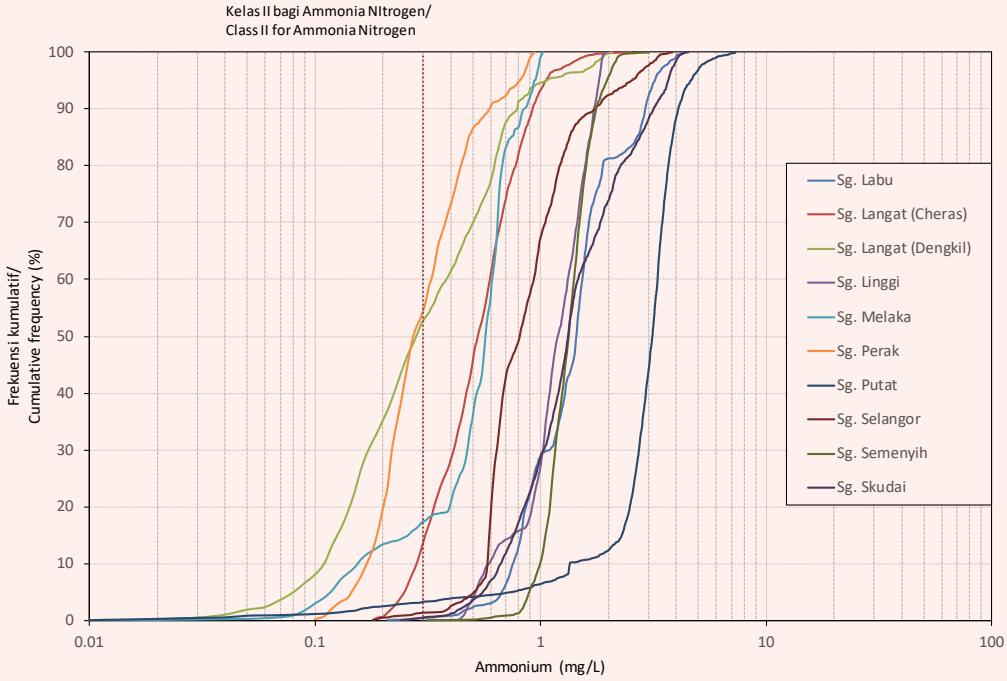
*The ammonium is an ionized form of ammonia. The measurement of ammonium indicates the potential to form ammonia or ammoniacal nitrogen pollutants in rivers when pH and temperature changes. It is about 54.2% of the ammonium levels recorded at Sg. Perak were within Class II limit based on ammoniacal nitrogen followed by Sg. Langat (Dengkil) (52.6%), Sg. Melaka (17.3%), Sg. Langat (Cheras) (13.5%), Sg. Putat (3.4%), Sg. Selangor (1.4%). Meanwhile, none of the recorded ammonium at Sg. Skudai, Sg. Labu, Sg. Linggi, and Sg. Semenyih were within the Class II limits (**Figure 2.4**).*

Kekeruhan digunakan sebagai penunjuk kehadiran pepejal terampai di dalam sungai. Sebanyak 35.6% daripada keseluruhan data kekeruhan yang direkodkan di stesen automatik Sg. Perak adalah berada dalam julat Kelas II dikuti Sg. Langat (Dengkil) (33.3%), Sg. Selangor (25%), Sg. Labu (24.2%), Sg. Skudai (10.1%), Sg. Linggi (7.3%), Sg. Semenyih (6.6%), Sg. Langat (Cheras) (4.3%), Sg. Putat (2.9%), manakala hanya 1.7% daripada bacaan kekeruhan di Sg. Melaka berada dalam julat tersebut (**Rajah 2.5**).

*Turbidity is used as an indicator of suspended solids in a river. Of all data recorded at automatic river water quality monitoring stations, 35.6% of turbidity data for Sg. Perak were within the Class II followed by Sg. Langat (Dengkil) (33.3%), Sg. Selangor (25%), Sg. Labu (24.2%), Sg. Skudai (10.1%), Sg. Linggi (7.3%), Sg. Semenyih (6.6%), Sg. Langat (Cheras) (4.3%), Sg. Putat (2.9%). Meanwhile, only 1.7% of the turbidity recorded at Sg. Melaka were within the Class II limit (**Figure 2.5**).*



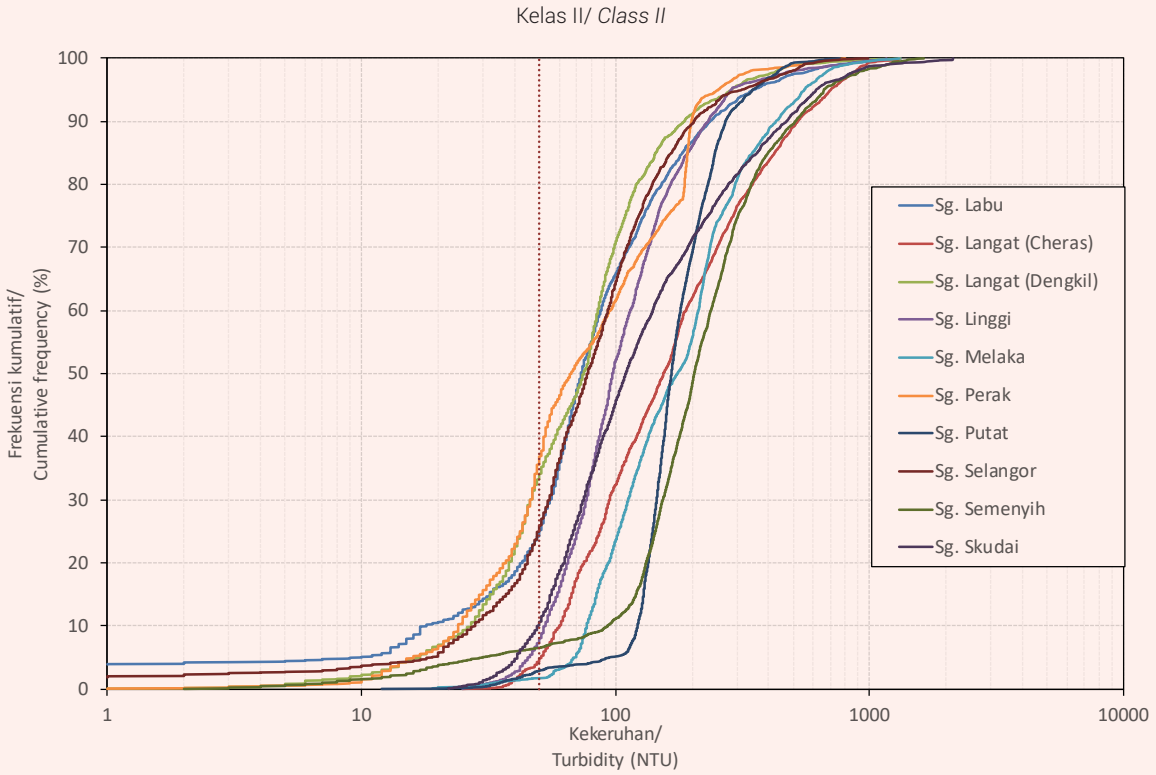
Rajah 2.3 Perbandingan Frekuensi Kumulatif Bagi 10 Stesen-Stesen CWQM Untuk Oksigen Terlarut, 2017
Figure 2.3 Comparison of Cumulative Frequency for 10 CWQM Stations for Dissolved Oxygen, 2017



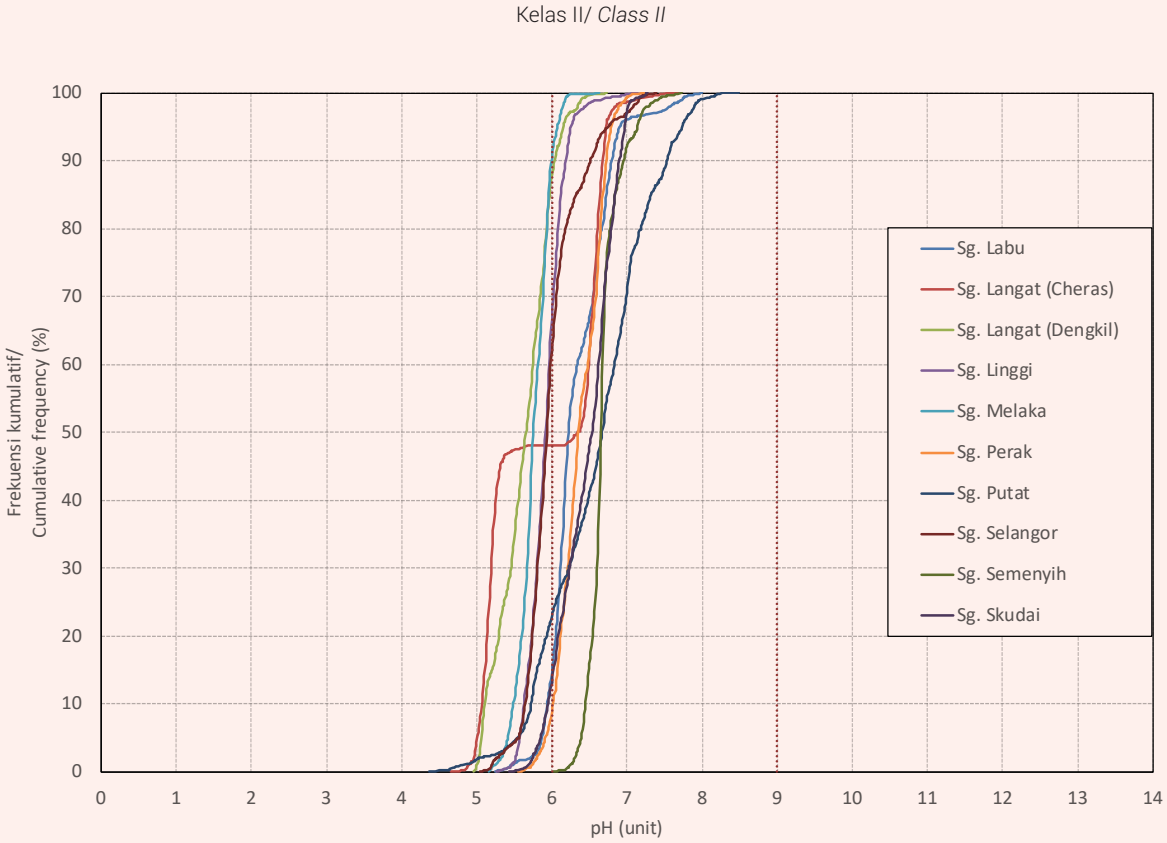
Rajah 2.4 Perbandingan Frekuensi Kumulatif Bagi 13 Stesen-Stesen CWQM Untuk Ammonium, 2017
Figure 2.4 Comparison of Cumulative Frequency for 13 CWQM Stations for Ammonium Concentration, 2017

pH adalah ukuran bagi keasidan dan kealkalian mengikut skala pH. Kesemua bacaan pH yang direkodkan di stesen Sg. Semenyih adalah berada dalam julat Kelas II diikuti oleh Sg. Perak (91.2%), Sg. Skudai (86.9%), Sg. Labu (85.4%), Sg. Putat (77%), Sg. Langat (Cheras) (52%), Sg. Selangor (37.9%), Sg. Linggi (33.3%), Sg. Langat (Dengkil) (12%), dan Sg. Melaka (9.6%), (**Rajah 2.6**).

*pH is a measurement of acidity and alkalinity based on pH scale. All of the data recorded at automatic river water quality monitoring stations in Sg. Semenyih were within Class II followed by Sg. Perak (91.2%), Sg. Skudai (86.9%), Sg. Labu (85.4%), Sg. Putat (77%), Sg. Langat (Cheras) (52%), Sg. Selangor (37.9%), Sg. Linggi (33.3%), Sg. Langat (Dengkil) (12%), dan Sg. Melaka (9.6%), (**Rajah 2.6**).*



Rajah 2.5 Perbandingan Frekuensi Kumulatif bagi 10 Stesen-Stesen CWQM untuk Kekeruhan, 2017
Figure 2.5 Comparison of Cumulative Frequency for 10 CWQM Stations for Turbidity, 2017



Rajah 2.6 Perbandingan Frekuensi Kumulatif bagi 10 Stesen-Stesen CWQM untuk pH, 2017
Figure 2.6 Comparison of Cumulative Frequency for 10 CWQM Stations for pH, 2017

TREN PENCEMARAN AIR SUNGAI

Kualiti air sungai yang ditentukan dari segi IKA telah menunjukkan sedikit penurunan pada tahun 2017. Peratus bilangan sungai yang dikategorikan sebagai bersih telah sedikit menurun kepada 46% pada tahun 2017 berbanding 47% pada tahun sebelumnya. Peratus bilangan sungai yang dikategorikan sebagai tercemar telah sedikit meningkat daripada 10% pada tahun 2016 kepada 11% pada tahun 2017. Trend ini adalah ditunjukkan oleh **Rajah 2.1**.

Berdasarkan sub-indeks BOD, tiada sungai yang dikategorikan sebagai bersih pada tahun 2017 (**Rajah 2.7**). Bilangan sungai yang tercemar dari segi sub-indeks BOD telah menurun daripada 404 pada tahun 2016 kepada 336 sungai pada tahun 2017. Kemerosotan kualiti air sungai dari segi BOD ini adalah disebabkan oleh pelepasan bahan buangan yang bersifat organik daripada pelbagai punca seperti air sisa industri, serta aktiviti komersil dan domestik.

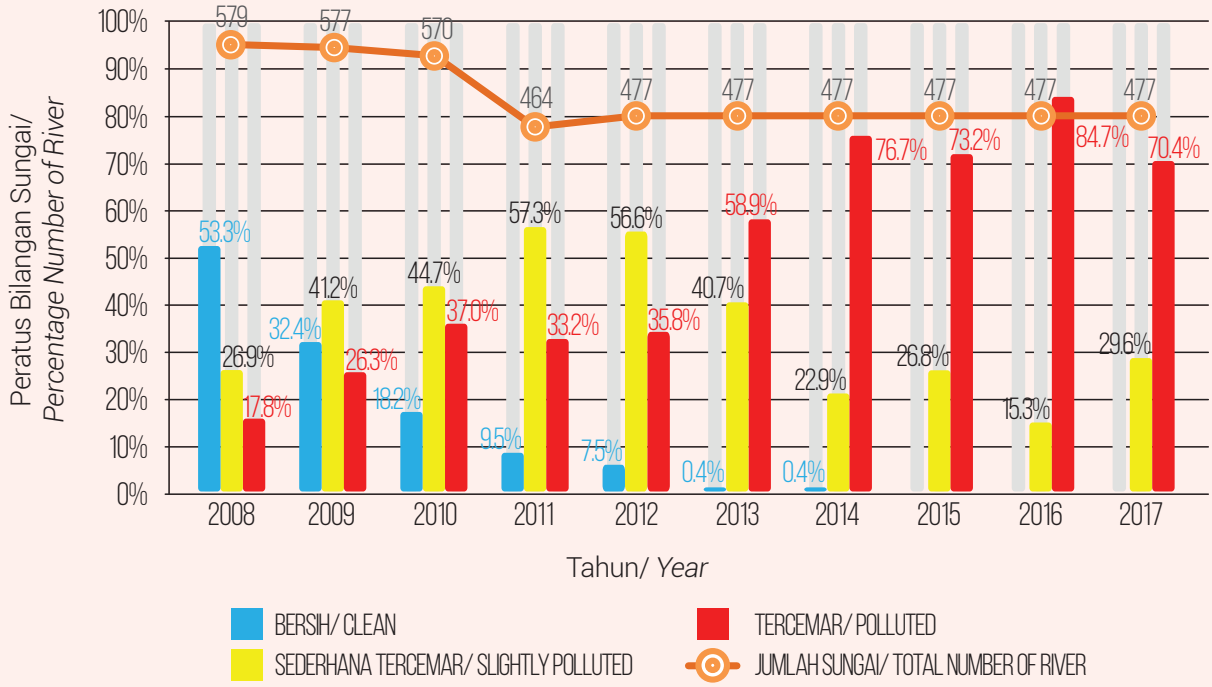
Dari segi sub-indeks NH_3-N pula, bilangan sungai bersih telah menurun daripada 115 pada tahun 2016 kepada 87 pada tahun 2017 (**Rajah 2.8**). Bilangan sungai yang tercemar dari segi sub-indeks NH_3-N telah meningkat daripada 149 pada tahun 2016 kepada 158 sungai pada tahun 2017. Kemerosotan kualiti air sungai yang disebabkan oleh NH_3-N boleh dikaitkan dengan pelepasan air sisa kumbahan manusia dan haiwan yang tidak diolah dan diolah ke dalam air sungai secara berterusan.

TREND IN RIVER WATER POLLUTION

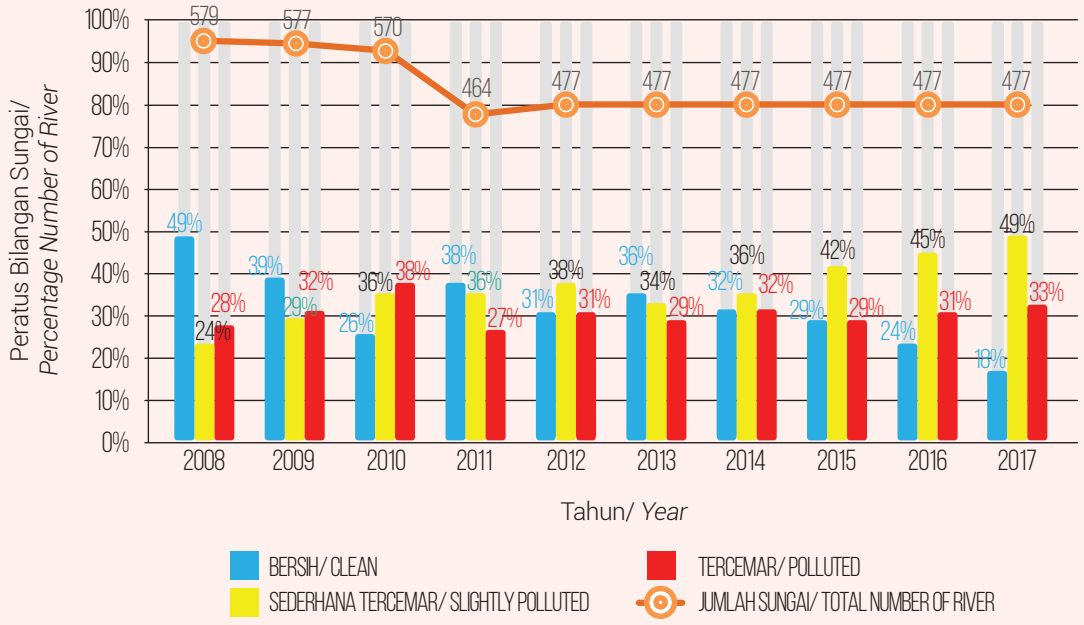
The river water quality in terms of WQI had shown a slight decrease in 2017. The percentage of clean rivers has slightly decreased to 46% in 2017 compared to 47% in the previous year. The percentage of polluted river has slightly increased from 10% to 11% in 2017. These trends are shown in ***Figure 2.1****.*

*In terms of BOD sub-index, none of the monitored rivers has been categorized as clean in 2017 (**Figure 2.7**). The number of polluted rivers in terms of BOD sub-index has decreased from 404 in 2016 to 336 rivers in 2017. The degradation of river water quality in terms of BOD may have been continuously attributed to various sources of organic pollutants including wastewater from industrial, domestic and commercials activities.*

*In term of NH_3-N sub-index, the number of clean rivers has decreased from 115 in 2016 to 87 rivers in 2017 (**Figure 2.8**). The number of polluted rivers in terms of NH_3-N has increased from 149 in 2016 to 158 rivers in 2017. The degradation of river water quality caused by NH_3-N can be associated with the continuous discharge of treated and untreated sewage into the rivers.*



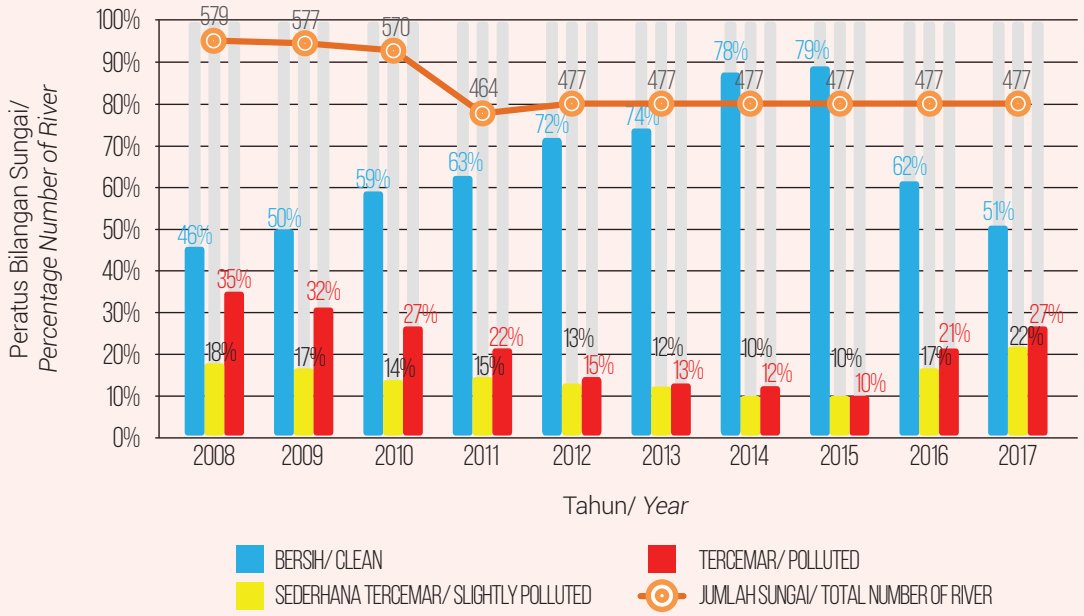
Rajah 2.7 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks BOD (2008- 2017)
Figure 2.7 Malaysia: River Water Quality Trend Based on BOD Sub-Index (2008-2017)



Rajah 2.8 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks AN (2008- 2017)
Figure 2.8 Malaysia: River Water Quality Trend Based on AN Sub-Index (2008-2017)

Dari segi sub-indeks SS pula, bilangan sungai yang dikategorikan bersih telah menurun daripada 296 pada tahun 2016 kepada 245 pada tahun 2017 (**Rajah 2.9**). Bilangan sungai yang dikategorikan sebagai tercemar dari segi sub-indeks SS pula telah meningkat kepada 127 berbanding 99 sungai pada tahun lepas. Kemerosotan kualiti air sungai dari segi pepejal terampai tersebut boleh disebabkan oleh ketidakcekapan kawalan ke atas aktiviti kerja tanah dan pembukaan tanah di kawasan-kawasan tertentu.

*In term of SS sub-index, the number of clean rivers has decreased from 296 in 2016 to 245 in 2017 (**Figure 2.9**). The number of polluted rivers in terms of SS sub-index has increased to 127 compared to 99 rivers in the previous year. The deteriorations in river water quality due to the suspended solids pollution can be attributed by inefficient control against improper earthworks and land clearing activities in certain areas.*



Rajah 2.9 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks SS (2008- 2017)
Figure 2.9 Malaysia: River Water Quality Trend Based on SS Sub-Index (2008-2017)

LOGAM BERAT DALAM SUNGAI

Analisis kandungan beberapa jenis logam berat dalam air sungai telah dilakukan ke atas Raksa (Hg), Arsenik (As), Kadmium (Cd), Kromium (Cr), Plumbum (Pb), and Zink (Zn). Pada tahun 2017 kesemua sampel air sungai telah menunjukkan kandungan logam Cd pada tahap Kelas II. Sebanyak 99.98% daripada sampel air sungai yang diuji telah menunjukkan kandungan Zn dalam Kelas II, diikuti dengan Cr (99.95%), Pb dan Hg masing-masing 99.89%, dan As (98.16%).

HEAVY METALS IN RIVERS

Heavy metals were analysed for Mercury (Hg), Arsenic (As), Cadmium (Cd), Chromium (Cr), Plumbum (Pb), and Zinc (Zn). In 2017, all of the water samples have shown that the concentration of Cd was within Class II limit. About 99.98% of water samples have shown that the concentrations of Zn were within Class II limit followed by Cr (99.95%), Pb and Hg 99.89 respectively, and As (98.16%).

KUALITI AIR SUNGAI DI HULU MUKA SAUK

Pada tahun 2017, 45 (82%) daripada 55 stesen pengawasan kualiti air di hulu muka sauk telah menunjukkan indeks kualiti air bersih sementara 10 (18%) stesen dikategorikan sebagai sederhana tercemar. Berdasarkan IKA juga, lima (9%) stesen telah dikategorikan sebagai kelas I dan 42 (76%) adalah Kelas II, tujuh (13%) adalah Kelas III, manakala satu (2%) adalah Kelas IV. **Jadual 2.6** menunjukkan status kualiti air di stesen hulu muka sauk terpilih berdasarkan IKA.

RIVER WATER QUALITY UPSTREAM WATER INTAKES

*In 2017, 45 (82%) from 55 monitoring stations upstream of water intakes have shown clean water quality while 10 (18%) other stations were categorized as slightly polluted. Based on overall WQI, five (9%) stations were categorized as Class I, 42 (76%) were Class II, seven (13%) were Class III, while one (2%) was Class IV. **Table 2.6** shows the water quality of the selected water intake stations based on WQI.*

Jadual 2.6 Malaysia: Status Kualiti Air di Hulu Muka Sauk, 2017
Table 2.6 Malaysia: Water Quality Status of Upstream Water Intakes, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ CLASS	IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	74	T/P	IV	83	B/C	III
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	77	T/P	IV	83	B/C	III
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	83	B/C	II	85	B/C	II
		Sg. Saga	2LG06	Padang Saga	80	ST/SP	II	85	B/C	II
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	83	B/C	II	87	B/C	II
		Sg. Padang Terap	2KD12	Kuala Nerang	90	B/C	II	89	B/C	II
		Sg. Temin	2KD10	Changloon	80	ST/SP	II	88	B/C	II
	Muda	Sg. Muda	2MD16	Jeneri	84	B/C	II	85	B/C	II
			2MD17	Jeniang	85	B/C	II	83	B/C	II
			2MD18	Bukit Selambau	86	B/C	II	82	B/C	II
			2MD20	Pinang Tunggal	80	ST/SP	II	80	ST/SP	II
Kedah	Muda	Sg. Nami	2MD21	Nami	88	B/C	II	83	B/C	II
		Sg. Sedim	2MD19	Bikan	86	B/C	II	83	B/C	II
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	91	B/C	II	88	B/C	II

Jadual 2.6 Malaysia: Status Kualiti Air di Hulu Muka Sauk, 2017
Table 2.6 Malaysia: Water Quality Status of Upstream Water Intakes, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ CLASS	IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	90	B/C	II	88	B/C	II
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	91	B/C	II	90	B/C	II
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	92	B/C	II	83	B/C	II
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	93	B/C	I	92	B/C	II
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	95	B/C	I	92	B/C	II
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	93	B/C	I	91	B/C	II
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	91	B/C	II	92	B/C	II
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	75	T/P	IV	95	B/C	II
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	93	B/C	I	94	B/C	I
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	68	ST/SP	III	64	ST/SP	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	73	ST/SP	III	67	ST/SP	III
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	83	B/C	II	83	B/C	II
	Benut	Sg. Machap Dam	3BN10	Machap Dam	87	B/C	II	82	B/C	II
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	82	B/C	II	86	B/C	II
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	82	B/C	II	85	B/C	II
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	90	B/C	II	93	B/C	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	74	ST/SP	III	78	ST/SP	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	84	B/C	II	91	B/C	II
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	76	T/P	IV	69	ST/SP	IV
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	90	B/C	II	96	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	85	B/C	II	90	B/C	II
		Sg. Ulong	2CH16	Brinchang Dam	92	B/C	II	93	B/C	I
	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	91	B/C	II	93	B/C	I

Jadual 2.6 Malaysia: Status Kualiti Air di Hulu Muka Sauk, 2017
Table 2.6 Malaysia: Water Quality Status of Upstream Water Intakes, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ CLASS	IKA/ WQI	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Pahang	Bertam	Sg. Jempol	4PH96	Loji Air Sg Jerik	88	B/C	II	74	ST/SP	III
			4PH97	Loji Air Jengka 3	87	B/C	II	84	B/C	II
		Sg. Mentiga	4PH98	Loji Air Chini	80	ST/SP	II	88	B/C	II
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	79	ST/SP	II	88	B/C	II
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	85	B/C	II	84	B/C	II
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	80	ST/SP	II	86	B/C	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	89	B/C	II	87	B/C	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	81	B/C	II	77	ST/SP	II
		Sg. Pehi	4KE67	Loji Air Pahi	82	B/C	II	84	B/C	II
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	83	B/C	II	84	B/C	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	90	B/C	II	92	B/C	II
			75PP05	Water Intake Kogopon	92	B/C	II	89	B/C	II
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	88	B/C	II	85	B/C	II
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	80	ST/SP	II	80	ST/SP	II
	Rajang	Sg. Daro	56DR01	Daro Water Intake	82	B/C	II	70	ST/SP	III
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	84	B/C	II	84	B/C	II
		Sg. Pakan	56PN01	Pakan Water Intake	81	B/C	II	82	B/C	II
		Sg. Pila Parit	56PL01	Igan Water Intake	80	ST/SP	II	74	ST/SP	III

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP. Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

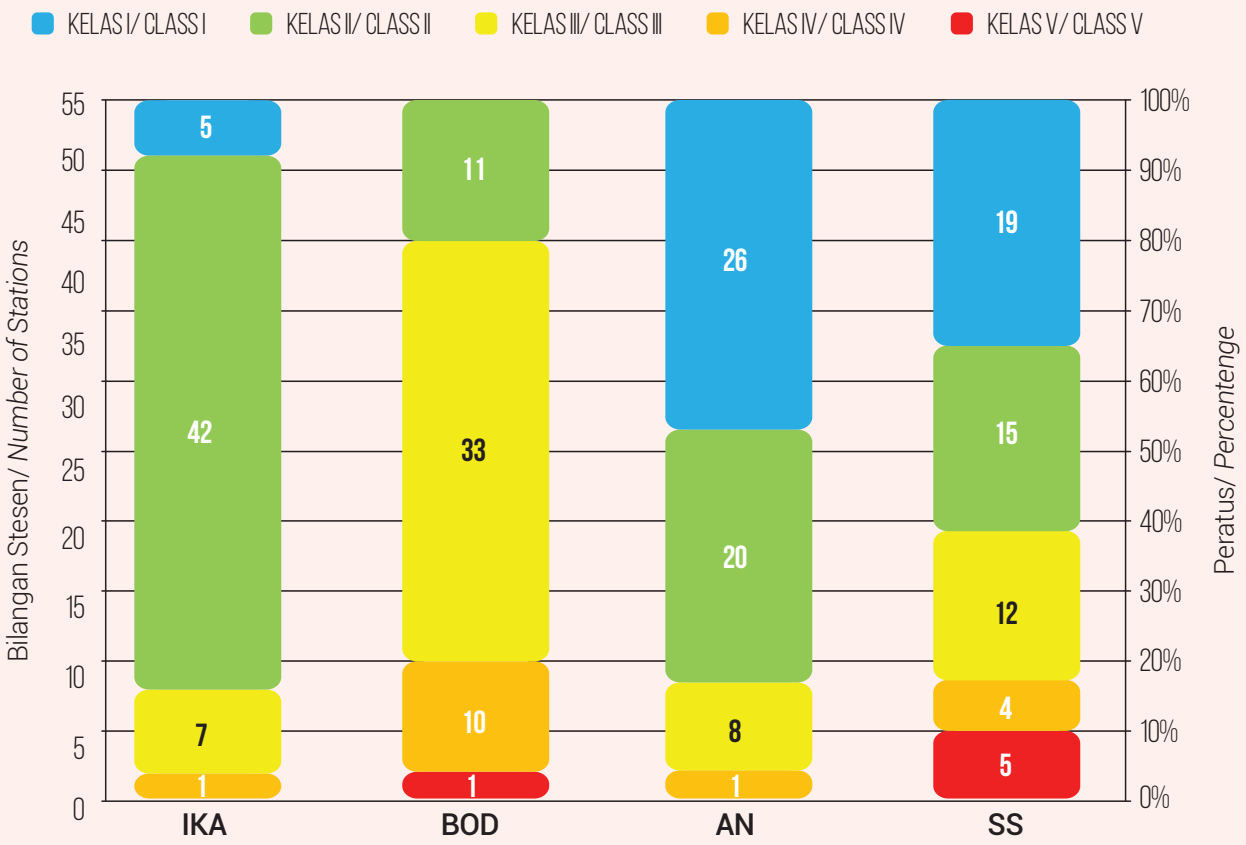
Dari segi BOD, 11 (20%) stesen telah menunjukkan kualiti air pada Kelas II, 33 (60%) stesen Kelas III, 10 (18%) stesen Kelas IV, manakala satu (2%) stesen Kelas V. Berdasarkan NH3-N pula, sebanyak 26 (47%) stesen menunjukkan kualiti air Kelas I, 20 (36%) Kelas II, lapan (15%) stesen Kelas III, dan satu stesen (2%) adalah Kelas IV. Dari segi SS, 19 (35%) stesen telah dikategorikan sebagai Kelas I, 15 (27%) stesen Kelas II, 12 (22%) stesen Kelas III, empat (7%) stesen Kelas IV manakala 5 (9%) stesen Kelas V.

In terms of BOD, 11 (20%) station have shown Class II water quality, 33 (60%) stations as Class III, 10 (18%) stations as Class IV, and one (2%) as Class V. In terms of NH3-N, 26 (47%) stations showed water quality of Class I, 20 (36%) as Class II, eight (15%) as Class IV, and one (2%) station as Class V. Meanwhile in terms of SS, 19 (35%) stations were categorized as Class I, 15 (27%) as Class II, 12 (22%) as Class III, four (7%) as Class IV, and five (9%) stations as Class V.

Rajah 2.10 menunjukkan peratusan stesen hulu muka sauk berdasarkan kelas kualiti air dan parameter utama. **Jadual 2.7**, **Jadual 2.8** dan **Jadual 2.9** menunjukkan kualiti air sungai di stesen di hulu muka sauk masing-masing berdasarkan sub-indeks BOD, AN dan SS.

***Figure 2.10** shows the percentage of water quality upstream of intake stations in term of classes based on main pollutant parameters. **Table 2.7**, **Table 2.8** and **Table 2.9** show the water quality of stations upstream of water intake points based on BOD, AN and SS sub-indexes respectively.*

Rajah 2.10 Kualiti Air Sungai di Stesen di Hulu Muka Sauk, 2017
Figure 2.10 River Water Quality at Stations Upstream of Water Intakes, 2017



Jadual 2.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2017
Table 2.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	74	T/P	IV	78	T/P	III
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	77	T/P	IV	79	T/P	III
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	76	T/P	IV	86	ST/SP	III
		Sg. Saga	2LG06	Padang Saga	76	T/P	IV	79	T/P	III
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	67	T/P	IV	79	T/P	III
		Sg. Padang Terap	2KD12	Kuala Nerang	85	ST/SP	III	80	ST/SP	III
		Sg. Temin	2KD10	Changloon	78	T/P	III	88	ST/SP	II
	Muda	Sg. Muda	2MD16	Jeneri	75	T/P	IV	74	T/P	IV
			2MD17	Jeniang	76	T/P	IV	73	T/P	IV
			2MD18	Bukit Selambau	76	T/P	IV	78	T/P	III
			2MD20	Pinang Tunggal	69	T/P	IV	77	T/P	III
		Sg. Nami	2MD21	Nami	80	ST/SP	III	83	ST/SP	III
		Sg. Sedim	2MD19	Bikan	80	ST/SP	III	82	ST/SP	III
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	76	T/P	IV	77	T/P	III
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	84	ST/SP	III	77	T/P	III
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	83	ST/SP	III	76	T/P	IV
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	84	ST/SP	III	84	ST/SP	III
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	86	ST/SP	III	82	ST/SP	III
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	88	ST/SP	III	77	T/P	III
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	84	ST/SP	III	78	T/P	III
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	79	T/P	III	80	ST/SP	III
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	75	T/P	IV	76	T/P	IV

Jadual 2.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2017
Table 2.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	83	ST/SP	III	86	ST/SP	III
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	67	T/P	IV	59	T/P	IV
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	71	T/P	IV	70	T/P	IV
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	76	T/P	IV	78	T/P	III
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	68	T/P	IV	67	T/P	IV
	Benut	Sg. Machap Dam	3BN10	Machap Dam	78	T/P	III	75	T/P	IV
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	74	T/P	IV	80	ST/SP	III
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	78	T/P	III	79	T/P	III
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	80	ST/SP	III	81	ST/SP	III
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	66	T/P	IV	74	T/P	IV
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	71	T/P	IV	84	ST/SP	III
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	75	T/P	IV	89	ST/SP	II
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	70	T/P	IV	74	T/P	IV
		Sg. Ulong	2CH16	Brinchang Dam	84	ST/SP	III	79	T/P	III
	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	82	ST/SP	III	88	ST/SP	II
		Sg. Jempol	4PH96	Loji Air Sg Jerik	80	ST/SP	III	41	T/P	V
			4PH97	Loji Air Jengka 3	79	T/P	III	83	ST/SP	III
		Sg. Mentiga	4PH98	Loji Air Chini	77	T/P	III	83	ST/SP	III
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	69	T/P	IV	88	ST/SP	II

Jadual 2.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2017
Table 2.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	82	ST/SP	III	82	ST/SP	III
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	75	T/P	IV	83	ST/SP	III
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	80	ST/SP	III	81	ST/SP	III
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	81	ST/SP	III	79	T/P	III
		Sg. Pehi	4KE67	Loji Air Pahi	68	T/P	IV	77	T/P	III
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	71	T/P	IV	94	B/C	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	82	ST/SP	III	88	ST/SP	II
			75PP05	Water Intake Kogopon	84	ST/SP	III	93	B/C	II
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	81	ST/SP	III	92	B/C	II
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	74	T/P	IV	91	B/C	II
	Rajang	Sg. Daro	56DR01	Daro Water Intake	76	T/P	IV	89	ST/SP	II
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	82	ST/SP	III	86	ST/SP	III
		Sg. Pakan	56PN01	Pakan Water Intake	80	ST/SP	III	87	ST/SP	III
		Sg. Pila Parit	56PL01	Igan Water Intake	71	T/P	IV	89	ST/SP	II

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP. Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Jadual 2.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2017
Table 2.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	93	B/C	I	88	ST/SP	II
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	95	B/C	I	81	ST/SP	II
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	85	ST/SP	II	90	ST/SP	II
		Sg. Saga	2LG06	Padang Saga	83	ST/SP	II	96	B/C	I
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	94	B/C	I	87	ST/SP	II
		Sg. Padang Terap	2KD12	Kuala Nerang	82	ST/SP	II	90	ST/SP	II
		Sg. Temin	2KD10	Changloon	65	T/P	III	70	T/P	II
	Muda	Sg. Muda	2MD16	Jeneri	88	ST/SP	II	94	B/C	I
			2MD17	Jeniang	80	ST/SP	II	92	B/C	I
			2MD18	Bukit Selambau	95	B/C	I	90	ST/SP	II
			2MD20	Pinang Tunggal	67	T/P	III	91	ST/SP	I
		Sg. Nami	2MD21	Nami	95	B/C	I	98	B/C	I
		Sg. Sedim	2MD19	Bikan	93	B/C	I	89	ST/SP	II
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	96	B/C	I	86	ST/SP	II
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	97	B/C	I	96	B/C	I
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	92	B/C	I	96	B/C	I
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	90	ST/SP	II	75	ST/SP	II
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	99	B/C	I	98	B/C	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	99	B/C	I	91	ST/SP	I
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	97	B/C	I	98	B/C	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	98	B/C	I	98	B/C	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	96	B/C	I	99	B/C	I

Jadual 2.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2017
Table 2.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	98	B/C	I	99	B/C	I
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	54	T/P	III	45	T/P	IV
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	72	ST/SP	II	56	T/P	III
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	82	ST/SP	II	63	T/P	III
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	96	B/C	I	91	ST/SP	I
	Benut	Sg. Machap Dam	3BN10	Machap Dam	88	ST/SP	II	73	ST/SP	II
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	87	ST/SP	II	84	ST/SP	II
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	92	B/C	I	91	ST/SP	I
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	96	B/C	I	97	B/C	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	86	ST/SP	II	82	ST/SP	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	68	T/P	III	90	ST/SP	II
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	99	B/C	I	100	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	97	B/C	I	97	B/C	I
		Sg. Ulong	2CH16	Brinchang Dam	98	B/C	I	100	B/C	I
	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	90	ST/SP	II	98	B/C	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	94	B/C	I	97	B/C	I
			4PH97	Loji Air Jengka 3	97	B/C	I	96	B/C	I
		Sg. Mentiga	4PH98	Loji Air Chini	90	ST/SP	II	92	B/C	I
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	97	B/C	I	99	B/C	I

Jadual 2.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2017
Table 2.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	84	ST/SP	II	82	ST/SP	II
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	92	B/C	I	71	ST/SP	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	98	B/C	I	90	ST/SP	II
Kelantan	Kelantan	Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	79	ST/SP	II	84	ST/SP	II
		Sg. Pehi	4KE67	Loji Air Pahi	98	B/C	I	91	ST/SP	I
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	82	ST/SP	II	89	ST/SP	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	95	B/C	I	91	ST/SP	I
			75PP05	Water Intake Kogopon	97	B/C	I	78	ST/SP	II
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	95	B/C	I	67	T/P	III
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	87	ST/SP	II	66	T/P	III
	Rajang	Sg. Daro	56DR01	Daro Water Intake	79	ST/SP	II	60	T/P	III
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	81	ST/SP	II	65	T/P	III
		Sg. Pakan	56PN01	Pakan Water Intake	85	ST/SP	II	65	T/P	III
		Sg. Pila Parit	56PL01	Igan Water Intake	82	ST/SP	II	65	T/P	III

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP: Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Jadual 2.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2017
Table 2.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	75	ST/SP	II	59	T/P	III
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	79	B/C	II	61	T/P	III
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	72	ST/SP	II	53	T/P	IV
		Sg. Saga	2LG06	Padang Saga	71	ST/SP	III	75	ST/SP	II
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	73	ST/SP	II	67	T/P	III
		Sg. Padang Terap	2KD12	Kuala Nerang	82	B/C	II	86	B/C	I
		Sg. Temin	2KD10	Changloon	71	ST/SP	III	83	B/C	II
	Muda	Sg. Muda	2MD16	Jeneri	68	T/P	III	36	T/P	V
			2MD17	Jeniang	81	B/C	II	50	T/P	IV
			2MD18	Bukit Selambau	72	ST/SP	III	39	T/P	IV
			2MD20	Pinang Tunggal	75	ST/SP	II	32	T/P	V
		Sg. Nami	2MD21	Nami	77	B/C	II	34	T/P	V
		Sg. Sedim	2MD19	Bikan	69	T/P	III	59	T/P	III
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	94	B/C	I	92	B/C	I
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	80	B/C	II	65	T/P	III
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	90	B/C	I	83	B/C	II
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	95	B/C	I	77	B/C	II
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	93	B/C	I	90	B/C	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	95	B/C	I	96	B/C	I
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	97	B/C	I	86	B/C	I

Jadual 2.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2017
Table 2.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Perak	Sg. Tesong	Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	95	B/C	I	88	B/C	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	95	B/C	I	97	B/C	I
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	95	B/C	I	92	B/C	I
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	62	T/P	III	56	T/P	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	53	T/P	IV	52	T/P	IV
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	90	B/C	I	84	B/C	II
	Benut	Sg. Machap Dam	3BN10	Machap Dam	92	B/C	I	79	B/C	II
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	69	T/P	III	80	B/C	II
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	59	T/P	III	62	T/P	III
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	93	B/C	I	90	B/C	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	81	B/C	II	73	ST/SP	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	94	B/C	I	86	B/C	I
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	82	ST/SP	II	57	T/P	III
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	94	B/C	I	93	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	75	ST/SP	II	81	B/C	II
		Sg. Ulong	2CH16	Brinchang Dam	97	B/C	I	93	B/C	I

Jadual 2.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2017
Table 2.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2017

NEGERI/ *STATE*	LEMBANGAN SUNGAI/ *RIVER BASIN*	SUNGAI/ *RIVER*	STESEN ID/ *ID STESEN*	MUKA SAUK/ *WATER INTAKE*	KUALITI AIR, 2016/ *WATER QUALITY 2016*			KUALITI AIR, 2017/ *WATER QUALITY 2017*		
					SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*	SUB-INDEKS BOD/ *BOD SUB-INDEX*	KATEGORI/ *CATEGORY*	KELAS/ *CLASS*
Pahang	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	97	B/C	I	96	B/C	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	92	B/C	I	84	B/C	II
			4PH97	Loji Air Jengka 3	90	B/C	I	70	ST/SP	III
		Sg. Mentiga	4PH98	Loji Air Chini	84	B/C	I	85	B/C	I
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	61	T/P	III	56	T/P	III
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	86	B/C	I	81	B/C	II
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	81	B/C	II	93	B/C	I
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	87	B/C	I	76	B/C	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	62	T/P	III	35	T/P	V
		Sg. Pehi	4KE67	Loji Air Pahi	77	B/C	II	62	T/P	III
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	42	T/P	IV	36	T/P	V
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	86	B/C	I	91	B/C	I
			75PP05	Water Intake Kogopon	89	B/C	I	90	B/C	I
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	94	B/C	I	96	B/C	I
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	81	B/C	II	71	ST/SP	III
	Rajang	Sg. Daro	56DR01	Daro Water Intake	85	B/C	I	89	B/C	I
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	84	B/C	I	84	B/C	II
		Sg. Pakan	56PN01	Pakan Water Intake	82	B/C	II	84	B/C	II
		Sg. Pila Parit	56PL01	Igan Water Intake	71	ST/SP	III	76	B/C	II

Nota/*Note*:
B/C : Bersih/ *Clean*
ST/SP: Sederhana tercemar/ *Slightly polluted*
T/P : Tercemar/ *Polluted*

Kualiti Air Tanah
Groundwater Quality

PENGAWASAN KUALITI AIR TANAH
GROUNDWATER QUALITY MONITORING

Program Pengawasan Kualiti Air Tanah Kebangsaan telah dimulakan pada tahun 1997. Pemilihan tapak telaga pengawasan dibuat berdasarkan jenis guna tanah spesifik dan terdiri dari 110 telaga pengawasan di seluruh negara. **Jadual 3.1** menunjukkan taburan telaga pemantauan air tanah di seluruh negeri mengikut jenis kategori guna tanah, 2017.

The groundwater quality monitoring program was established in 1997. Monitoring sites were selected based on specific land uses that. comprising of 110 wells throughout the country. **Table 3.1** *shows the distribution of groundwater monitoring wells in Malaysia by land use category, 2017.*

Pada tahun 2017, sebanyak 369 sampel telah dianalisa untuk sebatian organik meruap (VOCs), racun makhluk perosak, logam berat, anion, bakteria (koliform), sebatian berfenol, jumlah keliatan, jumlah pepejal terlarut, pH, suhu, konduktiviti dan oksigen terlarut (DO).

In 2017, a total of 369 water samples were analyzed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO).

Hasil analisa dibandingkan dengan Garis Panduan Kebangsaan Bagi Kualiti Air untuk Minuman yang telah dibangunkan oleh Kementerian Kesihatan Malaysia (Semakan Disember 2000) seperti (**Jadual 3.2**) bagi menentukan status kualiti air tanah.

*The results were compared with the National Guidelines for Drinking Water Quality Standard established by the Ministry of Health (Revised December 2000) (**Table 3.2**) to determine the status of groundwater quality.*

Jadual 3. 1 JAS: Taburan Telaga Pengawasan Air Tanah di Malaysia Mengikut Jenis Kategori Guna Tanah, 2017
Table 3.1 DOE: Distribution of Groundwater Monitoring Wells in Malaysia by Land Use Category, 2017

KATEGORI / *CATEGORY*	**BILANGAN TELAGA/ *NUMBER OF WELLS***	**NEGERI/ *STATE***	**BILANGAN TELAGA/ *NUMBER OF WELLS***
Kawasan Pertanian *Agricultural*	13	Sabah Terengganu Pahang Kedah Perlis Kelantan Selangor	2 4 1 2 1 2 1
Bandar & Pinggir Bandar *Urban & Suburban*	12	Sabah Terengganu Pahang Kedah Perlis Kelantan Selangor	1 2 1 1 2 2 3
Tapak Perindustrian *Industrial Sites*	19	Sabah Terengganu Johor Kedah Kelantan Melaka Selangor Pulau Pinang Negeri Sembilan Perak	1 4 2 1 2 1 3 3 1 1

Jadual 3. 1 JAS: Taburan Telaga Pengawasan Air Tanah di Malaysia Mengikut Jenis Kategori Guna Tanah, 2017
Table 3.1 DOE: Distribution of Groundwater Monitoring Wells in Malaysia by Land Use Category, 2017

KATEGORI / *CATEGORY*	**BILANGAN TELAGA/ *NUMBER OF WELLS***	**NEGERI/ *STATE***	**BILANGAN TELAGA/ *NUMBER OF WELLS***
Tapak Perlupusan Sampah *Solid Waste Landfills*	23	Sabah Sarawak Terengganu Johor Kelantan Perak Kuala Lumpur Negeri Sembilan	7 2 2 1 3 1 5 2
Padang Golf *Golf Courses*	7	Sabah Kelantan Kuala Lumpur	2 4 1
Luar Bandar *Rural Areas*	4	Terengganu Kelantan Melaka	1 2 1
Bekas Lombong Emas *Ex-Mining Areas (Gold Mine)*	3	Sarawak	3
Bekalan Air Tempatan *Municipal Water Supply*	6	Sabah Sarawak	1 5
Tapak Perlupusan Bangkai Haiwan *Animal Burial Areas*	14	Sarawak Johor Perak Selangor Pulau Pinang	2 3 3 3 3
Kolam Akuakultur *Aquaculture Farms*	7	Pahang Terangganu	6 1
Tapak Perlupusan Radioaktif *Radioactive Landliff*	1	Perak	1
Peranginan *Resorts*	1	Sabah	1

Jadual 3.2 Malaysia: Garis Panduan Kebangsaan Bagi Kualiti Air Untuk Minuman (Semakan Disember 2000)
Table 3.2 Malaysia: National Guidelines for Drinking Water Quality (Revised December 2000)

PARAMETER/ *PARAMETER*	**SIMBOL/ *SYMBOL***	**UNIT/ *UNIT***	**HAD PIAWAI/ *BENCHMARK***
Sulfat/ *Sulphate*	SO_4^-	mg/l	250
Keliatan/*Hardness*	$CaCO_3$	mg/l	500
Nitrat/ *Nitrate*	NO_3^-	mg/l	10
Kolifom/ *Total Coliform*	-	MPN/100ml	Mesti tidak dikesan dalam sebarang 100ml sampel Must not be detected in any 100 ml sample
Mangan/ *Manganese*	Mn	mg/l	0.1
Kromium/ *Chromium*	Cr	mg/l	0.05
Zink/ *Zinc*	Zn	mg/l	3
Arsenik/ *Arsenic*	As	mg/l	0.01
Selenium/ *Selenium*	Se	mg/l	0.01
Klorida/ *Chloride*	Cl	mg/l	250
Sebatian Fenol/ *Phenolics*	-	mg/l	0.002
Pepejal Terlarut/ *TDS*	-	mg/l	1000
Besi/ *Iron*	Fe	mg/l	0.3
Kuprum/ *Copper*	Cu	mg/l	1.0
Plumbum/ *Lead*	Pb	mg/l	0.01
Kadmium/ *Cadmium*	Cd	mg/l	0.003
Merkuri/ *Mercury*	Hg	mg/l	0.001

Sumber: Kementerian Kesihatan Malaysia (Tahun 2000)
Source: Ministry of Health, Malaysia (2000)

STATUS KUALITI AIR TANAH

Penilaian terhadap kualti air tanah adalah berdasarkan kepada nilai peratusan yang melebihi had penerimaan dalam Garis Panduan Kebangsaan Bagi Kualiti Air untuk Kualiti Air Minuman (NGDWQ) yang telah dibangunkan oleh Kementerian Kesihatan Malaysia (Semakan Disember 2000).

Nilai peratusan tersebut adalah sebagaimana di dalam jadual di bawah

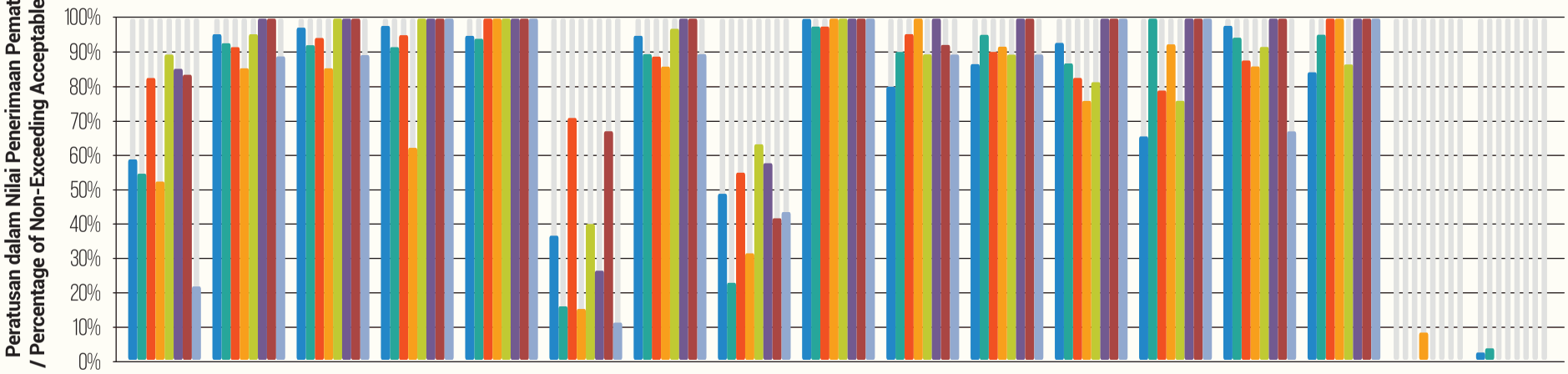
GROUNDWATER QUALITY STATUS

The assessment of groundwater quality was based on the percentage value exceeding the acceptance limit of the National Guidelines for Drinking Water Quality (NGDWQ) established by the Ministry of Health (Revised December 2000).

The percentage value is as shown in table below

PERATUSAN JULAT NILAI PEMATUHAM / *PERCENTAGE OF COMPLIANCE* (%)	**KATEGORI / *CATEGORY***
0% - 49%	Rendah / *Low*
50% - 79%	Sederhana / *Moderate*
80% - 100%	Tinggi / *High*

Rajah 3.1 Malaysia: Peratusan Pematuhan oleh Pencemar Terpilih Mengikut Guna Tanah, 2017
Figure 3.1 Malaysia: Percentage of Compliance of Selected Contaminants by Land Use, 2017



	As	Hg	Cd	Cr	Cu	Fe	Pb	Mn	Zn	Se	CaCO3	TDS	Cl	NO3	SO4	T-Coliform	Phenol
Industri / Industry	58	97	97	98	95	37	95	49	100	80	87	93	66	97	84	0	2
Tapak pelupusan sampah / Landfill	55	93	92	92	94	16	89	23	98	90	95	87	100	94	95	0	3
Pertanian / Agricultural	83	92	95	95	100	71	88	55	98	95	90	83	79	88	100	0	0
Bekalan Air Tempatan / Municipal Water Supply	54	85	85	62	100	15	85	31	100	92	92	77	92	85	100	9	0
Bandar / Pinggir Bandar / Urban / Suburban	89	97	100	100	100	40	97	63	100	89	89	82	76	91	97	0	0
Padang Golf / Golf Courses	84	100	100	100	100	26	100	58	100	100	100	100	100	100	100	0	0
Luar Bandar / Rural Areas	83	100	100	100	100	67	100	42	100	100	100	100	100	100	100	0	0
Bekas Lombong / Ex-mining	22	89	89	100	100	11	89	44	100	89	100	100	100	67	100	0	0

Pada tahun 2017, keputusan yang diperolehi daripada pengawasan kualiti air tanah yang dijalankan menunjukkan bahawa semua stesen berada dalam julat nilai pematuhan NGDWQ kecuali bagi arsenic (As), besi (Fe), mangan (Mn), jumlah koliform dan fenol mempunyai peratusan julat nilai pematuhan NGDWQ yang rendah bagi gunatanah tertentu seperti **Rajah 3.1** dan **Jadual 3.3.**

*In 2017, the results derived from monitoring showed that all stations were within the NGDWQ values except for arsenics (As),iron (Fe), manganese (Mn), total coliform and phenol has a low range of NGDWQ values for certain land use as shown in **Figure 3.1** and **Table 3.3.***

Jadual 3.3 Malaysia: Peratusan Pematuhan oleh Pencemar Mengikut Guna Tanah dalam Peratusan Julat 0-49%, Tahun 2017

Table 3.3 Malaysia: Percentage of Compliance of Selected contaminants by Land Use Within Percentage 0-49%, Year 2017

KATEGORI GUNATANAH/ ***CATEGORY OF LANDUSE***	**PARAMETER /** ***PARAMETER***	**PERATUSAN NGDWC/** ***PERCENTAGE OF NGDWC***
Tapak Perindustrian/ *Industrial Sites* Tapak Pelupusan Sampah/ *Landfill* Pertanian/ *Agriculture* Bekalan Air Tempatan/ *Municipal Water Supply* Bandar/ Pinggir Bandar/ *Urban Suburban* Padang Golf/ *Golf Cources* Luar Bandar/ *Rural Areas* Bekas Lombong/ *Ex Mining*	• *T Coliform* • *Phenol*	*0-10%*
Tapak Pelupusan Sampah/ *Landfill* Bekalan Air Tempatan/ *Municipal Water Supply* Padang Golf/ *Golf Courses* Bekas Lombong/ *Ex Mining*	• *Fe* • *Mn* • *AS*	*11-30%*
Tapak Perindustrian/ *Industrial Sites* Bakalan Air Tempatan/ *Municipal Water Supply* Luar Bandar/ *Rural* Bekas Lombong/ *Ex Mining*	• *Fe* • *Mn*	*31-49%*

Jadual 3.4 Malaysia: Peratusan yang melebihi NGDWQ mengikut Negeri, 2017
Table 3.4 Malaysia: Percentage of Exceedance NGDWQ by State, 2017

NEGERI/ *STATE*	BILANGAN STESEN/ *NO. OF STATION*	MAKLUMAT STESEN/ *STATION DESCRIPTION*	NILAI PERATUSAN YANG MELEBIHI NGDWQ(%)/ *THE PERCENTAGE OF EXCEEDANCE NGDWQ (%)*				
			As	Fe	Mn	T-coliform	Phenol
Sabah	14	1) ITAC, Penampang 1	100	50	50	100	100
		2) ITAC, Penampang 2	50	50	100	100	100
		3) ITAC, Penampang 3	0	100	100	100	100
		4) ITAC, Penampang 4	0	100	100	100	100
		5) ITAC, Penampang 5	50	50	50	100	100
		6) ITAC, Penampang 6	0	100	100	100	100
		7) ITAC, Penampang 7	25	75	100	100	100
		8) Limbawang	50	75	75	100	100
		9) Tawau	25	25	75	100	100
		10) Kg. Tajau Laut	0	100	100	100	100
		11) Sandakan Golf Club No.1	0	0	50	100	50
		12) Sandakan Golf Club No.2	0	50	50	100	50
		13) Inanam	25	75	75	100	100
		14) Pulau Manukan	50	100	100	100	100
Sarawak	12	1) Kemuyang no.1	0	100	100	100	75
		2) Kemuyang no.2	0	100	75	100	75
		3) Kabong	75	100	100	100	100
		4) Kuala Lawas no.1	100	0	0	100	100
		5) Kuala Lawas no.2	-	-	-	-	-
		6) Laku	0	100	0	100	100
		7) Kg. Lusut Kiri	50	100	100	100	100
		8) Bau no.1	100	100	100	100	100
		9) Bau no.2	100	100	100	100	100
		10) Bau	33	67	33	100	100
		11) Oya no.1	100	100	100	100	100
		12) Oya no.2	100	100	75	100	100
Terengganu	13	1) Kerteh no.1	0	25	25	100	100
		2) Kerteh no.2	0	75	0	100	100
		3) Telok Kalong no.1	0	100	0	100	100
		4) Telok Kalong no.2	25	100	100	100	100
		5) Kg. Kubang Badak no.1, K.Treg	0	0	0	100	100
		6) Kg. Kubang Badak no.2, K.Treg	0	100	0	100	100
		7) Kg. Merang,Setiu	0	0	0	100	100
		8) Kg. Raja no.1 , Besut	0	0	0	100	100
		9) Kg. Raja no.2, Besut	0	100	100	100	100
		10) Bukit Payung, Marang	0	0	25	100	100
		11) Kg. Alor Peroi no.1	50	100	100	100	100
		12) Kg. Alor Peroi no.2	33	100	100	100	100
		13) Kg. Alor Peroi no.3	0	100	0	100	100

Jadual 3.4 Malaysia: Peratusan yang melebihi NGDWQ mengikut Negeri, 2017
Table 3.4 Malaysia: Percentage of Exceedance NGDWQ by State, 2017

NEGERI/ *STATE*	BILANGAN STESEN/ *NO. OF STATION*	MAKLUMAT STESEN/ *STATION DESCRIPTION*	NILAI PERATUSAN YANG MELEBIHI NGDWQ(%)/ *THE PERCENTAGE OF EXCEEDANCE NGDWQ (%)*				
			As	Fe	Mn	T-coliform	Phenol
Pahang	8	1) Nenasi	0	100	100	100	100
		2) Lepar	0	75	0	100	100
		3) Agrobest no.2, Nenasi	25	0	0	100	100
		4) Agrobest no.3, Nenasi	25	100	100	100	100
		5) Agrobest no.4, Nenasi	25	100	50	100	100
		6) Agrobest no.5, Nenasi	25	100	25	100	100
		7) Agrobest no.6, Nenasi	25	100	100	100	100
		8) Agrobest no.7, Nenasi	25	100	100	100	100
Johor	6	1) Tg. Puteri, Pasir Gudang (MUCC)	0	50	0	100	100
		2) Tg. Puteri, Pasir Gudang	100	100	100	100	100
		3) Kota Tinggi	-	-	-	-	-
		4) Ulu Choh (Pintu)	100	100	100	100	100
		5) Ulu Choh (Kolam)	100	100	100	100	100
		6) Ulu Choh (Sungai)	100	100	100	100	100
Kedah	4	1) Kulim Hi-tech					
		2) Pulau Langkawi no.1	0	100	0	100	100
		3) Pulau Langkawi no.2	100	100	0	100	100
		4) Kepala Batas	100	100	100	100	100
Perlis	3	1) Arau no.1	0	100	25	75	100
		2) Arau no.2	0	0	50	100	100
		3) Padang Besar	0	0	0	100	100
Kelantan	15	1) Eastern Garment MFG no.1	0	75	75	100	100
		2) Eastern Garment MFG no.2	75	0	0	100	100
		3) Panji no.1	0	75	0	100	100
		4) Panji no.2	0	75	25	100	100
		5) Pasir Mas	0	100	100	100	100
		6) Kampong Jembal	0	100	100	100	100
		7) Beris Lalang	0	25	25	100	100
		8) Rantau Panjang no.1	0	75	0	100	100
		9) Rantau Panjang no.2	0	0	0	100	100
		12) Kelab Golf & Desa no.1	0	100	25	100	100
		13) Kelab Golf & Desa no.2	0	50	25	100	100
		10) Kelab Golf DiRaja Kubang Kerian no.1	50	100	100	100	100
		11) Kelab Golf DiRaja Kubang Kerian no.2	33	100	0	100	100
		14) Bachok no.1	25	25	75	100	100
		15) Bachok no.2	25	75	75	100	100

Jadual 3.4 Malaysia: Peratusan yang melebihi NGDWQ mengikut Negeri, 2017
Table 3.4 Malaysia: Percentage of Exceedance NGDWQ by State, 2017

NEGERI/ *STATE*	BILANGAN STESEN/ *NO. OF STATION*	MAKLUMAT STESEN/ *STATION DESCRIPTION*	NILAI PERATUSAN YANG MELEBIHI NGDWQ(%)/ *THE PERCENTAGE OF EXCEEDANCE NGDWQ (%)*				
			As	Fe	Mn	T-coliform	Phenol
Melaka	1	1) Petronas Sungai Udang	75	100	100	100	100
Perak	4	1) Tambun	100	100	100	100	100
		2) Jalong no.1	0	100	100	100	100
		3) Pusing, Batu Gajah	100	100	100	100	100
		4) Jalong no. 2	100	100	100	100	100
Kuala Lumpur	6	1) Jln. Sungai Besi no.1	100	67	100	100	100
		2) Jln. Sungai Besi no.2	100	100	100	100	100
		3) Jln. Sungai Besi no.3	100	67	100	100	100
		4) Taman Beringin no.1	100	100	100	100	100
		5) Taman Beringin no.2	100	100	100	100	100
		6) Royal Selangor Golf Club	-	-	-	-	-
Selangor	8	1) Sek Keb Seksyen 20,Shah Alam	25	100	0	100	100
		2) CIAST no.1, Shah Alam	0	100	100	100	75
		3) CIAST no.2, Shah Alam	100	100	100	100	75
		4) Saujana Golf Resort no.1, Subang	50	75	75	100	100
		5) Saujana Golf Resort no.2, Subang	-	-	-	-	-
		6) Stesen Kampung Sungai Keroh, Sepang	100	100	100	100	100
		7) TNB Sepang	25	100	100	100	100
		8) Ladang Sepang	0	100	100	100	100
Pulau Pinang	6	1) Mak Mandin no.1	75	0	100	100	100
		2) Mak Mandin no.2	100	50	100	100	100
		3) Bayan Lepas	25	25	0	100	100
		4) Valdor (Kelapa)	25	100	100	100	100
		5) Valdor (Tengah)	25	100	100	100	100
		6) Valdor (Jalan)	50	100	100	100	100
Negeri Sembilan	3	1) Senawang	100	67	0	100	100
		2) Kualiti Alam Sdn. Bhd no.1	67	100	100	100	100
		3) Kualiti Alam Sdn. Bhd no.2	67	34	34	100	100

Nota/*Note*:
Setiap nilai peratusan yang melebihi NGDWQ bagi parameter As, Fe, Mn, jumlah Koliform dan Fenol adalah merujuk kepada maksimum 4 kali persampelan.
Each percentenge exceeding NGDWQ values for As, Fe, Mn, T-coliform and Phenol is referred to maximum four times of sampling.

Kualiti Air Marin dan Pulau-Pulau

Marine and Island Marine Water Quality

KUALITI AIR MARIN DAN PULAU-PULAU
MARINE AND ISLAND MARINE WATER QUALITY

PENGAWASAN KUALITI AIR MARIN

Jabatan Alam Sekitar (JAS) menjalankan pengawasan kualiti air marin bermula pada tahun 1978 di Semenanjung Malaysia dan 1985 bagi Sabah dan Sarawak dengan tujuan untuk mengenalpasti status kualiti air marin dan menentukan tahap pencemaran daripada punca-punca di daratan dan juga di laut. Punca-punca pencemaran ini boleh menimbulkan ancaman kepada sumber kehidupan marin dan menganggu kestabilan dan kepelbagaian ekosistem marin.

Pada tahun 2017, sebanyak 188 stesen pantai, 88 stesen kuala dan 95 stesen pulau telah dipantau. Sebanyak 752 sampel di kawasan pantai, 352 di kuala dan 380 di pulau telah diambil untuk dianalisis dan hasilnya dilaporkan berdasarkan Indeks Kualiti Air Marin (IKAM).

IKAM digunakan sebagai satu kaedah untuk menentukan kategori dan status kualiti air marin. Indeks ini dibangunkan berdasarkan 7 parameter utama iaitu Oksigen Terlarut (DO), Nitrat (NO_3), Fosfat (PO_4), Ammonia Tidak Terion (NH_3), Faecal Coliform, Minyak dan Gris (O&G) dan Jumlah Pepejal Terampai (TSS).

IKAM yang berskala 0 hingga 100 akan menentukan kategori kualiti air marin daripada "**Terbaik**" hingga "**Tercemar**" **(Jadual 4.1)**.

MARINE WATER QUALITY MONITORING

The Department of Environment (DOE) has been monitoring the marine water quality since 1978 in Peninsular Malaysia and 1985 in Sabah and Sarawak with the objectives to establish the marine water quality status and to determine the pollution level from land-based and the sea based sources. These sources may pose threats to the marine resources and can disrupt the stability and diversity of the marine ecosystem.

In 2017, a total of 188 coastal, 88 estuary and 95 island stations were monitored. 752 samples from coastal, 352 samples from estuary and 380 samples from island were collected for analysis and reported based on the Marine Water Quality Index (MWQI).

The MWQI is used as a method to determine the marine water quality status and its category. The Index was developed based on the 7 main parameters which are Dissolved Oxygen (DO), Nitrate (NO_3), Phosphate (PO_4), Unionized Ammonia (NH_3), Faecal Coliform, Oil and Grease (O&G) and Total Suspended Solids (TSS).

*The resulting MWQI with a scale between 0 to 100 will determine the category of the marine water quality, ranging from "**Excellent**" to "**Poor**" **(Table 4.1)**.*

Jadual 4.1: Klasifikasi Indeks Kualiti Air Marin
Table 4.1: Marine Water Quality Index Classification

KATEGORI / *CATEGORY*	NILAI INDEKS / *INDEX VALUE*
Terbaik / *Excellent*	90 -100
Baik / *Good*	80 - <90
Sederhana / *Moderate*	50 - <80
Tercemar / *Poor*	0 - <50

Jadual 4.2: Standard dan Kriteria Kualiti Air Marin Malaysia
Table 4.2: Malaysia Marine Water Quality Criteria and Standards

PARAMETER/ *PARAMETER*	**KELAS 1/ *CLASS 1***	**KELAS 2/ *CLASS 2***	**KELAS 3/ *CLASS 3***	**KELAS E/ *CLASS E***
Kegunaan/ *Uses*	Pemeliharaan, Kawasan Dilindungi,Taman Laut/ *Preservation, Marine Protected areas, Marine Parks*	Kehidupan Laut, Perikanan, Terumbu Karang, Rekreasi dan Marikultur/ *Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture*	Pelabuhan, Lapangan Minyak dan Gas/ *Ports, Oil & Gas Fields*	Paya Bakau &Muara Sungai/ *Mangroves Estuarine & River-mouth Water*
Suhu (°C)/ Temperature (°C)	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*
Oksigen Terlarut (mg/L)/ *Dissolved Oxygen (mg/L)*	>80% tepu >80% saturation	5	3	4
Jumlah Pepejal Terampai* (mg/L)/ *Total suspended solid (mg/L)*	25 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ *25 mg/L or ≤ 10% increase in seasonal average, whichever is lower*	50mg/L (25 mg/L) atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ *50mg/L (25 mg/L) or ≤ 10% increase in seasonal average, whichever is lower*	100 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ *100 mg/L or ≤ 10% increase in seasonal average, whichever is lower*	100 mg/L atau ≤ 30 % peningkatan dalam purata bermusim, yang mana lebih rendah/ *100 mg/L or ≤ 30 % increase in seasonal average, whichever is lower*
Minyak dan Geris (mg/L)/ *Oil and grease (mg/L)*	0.01	0.14	5	0.14
Raksa* (µg/L)/ *Mercury* (µg/L)*	0.04	0.16 (0.04)	50	0.5
Kadmium* (µg/L)/ *Cadmium* (µg/L)*	0.5	2 (3)	10	2
Kromium (VI) (µg/L)/ *Chromium (VI) (µg/L)*	5	10	48	10
Kuprum (µg/L)/ *Copper (µg/L)*	1.3	2.9	10	2.9
Arsenik (III)* (µg/L)/ *Arsenic (III)* (µg/L)*	3	20(3)	50	20 (3)

Jadual 4.2: Standard dan Kriteria Kualiti Air Marin Malaysia
Table 4.2: Malaysia Marine Water Quality Criteria and Standards

PARAMETER/ *PARAMETER*	**KELAS 1/ *CLASS 1***	**KELAS 2/ *CLASS 2***	**KELAS 3/ *CLASS 3***	**KELAS E/ *CLASS E***
Kegunaan/ *Uses*	Pemeliharaan, Kawasan Dilindungi,Taman Laut/ *Preservation, Marine Protected areas, Marine Parks*	Kehidupan Laut, Perikanan, Terumbu Karang, Rekreasi dan Marikultur/ *Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture*	Pelabuhan, Lapangan Minyak dan Gas/ *Ports, Oil & Gas Fields*	Paya Bakau &Muara Sungai/ *Mangroves Estuarine & River-mouth Water*
Plumbum (µg/L)/ *Lead (µg/L)*	4.4	8.5	50	8.5
Zink (µg/L)/ *Zinc (µg/L)*	15	50	100	50
Sianida (µg/L)/ *Cyanide (µg/L)*	2	7	20	7
Ammonia (tidak terion) (µg/L)/ *Ammonia (unionized) (µg/L)*	35	70	320	70
Nitrit (NO_2) (µg/L)/ *Nitrite (NO_2) (µg/L)*	10	55	1,000	55
Nitrat (NO_3) (µg/L)/ *Nitrate (NO_3) (µg/L)*	10	60	1,000	60
Fosfat (µg/L)/ *Phosphate (µg/L)*	5	75	670	75
Fenol (µg/L)/ *Phenol (µg/L)*	1	10	100	10
Tributyltin (TBT) (µg/L)	0.001	0.01	0.05	0.01
Faecal coliform	70 faecal coliform count/100mL	100 faecal coliform count/100mL & (70 faecal coliform count/100mL)	200 faecal coliform count/100mL	100 faecal coliform count/100mL & (70 faecal coliform count/100mL)
Polycyclic Aromatic Hydrocarbon (PAHs) µg/L	100	200	1000	1000

Nota: * Nilai SKKAM dalam kurungan digunakan untuk kawasan air marin yang menjadi sumber makanan laut
*Note: * MWQCS in parentheses are for coastal and marine water areas where seafood for human consumption is applicable*

STATUS KUALITI AIR MARIN PANTAI

Pada tahun 2017, sebanyak 188 stesen pantai telah dipantau dan dianalisis serta dilaporkan dalam Indeks Kualiti Air Marin. Hasil pengawasan menunjukkan 60 stesen (31.9%) dikategorikan sebagai **Terbaik**, 56 stesen (29.8%) sebagai **Baik**, 70 stesen (37.2%) sebagai **Sederhana** dan 2 stesen (1.1%) sebagai **Tercemar**. (**Jadual 4.3**).

COASTAL WATER QUALITY STATUS

*In 2017, a total of 188 coastal stations were monitored, analysed and reported in terms of the Marine Water Quality Index. The monitoring results indicated that 60 stations (31.9%) as **Excellent**, 56 stations (29.8%) as **Good**, 70 stations (37.2%) as **Moderate** and 2 stations (1.1%) as **Poor**. (**Table 4.3**).*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Kedah	Pantai/ *Coastal*	Pantai Merdeka	5603905	MMKC001	59.92	65.63	68.57	76.30	79.04	Sederhana/ *Moderate*
		Langkawi Island Resort	6399914	MMKC002	60.61	80.51	71.44	66.09	90.51	Terbaik/ *Excellent*
		Pantai Kok	6397922	MMKC003	69.04	82.15	72.23	66.59	83.69	Baik/*Good*
		Pantai Kuah	6398925	MMKC004	62.02	80.37	71.05	71.01	91.54	Terbaik/ *Excellent*
		Pantai Pasir Tengkorak	6499701	MMKC005	84.28	82.05	85.47	68.89	93.10	Terbaik/ *Excellent*
		Pantai Teluk Burau	6396923	MMKC006	81.59	88.36	70.95	64.55	85.55	Baik/*Good*
		Pantai Teluk Nibong	6497915	MMKC007	74.92	79.68	74.75	63.19	91.78	Terbaik/ *Excellent*
		Pantai Tengah	6297903	MMKC008	69.04	70.21	68.06	60.04	87.80	Baik/*Good*
		Pantai Beras Basah*	NA	MMKC009	-	-	-	-	93.92	Terbaik/ *Excellent*
Pulau Pinang	Pantai/ *Coastal*	Gertak Sanggul	5201919	MMPC001	56.60	55.64	53.11	53.91	71.21	Sederhana/ *Moderate*
		Kawasan Perindustrian Bayan Lepas 1	5303932	MMPC002	50.26	55.34	-	-	67.05	Sederhana/ *Moderate*
		Kawasan Perindustrian Bayan Lepas 2**	5303933	NA	51.17	54.71	-	-	-	Stesen tutup/ *Station closed*
		Kawasan Perindustrian Bayan Lepas 3**	5302939	NA	49.12	54.46	53.88	50.05	-	Stesen tutup/ *Station closed*
		Pantai Bersih	5403906	MMPC003	61.81	61.22	52.63	76.02	50.80	Sederhana/ *Moderate*
		Pantai Miami	5502901	MMPC004	50.22	65.47	69.18	61.60	68.12	Sederhana/ *Moderate*
		Pantai Pasir Panjang	5201938	MMPC005	58.66	66.81	70.46	63.77	86.17	Baik/*Good*
		Batu Feringgi (Casuarina)	5402904	MMPC006	53.81	69.22	66.07	79.68	67.86	Sederhana/ *Moderate*
		Luar Pantai Teluk Bahang	5402930	MMPC007	74.79	66.54	65.36	88.10	85.28	Baik/*Good*
		Persiaran Gurney	5403902	MMPC008	51.75	66.86	48.03	83.66	63.00	Sederhana/ *Moderate*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Pulau Pinang	Pantai/ *Coastal*	Rumah Pam Baru Perai	5304927	MMPC009	50.53	55.45	52.80	66.44	59.80	Sederhana/ *Moderate*
		Rumah Pam Lama Perai	5303926	MMPC010	51.02	59.73	55.26	61.75	64.91	Sederhana/ *Moderate*
		Selat PP Selatan (Jelutong)	5303911	MMPC011	60.52	51.73	49.68	60.39	49.33	Tercemar/ *Poor*
		Tanjung Bungah	5402937	MMPC012	51.91	67.36	61.82	83.73	84.84	Baik/*Good*
		Teluk Tempoyak	5202923	MMPC013	57.00	61.87	52.55	51.15	61.99	Sederhana/ *Moderate*
		Batu Maung	5202901	MMPC014	72.34	57.26	52.83	46.69	59.39	Sederhana/ *Moderate*
Perak	Pantai/ *Coastal*	Pantai Pasir Bogak	4205908	MMAC001	51.75	80.41	55.97	58.61	91.20	Terbaik/ *Excellent*
		Pantai Teluk Dalam	4205928	MMAC002	65.64	70.01	54.45	75.24	91.52	Terbaik/ *Excellent*
		Pantai Teluk Batik	4205932	MMAC003	63.86	71.11	73.00	51.24	89.77	Baik/*Good*
		Pantai Tanjung Batu	4406927	MMAC004	56.32	84.07	69.34	53.16	92.86	Terbaik/ *Excellent*
		Pantai Teluk Rubiah*	NA	MMAC005	-	-	-	-	93.00	Terbaik/ *Excellent*
		Pantai Damai Laut*	NA	MMAC006	-	-	-	-	91.49	Terbaik/ *Excellent*
		Pantai Teluk Senangin*	NA	MMAC007	-	-	-	-	92.82	Terbaik/ *Excellent*
		Pantai Pasir Panjang	4205924	MMAC008	64.09	85.58	51.97	52.02	93.57	Terbaik/ *Excellent*
Selangor	Pantai/*Coastal*	Pantai Bagan Lalang	2616927	MMBC001	86.08	85.49	89.27	90.62	92.68	Terbaik/ *Excellent*
		Pantai Morib	2712902	MMBC002	53.76	87.97	70.10	62.47	89.80	Baik/*Good*
		Selat Pulau Babi	3012929	MMBC003	65.21	93.51	87.15	75.42	72.81	Sederhana/ *Moderate*
		Selat Klang Utara	3013908	MMBC004	64.28	94.96	68.11	78.09	64.95	Sederhana/ *Moderate*
		Pantai Remis*	NA	MMBC005	-	-	-	-	67.30	Sederhana/ *Moderate*
		Pantai Klanang*	NA	MMBC006	-	-	-	-	91.39	Terbaik/ *Excellent*
Negeri Sembilan	Pantai/*Coastal*	Bagan Pinang	2518915	MMNC001	67.90	92.75	87.97	97.65	68.29	Sederhana/ *Moderate*
		Telok Sinting	2419908	MMNC002	72.29	88.84	90.65	97.53	87.24	Baik/*Good*
		Port Dickson Bandar	2517907	MMNC003	75.97	70.39	84.10	97.95	68.68	Sederhana/ *Moderate*
		Port Dickson Batu 4	2518937	MMNC004	68.60	93.92	91.61	97.91	67.96	Sederhana/ *Moderate*
		Port Dickson Batu 5	2418906	MMNC005	68.41	67.31	88.16	97.82	79.69	Sederhana/ *Moderate*
		Port Dickson Batu 6	2418916	MMNC006	73.31	81.68	88.80	97.93	68.19	Sederhana/ *Moderate*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Negeri Sembilan	Pantai/*Coastal*	Port Dickson Batu 7	2418905	MMNC007	71.36	90.13	86.85	97.94	67.91	Sederhana/ *Moderate*
		Port Dickson Batu 8	2418912	MMNC008	94.06	93.86	77.94	97.95	75.82	Sederhana/ *Moderate*
		Port Dickson Batu 10	2418914	MMNC009	94.40	90.10	93.11	97.91	68.64	Sederhana/ *Moderate*
		Port Dickson Janakuasa TNB	2517909	MMNC010	74.92	91.99	79.48	97.91	68.02	Sederhana/ *Moderate*
		Telok Pelanduk	2419917	MMNC011	91.62	91.50	93.60	97.86	81.03	Baik/*Good*
		Pantai Cermin	2416918	MMNC012	92.36	88.47	89.62	97.79	68.11	Sederhana/ *Moderate*
		Pantai Teluk Kemang*	NA	MMNC013	-	-	-	-	68.50	Sederhana/ *Moderate*
		Pantai Seri Purnama*	NA	MMNC014	-	-	-	-	85.39	Baik/*Good*
Melaka	Pantai/*Coastal*	Pantai Rombang	2221916	MMMC001	45.21	55.15	58.84	68.99	85.13	Baik/*Good*
		Pantai Kundur	2221908	MMMC002	46.15	55.51	55.38	57.84	84.20	Baik/*Good*
		Pantai Tanjung Bidara	2320909	MMMC003	44.08	52.04	53.50	57.91	82.07	Baik/*Good*
		Teluk Gong	2320902	MMMC004	45.18	51.58	55.56	57.93	88.35	Baik/*Good*
		Pulau Melaka Point A1	2121915	MMMC005	42.39	-	78.57	72.98	64.69	Sederhana/ *Moderate*
		Pulau Melaka Point A2	2121915	MMMC006	40.67	-	-	-	72.65	Sederhana/ *Moderate*
		Pulau Melaka Point B1	2121916	MMMC007	41.95	-	84.38	63.91	63.42	Sederhana/ *Moderate*
		Pulau Melaka Point B2	2121916	MMMC008	42.32	-	-	-	66.54	Sederhana/ *Moderate*
		Pantai Klebang*	NA	MMMC009	-	-	-	-	67.73	Sederhana/ *Moderate*
Johor	Pantai/*Coastal*	Tanjung Bin	1336975	MMJC001	88.26	90.21	90.25	84.91	92.25	Terbaik/ *Excellent*
		Pelabuhan Tanjung Pelepas	1438943	MMJC002	85.67	85.79	89.61	85.92	90.15	Terbaik/ *Excellent*
		Hadapan Jabatan Laut	1438918	MMJC003	78.90	87.11	62.51	84.09	80.94	Baik/*Good*
		Pantai Stulang Laut	1437951	MMJC004	61.19	61.00	58.56	76.01	61.90	Sederhana/ *Moderate*
		Jeti Teluk Jawa	1438918	MMJC005	65.03	84.28	64.59	53.12	62.01	Sederhana/ *Moderate*
		Pelabuhan Pasir Gudang	1428939	MMJC006	63.94	64.62	75.37	75.61	64.46	Sederhana/ *Moderate*
		Hadapan HSAJB	1437920	MMJC007	63.48	55.74	64.08	44.36	59.09	Sederhana/ *Moderate*
		Pantai Lido	1437921	MMJC008	64.32	63.25	59.16	66.36	55.01	Sederhana/ *Moderate*
		Pantai Teluk Mahkota	1841911	MMJC009	82.96	85.51	85.58	89.13	92.22	Terbaik/ *Excellent*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Johor	Pantai/*Coastal*	Pantai Tanjung Leman	2140694	MMJC010	83.06	87.85	88.85	88.87	94.20	Terbaik/ *Excellent*
		Pantai Sri Pantai	2339960	MMJC011	59.57	87.81	87.93	88.88	94.21	Terbaik/ *Excellent*
		Tanjung Merak	1441968	MMJC012	49.56	61.98	73.30	89.54	93.47	Terbaik/ *Excellent*
		Tanjung Pengelih	1441967	MMJC013	76.20	85.38	88.54	88.20	93.96	Terbaik/ *Excellent*
		Pantai Tanjong Stapa	1341961	MMJC014	57.47	57.22	88.08	89.76	93.88	Terbaik/ *Excellent*
		Pantai Teluk Gorek	2538958	MMJC015	60.72	79.89	89.11	88.61	93.45	Terbaik/ *Excellent*
		Pantai Air Papan	2538959	MMJC016	79.08	86.86	89.75	89.22	93.85	Terbaik/ *Excellent*
		Jeti Kukup	1334925	MMJC017	58.52	64.52	62.22	87.52	88.60	*Baik/Good*
		Pasir Gogok	1441966	MMJC018	71.97	79.73	89.48	90.36	94.04	Terbaik/ *Excellent*
		Tanjung Buai	1340973	MMJC019	60.45	89.89	88.39	80.37	92.09	Terbaik/ *Excellent*
		Pantai Desaru	1542914	MMJC020	82.91	71.54	65.60	89.51	94.17	Terbaik/ *Excellent*
		Tanjung Sepang	1443969	MMJC021	81.78	83.51	64.57	87.30	94.16	Terbaik/ *Excellent*
		Tanjung Penyusup	1444920	MMJC022	82.02	77.08	62.72	86.43	92.46	Terbaik/ *Excellent*
		Pantai Sungai Lurus	1730962	MMJC023	64.81	86.68	64.68	89.10	90.64	Terbaik/ *Excellent*
		Punggur	1531974	MMJC024	49.47	52.74	87.55	88.36	84.61	Baik/*Good*
		Pantai Penyabung*	NA	MMJC025	-	-	-	-	93.92	Terbaik/ *Excellent*
		Tanjung Resang*	NA	MMJC026	-	-	-	-	94.41	Terbaik/ *Excellent*
		Tanjung Balau*	NA	MMJC027	-	-	-	-	93.86	Terbaik/ *Excellent*
		Batu Layar*	NA	MMJC028	-	-	-	-	93.86	Terbaik/ *Excellent*
		Tanjung Sengat*	NA	MMJC029	-	-	-	-	92.57	Terbaik/ *Excellent*
Pahang	Pantai/*Coastal*	Pantai Cherating (Club Med A)	4133903 (A)	MMCC001	73.92	91.11	85.03	60.09	92.11	Terbaik/ *Excellent*
		Pantai Cherating (Club Med B)	4133903 (B)	MMCC002	73.83	94.11	85.22	61.61	93.60	Terbaik/ *Excellent*
		Pantai Cherating (Legend A)	4133942 (A)	MMCC003	73.76	67.36	87.51	81.62	92.61	Terbaik/ *Excellent*
		Pantai Cherating (Legend B)	4133942 (B)	MMCC004	73.96	92.74	87.95	61.87	89.74	Baik/*Good*
		Pantai Muhibbah Balok A	3933901 (A)	MMCC005	72.82	87.45	77.60	58.94	68.10	Sederhana/ *Moderate*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Pahang	Pantai/Coastal	Pantai Muhibbah Balok B	3933901 (B)	MMCC006	71.03	86.44	75.96	59.70	65.04	Sederhana/ *Moderate*
		Pantai Batu Hitam A	3833915 (A)	MMCC007	73.09	93.94	85.10	62.06	68.56	Sederhana/ *Moderate*
		Pantai Batu Hitam B	3833915 (B)	MMCC008	73.87	91.21	87.43	56.89	81.00	Baik/*Good*
		Pantai Berserah A	3933941 (A)	MMCC009	73.62	93.92	90.27	65.05	80.33	Baik/*Good*
		Pantai Berserah B	3933941 (B)	MMCC010	73.84	71.49	78.41	63.68	67.80	Sederhana/ *Moderate*
		Pantai Teluk Cempedak A	3833910 (A)	MMCC011	73.96	93.36	78.44	59.21	67.63	Sederhana/ *Moderate*
		Pantai Teluk Cempedak B	3833910 (B)	MMCC012	73.89	94.29	67.43	59.02	88.17	Baik/*Good*
		Pantai Teluk Gelora A	3833909 (A)	MMCC013	55.80	71.47	62.30	64.01	67.65	Sederhana/ *Moderate*
		Pantai Teluk Gelora B	3833909 (B)	MMCC014	61.48	78.43	64.60	59.26	66.33	Sederhana/ *Moderate*
		Pantai Sepat A	3737915	MMCC015	73.52	93.66	62.05	88.46	91.76	Terbaik/ *Excellent*
		Pantai Sepat B	3633916	MMCC016	73.89	94.29	85.58	80.21	91.74	Terbaik/ *Excellent*
		Pantai Legenda A	3534943 (A)	MMCC017	73.62	94.25	82.83	85.48	93.97	Terbaik/ *Excellent*
		Pantai Legenda B	3534943 (B)	MMCC018	73.62	94.20	64.31	79.76	94.00	Terbaik/ *Excellent*
		Pantai Kuala Api-Api	3235917	MMCC019	72.90	93.21	66.17	79.71	90.68	Terbaik/ *Excellent*
		Pantai Tanjung Batu	3334915	MMCC020	72.65	93.03	83.32	79.29	90.23	Terbaik/ *Excellent*
		Pantai Chendor*	NA	MMCC021	-	-	-	-	86.73	Baik/*Good*
		Pantai Lanjut*	NA	MMCC022	-	-	-	-	93.87	Terbaik/ *Excellent*
Terengganu	Pantai/*Coastal*	Pantai Batu Buruk	5331935	MMTC001	66.87	66.63	58.57	78.18	94.43	Terbaik/ *Excellent*
		Pantai Bukit Keluang	5825903	MMTC002	63.44	69.87	52.50	64.21	94.14	Terbaik/ *Excellent*
		Pantai Chendering	5231934	MMTC003	66.03	69.84	53.93	61.90	89.64	Baik/*Good*
		Pantai Rantau Abang	4833917	MMTC004	68.06	70.35	60.72	61.70	90.20	Terbaik/ *Excellent*
		KIPC Utara	4634954	MMTC005	65.02	62.22	62.63	74.41	91.53	Terbaik/ *Excellent*
		KIPC Tengah	4534955	MMTC006	64.23	63.60	73.57	77.28	89.32	Baik/*Good*
		KIPC Selatan	4534956	MMTC007	69.81	66.53	75.99	74.86	89.73	Baik/*Good*
		Pantai Rhu 10*	NA	MMTC008	-	-	-	-	94.35	Terbaik/ *Excellent*
		Pantai Tok Jembal*	NA	MMTC009	-	-	-	-	94.19	Terbaik/ *Excellent*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Terengganu	Pantai/*Coastal*	Pantai Kelului*	NA	MMTC010	-	-	-	-	94.09	Terbaik/ *Excellent*
		Pantai Teluk Ketapang*	NA	MMTC011	-	-	-	-	94.36	Terbaik/ *Excellent*
		Pantai Kuala Abang*	NA	MMTC012	-	-	-	-	94.18	Terbaik/ *Excellent*
		Pantai Teluk Kalong*	NA	MMTC013	-	-	-	-	94.43	Terbaik/ *Excellent*
		Pantai Sura*	NA	MMTC014	-	-	-	-	94.23	Terbaik/ *Excellent*
		Pantai Tanjung Bidara*	NA	MMTC015	-	-	-	-	94.13	Terbaik/ *Excellent*
		Pantai Kemasik*	NA	MMTC016	-	-	-	-	93.96	Terbaik/ *Excellent*
Kelantan	Pantai/*Coastal*	Pantai Seri Tujuh	6221910	MMDC001	66.22	71.10	63.01	66.23	88.59	Baik/*Good*
		Pantai Cahaya Bulan	6122903	MMDC002	66.00	74.47	61.56	78.02	87.27	Baik/*Good*
		Pantai Sabak	6123909	MMDC003	58.87	72.13	61.66	66.66	81.71	Baik/*Good*
		Pantai Irama Bachok	6024908	MMDC004	56.77	69.29	62.24	66.25	86.72	Baik/*Good*
		Pantai Bisikan Bayu	5825905	MMDC005	50.28	67.44	64.01	66.69	89.28	Baik/*Good*
		Pantai Melawi*	NA	MMDC006	-	-	-	-	93.91	Terbaik/ *Excellent*
Sarawak	Pantai/*Coastal*	Pantai Sematan	1898902	MMQC001	59.58	91.47	76.37	74.39	88.38	Baik/*Good*
		Pantai Pandan	1824918	MMQC002	57.94	94.47	87.00	75.63	87.29	Baik/*Good*
		Pantai Pasir Putih	1604910	MMQC003	44.04	67.36	67.73	88.80	80.70	Baik/*Good*
		Pantai Bako	1704906	MMQC004	69.65	94.29	88.54	74.23	88.23	Baik/*Good*
		Pantai Damai	1702904	MMQC005	58.34	91.29	76.13	89.00	86.35	Baik/*Good*
		Pantai Tanjung Kembang	1810923	MMQC006	69.32	73.99	87.39	85.32	69.40	Sederhana/ *Moderate*
		Pantai Harmoni Mukah	2920921	MMQC007	53.42	53.87	54.68	85.54	72.22	Sederhana/ *Moderate*
		Pantai Tanjung Batu	3132602	MMQC008	62.49	70.29	67.28	82.07	84.93	Baik/*Good*
		Pantai Likau	3230915	MMQC009	51.99	63.19	89.02	79.00	85.38	Baik/*Good*
		Pantai Emas	3331903	MMQC010	63.45	63.77	88.93	90.88	87.54	Baik/*Good*
		Pantai Piasau	4539918	MMQC011	54.53	88.55	82.17	68.65	86.75	Baik/*Good*
		Pantai Brighton	4449917	MMQC012	54.84	91.43	94.00	68.01	81.72	Baik/*Good*
		Pantai Esplaned	4339920	MMQC013	54.97	89.63	97.11	68.31	86.60	Baik/*Good*
		Pantai Beraya	4238921	MMQC014	70.12	89.42	97.32	68.08	87.88	Baik/*Good*

Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Sarawak	Pantai/*Coastal*	Pantai Bungai	4137922	MMQC015	53.41	91.11	82.96	94.62	88.37	Baik/*Good*
		Pantai Belawai	2212913	MMQC016	76.91	65.92	83.80	73.02	84.97	Baik/*Good*
		Pantai Mukah*	NA	MMQC017	-	-	-	-	84.59	Baik/*Good*
		Tanjung Kidurong*	NA	MMQC018	-	-	-	-	85.41	Baik/*Good*
		Pasir Pandak*	NA	MMQC019	-	-	-	-	86.99	Baik/*Good*
		Rambungan*	NA	MMQC020	-	-	-	-	89.13	Baik/*Good*
		Sri Tanjung Lawas*	NA	MMQC021	-	-	-	-	92.56	Terbaik/ *Excellent*
		Pantai Luak*	NA	MMQC022	-	-	-	-	88.30	Baik/*Good*
		Pasir Panjang*	NA	MMQC023	-	-	-	-	87.14	Baik/*Good*
Sabah	Pantai/*Coastal*	Pantai Teluk Brunei 1	5053901	MMSC001	71.27	80.05	82.27	66.57	70.24	Sederhana/ *Moderate*
		Pantai Teluk Brunei 2	5053902	MMSC002	70.87	79.10	83.66	59.43	65.45	Sederhana/ *Moderate*
		Pantai Teluk Brunei 3	5053903	MMSC003	69.26	73.19	85.93	67.49	65.95	Sederhana/ *Moderate*
		Pantai Teluk Brunei 4	5053904	MMSC004	73.17	75.80	86.68	66.44	69.83	Sederhana/ *Moderate*
		Pantai Teluk Brunei 5	5053905	MMSC005	73.94	71.05	85.90	65.83	69.58	Sederhana/ *Moderate*
		Pantai Teluk Brunei 6	5053906	MMSC006	74.56	80.37	83.74	67.28	70.41	Sederhana/ *Moderate*
		Borneo Golf Seawater	5355901	MMSC007	79.01	80.38	79.00	68.17	68.42	Sederhana/ *Moderate*
		Pantai Manis Papar	5555901	MMSC008	81.64	81.01	83.86	66.82	69.47	Sederhana/ *Moderate*
		Pantai Melinsung	5565902	MMSC009	78.52	77.45	83.08	67.71	73.23	Sederhana/ *Moderate*
		Pantai Tanjung Aru (Roll Skating)	5656902	MMSC010	76.46	70.13	67.09	63.82	86.27	Baik/*Good*
		Pantai Tanjung Aru (No. 3)	5656903	MMSC011	65.33	67.59	66.39	67.11	82.97	Baik/*Good*
		Pantai Lok Kawi	5656904	MMSC012	67.48	59.14	69.30	62.71	85.57	Baik/*Good*
		Pantai Dalit Tuaran	6161901	MMSC013	70.89	85.15	70.73	64.08	74.07	Sederhana/ *Moderate*
		Mangrove Paradise	6161902	MMSC014	77.51	86.21	67.12	68.23	86.68	Baik/*Good*
		Pantai Sabandar	6161903	MMSC015	72.57	83.07	68.84	67.87	71.41	Sederhana/ *Moderate*
		Pantai Bak-Bak Kudat	6665901	MMSC016	81.06	85.11	65.47	63.48	70.55	Sederhana/ *Moderate*
		Pasir Putih Sandakan	5580901	MMSC017	73.89	83.49	84.12	67.92	66.71	Sederhana/ *Moderate*
		Pantai TLDM	5580902	MMSC018	75.20	81.66	87.84	69.45	69.50	Sederhana/ *Moderate*

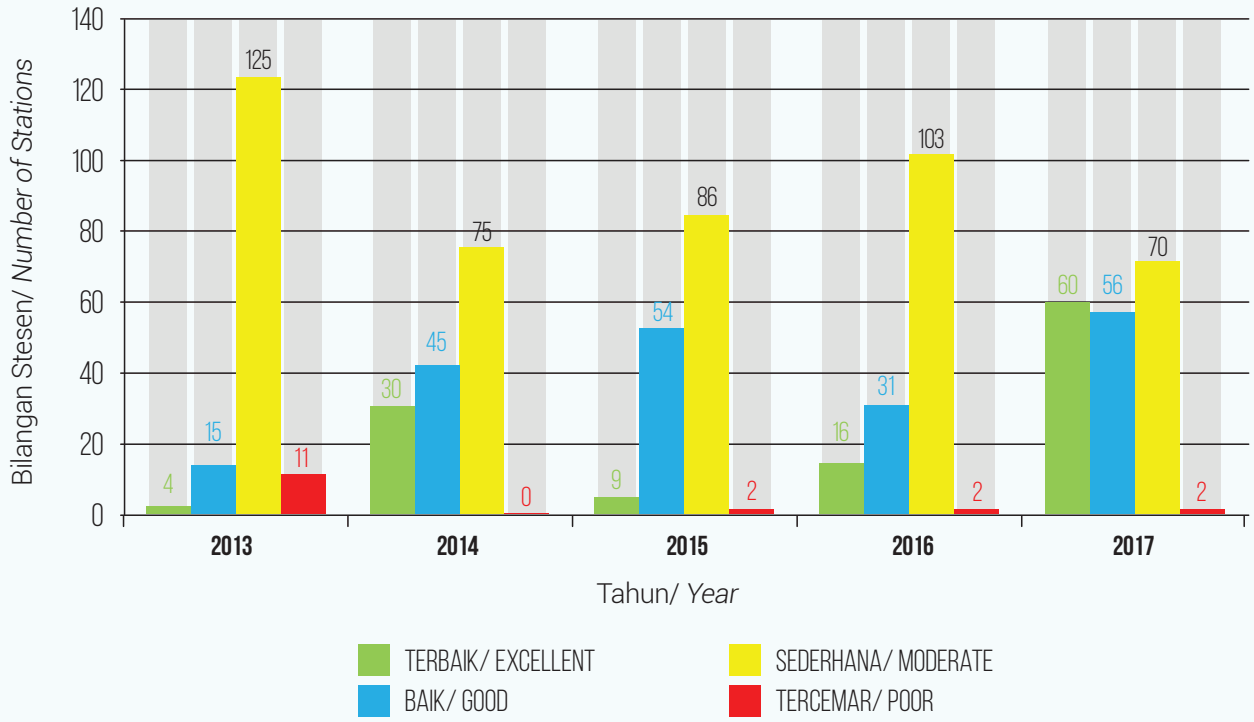
Jadual 4.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai
Table 4.3 Malaysia: Marine Water Quality Status for Coastal

NEGERI / *STATE*	KLASIFIKASI STESEN / *STATION CLASSIFICATION*	KAWASAN / *AREA*	NOMBOR STESEN LAMA / *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM / *MWQI VALUE*					KATEGORI (2017) / *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Sabah	Pantai/*Coastal*	Pantai Batu Sapi	5580903	MMSC019	74.90	83.05	84.66	67.58	51.55	Sederhana/ *Moderate*
		Pantai Ulu Tungku	5085901	MMSC020	72.82	83.94	84.70	68.32	69.98	Sederhana/ *Moderate*
		Pantai Sarina Kunak	4481901	MMSC021	72.77	83.69	82.82	69.83	68.64	Sederhana/ *Moderate*
		Pantai Kg. Lamak	4581902	MMSC022	71.67	-	82.64	67.95	49.35	Tercemar/ *Poor*
		Pantai Tinagat	4473901	MMSC023	74.51	83.50	82.05	69.28	70.68	Sederhana/ *Moderate*
		Pantai Tanjung Aru (Rest Lido)	5656901	MMSC024	77.54	82.39	68.15	68.12	86.72	Baik/*Good*
Labuan	Pantai/*Coastal*	Pulau Papan	5151905	MMLC001	65.92	51.08	76.37	75.30	73.85	Sederhana/ *Moderate*
		Kiamsam	5151906	MMLC002	61.69	67.74	77.30	76.16	73.74	Sederhana/ *Moderate*
		Sungai Pagar	5151907	MMLC003	63.05	79.75	77.91	78.88	71.99	Sederhana/ *Moderate*
		Layang-Layangan	5251902	MMLC004	62.22	79.49	76.44	77.98	73.04	Sederhana/ *Moderate*
		Tanjung Aru	5251903	MMLC005	66.59	75.93	78.49	72.34	73.12	Sederhana/ *Moderate*

Nota/ *Note*:
* (Stesen baharu/ *New station*)
** (Stesen tutup/ *Station closed*)
- (Tiada data/ *No data*)
NA (Tidak berkenaan/ *Not applicable*)

Tren Indeks Kualiti Air Marin (IKAM) mulai tahun 2013 hingga 2017 adalah seperti yang ditunjukkan dalam **Rajah 4.1**. Berdasarkan **Rajah 4.1**, didapati bilangan stesen kategori **Terbaik** dan **Baik** meningkat manakala bilangan stesen kategori **Sederhana** menurun berbanding tahun 2016. Bilangan stesen kategori **Tercemar** pula didapati tidak berubah sejak tahun 2015

*The trend in terms of Marine Water Quality Index (MWQI) from 2013 to 2017 is shown in **Figure 4.1**. Based on **Figure 4.1**, the number of **Excellent** and **Good** stations had increased while the number of **Moderate** stations had declined compared to 2016. The number of **Poor** stations has remained unchanged since 2015*



Rajah 4.1 Malaysia: Tren Status Kualiti Air Marin Kawasan Pantai Di Malaysia, 2013-2017
Figure 4.1 Malaysia: The trend of Marine Water Status for Coastal Area in Malaysia, 2013-2017

STATUS KUALITI AIR KUALA

Pada tahun 2017, sebanyak 88 stesen Kuala telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil program pengawasan yang telah dijalankan menunjukkan 15 stesen (17.1%) dikategorikan sebagai **Terbaik**, 23 stesen (26.1%) sebagai **Baik**, 47 stesen (53.4%) sebagai **Sederhana** dan 3 stesen (3.4%) sebagai **Tercemar**. **(Jadual 4.4)**

COASTAL WATER QUALITY STATUS

*In 2017, a total of 188 coastal stations were monitored, analysed and reported in terms of the Marine Water Quality Index. The monitoring results indicated that 60 stations (31.9%) as **Excellent**, 56 stations (29.8%) as **Good**, 70 stations (37.2%) as **Moderate** and 2 stations (1.1%) as **Poor**. **(Table 4.3)**.*

Jadual 4.4 Malaysia: Status Kualiti Air Marin Di Kawasan Kuala
Table 4.4 Malaysia: Marine Water Quality Status for Estuary

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	NOMBOR STESEN LAMA/ *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Perlis	Kuala/Estuary	Kuala Sungai Perlis	6401901	MMRE001	48.76	59.25	53.96	61.90	64.53	Sederhana/ Moderate
		Kuala Sungai Baru	6201902	MMRE002	55.87	76.48	56.12	60.52	64.02	Sederhana/ Moderate
Kedah	Kuala/Estuary	Kuala Kedah	6102908	MMKE001	84.21	53.46	50.46	77.55	62.41	Sederhana/ Moderate
		Kuala Jerlun	6302925	MMKE002	74.29	65.21	59.02	75.28	62.09	Sederhana/ Moderate
		Kuala Segantang Garam*	NA	MMKE003	-	-	-	-	83.78	Baik/Good
		Kuala Sungai Muda*	NA	MMKE004	-	-	-	-	64.39	Sederhana/ Moderate

Jadual 4.4 Malaysia: Status Kualiti Air Marin Di Kawasan Kuala
Table 4.4 Malaysia: Marine Water Quality Status for Estuary

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	NOMBOR STESEN LAMA/ *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Pulau Pinang	Kuala/Estuary	Kuala Sungai Jawi	5204901	MMPE001	50.49	58.35	49.63	45.56	49.29	Tercemar/ Poor
		Kuala Sungai Juru	5303904	MMPE002	49.72	63.62	59.40	70.61	49.79	Tercemar/ Poor
		Kuala Sungai Kerian	5104901	MMPE003	80.43	61.57	60.38	34.21	56.46	Sederhana/ Moderate
		Kuala Sungai Pinang	5403934	MMPE004	50.97	50.66	47.28	58.39	52.23	Sederhana/ Moderate
		Kuala Sungai Perai	5303908	MMPE005	61.88	53.06	56.22	64.89	52.61	Sederhana/ Moderate
		Kuala Sungai Tengah	5204935	MMPE006	63.34	60.95	67.81	65.19	58.88	Sederhana/ Moderate
		Kuala Sungai Pinang (Balik Pulau)	5202929	MMPE007	37.63	67.78	46.17	60.11	55.53	Sederhana/ Moderate
Perak	Kuala/Estuary	Kuala Sungai Manjung	4205930	MMAE001	60.32	70.13	67.56	78.96	88.70	Baik/Good
		Kuala Sungai Gula	4906926	MMAE002	50.92	68.90	60.95	67.43	82.03	Baik/Good
		Kuala Sungai Kurau	4994919	MMAE003	67.63	56.98	73.47	59.70	61.99	Sederhana/ Moderate
		Kuala Sungai Tanjung Piandang	5003921	MMAE004	52.25	75.74	73.57	57.25	59.37	Sederhana/ Moderate
		Kuala Sungai Sepetang	4806925	MMAE005	32.33	53.51	66.87	56.64	60.85	Sederhana/ Moderate
		Kuala Sungai Perak	4007901	MMAE006	66.08	62.01	70.96	64.94	61.25	Sederhana/ Moderate
Selangor	Kuala/Estuary	Kuala Sungai Sepang	2517922	MMBE001	88.35	71.62	78.04	85.61	92.71	Terbaik/ Excellent
		Kuala Sungai Sepang (Kecil)	2612928	MMBE002	89.61	68.14	92.31	86.56	93.76	Terbaik/ Excellent
		Kuala Sungai Sepang (Kawalan)	2616926	MMBE003	72.81	81.15	86.88	92.35	93.70	Terbaik/ Excellent
		Kuala Sungai Langat (Jugra)	2814925	MMBE004	53.62	69.84	55.07	72.13	82.34	Baik/Good
		Kuala Sungai Klang	3013909	MMBE005	50.83	95.64	67.65	77.34	60.17	Sederhana/ Moderate
		Kuala Sungai Langat (Lumut)	2913903	MMBE006	61.85	93.71	67.50	81.83	60.78	Sederhana/ Moderate
		Kuala Sungai Buloh	3212930	MMBE007	53.82	64.43	66.90	67.08	64.84	Sederhana/ Moderate
		Kuala Sungai Selangor	3312915	MMBE008	51.01	90.87	90.85	74.56	85.03	Baik/Good
		Kuala Sungai Tengi	3311931	MMBE009	47.95	68.06	67.87	72.90	74.28	Sederhana/ Moderate
		Kuala Sungai Bernam	3808924	MMBE010	70.11	67.16	55.15	72.36	56.01	Sederhana/ Moderate
Negeri Sembilan	Kuala/Estuary	Kuala Sungai Linggi	2319901	MMNE001	75.46	93.77	81.80	97.51	75.53	Sederhana/ Moderate
		Kuala Sungai Lukut	2517910	MMNE002	66.78	91.78	68.28	97.91	66.35	Sederhana/ Moderate

Jadual 4.4 Malaysia: Status Kualiti Air Marin Di Kawasan Kuala
Table 4.4 Malaysia: Marine Water Quality Status for Estuary

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	NOMBOR STESEN LAMA/ *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Melaka	Kuala/Estuary	Kuala Sungai Melaka	2123903	MMME001	35.12	59.64	55.61	56.59	63.85	Sederhana/ Moderate
		Kuala Sungai Sri Melaka	2121914	MMME002	34.00	59.55	52.71	53.65	57.60	Sederhana/ Moderate
		Kuala Sungai Merlimau	2124912	MMME003	35.41	62.57	86.19	71.71	81.07	Baik/Good
		Kuala Sungai Kesang	2186905	MMME004	45.29	68.74	77.06	70.53	83.36	Baik/Good
		Kuala Sungai Sebatu	2186904	MMME005	45.37	61.48	58.62	69.80	86.94	Baik/Good
		Kuala Sungai Melaka 2*	NA	MMME006	-	-	-	-	64.40	Sederhana/ Moderate
		Kuala Sungai Baru*	NA	MMME007	-	-	-	-	84.11	Baik/Good
		Kuala Sungai Lereh	2221922	MMME008	-	-	-	69.62	63.47	Sederhana/ Moderate
Johor	Kuala/Estuary	Kuala Sungai Melayu	1437946	MMJS001	63.73	75.12	66.06	58.46	63.97	Sederhana/ Moderate
		Kuala Sungai Skudai	1437922	MMJS002	60.73	58.88	57.37	65.17	40.94	Tercemar/ Poor
		Kuala Sungai Tebrau	1438943	MMJS003	59.46	61.58	59.96	56.08	62.20	Sederhana/ Moderate
		Kuala Sungai Segget	1437919	MMJE001	61.50	61.62	62.52	47.53	53.64	Sederhana/ Moderate
		Kuala Sungai Kim-Kim	1439965	MMJE002	66.47	64.21	87.73	82.87	61.83	Sederhana/ Moderate
		Kuala Sungai Johor	1440916	MMJE003	83.38	82.71	88.96	85.31	92.09	Terbaik/ Excellent
		Kuala Sungai Batu Pahat	1729930	MMJE004	59.89	51.23	84.41	87.17	90.20	Terbaik/ Excellent
		Kuala Sungai Muar	2024932	MMJE005	49.41	64.89	81.78	88.97	92.86	Terbaik/ Excellent
		Kuala Sungai Mersing	2438905	MMJE006	75.62	64.89	89.60	85.51	67.84	Sederhana/ Moderate
Pahang	Kuala/Estuary	Kuala Kuantan*	NA	MMCE001	-	-	-	-	66.77	Sederhana/ Moderate
		Kuala Rompin Kecil*	NA	MMCE002	-	-	-	-	89.04	Baik/Good
		Kuala Pahang*	NA	MMCE003	-	-	-	-	92.63	Terbaik/ Excellent
		Kuala Nenasi*	NA	MMCE004	-	-	-	-	93.96	Terbaik/ Excellent
		Kuala Sungai Balok*	NA	MMCE005	-	-	-	-	65.56	Sederhana/ Moderate
Terengganu	Kuala/Estuary	Kuala Sungai Besut	5825902	MMTE001	61.30	70.72	64.29	63.08	73.75	Sederhana/ Moderate
		Kuala Sungai Dungun	4734918	MMTE002	49.72	54.17	55.45	53.39	65.42	Sederhana/ Moderate
		Kuala Sungai Ibai	5231949	MMTE003	51.26	70.65	63.70	61.82	90.03	Terbaik/ Excellent
		Kuala Sungai Kerteh	4534922	MMTE004	52.34	58.43	54.87	56.37	91.03	Terbaik/ Excellent
		Kuala Sungai Marang	5232911	MMTE005	70.04	67.68	63.99	72.47	90.14	Terbaik/ Excellent

Jadual 4.4 Malaysia: Status Kualiti Air Marin Di Kawasan Kuala
Table 4.4 Malaysia: Marine Water Quality Status for Estuary

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	NOMBOR STESEN LAMA/ *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Terengganu	Kuala/Estuary	Kuala Sungai Paka	4634920	MMTE006	59.15	66.24	69.21	72.10	80.97	Baik/Good
		Kuala Sungai Setiu	5627953	MMTE007	61.10	70.04	62.71	75.28	92.97	Terbaik/ Excellent
		Kuala Sungai Terengganu	5331907	MMTE008	63.64	57.95	72.33	55.93	66.78	Sederhana/ Moderate
		Kuala Sungai Kemaman/Chukai	4234929	MMTE009	49.06	59.64	54.65	56.94	90.29	Terbaik/ Excellent
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	4234950	MMTE010	64.84	66.36	63.49	63.54	89.52	Baik/Good
		Tioxide Tengah (Pupuk Semangat, Kijal)	4234951	MMTE011	66.61	70.08	62.99	61.31	90.17	Terbaik/ Excellent
		Tioxide Selatan (KSB, T. Kalong)	4234952	MMTE012	66.52	69.01	53.15	-	94.30	Terbaik/ Excellent
		Pulau Duyung	5231908	MMTE013	64.80	50.09	48.69	57.06	66.07	Sederhana/ Moderate
Kelantan	Kuala/Estuary	Kuala Sungai Golok	6220911	MMDE001	64.02	52.34	57.71	76.75	75.07	Sederhana/ Moderate
		Kuala Sungai Kelantan	6222901	MMDE002	53.90	51.26	52.64	74.89	79.74	Sederhana/ Moderate
		Kuala Sungai Pengkalan Chepa	6223912	MMDE003	54.67	54.89	63.96	72.07	89.17	Baik/Good
		Kuala Sungai Pengkalan Datu	6123913	MMDE004	51.07	60.40	63.16	61.91	86.66	Baik/Good
		Kuala Sungai Kemasin	5824914	MMDE005	50.90	67.15	58.29	57.49	63.47	Sederhana/ Moderate
		Kuala Sungai Semerak*	NA	MMDE006	-	-	-	-	87.51	Baik/Good
Sarawak	Kuala/Estuary	Kuala Sungai Semantan	1898901	MMQE001	55.06	95.23	80.93	90.32	86.49	Baik/Good
		Kuala Sungai Sarawak	1604907	MMQE002	51.47	80.57	62.94	70.29	85.36	Baik/Good
		Kuala Sungai Bako	1704905	MMQE003	53.91	65.94	69.21	66.35	55.39	Sederhana/ Moderate
		Kuala Sungai Santubong	1702903	MMQE004	66.57	75.42	87.22	89.35	87.45	Baik/Good
		Kuala Batang Krian (Kabong)	1710922	MMQE005	53.09	79.26	64.72	73.53	64.91	Sederhana/ Moderate
		Kuala Batang Rejang	2111909	MMQE006	86.75	82.83	82.31	87.43	83.52	Baik/Good
		Kuala Mukah	2920920	MMQE007	34.57	51.26	70.05	89.46	72.36	Sederhana/ Moderate
		Kuala Batang Kemena	3130911	MMQE008	63.94	64.20	77.23	69.10	68.80	Sederhana/ Moderate
		Kuala Tanjung Similajau	3431903	MMQE009	63.98	85.68	90.37	92.25	84.40	Baik/Good
		Kuala Sungai Panipah	3332904	MMQE010	88.78	89.47	91.49	92.76	86.56	Baik/Good
		Kuala Pantai Nyalau	3431903	MMQE011	90.10	55.67	93.69	86.88	84.53	Baik/Good
		Kuala Sungai Baram	4539919	MMQE012	64.13	96.20	97.62	66.66	72.37	Sederhana/ Moderate

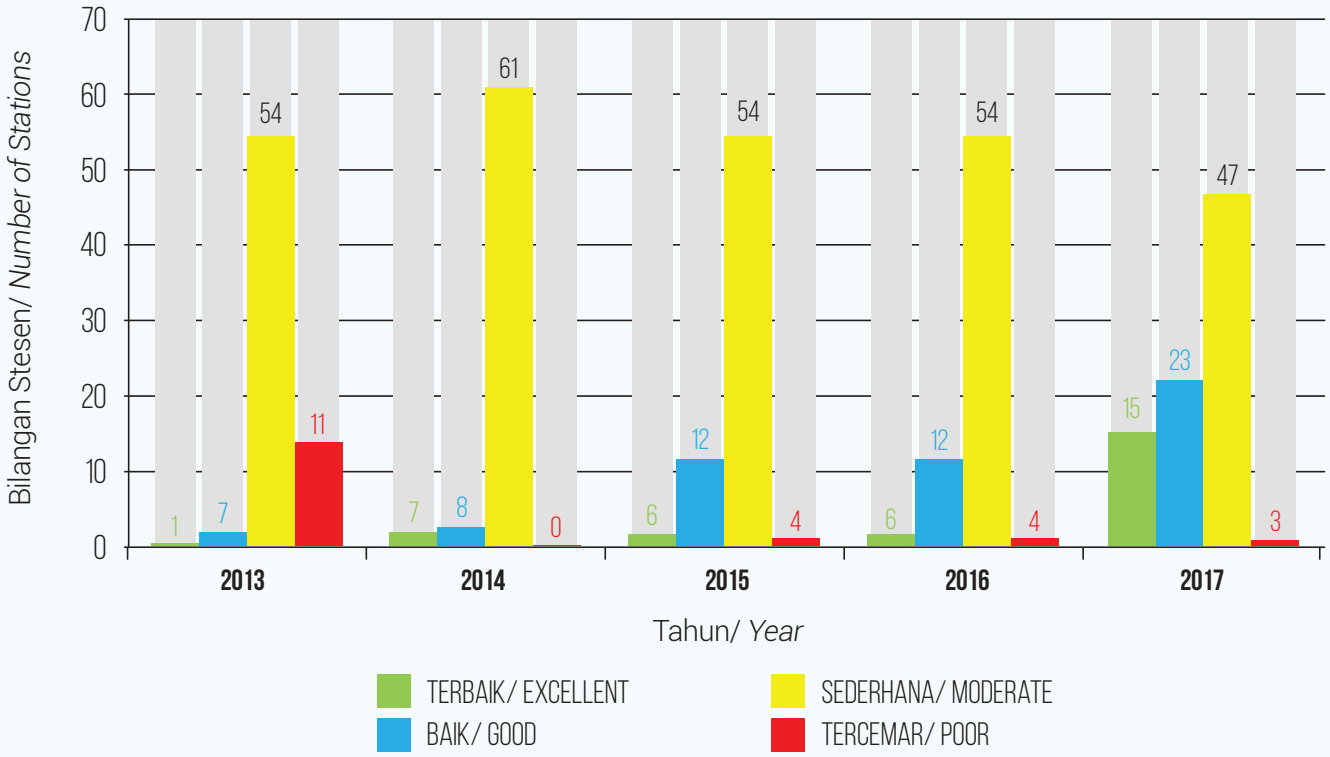
Jadual 4.4 Malaysia: Status Kualiti Air Marin Di Kawasan Kuala
Table 4.4 Malaysia: Marine Water Quality Status for Estuary

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	NOMBOR STESEN LAMA/ *OLD STATION NUMBER*	NOMBOR STESEN BARU / *NEW STATION NUMBER*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Sarawak	Kuala/Estuary	Kuala Sungai Miri	4349915	MMQE013	64.63	84.73	72.23	68.34	61.55	Sederhana/ Moderate
		Kuala Sungai Trusan*	NA	MMQE014	-	-	-	-	70.53	Sederhana/ Moderate
Sabah	Kuala/Estuary	Kuala Penyu	5453901	MMSE001	77.68	82.00	65.10	66.98	71.36	Sederhana/ Moderate
		Muara Sungai Inanam	5050905	MMSE002	59.15	60.16	88.78	45.03	86.17	Baik/Good

Nota/ *Note*:
* (Stesen baharu/ *New station*)
** (Stesen tutup/ *Station closed*)
- (Tiada data/ *No data*)
NA (Tidak berkenaan/ *Not applicable*)

Tren Indeks Kualiti Air Marin (IKAM) mulai tahun 2013 hingga 2017 adalah seperti yang ditunjukkan dalam **Rajah 4.2**. Berdasarkan **Rajah 4.2**, didapati bilangan stesen kategori **Terbaik** dan **Baik** meningkat berbanding tahun 2016. Bilangan stesen kategori **Sederhana** dan **Tercemar** juga didapati menurun berbanding tahun 2016.

*The trend in terms of Marine Water Quality Index (MWQI) from 2013 to 2017 is shown in **Figure 4.1**. Based on **Figure 4.2**, the number of **Excellent** and **Good** stations had increased compared to 2016. Meanwhile, the number of **Moderate** and **Poor** stations had decreased compared to 2016.*



Rajah 4.2 Malaysia: Tren Status Kualiti Air Marin Bagi Kawasan Kuala, 2013-2017
Figure 4.2 Malaysia: The Trend Of Marine Water Quality Status for Estuary, 2013-2017

KUALITI AIR MARIN PULAU

Senarai stesen Pulau berdasarkan kategori stesen seperti yang ditunjukkan dalam **Jadual 4.5.**

ISLAND MARINE WATER QUALITY

*The list of island stations by island category is shown in **Table 4.5**.*

Jadual 4.5 Malaysia: Stesen-Stesen Pulau, 2017
Table 4.5 Malaysia: Island Stations, 2017

NEGERI/ *STATE*	BIL. PULAU/ *NO. OF ISLAND*	BIL. STESEN/ *NO. OF STATION*	PULAU/ *ISLAND*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	KATEGORI/ *CATEGORY*
KEDAH	11	1	Singa Besar	7KR01	MMKR001	PERANGINAN/ RESORT
		2	Dayang Bunting	7KR02	MMKR002	PERANGINAN/ RESORT
			Dayang Bunting 2*	NA	MMKR003	STESEN BARU/ NEW STATION
		1	Pulau Perak	7KP01	MMRP001	DILINDUNGI/ PROTECTED
		1	Payar	7KM03	MMKM001	TAMAN LAUT/ MARINE PARK
		1	Kaca	7KM04	MMKM002	TAMAN LAUT / MARINE PARK
		1	Segantang	7KM06	MMKM003	TAMAN LAUT / MARINE PARK
		4	Pantai Kuah	7KD07	MMKD001	PEMBANGUNAN / DEVELOPMENT
			Pantai Chenang	7KD09	MMKD002	PEMBANGUNAN / DEVELOPMENT
			Tanjung Rhu	7KD010	MMKD003	PEMBANGUNAN / DEVELOPMENT
			Teluk Ewa	7KD08	MMKD004	PEMBANGUNAN / DEVELOPMENT
		1	Lembu**	7KM05	NA	TAMAN LAUT / MARINE PARK
		1	Pasir*	NA	MMKP001	STESEN BARU / NEW STATION
		1	Gasing*	NA	MMKP002	STESEN BARU / NEW STATION
		1	Dangli*	NA	MMKP003	STESEN BARU / NEW STATION
PULAU PINANG	7	1	Tanjung Tokong*	NA	MMPP001	STESEN BARU / NEW STATION
		3	Batu Maung	7PD01	MMPD001	PEMBANGUNAN / DEVELOPMENT
			Padang Kota	7PD04	MMPD002	PEMBANGUNAN / DEVELOPMENT
			Teluk Bahang	7PD03	MMPD003	PEMBANGUNAN / DEVELOPMENT
		1	Aman	7PR05	MMPR001	PERANGINAN / RESORT
		1	Jerejak	7PR06	MMPR002	PERANGINAN / RESORT
		1	Kendi	7PR07	MMPR003	PERANGINAN / RESORT

Jadual 4.5 Malaysia: Stesen-Stesen Pulau, 2017
Table 4.5 Malaysia: Island Stations, 2017

NEGERI/ *STATE*	BIL. PULAU/ *NO. OF ISLAND*	BIL. STESEN/ *NO. OF STATION*	PULAU/ *ISLAND*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	KATEGORI/ *CATEGORY*
PULAU PINANG	7	1	Rimau	7PR08	MMPR004	PERANGINAN / RESORT
		1	Gedong	7PR09	MMPR005	PERANGINAN / RESORT
PERAK	4	2	Pantai Teluk Gedong	7AR01	MMAR001	PERANGINAN / RESORT
			Pantai Puteri Dewi	7AR02	MMAR002	PERANGINAN / RESORT
		1	Pangkor Laut	7AR03	MMAR003	PERANGINAN / RESORT
		1	Sembilan	7AR04	MMAR004	PERANGINAN / RESORT
		1	Tukun Perak	7AP05	MMAP001	DILINDUNGI / PROTECTED
SELANGOR	3	1	Ketam	7BR01	MMBR001	PERANGINAN / RESORT
		1	Angsa	7BR02	MMBR002	PERANGINAN / RESORT
		1	Lumut	7BR03	MMBR003	PERANGINAN / RESORT
NEGERI SEMBILAN	1	1	Arang	7NP01	MMNP001	DILINDUNGI / PROTECTED
MELAKA	3	2	Upeh (Point A)	7MR02	MMMR001	PERANGINAN / RESORT
			Upeh (Point B)	7MR02	MMMR002	PERANGINAN / RESORT
		2	Besar (Point A)	7MR01	MMMR003	PERANGINAN / RESORT
			Besar (Point B)	7MR01	MMMR004	PERANGINAN / RESORT
		2	Undan (Point A)	7MR03	MMMR005	PERANGINAN / RESORT
			Undan (Point B)	7MR03	MMMR006	PERANGINAN / RESORT
JOHOR	8	1	Setindan	7JR01	MMJR001	PERANGINAN / RESORT
		1	Babi Tengah	7JR02	MMJR002	PERANGINAN / RESORT
		1	Dayang	7JM03	MMJM001	TAMAN LAUT / MARINE PARK
		1	Nanga Besar	7JM08	MMJM002	TAMAN LAUT / MARINE PARK
		1	Sibu Tengah	7JM11	MMJM003	TAMAN LAUT / MARINE PARK
		1	Pemanggil	7JM15	MMJM004	TAMAN LAUT / MARINE PARK
		1	Kukup	7JP17	MMJP001	DILINDUNGI / PROTECTED
		1	Pisang	7JP18	MMJP002	DILINDUNGI / PROTECTED

Jadual 4.5 Malaysia: Stesen-Stesen Pulau, 2017
Table 4.5 Malaysia: Island Stations, 2017

NEGERI/ *STATE*	BIL. PULAU/ *NO. OF ISLAND*	BIL. STESEN/ *NO. OF STATION*	PULAU/ *ISLAND*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	KATEGORI/ *CATEGORY*
PAHANG	9	1	Tioman (Teluk Salang)	7CM02	MMCM001	TAMAN LAUT / MARINE PARK
		1	Tioman (Kg. Nipah)	7CM01	MMCM002	TAMAN LAUT / MARINE PARK
		1	Tulai	7CM05	MMCM003	TAMAN LAUT / MARINE PARK
		1	Labas	7CM07	MMCM004	TAMAN LAUT / MARINE PARK
		1	Cebeh	7CM04	MMCM005	TAMAN LAUT / MARINE PARK
		1	Sepui	7CM06	MMCM006	TAMAN LAUT / MARINE PARK
		1	Sembilang	7CM08	MMCM007	TAMAN LAUT / MARINE PARK
		1	Seri Buat	7CM03	MMCM008	TAMAN LAUT / MARINE PARK
		1	Tokong Bahara	7CM09	MMCM009	TAMAN LAUT / MARINE PARK
TERENGGANU	9	1	Gemia	7TR01	MMTR001	PERANGINAN / RESORT
		1	Perhentian Besar (South)	7TM04	MMTM001	TAMAN LAUT / MARINE PARK
		2	Perhentian Besar (West)	7TM05	MMTM002	TAMAN LAUT / MARINE PARK
			Perhentian Kecil	7TM06	MMTM003	TAMAN LAUT / MARINE PARK
		2	Redang (North)	7TM07	MMTM004	TAMAN LAUT / MARINE PARK
			Redang (South)	7TM08	MMTM005	TAMAN LAUT / MARINE PARK
		1	Lang Tengah	7TM11	MMTM006	TAMAN LAUT / MARINE PARK
		1	Pinang	7TM12	MMTM007	TAMAN LAUT / MARINE PARK
		1	Ekor Tebu	7TM13	MMTM008	TAMAN LAUT / MARINE PARK
		1	Lima	7TM14	MMTM009	TAMAN LAUT / MARINE PARK
		1	Kapas	7TM09	MMTM010	TAMAN LAUT / MARINE PARK
KELANTAN	2	1	Panjang	7DP01	MMDP001	DILINDUNGI / PROTECTED
		1	Kundur	7DP02	MMDP002	DILINDUNGI / PROTECTED
SARAWAK	3	1	Satang	7QP01	MMQP001	DILINDUNGI / PROTECTED
		1	Talang-Talang Kecil	7QP02	MMQP002	DILINDUNGI / PROTECTED
		1	Talang-Talang Besar	7QP03	MMQP003	DILINDUNGI / PROTECTED

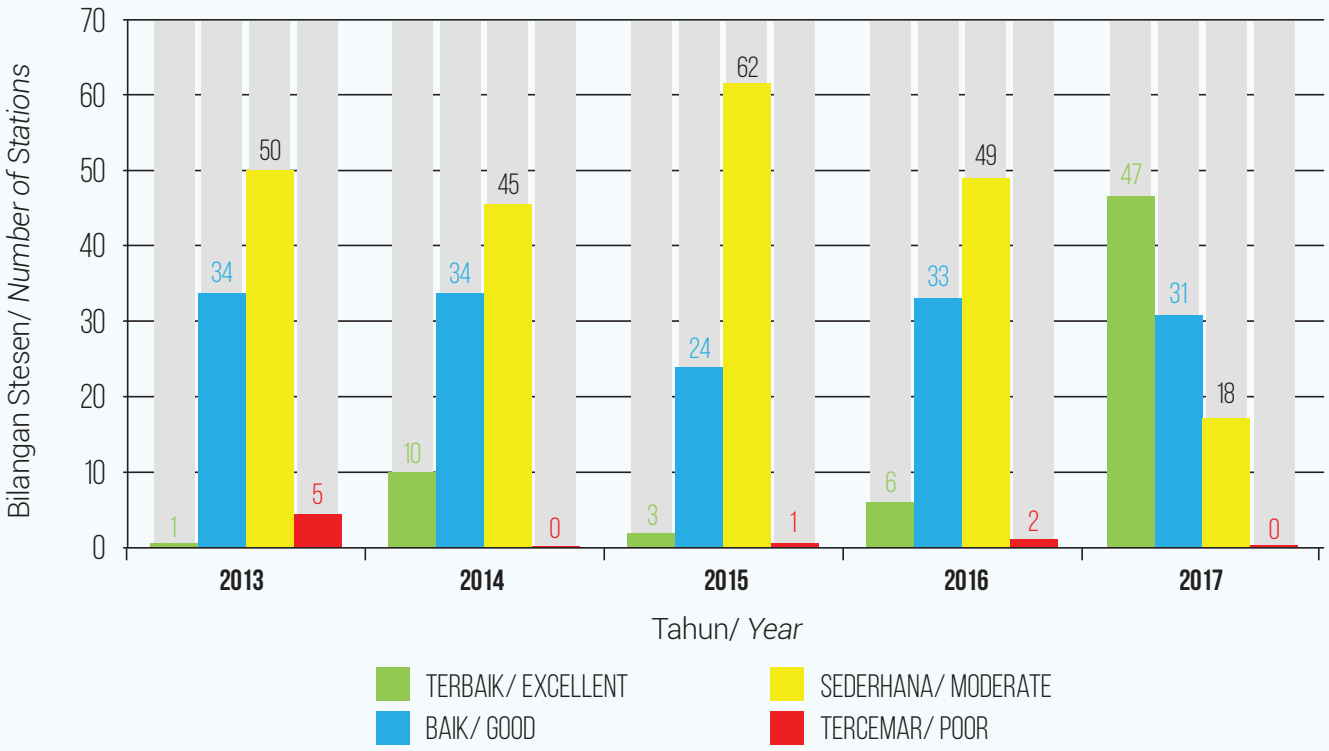
Jadual 4.5 Malaysia: Stesen-Stesen Pulau, 2017
Table 4.5 Malaysia: Island Stations, 2017

NEGERI/ *STATE*	BIL. PULAU/ *NO. OF ISLAND*	BIL. STESEN/ *NO. OF STATION*	PULAU/ *ISLAND*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	KATEGORI/ *CATEGORY*
SABAH	16	1	Gaya	7SR01	MMSR001	PERANGINAN / RESORT
		1	Mabul	7SR03	MMSR002	PERANGINAN / RESORT
		2	Sipadan (N)	7SR04	MMSR003	PERANGINAN / RESORT
			Sipadan (W)	7SR05	MMSR004	PERANGINAN / RESORT
		1	Manukan	7SM09	MMSR005	PERANGINAN / RESORT
		1	Tiga	7SR10	MMSR006	PERANGINAN / RESORT
		1	Kapalai	7SR12	MMSR007	PERANGINAN / RESORT
		1	Molleangan Besar	7SR14	MMSR008	PERANGINAN / RESORT
		1	Banggi (South)	7SR15	MMSR009	PERANGINAN / RESORT
		1	Banggi (East)	7SR20	MMSR010	PERANGINAN / RESORT
		1	Balambangan	7SR16	MMSR011	PERANGINAN / RESORT
		1	Mantanani Besar	7SR21	MMSR012	PERANGINAN / RESORT
		1	Sapi	7SM08	MMSM001	TAMAN LAUT / MARINE PARK
		1	Kalampunian Besar	7SM11	MMSM002	TAMAN LAUT / MARINE PARK
		1	Selingan	7SP17	MMSP001	DILINDUNGI / PROTECTED
		1	Gulisan	7SP18	MMSP002	DILINDUNGI / PROTECTED
		1	Bakungan Kecil	7SP19	MMSP003	DILINDUNGI / PROTECTED
LABUAN	4	1	Kuraman	7LM05	MMLM001	TAMAN LAUT / MARINE PARK
		1	Rusukan Besar	7LM07	MMLM002	TAMAN LAUT / MARINE PARK
		1	Rusukan Kecil	7LM06	MMLM003	TAMAN LAUT / MARINE PARK
		4	Pohon Batu	7LD01	MMLD001	PEMBANGUNAN / DEVELOPMENT
			Water Front	7LD02	MMLD002	PEMBANGUNAN / DEVELOPMENT
			LubukTemiang	7LD03	MMLD003	PEMBANGUNAN / DEVELOPMENT
			Ranca-Ranca	7LD04	MMLD004	PEMBANGUNAN / DEVELOPMENT

Nota/ *Note*:
* (Stesen baharu/ *New station*)
** (Stesen tutup/ *Station closed*)
- (Tiada data/ *No data*)
NA (Tidak berkenaan/ *Not applicable*)

Perairan di sekelliling 80 buah pulau telah dipantau dalam tahun 2017. Sebanyak 95 stesen telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil analisis menunjukkan 47 stesen (49.5%) dikategorikan sebagai **Terbaik**, 31 stesen (32.6%) dikategorikan sebagai **Baik**, 18 stesen (17.9%) dikategorikan sebagai **Sederhana** dan tiada stesen dikategorikan sebagai **Tercemar. (Rajah 4.3)**

*The waters around 80 islands were monitored in 2017. A total of 95 island stations were monitored, analysed and reported as Marine Water Quality Index. The result indicated that 47 stations (49.5%) as **Excellent**, 31 stations (32.6%) as **Good**, 18 stations (17.9%) as **Moderate** and no station categorized as **Poor. (Figure 4.3)***



Rajah 4.3 Malaysia: Tren Status Kualiti Air Marin Bagi Pulau, 2013-2017
Figure 4.3 Malaysia: The Trend of Marine Water Quality Status for Island, 2013-2017

Jadual 4.6 Malaysia: Status Kualiti Air Marin Bagi Pulau
Table 4.6 Malaysia: Marine Water Quality Status for Island

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Kedah	Pulau/Island	Singa Besar	7KR01	MMKR001	74.45	83.28	73.83	61.96	90.72	Terbaik/ Excellent
		Dayang Bunting	7KR02	MMKR002	75.91	89.65	71.27	60.13	91.60	Terbaik/ Excellent
		Dayang Bunting 2*	NA	MMKR003	-	-	-	-	93.37	Terbaik/ Excellent
		Pulau Perak	7KP01	MMRP001	-	-	72.47	56.51	94.49	Terbaik/ Excellent
		Payar	7KM03	MMKM001	83.73	79.74	73.65	75.06	91.75	Terbaik/ Excellent
		Kaca	7KM04	MMKM002	85.84	82.98	75.03	74.98	93.03	Terbaik/ Excellent
		Segantang	7KM06	MMKM003	84.69	84.43	75.09	70.33	91.67	Terbaik/ Excellent
		Pantai Kuah	7KD07	MMKD001	74.45	75.11	69.31	51.54	92.30	Terbaik/ Excellent
		Pantai Chenang	7KD09	MMKD002	83.07	86.55	73.55	63.39	74.80	Sederhana/ Moderate
		Tanjung Rhu	7KD010	MMKD003	69.05	86.38	88.66	67.11	92.68	Terbaik/ Excellent
		Teluk Ewa	7KD08	MMKD004	81.15	67.38	74.22	74.48	92.89	Terbaik/ Excellent
		Lembu**	7KM05	NA	-	85.48	75.82	71.77	-	Stesen tutup/ Close station
		Pasir*	NA	MMKP001	-	-	-	-	93.17	Terbaik/ Excellent
		Gasing*	NA	MMKP002	-	-	-	-	94.15	Terbaik/ Excellent
		Dangli*	NA	MMKP003	-	-	-	-	92.32	Terbaik/ Excellent
Pulau Pinang	Pulau/Island	Tanjung Tokong*	NA	MMPP001	-	-	-	-	63.41	Sederhana/ Moderate
		Batu Maung	7PD01	MMPD001	49.71	70.40	52.83	46.69	64.36	Sederhana/ Moderate
		Padang Kota	7PD04	MMPD002	50.50	51.21	47.21	82.05	52.01	Sederhana/ Moderate
		Teluk Bahang*	7PD03	MMPD003	-	-	-	-	61.53	Sederhana/ Moderate
		Aman	7PR05	MMPR001	83.95	61.84	69.87	72.80	72.53	Sederhana/ Moderate
		Jerejak	7PR06	MMPR002	75.63	54.80	68.19	46.41	57.19	Sederhana/ Moderate
		Kendi	7PR07	MMPR003	73.86	67.01	72.24	76.83	83.90	Baik/Good
		Rimau	7PR08	MMPR004	85.96	61.24	72.27	51.41	85.24	Baik/Good
		Gedong	7PR09	MMPR005	84.97	57.46	66.26	71.97	63.30	Sederhana/ Moderate
Perak	Pulau/Island	Pantai Teluk Gedong	7AR01	MMAR001	54.52	70.80	68.72	56.07	85.18	Baik/Good
		Pantai Puteri Dewi	7AR02	MMAR002	74.58	50.44	68.35	79.63	92.29	Terbaik/ Excellent

Jadual 4.6 Malaysia: Status Kualiti Air Marin Bagi Pulau
Table 4.6 Malaysia: Marine Water Quality Status for Island

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Perak	Pulau/Island	Pangkor Laut	7AR03	MMAR003	72.07	66.78	63.63	52.16	89.18	Baik/Good
		Sembilan	7AR04	MMAR004	80.45	70.30	63.31	58.86	93.45	Terbaik/ Excellent
		Tukun Perak	7AP05	MMAP001	82.35	73.17	62.43	69.53	93.64	Terbaik/ Excellent
Selangor	Pulau/Island	Ketam	7BR01	MMBR001	87.70	93.63	54.29	93.20	88.82	Baik/Good
		Angsa	7BR02	MMBR002	92.07	93.08	59.07	88.90	85.74	Baik/Good
		Lumut	7BR03	MMBR003	56.73	61.03	58.36	87.52	61.79	Sederhana/ Moderate
Negeri Sembilan	Pulau/Island	Arang	7NP01	MMNP001	68.56	92.86	94.46	97.94	68.59	Sederhana/ Moderate
Melaka	Pulau/Island	Upeh (Point A)	7MR02	MMMR001	43.76	60.28	56.67	58.11	65.07	Sederhana/ Moderate
		Upeh (Point B)	7MR02	MMMR002	41.08	57.20	54.93	67.26	82.00	Baik/Good
		Besar (Point A)	7MR01	MMMR003	56.27	64.11	62.65	70.91	89.63	Baik/Good
		Besar (Point B)	7MR01	MMMR004	46.81	58.73	56.93	70.58	90.36	Terbaik/ Excellent
		Undan (Point A)	7MR03	MMMR005	47.02	58.74	54.46	77.89	90.34	Terbaik/ Excellent
		Undan (Point B)	7MR03	MMMR006	55.18	71.01	56.70	61.70	90.47	Terbaik/ Excellent
Johor	Pulau/Island	Setindan	7JR01	MMJR001	85.80	88.51	89.46	89.86	94.45	Terbaik/ Excellent
		Babi Tengah	7JR02	MMJR002	86.92	89.74	89.43	89.09	94.18	Terbaik/ Excellent
		Dayang	7JM03	MMJM001	87.03	88.76	90.05	88.62	94.53	Terbaik/ Excellent
		Nanga Besar	7JM08	MMJM002	86.64	87.65	89.56	90.58	94.50	Terbaik/ Excellent
		Sibu Tengah	7JM11	MMJM003	86.35	88.92	89.66	88.66	94.34	Terbaik/ Excellent
		Pemanggil	7JM15	MMJM004	85.95	88.68	89.35	90.10	94.09	Terbaik/ Excellent
		Kukup	7JP17	MMJP001	82.27	81.08	87.01	83.40	91.62	Terbaik/ Excellent
		Pisang	7JP18	MMJP002	84.29	87.52	89.05	86.44	93.66	Terbaik/ Excellent
Pahang	Pulau/Island	Tioman (Teluk Salang)	7CM02	MMCM001	71.84	85.77	76.92	78.23	92.90	Terbaik/ Excellent
		Tioman (Kg. Nipah)	7CM01	MMCM002	73.89	85.52	83.01	85.39	94.00	Terbaik/ Excellent
		Tulai	7CM05	MMCM003	73.99	84.52	88.79	85.73	93.63	Terbaik/ Excellent
		Labas	7CM07	MMCM004	73.88	86.44	85.22	86.18	93.87	Terbaik/ Excellent
		Cebeh	7CM04	MMCM005	73.90	85.27	85.38	85.91	94.16	Terbaik/ Excellent

Jadual 4.6 Malaysia: Status Kualiti Air Marin Bagi Pulau
Table 4.6 Malaysia: Marine Water Quality Status for Island

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Pahang	Pulau/Island	Sepui	7CM06	MMCM006	73.90	85.63	79.94	83.35	93.20	Terbaik/ Excellent
		Sembilang	7CM08	MMCM007	73.91	85.76	58.56	75.44	93.90	Terbaik/ Excellent
		Seri Buat	7CM03	MMCM008	73.89	86.56	57.06	84.53	94.19	Terbaik/ Excellent
		Tokong Bahara	7CM09	MMCM009	74.00	85.71	75.91	86.71	93.71	Terbaik/ Excellent
Terengganu	Pulau/Island	Gemia	7TR01	MMTR001	61.96	66.94	58.69	64.70	89.29	Baik/Good
		Perhentian Besar (South)	7TM04	MMTM001	69.03	69.42	59.82	63.15	89.80	Baik/Good
		Perhentian Besar (West)	7TM05	MMTM002	67.88	69.18	57.60	62.71	90.21	Terbaik/ Excellent
		Perhentian Kecil	7TM06	MMTM003	64.88	70.52	59.28	61.79	90.51	Terbaik/ Excellent
		Redang (North)	7TM07	MMTM004	66.65	72.94	58.58	78.07	90.34	Terbaik/ Excellent
		Redang (South)	7TM08	MMTM005	68.87	72.14	58.46	64.14	89.98	Baik/Good
		Lang Tengah	7TM11	MMTM006	65.89	69.79	71.52	64.74	90.00	Terbaik/ Excellent
		Pinang	7TM12	MMTM007	68.11	71.15	59.11	63.87	90.12	Terbaik/ Excellent
		Ekor Tebu	7TM13	MMTM008	67.51	69.21	60.70	63.19	90.89	Terbaik/ Excellent
		Lima	7TM14	MMTM009	66.19	73.52	59.12	64.40	90.46	Terbaik/ Excellent
		Kapas	7TP16	MMTM010	67.89	67.29	58.42	76.30	90.26	Terbaik/ Excellent
Kelantan	Pulau/Island	Panjang	7DP01	MMDP001	65.20	67.07	65.49	66.03	88.20	Baik/Good
		Kundur	7DP02	MMDP002	69.22	70.43	63.22	65.72	89.10	Baik/Good
Sarawak	Pulau/Island	Satang	7QP01	MMQP001	58.98	83.36	75.17	90.52	87.58	Baik/Good
		Talang-Talang Kecil	7QP02	MMQP002	70.35	84.70	87.37	77.08	87.83	Baik/Good
		Talang-Talang Besar	7QP03	MMQP003	70.87	84.50	90.76	91.63	87.71	Baik/Good
Sabah	Pulau/Island	Gaya	7SR01	MMSR001	67.05	81.83	85.60	85.50	73.28	Sederhana/ Moderate
		Mabul	7SR03	MMSR002	82.35	53.86	71.43	82.47	87.52	Baik/Good
		Sipadan (N)	7SR04	MMSR003	81.39	58.91	70.70	84.23	88.12	Baik/Good
		Sipadan (W)	7SR05	MMSR004	67.73	79.41	70.87	80.25	85.22	Baik/Good
		Manukan	7SM09	MMSR005	69.13	80.44	84.48	82.77	70.88	Sederhana/ Moderate
		Tiga	7SR10	MMSR006	77.13	81.80	82.56	84.57	85.55	Baik/Good
		Kapalai	7SR12	MMSR007	81.32	81.22	70.17	85.77	85.82	Baik/Good

Jadual 4.6 Malaysia: Status Kualiti Air Marin Bagi Pulau
Table 4.6 Malaysia: Marine Water Quality Status for Island

NEGERI/ *STATE*	KLASSIFIKASI STESEN/ *STATION CLASSIFICATION*	KAWASAN/ *AREA*	ID STESEN LAMA/ *OLD STATION ID*	ID STESEN BARU/ *NEW STATION ID*	NILAI IKAM/ *MWQI VALUE*					KATEGORI (2017)/ *CATEGORY (2017)*
					2013	2014	2015	2016	2017	
Sabah	Pulau/Island	Molleangan Besar	7SR14	MMSR008	86.61	79.48	83.20	83.19	88.46	Baik/Good
		Banggi (South)	7SR15	MMSR009	84.16	76.84	82.57	84.21	87.35	Baik/Good
		Banggi (East)	7SR20	MMSR010	85.67	79.39	83.43	83.29	88.30	Baik/Good
		Balambangan	7SR16	MMSR011	84.95	77.52	84.44	83.98	88.13	Baik/Good
		Mantanani Besar	7SR21	MMSR012	83.41	83.08	82.18	83.46	85.81	Baik/Good
		Sapi	7SM08	MMSM001	69.67	81.27	84.01	84.42	72.40	Sederhana/ Moderate
		Kalampunian Besar	7SM11	MMSM002	66.79	84.67	83.80	81.75	86.43	Baik/Good
		Selingan	7SP17	MMSP001	68.34	55.98	66.87	84.70	89.04	Baik/Good
		Gulisan	7SP18	MMSP002	81.40	59.89	87.00	85.63	89.72	Baik/Good
		Bakungan Kecil	7SP19	MMSP003	84.07	54.40	50.73	83.33	87.08	Baik/Good
Labuan	Pulau/Island	Kuraman	7LM05	MMLM001	81.63	97.79	68.67	73.50	89.83	Baik/Good
		Rusukan Besar	7LM07	MMLM002	84.15	94.87	66.46	50.99	91.22	Terbaik/ Excellent
		Rusukan Kecil	7LM06	MMLM003	81.68	93.58	66.22	50.93	90.39	Terbaik/ Excellent
		Pohon Batu	7LD01	MMLD001	78.08	97.94	67.65	67.70	63.76	Sederhana/ Moderate
		Water Front	7LD02	MMLD002	72.81	97.65	64.47	76.60	66.09	Sederhana/ Moderate
		LubukTemiang	7LD03	MMLD003	79.85	97.79	65.77	74.67	72.79	Sederhana/ Moderate
		Ranca-Ranca	7LD04	MMLD004	88.04	91.44	66.63	52.02	91.81	Terbaik/ Excellent

Nota/ *Note*:
* (Stesen baharu/ *New station*)
** (Stesen tutup/ *Station closed*)
- (Tiada data/ *No data*)
NA (Tidak berkenaan/ *Not applicable*)

STATUS STESEN-STESEN KUALITI AIR MARIN

Jadual 4.7 dan **Jadual 4.8** menunjukkan senarai stesen Pantai dan Kuala yang mencapai kategori **Terbaik** bagi tahun 2017.

Stesen Pulau yang mencapai Kategori **Terbaik** bagi tahun 2017 adalah seperti di **Jadual 4.9**.

STATUS OF MARINE WATER QUALITY STATIONS

***Table 4.7** and **Table 4.8** show the list of coastal and estuaries stations that achieved the **Excellent** Category in 2017.*

*The islands that achieved the **Excellent** Category for Marine Water Quality Index in 2017 are listed in **Table 4.9**.*

Jadual 4.7 Malaysia: Senarai Pantai Terbaik, 2017
Table 4.7 Malaysia: List of Excellent Coastal, 2017

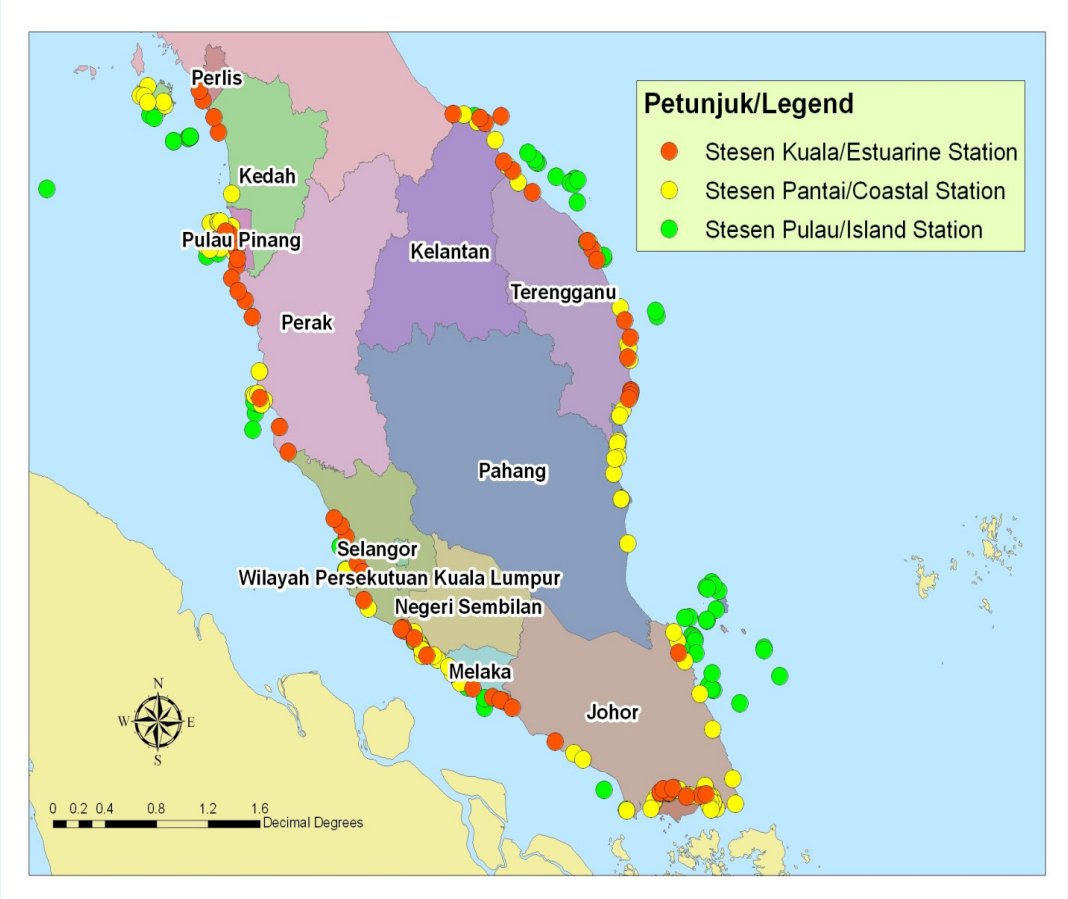
BIL./ NO.	NEGERI/ STATE	LOKASI/ LOCATION
1	Terengganu	Pantai Teluk Kalong
2	Terengganu	Pantai Batu Buruk
3	Johor	Tanjung Resang
4	Terengganu	Pantai Teluk Ketapang
5	Terengganu	Pantai Rhu 10
6	Terengganu	Pantai Sura
7	Johor	Pantai Sri Pantai
8	Johor	Pantai Tanjung Leman
9	Terengganu	Pantai Tok Jembal
10	Terengganu	Pantai Kuala Abang

Jadual 4.8 Malaysia: Senarai Kuala Kategori Terbaik, 2017
Table 4.8 Malaysia: List of Excellent Estuaries, 2017

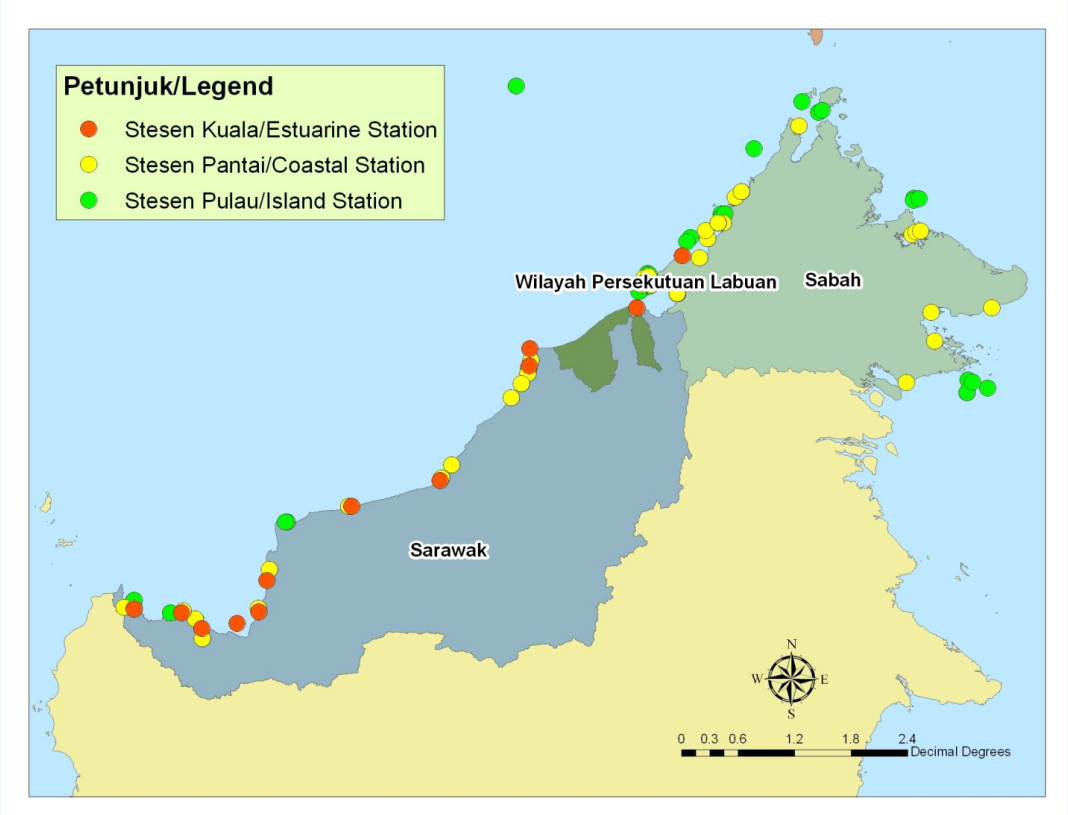
BIL./ NO.	NEGERI/ STATE	LOKASI/ LOCATION
1	Terengganu	Tioxide Selatan (KSB, T. Kalong)
2	Pahang	Kuala Nenasi
3	Selangor	Kuala Sungai Sepang (Kecil)
4	Selangor	Kuala Sungai Sepang (Kawalan)
5	Terengganu	Kuala Sungai Setiu
6	Johor	Kuala Sungai Muar
7	Selangor	Kuala Sungai Sepang
8	Pahang	Kuala Pahang
9	Johor	Kuala Sungai Johor
10	Terengganu	Kuala Sungai Kerteh

Jadual 4.9 Malaysia: Senarai Pulau Terbaik, 2017
Table 4.9 Malaysia: List of Excellent Islands, 2017

BIL./ NO.	NEGERI/ STATE	LOKASI/ LOCATION
1	Johor	Dayang
2	Johor	Nanga Besar
3	Perlis	Pulau Perak
4	Johor	Setindan
5	Johor	Sibu Tengah
6	Pahang	Seri Buat
7	Johor	Babi Tengah
8	Pahang	Cebeh
9	Kedah	Gasing
10	Johor	Pemanggil



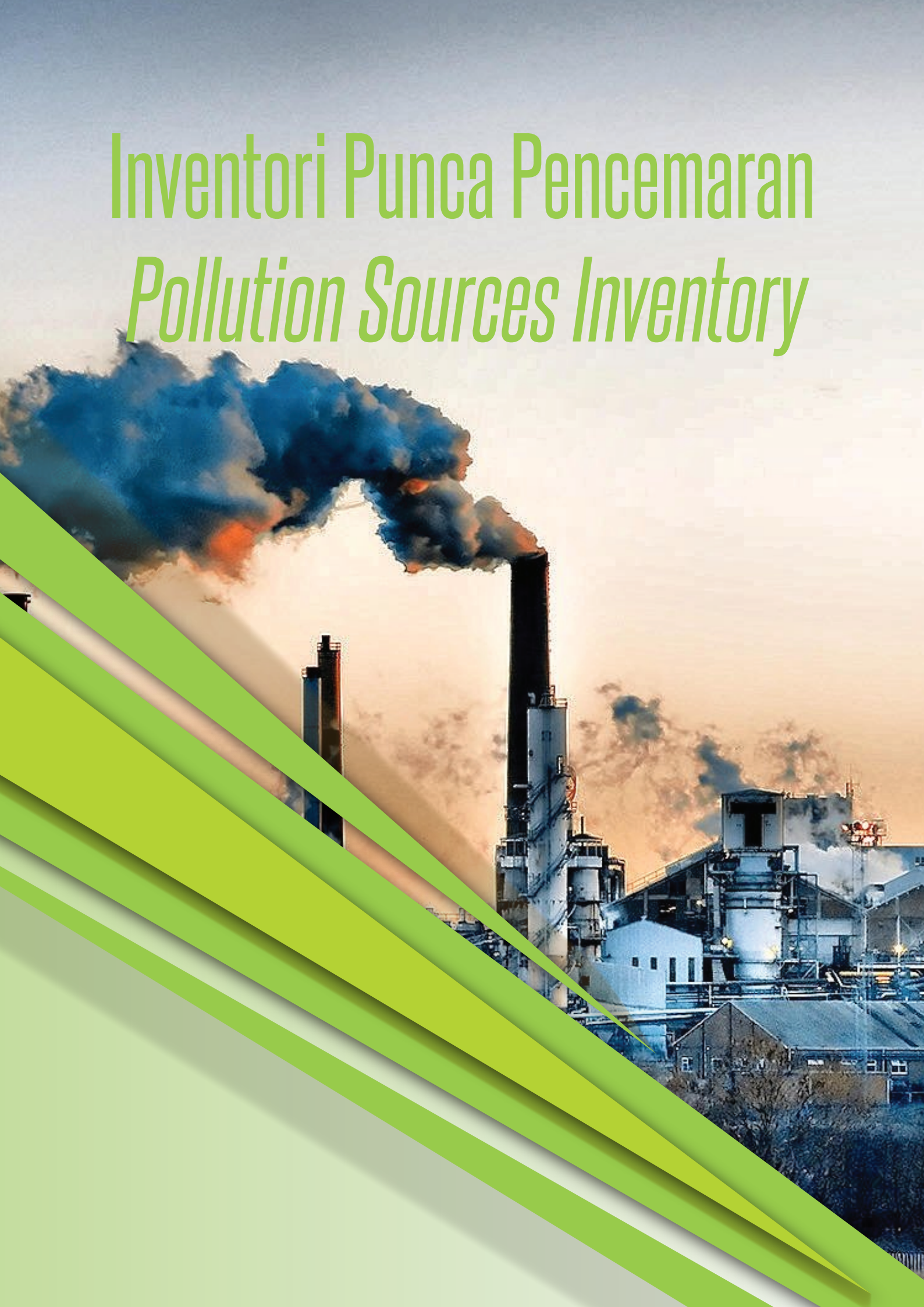
Peta: Semenanjung Malaysia: Lokasi Stesen Pengawasan Kualiti Air Marin
Map: Peninsular Malaysia: Location of Marine Water Quality Stations



Peta : Sabah & Sarawak : Lokasi Stesen Pengawasan Kualiti Air Marin
Map : Sabah & Sarawak : Location of Marine Water Quality Stations

Inventori Punca Pencemaran

Pollution Sources Inventory



PENGIRAAN BEBAN PENCEMARAN
(POLLUTION LOAD CALCULATION)

Pendahuluan

Beban pencemaran air adalah kepekatan bahan cemar yang dibawa oleh jasad air pada sesuatu masa yang diberikan. Secara matematik, beban pada dasarnya adalah hasil daripada pelepasan air dan kepekatan bahan di dalam air.

Beban pencemaran air adalah penting bertujuan untuk mengatur strategi dan merancang tindakan pencegahan dan mengawal pencemaran. Pelaksanaan kawalan beban pencemaran air adalah usaha untuk meningkatkan kualiti air sungai demi mengekalkan pelbagai kegunaan berfaedah sungai seperti sumber bekalan air, rekreasi, ternakair (akuakultur), pertanian serta menampung keperluan sistem ekologi

Introduction

Water pollution load are the amount of polluting material that a water body is actually carrying at a given time. Mathematically, load is essentially the product of water discharge and the concentration of a substance in the water.

The pollution loads are useful in strategizing and planning the course of action for the prevention and control of pollution, as to maintain the beneficial use of rivers as a source of water supply, recreation, aquaculture, agriculture as well as meeting the needs of ecological system.

Beban Pencemaran Air

Pada tahun 2017, anggaran pengiraan beban pencemaran ditumpukan ke atas lima (5) jenis punca pencemaran air iaitu industri pembuatan, industri berasaskan pertanian, loji rawatan kumbahan, ternakan babi dan pasar basah.

Sumber data industri pembuatan dan industri berasaskan pertanian diperolehi daripada JAS negeri manakala bagi loji rawatan kumbahan adalah daripada Indah Water Konsortium Sdn. Bhd. Data-data berkaitan aktiviti ternakan babi diperolehi daripada Jabatan Perkhidmatan Veterinar dan Pihak Berkuasa Tempatan membekalkan data bilangan pasar basah.

Pengiraan beban pencemaran di tumpukan kepada tiga (3) parameter utama yang memberikan kesan ketara kepada kualiti air sungai iaitu Keperluan Oksigen Biokimia (BOD), Pepejal Terampai (SS) dan Ammoniakal Nitrogen (NH_3N).

Water Pollution Load

In the year of 2017, the estimation of pollution loads are focused on five (5) type of water pollution sources such as manufacturing industries, agricultural industries, sewage treatment plant, piggery and wet market.

State DOE provides data on manufacturing industries and agricultural industries while sewage treatment plant was obtained from Indah Water Consortium Sdn. Bhd. Department of Veterinary Services provide piggery data and data on wet market were acquired from Local Authority.

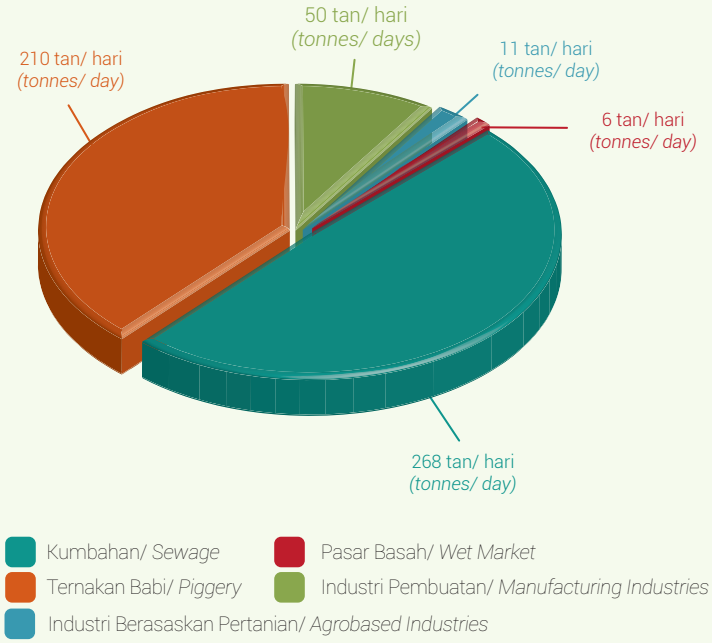
Assessment on pollution load were focused on three (3) prime parameter that shows high impact to the water body namely Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Ammoniacal Nitrogen (NH_3N).

Keperluan Oksigen Biokimia

Pada tahun 2017, anggaran jumlah beban pencemaran BOD adalah sebanyak 545 tan/hari. Pelepasan daripada loji kumbahan adalah penghasil beban pencemaran BOD tertinggi iaitu sebanyak 268 tan/hari (49%), diikuti aktiviti ternakan babi 210 tan/hari (39%), industri pembuatan 50 tan/hari (9%), industri berasaskan pertanian 11 tan/hari (2%) dan pasar basah 6 tan/hari (1%) ditunjukkan seperti di **Rajah 5.1**

Biochemical Oxygen Demand

*In year 2017, a total of 545 tonnes/day pollution load for BOD were generated. Sewage remained the largest BOD loads contributor with a total load of 268 tonnes/day (49%), followed by piggery which contributed 210 tonnes/day (39%), while manufacturing industries contributed 50 tonnes/day (9%), agro-based industries 11 tonnes/day (2 %) and wet markets 6 tonnes/ day (1%) as shown in **Figure 5.1**.*



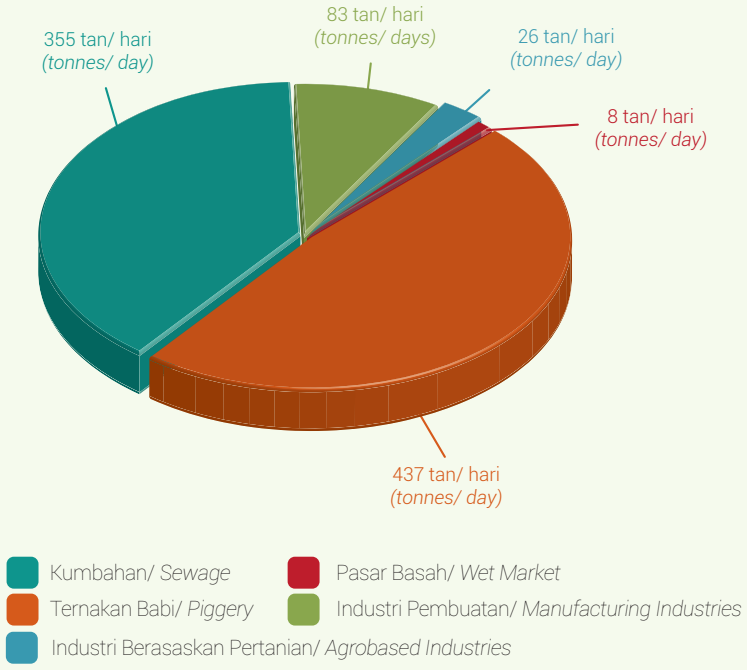
Rajah 5.1 Malaysia: Anggaran Beban BOD mengikut Punca Pencemaran Air, 2017
Figure 5.1 Malaysia: Assessment of BOD Load by Sources of Water Pollution, 2017

Beban Pepejal Terampai

Pada tahun 2017, anggaran penghasilan beban pencemaran bagi SS adalah sebanyak 909 tan/hari, di mana aktiviti ternakan babi kekal sebagai penghasil beban SS utama sebanyak 437 tan/hari (48%), diikuti kumbahan sebanyak 355 tan/hari (39%), industri pembuatan 83 tan/hari (9%), industri berasaskan pertanian 26 tan/hari (3%), dan pasar basah 8 tan/ hari (1%), seperti ditunjukkan dalam **Rajah 5.2**.

Suspended Solids Load

*In year 2017, estimation of summing-up the SS loads gave in a totalled of 909 tonnes/day in which piggery remain largest contributor with a total load of 437 tonnes/day (48%), followed by sewage 355 tonnes/ day (39%), manufacturing industries 83 tonnes/day (9 %), agro-based industries 26 tonnes/day (3%) and wet market 8 tonnes/ day (1 %) as shown in **Figure 5.2**.*



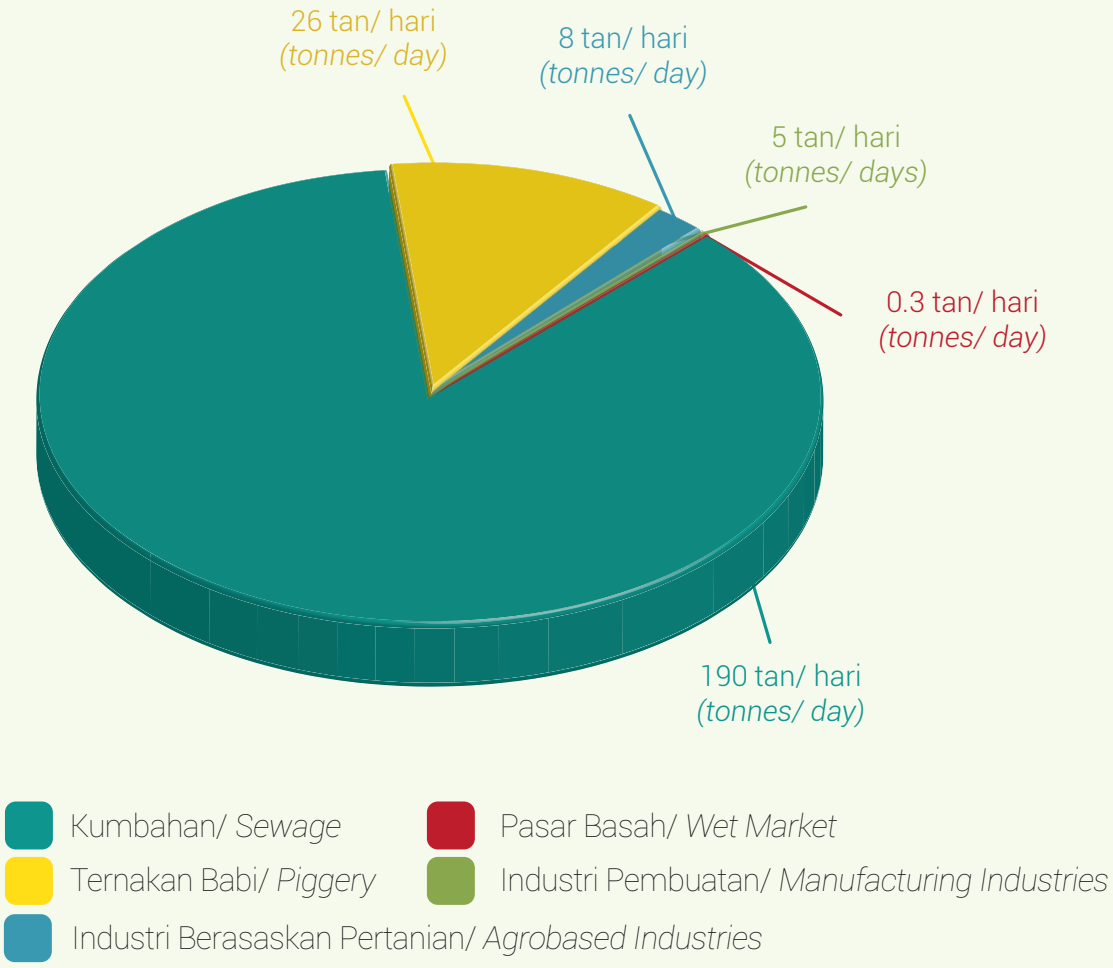
Rajah 5.2 Malaysia: Anggaran Beban SS mengikut Punca Pencemaran Air, 2017
Figure 5.2 Malaysia: Assessment of SS Load by Sources of Water Pollution, 2017

Beban Ammoniakal Nitrogen

Pada tahun 2017, anggaran beban pencemar NH_3N sebanyak 229.3 tan/hari di mana pelepasan kumbahan adalah penghasil terbesar beban NH_3N dengan jumlah sebanyak 190 tan/hari (82.9%), diikuti aktiviti ternakan babi iaitu 26 tan/hari (11.3%), industri berasaskan pertanian 8 tan/hari (3.5%), industri pembuatan 5 tan/hari (2.2%) dan pasar basah 0.3 tan/hari (0.1%) ditunjukkan seperti dalam **Rajah 5.3**.

Ammoniacal Nitrogen Load

*In year 2017, estimation of summing-up NH_3N loads resulted a total of 229.3 tonnes/day in which sewage remain largest contributor with a total load of 190 tonnes/day (82.9%), followed by piggery activities 26 tonnes/ day (11.3%), agro-based industries 8 tonnes/ day (3.5%), manufacturing industries 5 tonnes/day (2.2%) and wet market 0.3 tonnes/day (0.1%) as shown in **Figure 5.3.***



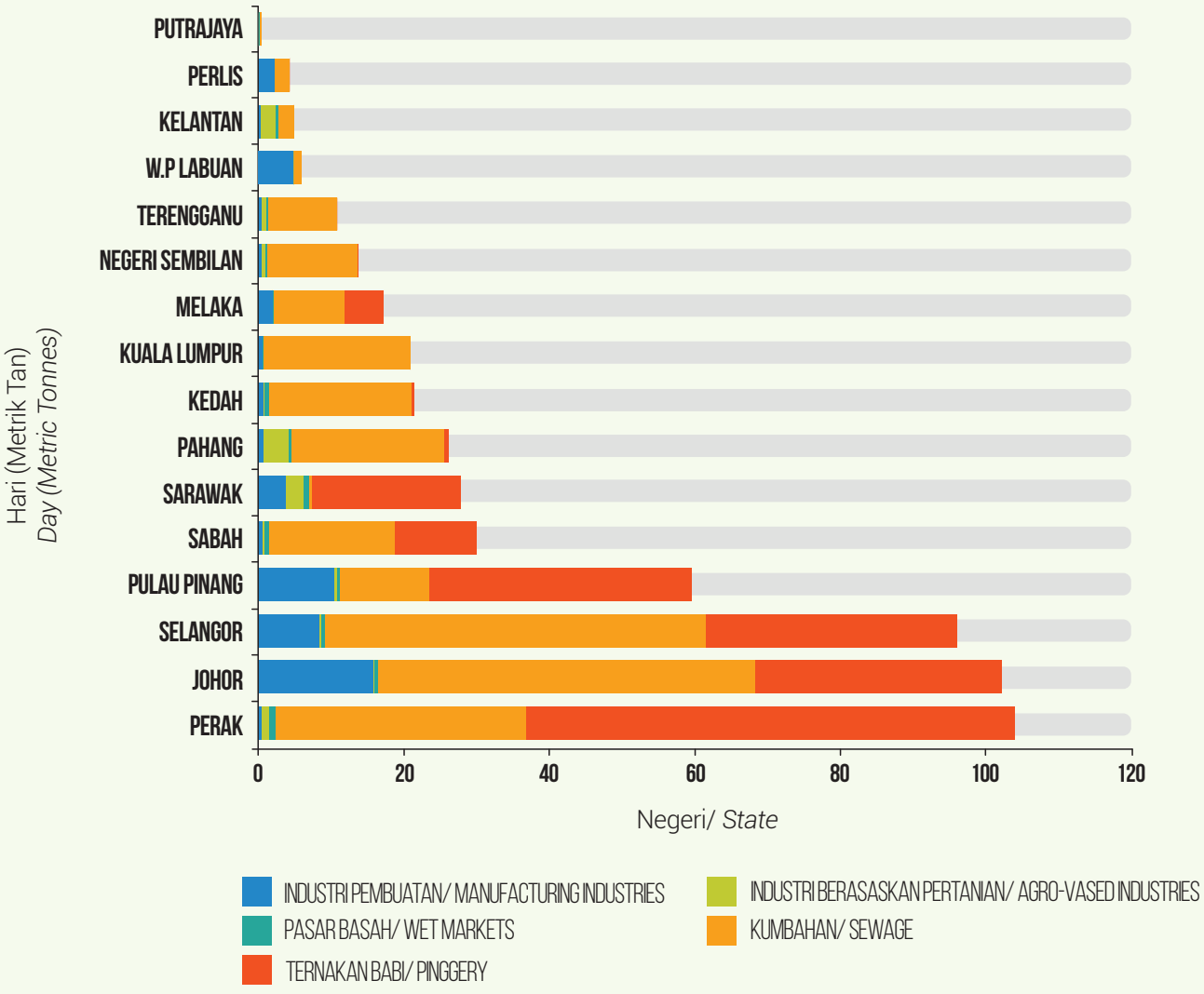
Rajah 5.3 Malaysia: Malaysia; Anggaran Beban NH_3N mengikut Punca Pencemaran Air, 2017
Figure 5.3 Malaysia: Assessment of NH_3N Load by Sources of Water Pollution, 2017

Beban Pencemaran Keperluan Oksigen Biokimia (BOD) Mengikut Negeri

Anggaran pengiraan beban BOD di Negeri Perak adalah tertinggi iaitu sebanyak 104 tan/hari, diikuti negeri Johor 102 tan/hari, Selangor 96 tan/hari, Pulau Pinang 60 tan/hari, Sabah 30 tan/hari dan Sarawak sebanyak 28 tan/hari. Beban BOD untuk lain-lain negeri termasuk Wilayah Persekutuan Labuan dan Putrajaya adalah kurang daripada 27 tan/hari. Beban pencemar BOD mengikut negeri ditunjukkan seperti di **Rajah 5.4**.

Biochemical Oxygen Demand Load (BOD) By States

*Estimation of BOD loads generated in the state of Perak recorded the highest value with 104 tonnes/day, followed by the state of Johor 102 tonnes/day, Selangor 96 tonnes/day, Penang 60 tonnes/day, Sabah 30 tonnes/day and Sarawak generated 28 tonnes/day. BOD load for the rest of the states including Federal Territory of Labuan and Putrajaya generated less than 27 tonnes/day. BOD pollution load based on state is shown in **Figure 5.4**.*



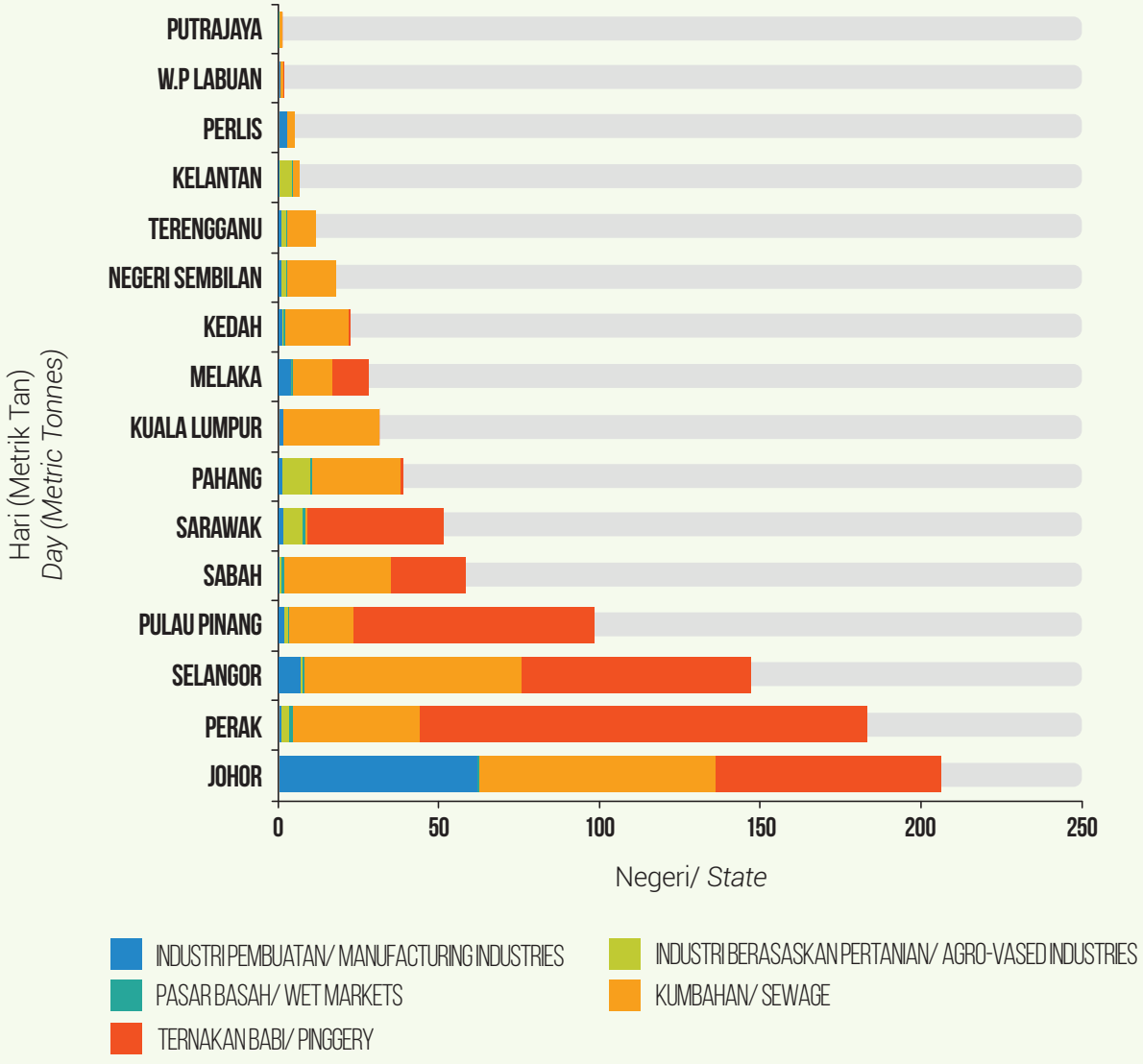
Rajah 5.4 Malaysia: Taburan Anggaran Beban BOD dan Punca Pencemaran Air mengikut Negeri, 2017
Figure 5.4 Malaysia: Dispersions of BOD Load Assessment and Sources of Water Pollution by States, 2017

Beban Pencemaran Pepejal Terampai Mengikut Negeri

Suspended Solids Load By State

Anggaran penjanaan beban SS di Negeri Johor di dapati tertinggi dengan jumlah sebanyak 207 tan/ hari, diikuti Perak 184 tan/hari, Selangor 147 tan/ hari, Pulau Pinang 98 tan/hari dan Sabah 58 tan/ hari. Lain-lain negeri didapati menghasilkan kurang daripada 52 tan/hari ditunjukkan seperti di **Rajah 5.5**.

*The highest SS loads was generated in the state of Johor with 207 tonnes/ day, followed by the state of Perak 184 tonnes/ day, state of Selangor 147 tonnes/ day, state of Penang 98 tonnes/ day and Sabah state 58 tonnes/ day. Other states generated less than 52 tonnes/ day, as shown in **Figure 5.5**.*



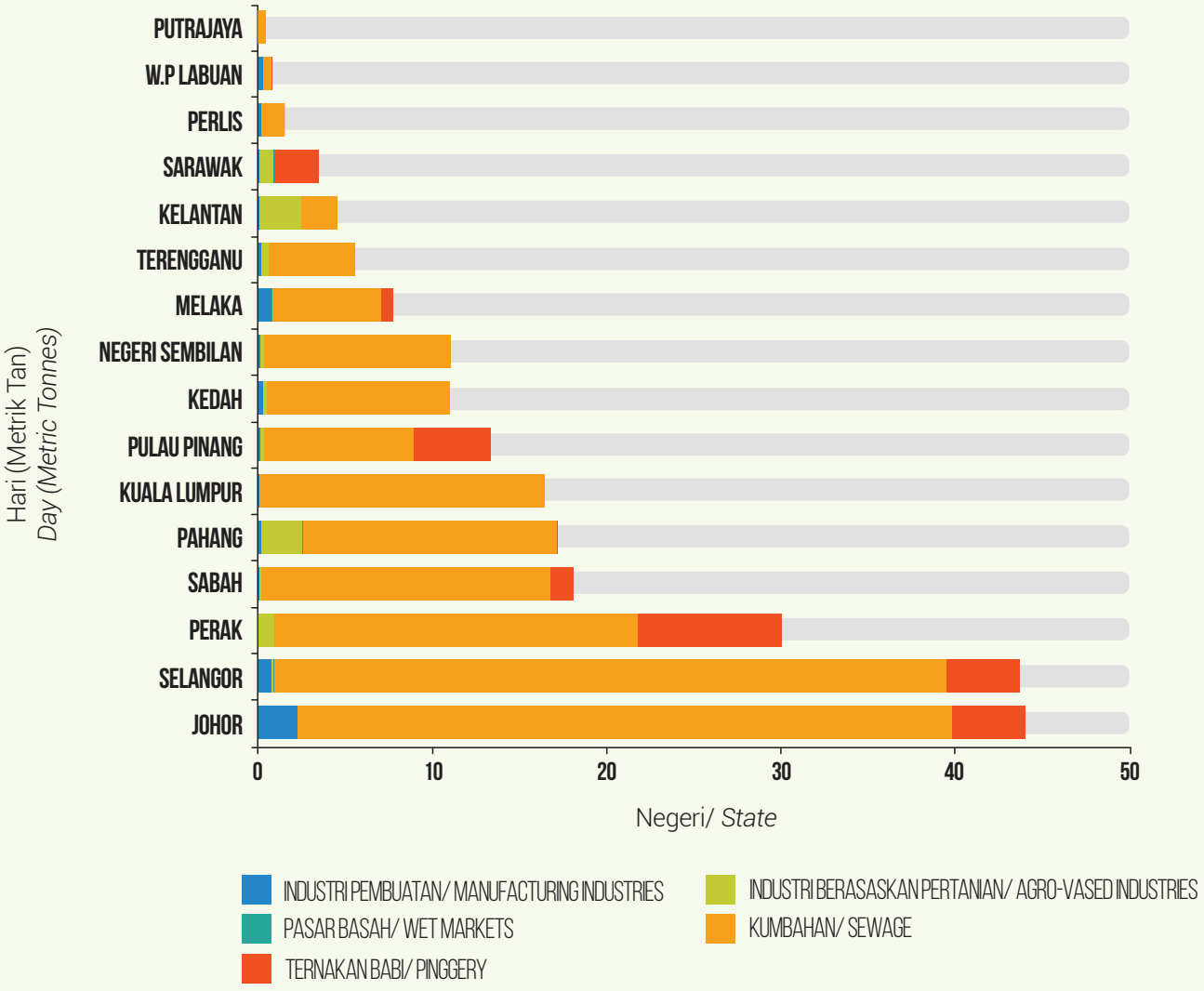
Rajah 5.5 Malaysia: Taburan Anggaran Beban SS dan Punca Pencemaran Air mengikut Negeri, 2017
Figure 5.5 Malaysia: Dispersions of SS Load Assessment and Sources of Water Pollution by States, 2017

Beban Pencemaran Ammoniakal Nitrogen Mengikut Negeri

Anggaran beban NH_3N di negeri Selangor dan Johor adalah tertinggi dengan masing-masing sebanyak 44 tan/hari. Diikuti Negeri Perak 30 tan/hari, Sabah 18 tan/hari, Pahang 17 tan/hari dan Wilayah Persekutuan Kuala Lumpur 16 tan/hari. Lain-lain Negeri didapati menyumbangkan kurang daripada 15 tan/hari, ditunjukkan sepertimana di **Rajah 5.6**.

Ammoniacal Nitrogen Load By State

Estimation of NH_3N load in Selangor and Johor are the highest with 44 tons/day respectively. Followed by state of Perak 30 tonnes/day, Sabah 18 tonnes/day, Pahang 17 tonnes/day and Federal Territory of Kuala Lumpur 16 tonnes/day. Other states generated less than 15 tonnes/day, as shown in ***Figure 5.6****.*



Rajah 5.6 Malaysia: Taburan Anggaran Beban NH_3N dan Punca Pencemaran Air Mengikut Negeri, 2017
Figure 5.6 Malaysia: Dispersions of NH_3N Load Assessment and Sources of Water Pollution by States, 2017

PUNCA- PUNCA PENCEMARAN UDARA

Peningkatan punca industri dan bilangan kenderaan bermotor boleh menyebabkan pencemaran udara yang teruk jika pelepasan pencemar termasuk pelepasan asap daripada kedua-dua aktiviti ini tidak dikawal dengan berkesan.

Sehingga bulan Disember 2017, jumlah punca industri yang melepaskan bahan pencemar ke udara adalah sebanyak 13,586. Bilangan punca pencemar yang tertinggi adalah di negeri Selangor (2704:20%) diikuti negeri Johor (2350:17%) dan negeri Perak (1533:11%). Pecahan punca industri berdasarkan negeri adalah seperti **Rajah 5.7**.

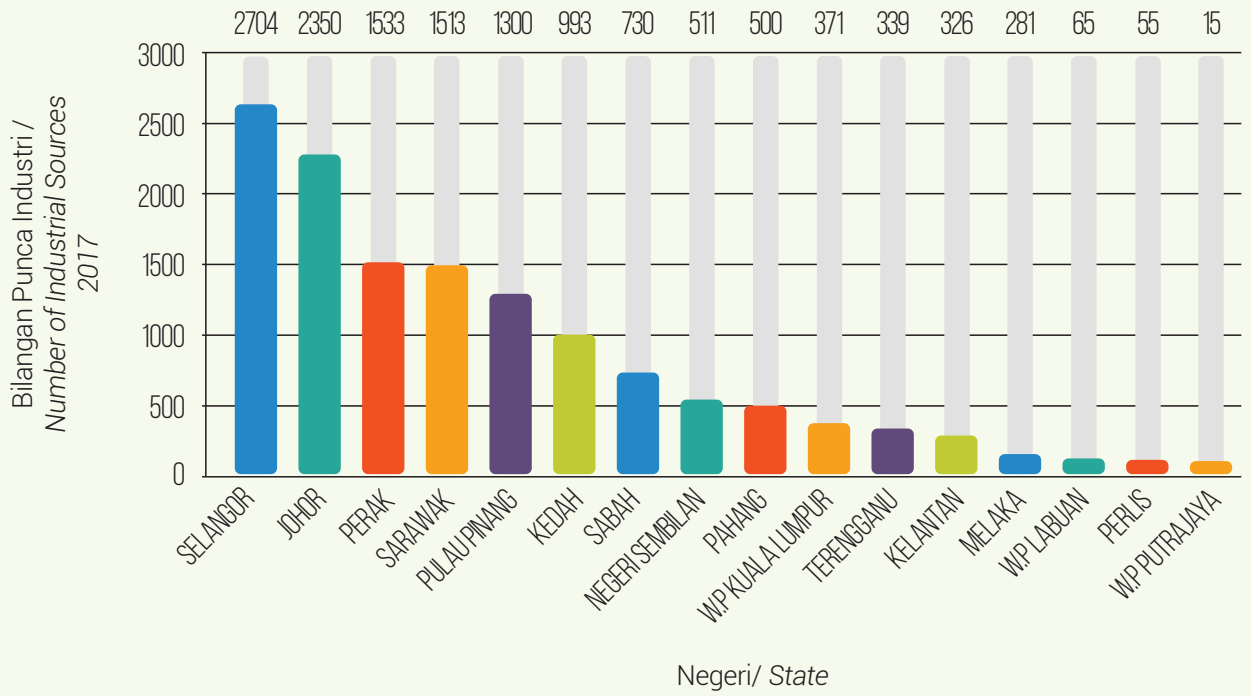
Seperti tahun-tahun yang lepas, pelepasan asap dari kenderaan bermotor merupakan punca utama yang menyumbang kepada pencemaran udara terutamanya di kawasan bandar. Pada tahun 2017, terdapat peningkatan bagi jumlah keseluruhan kenderaan bermotor yang didaftarkan. Bilangan pendaftaran yang direkodkan bagi teksi meningkat sebanyak 23.48%, diikuti dengan peningkatan kenderaan penumpang 4.49%, motosikal 3.91%, kenderaan barangan 2.73%, dan bas 1.84% berbanding pada tahun 2016. Pendaftaran kenderaan bermotor yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2016 dan 2017 adalah seperti yang ditunjukkan dalam **Rajah 5.8**. Bilangan bagi kenderaan yang sedang digunakan dan yang masih aktif juga meningkat jumlahnya secara keseluruhan (1.82%). Bilangan bagi kenderaan penumpang meningkat sebanyak 3.30%, manakala kategori lain menurun. Bilangan motosikal menurun sebanyak 0.02%, kenderaan barangan menurun sebanyak 0.88% dan teksi menurun sebanyak 1.64% dan bas 9.38% jika dibandingkan dengan tahun 2016 **(Rajah 5.9)**.

SOURCES OF AIR POLLUTION

The increasing trend of industrial sources and number of motor vehicles can caused severe air pollution if the emissions including smoke emission from both the sources are not effectively controlled.

*As of December 2017, a total of 13,586 industrial sources were recorded to emit air pollutants. The highest number of stationary pollution sources was in Selangor (2,704:20%) followed by Johor (2,350:17%) and Perak (1,533:11%). The distribution of industrial sources by states is as shown in **Figure 5.7**.*

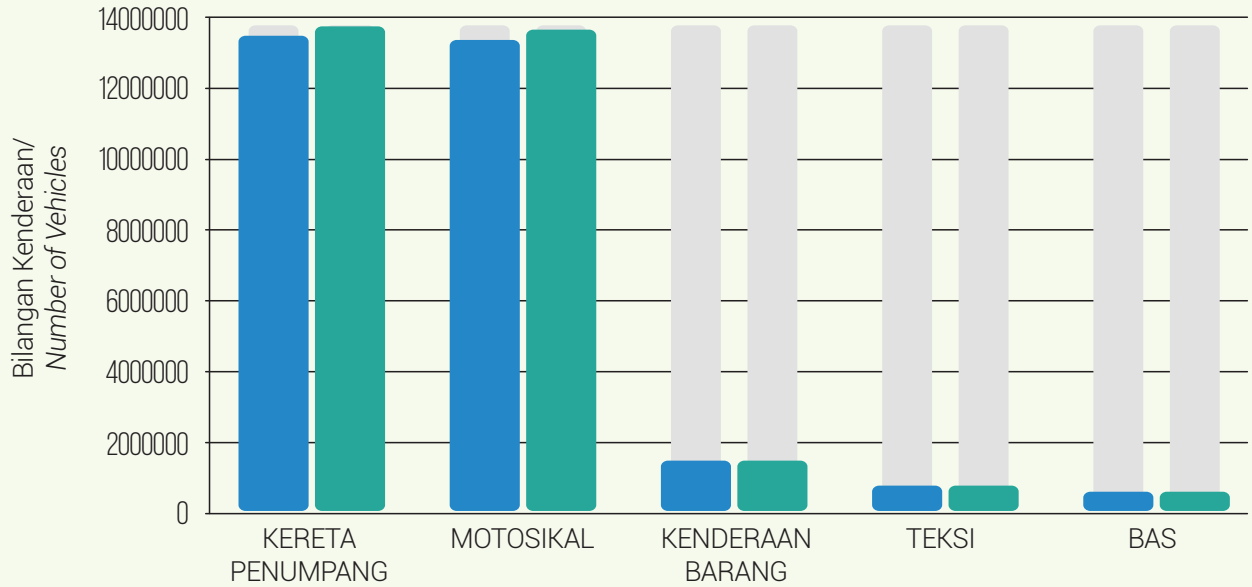
*Like the past years, emission from motor vehicles remained the major source of air pollution especially in urban areas. In 2017, there was an overall increase in the number of motor vehicles registered. The number of registered taxi increased by 23.48%, followed by increase of passenger cars 4.49%, motorcycles 3.91%, goods vehicles 2.73%, and buses 1.84% compared to 2016. The number of registered vehicles in Malaysia as reported by the Road Transport Department for 2016 and 2017 is shown in **Figure 5.8**. The number of in use vehicles or active on the road also has shown an overall increase in number (1.82%). The number of passenger vehicles has increased by 3.30%, while others categories has decreased. Motorcycles decreased by 0.02%, goods vehicles by 0.88%, taxis by 1.64% and buses by 9.38% compared to 2016. **(Figure 5.9)**.*



Rajah 5.7 Malaysia: Punca Pencemaran Udara Tertakluk kepada Peraturan Udara Bersih Mengikut Negeri untuk tahun 2017

Figure 5.7 Malaysia: Industrial Air Pollution Subjected to Clean Air Regulations for year 2017

(Sumber: Sistem Inventori Pencemaran Alam Sekitar (SIMPAS), Jabatan Alam Sekitar)
(Sources: Environmental Pollution Inventory System (SIMPAS), Department of Environment)

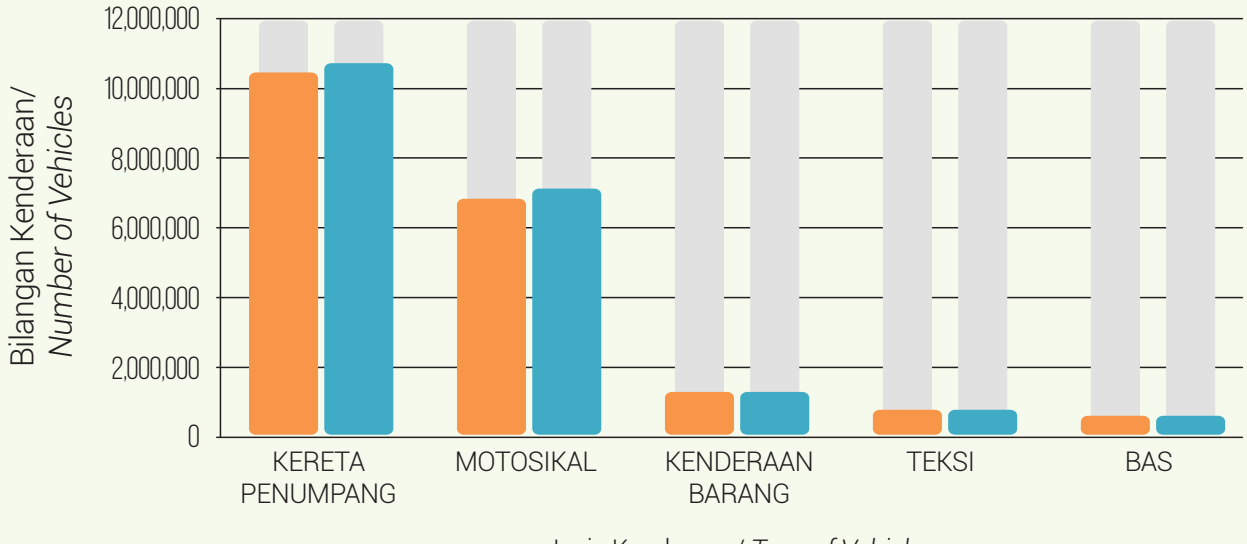


	KERETA PENUMPANG	MOTOSIKAL	KENDERAAN BARANG	TEKSI	BAS
2016	12997839	12677041	1191310	99705	59977
2017	13581276	13173030	1223865	123118	123118

Rajah 5.8 Malaysia: Bilangan Kenderaan Berdaftar Tahun 2016-2017

Figure 5.8 Malaysia: Number of Registered Vehicles in 2016-2017

(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2017)
(Source: Road Transport Department, Malaysia, 2017)



	KERETA PENUMPANG	MOTOSIKAL	KENDERAAN BARANG	TEKSI	BAS
2016	10,180,542	6,919,641	759,111	21,389	14,410
2017	10,516,940	6,918,046	752,430	21,038	13,059

Rajah 5.9 Malaysia: Bilangan Kenderaan Aktif Tahun 2016-2017
Figure 5.9 Malaysia: Number of in Use Vehicles in 2016-2017

(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2017)
(Source: Road Transport Department, Malaysia, 2017)

BEBAN PENCEMARAN PENCEMAR UDARA

Beban Pencemaran Secara Menyeluruh

Dianggarkan pada tahun 2017, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 2,123,281 metrik tan; 860,390 metrik tan bagi nitrogen dioksida (NO_2); 218,700 metrik tan bagi sulfur dioksida (SO_2) dan 23,964 metrik tan bagi jirim zarahan (PM). Perbandingan keseluruhan beban pencemaran bagi tahun 2016 dan 2017 adalah ditunjukkan dalam **Rajah 5.10**.

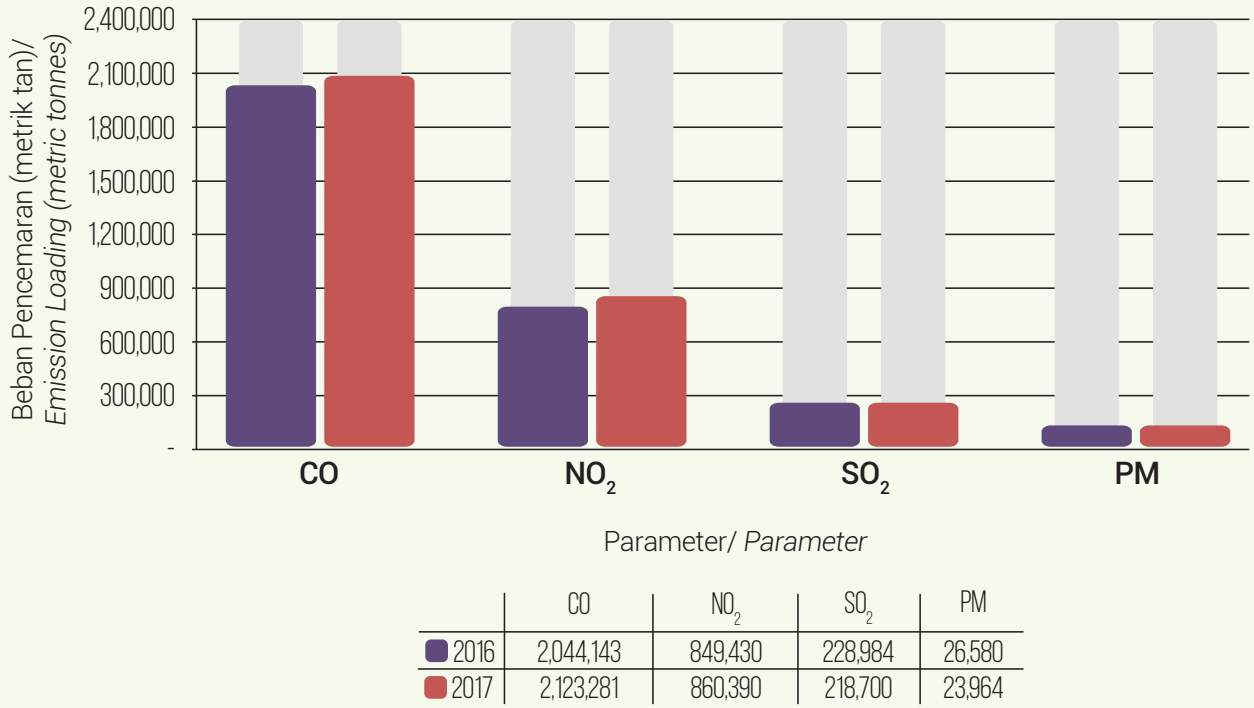
Beban pencemaran bagi CO meningkat pada tahun 2017 berbanding dengan 2016 disebabkan peningkatan penggunaan bahan api minyak dan arang batu sebagai bahan api dalam industri dan loji janakuasa (Sumber: National Energy Balance, 2015). Peningkatan adalah sebanyak 3.9% bagi beban pencemar CO, 1.3% dan beban pencemar NO_2. Manakala beban pencemar pada 2017 bagi parameter SO_2 dan PM menunjukkan penurunan masing-masing sebanyak 4.5% dan 9.8% berbanding dengan tahun 2016.

AIR POLLUTANT EMISSION LOAD

Overall Emission Load

*It was estimated that in 2017 the combined air pollutant emission load accumulated to 2,123,281 metric tonnes of carbon monoxide (CO); 860,390 metric tonnes of nitrogen oxides (NO_2); 218,700 metric tonnes of sulphur dioxide (SO_2) and 23,964 metric tonnes of particulate matter (PM). A comparison of the combined air pollutants emission load in 2016 and 2017 is shown in **Figure 5.10**.*

Emission load for CO had increased in 2017 compared to 2016 due to high consumptions of fuel oil and coke which were used as fuels in industries and, power and heat generation plants (Sources: National Energy Balance 2015). The increment in CO emission load was 3.9% and 1.3% in NO_2 emission load. However in year 2017, emission load of SO_2 and PM has declined to 4.5% and 9.8% respectively compared to 2016.



	CO	NO_2	SO_2	PM
2016	2,044,143	849,430	228,984	26,580
2017	2,123,281	860,390	218,700	23,964

Rajah 5.10 Malaysia: Beban Pencemaran Bahan Pencemar Udara Dari Semua Punca, 2016-2017
Figure 5.10 Malaysia: Air Pollutant Emission Load from All Sources, 2016-2017

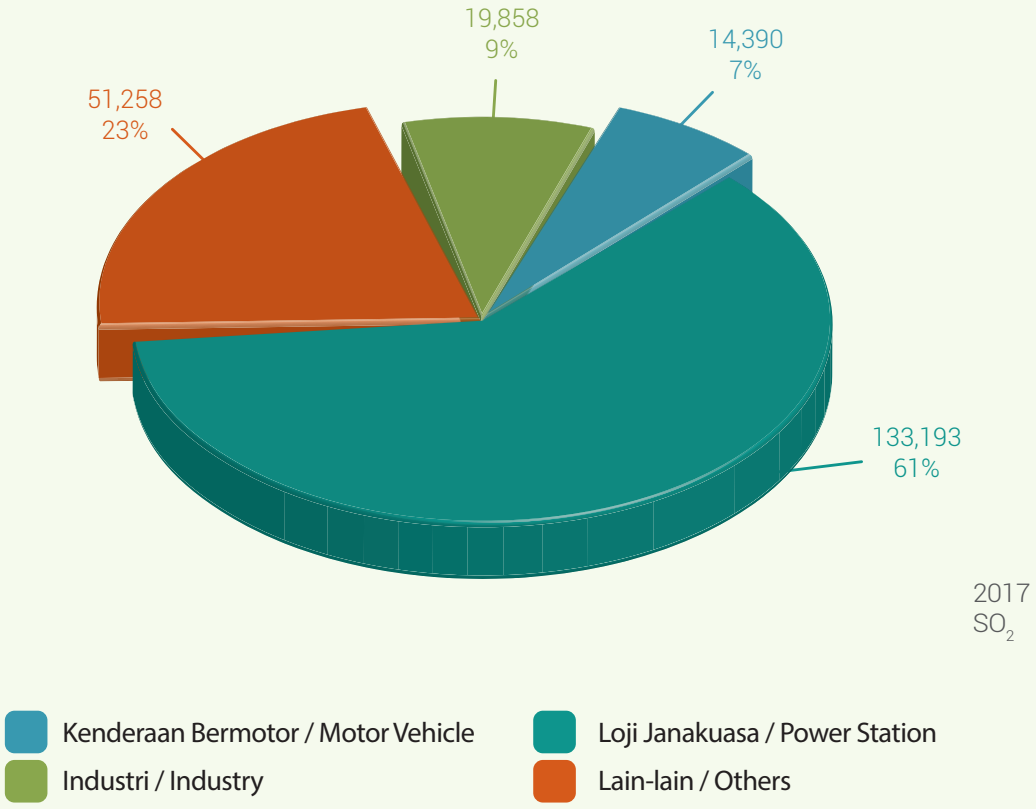
(Sumber: Dari National Energy Balance 2015)
(Sources: From National Energy Balance 2015)

Punca Beban Pencemaran

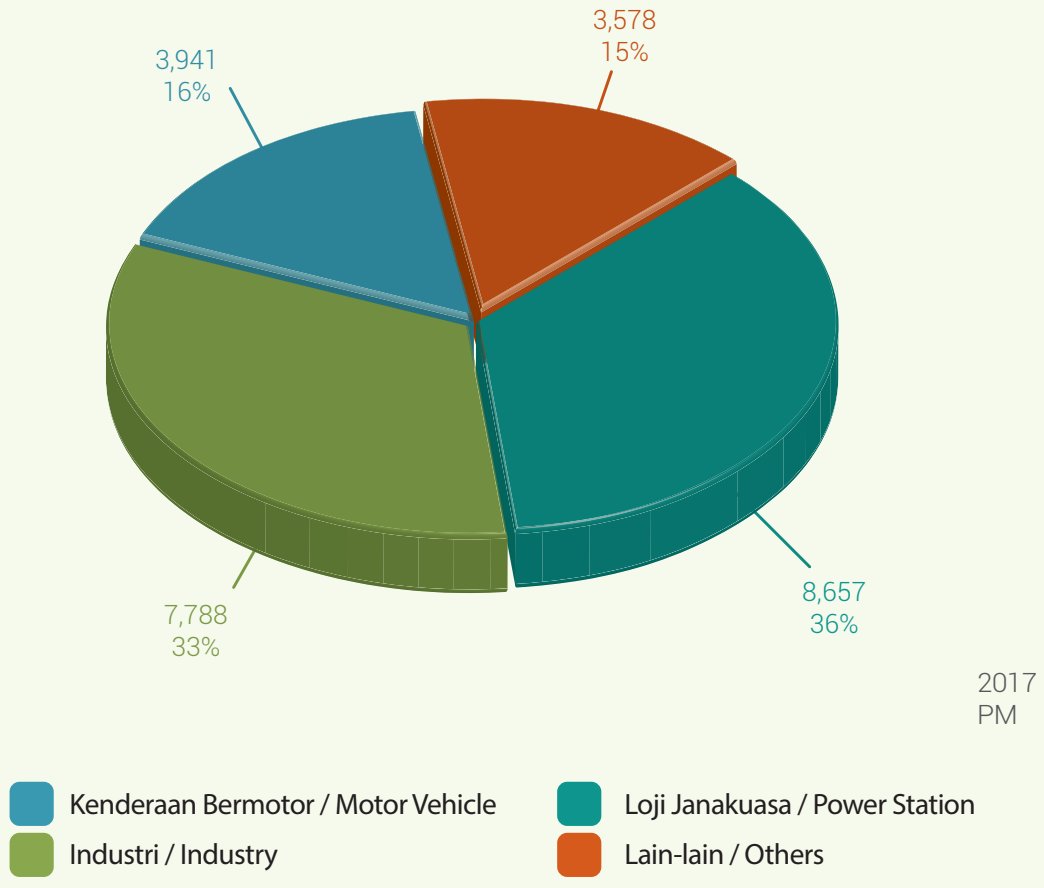
Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO_2 (61%), diikuti dengan lain-lain kategori (23%), industri (9%) dan kenderaan bermotor (7%) **(Rajah 5.11)**. Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada loji janakuasa (36%), industri (33%), diikuti kenderaan bermotor (16%) dan lain-lain kategori (15%) **(Rajah 5.12)**. Seperti yang ditunjukkan dalam **Rajah 5.13**, penyumbang terbesar bagi NO_2 adalah daripada loji janakuasa (66%) diikuti kenderaan bermotor (26%), industri (7%) dan lain-lain kategori (1%). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95.7%) **(Rajah 5.14)**. Punca-punca bagi kategori 'Lain-lain' yang dinyatakan di dalam rajah-rajah di atas adalah merupakan pelepasan bahan pencemar udara dari kawasan perumahan, komersial, penggunaan bukan tenaga serta pertanian.

Emission Load by Sources

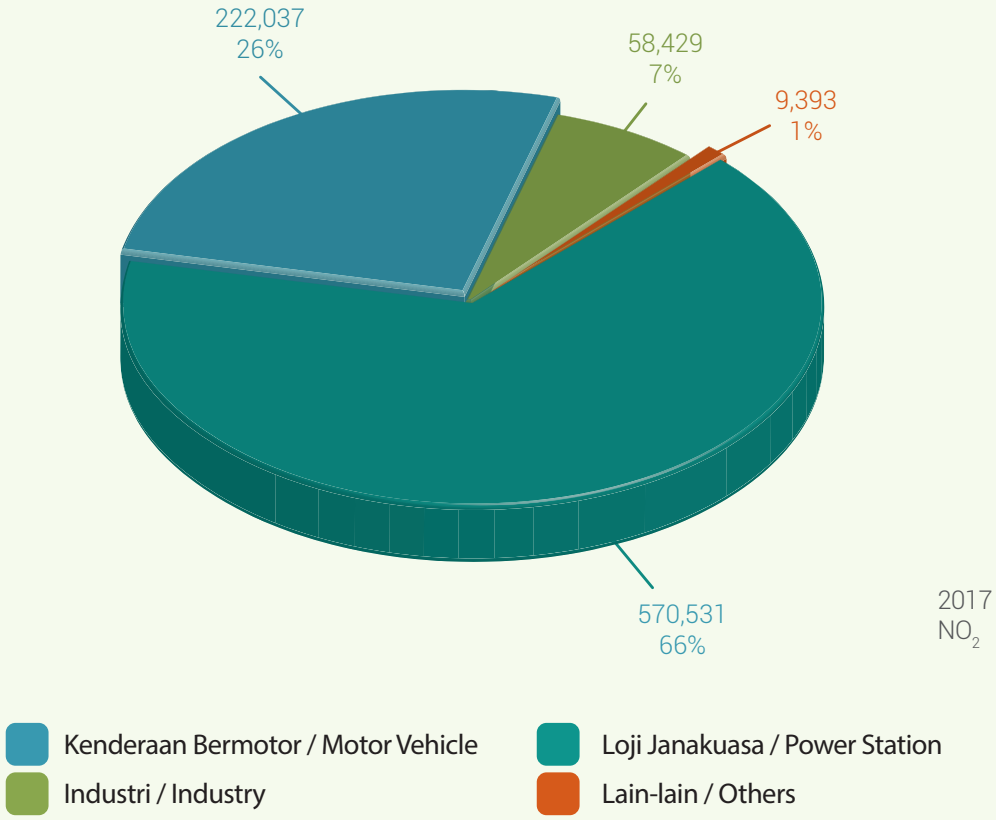
*Power plants contributed the highest SO_2 emission load (61%), followed by other categories (23%), industries (9%) and motor vehicles (7%) **(Figure 5.11)**. As for the PM, the highest contributors were power plants (36%) followed by industries (33%), motor vehicles (16%) and others (15%) **(Figure 5.12)**. As shown in **Figure 5.13** the highest contributors of NO_2 were power plants (66%) followed by motor vehicles (26%), industries (7%), and others (1%). However, motor vehicles remained the highest contributor of CO (95.7%) **(Figure 5.14)**. 'Others' in the figures represent air pollutant sources from residential, commercial, non-energy use and agriculture.*



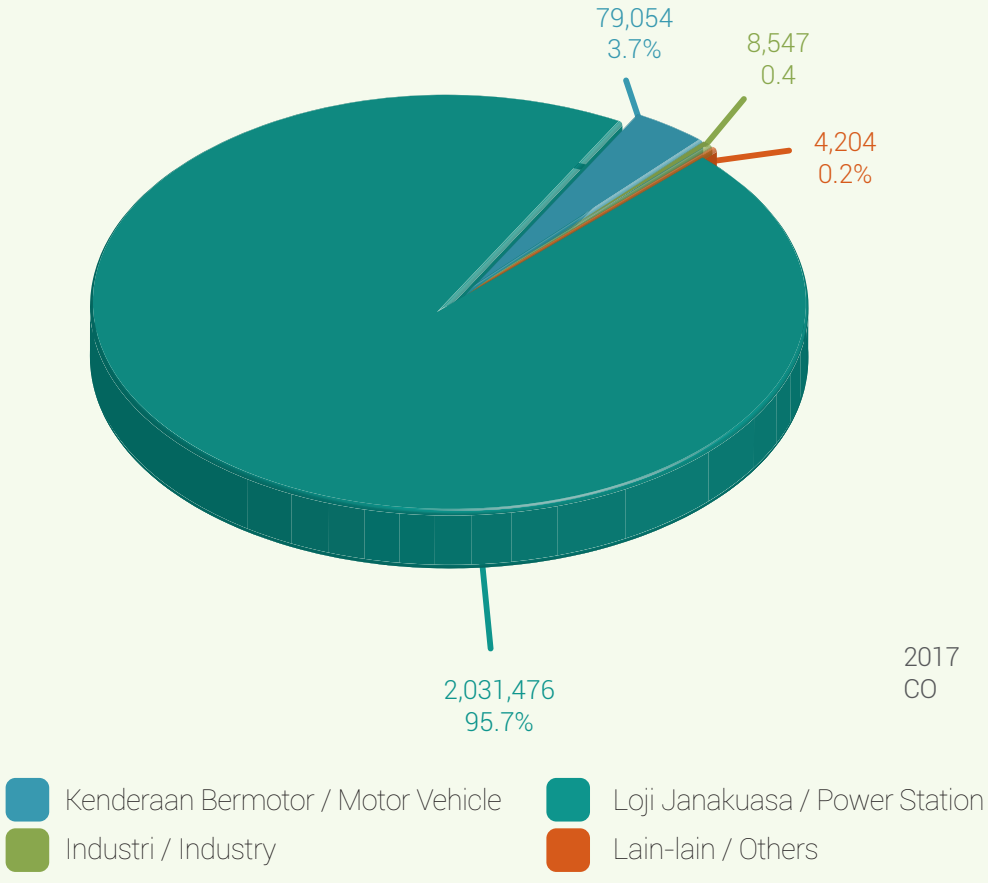
Rajah 5.11 Malaysia: Punca Beban Pencemaran SO_2 (Metrik Tan), 2017
Figure 5.11 Malaysia: SO_2 Emission Load by Sources (Metric Tonnes), 2017



Rajah 5.12 Malaysia: Punca Beban Pencemaran Jirim Zarahan (PM) (Metrik Tan), 2017
Figure 5.12 Malaysia: Particulate Matter (PM) Emission Load by Sources (Metric Tonnes), 2017



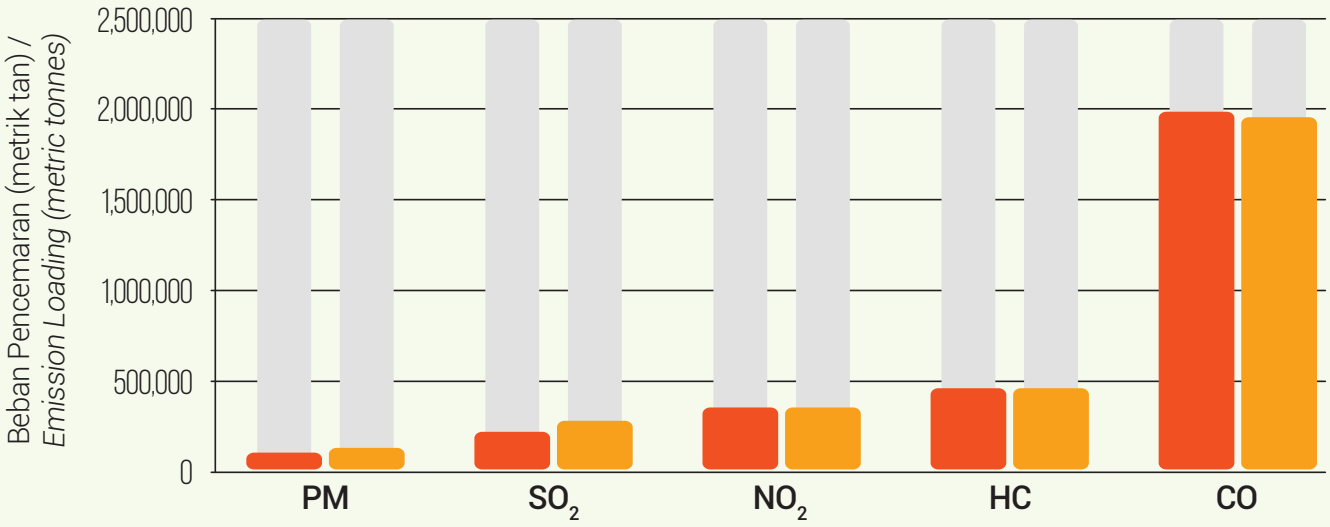
Rajah 5.13 Malaysia: Punca Beban Pencemaran NO_2 (Metrik Tan), 2017
Figure 5.13 Malaysia: NO_2 Emission Load by Sources (Metric Tonnes), 2017



Rajah 5.14 Malaysia: Punca Pencemaran CO (Metrik Tan), 2017
Figure 5.14 Malaysia: CO Emission by Sources (Metric Tonnes), 2017

Anggaran pencemaran yang dihasilkan oleh beban pencemar udara daripada kenderaan bermotor iaitu HC, CO, PM, NO_2 dan SO_2 pada tahun 2016 dan 2017 ditunjukkan dalam **Rajah 5.15**. Pada tahun 2017, beban pencemaran bagi pencemar HC dan CO dianggarkan 453,004 metrik tan dan 2,031,476 metrik tan masing-masing. Terdapat peningkatan sebanyak 1.82% dan 0.69% bagi beban pencemaran CO dan HC jika dibandingkan dengan tahun 2016. Peningkatan beban pencemar dari kenderaan bermotor ini adalah berkait rapat dengan peningkatan bilangan kenderaan motor berenjin petrol yang aktif digunakan pada tahun 2017. Tren penurunan pula dapat dilihat bagi beban pencemaran yang dihasilkan oleh SO_2, NO_2, dan PM daripada kenderaan motor pada tahun 2017 berikutan bilangan kenderaan yang aktif bagi kenderaan berenjin diesel menurun. Beban pencemar SO_2 dianggarkan sebanyak 14,390 metrik tan pada tahun 2017 berbanding 14,514 metrik tan pada tahun 2016 (penurunan sebanyak 0.86%) dan NO_2 sebanyak 222,037 metrik tan berbanding 224,096 metrik tan pada 2016 (menurun sebanyak 0.92%) manakala PM sebanyak 3,941 metrik tan berbanding 4,121 metrik tan (menurun sebanyak 4.36%).

The estimated annual air pollutants emission load of PM, SO_2, NO_2, HC and CO from motor vehicles for year 2016 and 2017 is shown in ***Figure 5.15****. In 2017, the emission load of HC and CO were estimated to be 453,004 metric tonnes and 2,031,476 metric tonnes, respectively. For year 2017, there were an increase of 1.82% and 0.69% of CO and HC emission load compared to 2016. The increment was closely related to the increase in the number of active petrol-powered motor vehicles in 2017. The downtrend can be seen for pollution load of NO_2, SO_2 and PM from motor vehicles in 2017 as the number of active vehicles for diesel-powered vehicles has decreased. The SO_2 pollution burdens was estimated to be 14,390 metric tonnes in 2017 as compared to 14,514 metric tonnes in 2016 (a decrease of 0.86%); NO_2 emissions were estimated to be 222,037 metric tonnes compared with 224,096 metric tonnes in 2016 (decreased by 0.92%) while PM emissions were estimated to be 3,941 metric tonnes compared to 4,121 tonne (decreased by 4.36%).*



	PM	SO_2	NO_2	HC	CO
2016	3,941	14,390	222,037	153,004	2,031,476
2017	4,121	14,514	224,096	449,895	1,995,256

Rajah 5.15 Malaysia: Beban Pencemar Udara Dari Kenderaan Bermotor, 2016-2017
Figure 5.15 Malaysia: Air Pollutant Emission Load from Motor Vehicles, 2016-2017

INVENTORI BUANGAN TERJADUAL

Pada tahun 2017 sebanyak 2,017,280.76 tan metrik buangan terjadual telah dihasilkan. Ini mewakili penurunan keseluruhan sebanyak 27.08% berbanding 2,766,613.45 tan metrik yang dilaporkan pada 2016. Dros/ sanga/ klinker/ abu, buangan gipsum dan enapcemar logam berat merupakan kategori utama dalam kategori buangan yang dihasilkan (**Jadual 5.1**). Negeri Johor telah menghasilkan jumlah terbesar buangan terjadual (19.6%), diikuti oleh Negeri Terengganu (18.4%), Perak (18.3%), Selangor (15.8%), Pulau Pinang (9.7%), manakala 10 negeri-negeri yang lain menghasilkan sebanyak 18.3%. (**Rajah 5.16**)

Sebanyak 661,557.87 tan metrik (33.3%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara. Ini menunjukkan penurunan sebanyak 22.3% berbanding 863,124.13 tan metrik pada tahun 2016. Daripada jumlah itu, 661,557.87 tan metrik (32.8%) daripada buangan terjadual yang diperoleh kembali di kemudahan pemerolehan kembali luar tapak tempatan dan 9,353.67 tan metrik (0.5%) telah dieksport untuk pemerolehan kembali di kemudahan di luar negara.

Sebanyak 173,276.67 tan metrik (8.59%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan untuk pelupusan akhir, iaitu di Kualiti Alam Sdn. Bhd (133,507.97 MT), Trienekens (Sarawak) Sdn. Bhd (11,393.47 MT) dan 28,375.24 tan metrik daripada buangan klinikal telah dibakar dan dilupuskan di kemudahan luar tapak yang dilesenkan (**Jadual 5.2**). Jumlah ini menunjukkan penurunan sebanyak 0.87% daripada sejumlah 174,803.74 tan metrik buangan berjadual dilupuskan pada tahun 2016. Sebanyak 510,724.45 tan metrik (25.32%) daripada buangan terjadual terhasil telah diolah di tapak; manakala 152,161.45 tan metrik (7.54%) telah distor di premis pengeluar buangan (**Jadual 5.3**).

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2017, 510,206.65 tan metrik (25.29%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005 (**Jadual 5.4**). Jumlah ini merupakan penurunan sebanyak 46.89% berbanding 960,663.32 tan metrik pada tahun 2016. Kebanyakan buangan dihasilkan dari loji jana kuasa arang batu (71.17%), enap cemar daripada kemudahan rawatan air minuman (5.10%) dan lain-lain (23.73%) .

SCHEDULED WASTES INVENTORY

*In 2017, a total of 2,017,280.76 metric tonnes of scheduled wastes were generated. This represents an overall decrease of 27.08% as compared to 2,766,613.45 metric tonnes reported in 2016. Of the total waste generated, dross/slag/clinker/ash, gypsum and heavy metal sludge, were the main categories (**Table 5.1**). Referring to **Figure 5.16**, the state of Johor generated the largest amount of scheduled wastes (19.6%), followed by Terengganu (18.4%), Perak (18.3%), Selangor (15.8%), Pulau Pinang (9.7%), whilst the other 10 states generated a total of 18.3%.*

A total of 661,557.87 metric tonnes (33.3%) of waste were being recovered locally and abroad. This showed a decrease of 22.3% as compared to 863,124.13 metric tonnes in 2016. From the total, 661,557.87 metric tonnes (32.8%) of scheduled wastes were recovered at local off-site facilities and 9,353.67 metric tonnes (0.5%) were exported for recovery at foreign facilities abroad.

*A total of 173,276.67 metric tonnes (8.59%) of waste were treated and disposed for final disposal, at Kualiti Alam Sdn. Bhd. (133,507.97 MT), Trienekens (Sarawak) Sdn. Bhd. (11,393.47 MT) and 28,375.24 metric tonnes of clinical wastes were incinerated at licensed off-site facilities (**Table 5.2**). The amount showed a decrease of 0.87% from a total of 174,803.74 metric tonnes of scheduled waste disposed in 2016. A sum of 510,724.45 metric tonnes (25.32%) of scheduled waste was treated on-site; while 152,161.45 metric tonnes (7.54%) were stored on-site at waste generators' premises (**Table 5.3**).*

*Of the total wastes produced in 2017, 510,206.65 metric tonnes (25.29%) were granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations, 2005 (**Table 5.4**). The amount represented a decrease of 46.89% as compared to 960,663.32 metric tonnes in 2016. These waste streams are mostly generated from coal-fired power plant (71.17%), sludges from drinking water treatment facilities (5.10%) and others (23.73%).*

Jadual 5.1 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2017
Table 5.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2017

NO	NAMA BUANGAN/ *NAME OF WASTE*	KOD BUANGAN/ *WASTE CODE*	KUANTITI BUANGAN/*QUANTITY OF WASTE*	
			(MT/ TAHUN) *(MT/YEAR)*	PERATUS/ *PERCENTAGE* (%)
1	Dros/ Sanga/ Klinker/ Abu/ *Dross/Slag/Clinker/Ash*	SW 104	706,750.00	35.03
2	Gipsum/ *Gypsum*	SW 205	510,724.45	25.32
3	Enap cemar logam berat/ *Heavy Metal Sludges*	SW 204	226,747.90	11.24
4	Minyak Pelincir Terpakai/ *Spent Lubricating oil*	SW 305	94,582.12	4.69
5	Asid Terpakai/ *Spent Acids*	SW 206	86,664.98	4.30
6	Bekas tercemar/ *Used Container*	SW 409	47,509.28	2.36
7	Campuran buangan terjadual dan buangan tidak terjadual/ *Mixture of Scheduled Waste & Non-Scheduled Waste*	SW 422	31,962.60	1.58
8	Buangan elektronik/ *E-Waste*	SW 110	28,604.15	1.42
9	Buangan patogenik / klinikal/ *Pathogenics Clinical Waste*	SW 404	28,375.24	1.41
10	Buangan getah atau lateks yang mengandungi logam berat/ *Rubber/Latex Waste Containing Heavy Metal*	SW 321	27,243.89	1.35
11	Emulsi minyak mineral-air terpakai/ *Spent mineral oil-water emulsion*	SW 307	26,113.03	1.29
12	Kain buruk, plastik, kertas atau turas tercemar/ *Rags/Plastics/Papers contaminated with Scheduled Waste*	SW 410	23,262.15	1.15
13	Buangan pelarut organic bukan terhalogen/ *Waste of Non-Halogenated Solvent*	SW 322	20,815.18	1.03
14	Sisa dari pengolahan atau pemerolehan kembali buangan terjadual/ *Residue From Recovery*	SW 501	18,809.16	0.93
15	Enap cemar mineral/ *Mineral Sludges*	SW 427	16,443.87	0.82
16	Buangan minyak atau enap cemar berminyak *Waste oil/Oily sludges*	SW 311	16,421.67	0.81
17	Buangan kimia/ *Lab Waste*	SW 429	11,546.37	0.57
18	Buangan dakwat dan cat/ *Waste of Inks & Paints*	SW 417	8,370.65	0.41

Jadual 5.1 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2017
Table 5.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2017

NO	NAMA BUANGAN/ *NAME OF WASTE*	KOD BUANGAN/ *WASTE CODE*	KUANTITI BUANGAN/*QUANTITY OF WASTE*	
			(MT/ TAHUN) *(MT/YEAR)*	PERATUS/ *PERCENTAGE* (%)
19	Enap cemar dakwat dan cat/ *Ink&Paints Sludges*	SW 416	8,060.58	0.40
20	Buangan pelekat / glu yang mengandungi pelarut organik *Adhesive/Glue Contaning Organic Solvent*	SW 303	6,598.62	0.33
21	Enap cemar yang mengandungi fluorida/ *Sludge Containing Flouride*	SW 207	6,153.01	0.31
22	Buangan mangkin/ *Waste Catalyst*	SW 202	5,921.14	0.29
23	Alkali terpakai/ *Spent Alkalis*	SW 401	5,880.38	0.29
24	Produk dakwat, cat, pigmen atau lakuer yang tidak mengikut spesifikasi yang mengandungi pelarut organik *Discarded of Ink/Paint/Pigment/Lacquer Containing Organic Solvent*	SW 418	4,455.15	0.22
25	Campuran minyak-air/ *Oil -Water mixture*	SW 309	4,437.57	0.22
26	Karbon teraktif terpakai/ *Contaminated Actice Carbon*	SW 411	4,361.88	0.22
27	Minyak hidraulik terpakai/ *Spent Hydraulic oil*	SW 306	3,934.79	0.20
28	Buangan pelarut organik terhalogen/ *Waste Of Halogenated Solvents*	SW 323	3,576.95	0.18
29	Campuran buangan terjadual/ *Mixture of Scheduled Waste*	SW 421	3,389.63	0.17
30	Alkali terpakai dengan pH ≥ 11.5/ *Spent Alkalis With PH > 11.5*	SW 402	3,139.91	0.16
31	Buangan bateri asid plumbum/ *Waste of acid plumbum baterries*	SW 102	2,954.29	0.15
32	Minyak/Enapcemar daripada loji penapisan minyak/ *Oil/Sludges from Oil Refinery*	SW 314	2,390.59	0.12
33	Tanah/puing tercemar/ *Contaminated Land/oil*	SW 408	2,170.63	0.11
34	Buangan cecair terma/ *Waste Of Thermal Fluids*	SW 327	1,943.32	0.10
35	Buangan bateri yang mengandungi cadmium dan nikel/ *Waste Of Bateries Containing Cadmium/Hg/Litium*	SW 103	1,917.30	0.10
36	Buangan resin yang mengandungi pelarut organik/ *Waste of Resin Containing Organic*	SW 325	1,864.74	0.09

Jadual 5.1 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2017
Table 5.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2017

NO	NAMA BUANGAN/ *NAME OF WASTE*	KOD BUANGAN/ *WASTE CODE*	KUANTITI BUANGAN/*QUANTITY OF WASTE*	
			(MT/ TAHUN) *(MT/YEAR)*	PERATUS/ *PERCENTAGE* (%)
37	Asid organik terpakai/ *Spent Organic Acids*	SW 301	1,743.44	0.09
38	Enap cemar dari tangki penyimpanan minyak mineral/ *Sludges from mineral oil storage tank*	SW 310	1,486.01	0.07
39	Buangan mengandungi merkuri/ *Waste contaning Mercury/Compound*	SW 109	1,478.05	0.07
40	Buangan fotografi/ *Photographic Waste*	SW 423	1,299.52	0.06
41	Buangan sisa penyulingan tidak berair terhalogen atau bukan terhalogen/ *Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process*	SW 324	1,070.27	0.05
42	Sisa berminyak dari bengkel automotif/ *Oily Residue from Workshop*	SW 312	1,047.95	0.05
43	Klinker, sanga dan abu dari penunu buangan terjadual/ *Clinker/Slag/Ashes From Incinerator*	SW 406	976.34	0.05
44	Larutan alkali berair terpakai yang mengandungi sianida/ *Spent Aqueous alkaline Containing Cyanide*	SW 414	653.46	0.03
45	Buangan asbestos/ *Asbestos*	SW 201	642.72	0.03
46	Tar atau sisa bertar dari loji penapisan minyak/ *Tar Residue From Oil Refinery/Petrochemical Plant*	SW 315	529.13	0.03
47	Dadah terbuang/ *Expired Drug*	SW 403	458.97	0.02
48	Buangan farmaseutikal/ *Discarded Drug*	SW 405	298.53	0.01
49	Buangan makmal/ *Chemical Waste*	SW 430	291.76	0.01
50	Buangan mengandungi formaldehid/ *Waste Containing Formaldehyde*	SW 320	207.86	0.01
51	Tanah yang dicemari dengan minyak daripada penapisan semula minyak pelincir terpakai *Contaminated Oil from re-refining/used lubricating Oil*	SW 313	196.28	0.01
52	Buangan yang mengandungi peroksida/ *Waste Containing Peroxides*	SW 432	168.13	0.01
53	Enap cemar yang distabilkan/ *Stabilized Sludges*	SW 203	168.11	0.01

Jadual 5.1 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2017
Table 5.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2017

NO	NAMA BUANGAN/ *NAME OF WASTE*	KOD BUANGAN/ *WASTE CODE*	KUANTITI BUANGAN/*QUANTITY OF WASTE*	
			(MT/ TAHUN) *(MT/YEAR)*	PERATUS/ *PERCENTAGE* (%)
54	Sisa dari pemerolehan kembali likuor penjerukan asid/ *Residue from Recovery of Acid Pickling Liquor*	SW 106	99.00	0.00
55	Enap cemar dari tangki minyak/ *Oil tankers sludges*	SW 308	97.86	0.00
56	Buangan fluks/ *Flux Waste*	SW 302	88.53	0.00
57	Buangan racun perosak/ *Pesticide*	SW 425	78.40	0.00
58	Buangan yang mengandungi arsenik/ *Waste containing arsenic*	SW 101	45.72	0.00
59	Diisosianat terpakai/ *Spent di-Isocyanates*	SW 419	13.37	0.00
60	Agen pengoksidaan terpakai/ *Spent Oxidizing Agent*	SW 424	12.23	0.00
61	Buangan fenol/ *Waste Of Phenols/Its Compound*	SW 319	9.67	0.00
62	Buangan yang mengandungii dioksin atau furan/ *Waste Contaning Dioxins Or Furans*	SW 407	7.49	0.00
63	Enap cemar asid/ Acid Sludges	SW 316	7.05	0.00
64	Buangan sebatian fosforus organik/ *Waste of Organic phosphorus compound*	SW 326	2.74	0.00
65	Produk racun perosak yang tidak mengikut spesifikasi/ *Used Pesticide/Herbicides/Biocides*	SW 426	1.28	0.00
66	Sanga kuprum/ *Slag of Copper*	SW 107	1.24	0.00
67	Enap cemar yang mengandungi sianida/ *Sludges Contaning Cyanide*	SW 412	0.80	0.00
68	Buangan yang mengandungi BFT dan TFT/ *Waste containing PCB or PCT*	SW 318	0.75	0.00
69	Sisa dari pemprosesan zink/ *Zink Residue*	SW 108	0.35	0.00
70	Garam terpakai yang mengandungi sianida/ *Spent salt containing Cyanide*	SW 413	0.29	0.00
71	Enap cemar galvani/ *Galvanic sludges*	SW 105	0.20	0.00
72	Minyak pelindapan terpakai yang mengandungi sianida/ *Spent quenching Oil Containing Cyanide*	SW 415	0.08	0.00

Jadual 5.1 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2017
Table 5.1 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2017

NO	NAMA BUANGAN/ *NAME OF WASTE*	KOD BUANGAN/ *WASTE CODE*	KUANTITI BUANGAN/*QUANTITY OF WASTE*	
			(MT/ TAHUN) *(MT/YEAR)*	PERATUS/ *PERCENTAGE* (%)
73	Kek tekan daripada prapengolahan lai sabun gliserol/ *Cake From Glycerol Soap Iye*	SW 304	-	0.00
74	Sebatian organologam terpakai/ *Spent Of Organometallic compound*	SW 317	-	0.00
75	Larutan resap dari tapak pelupusan buangan terjadual/ *Leachate From Scheduled Waste Landfill*	SW 420	-	0.00
76	Buangan daripada opearsi pengawetan kayu/ *Waste From Wood Containing Heavy Metals*	SW 428	-	0.00
77	Buangan dari pengilangan bahan letupan/ *Waste From Manufacturing/Processing or use of explosive*	SW 431	-	0.00
JUMLAH/ *TOTAL*			**2,017,280.76**	**100.00**

Jadual 5.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2017
Table 5.2 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2017

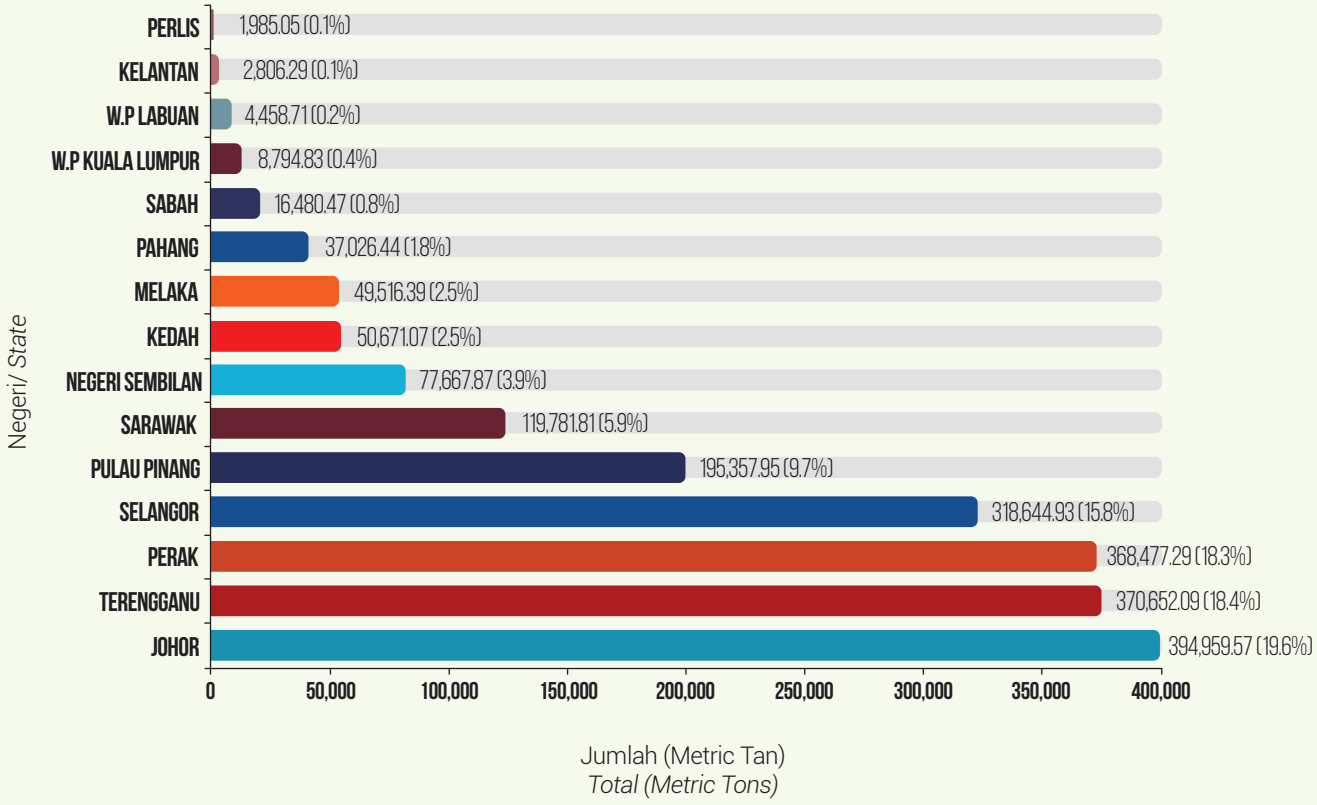
NO	JENIS INDUSTRI/ *TYPE OF INDUSTRY*	JUMLAH BUANGAN/ *QUANTITY OF WASTE*	
		(MT/TAHUN) *(MT/YEAR)*	PERATUS (%) *PERCENTAGE (%)*
1	Loji Janakuasa/ *Scheduled Waste Treatment And Disposal Facilities*	510,724.45	25.32
2	Premis Buangan Terjadual/ *Power Plant*	363,087.02	18.00
3	Industri Kimia/ *Chemical Industry*	276,242.51	13.69
4	Elektrik Dan Elektronik/ *Electric And Electronic*	223,897.54	11.10
5	Pengilangan Logam/ *Metal Refinery*	166,618.59	8.26
6	Bengkel/ *Workshop*	63,094.96	3.13
7	Lain-lain/ *Others*	53,714.21	2.66
8	Kenderaan/ *Vehicle*	50,704.63	2.51
9	Penapisan Petroleum/ *Petroleum Refinery*	43,906.22	1.23
10	Galian Bukan Logam/ *Excavation Non Metal*	40,043.01	1.98
11	Berasaskan Getah/ *Rubber Base*	39,139.64	1.94
12	Percetakan/ *Printing*	34,060.17	1.69
13	Perubatan/ *Health Care Services*	28,375.24	1.41
14	Loji Rawatan Air/ *Water Treatment Plant*	26,032.33	1.29
15	Penyudahan Logam Dan Sadur Elektrik/ *Metal Finishing and Coating*	22,497.20	1.12
16	Kertas/ *Paper*	21,629.65	1.07
17	Fabrikasi Logam/ *Metal Fabrication*	11,139.25	0.55
18	Plastik/ *Plastic*	5,969.12	0.30
19	Kuari/ *Quarry*	5,121.40	0.25

Jadual 5.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2017
Table 5.2 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2017

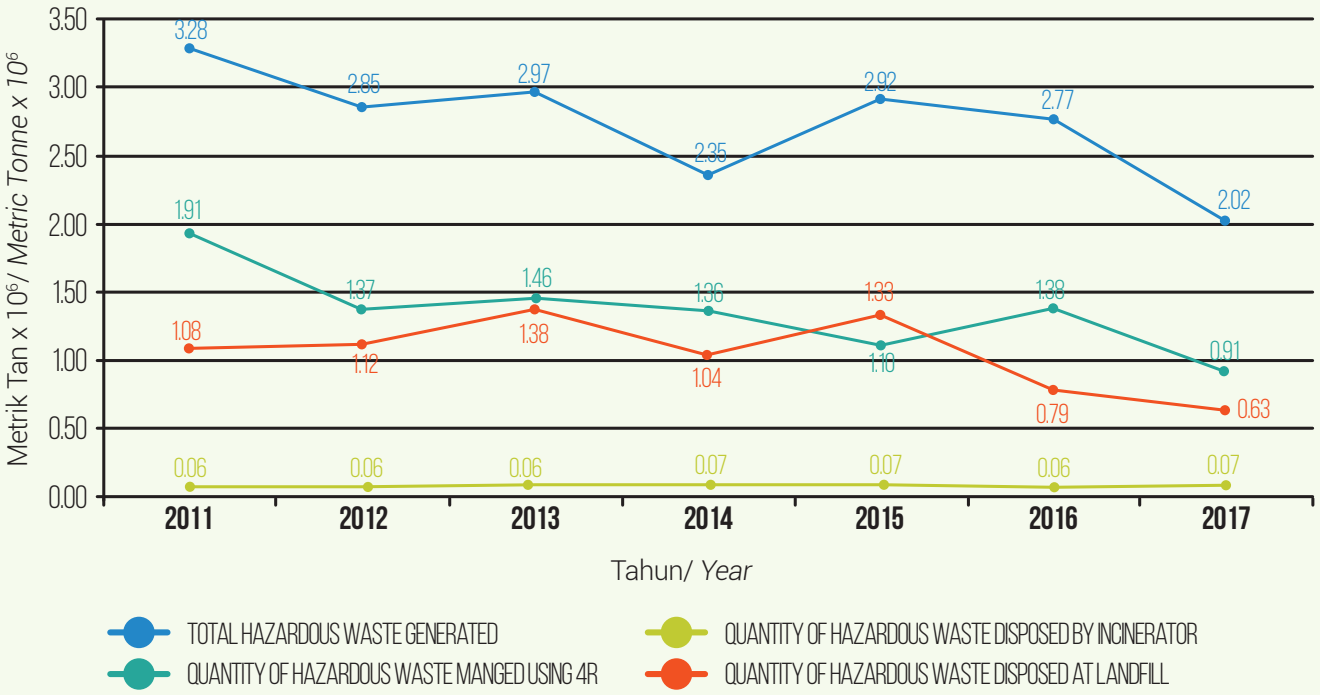
NO	JENIS INDUSTRI/ *TYPE OF INDUSTRY*	JUMLAH BUANGAN/ *QUANTITY OF WASTE*	
		(MT/TAHUN) *(MT/YEAR)*	PERATUS (%) *PERCENTAGE (%)*
20	Kilang Kelapa Sawit/ *Palm Oil Mill*	4,599.74	0.23
21	Penapisan Minyak Makan/ *Edible Oil Refinery*	4,283.44	0.21
22	Makanan & Minuman/ *Food & Drink*	4,157.47	0.21
23	Pembuatan Payung dan Lain-lain Industri Pembuatan/ *Others Manufacturing*	3,086.39	0.15
24	Perlombongan/ *Mining*	2,798.98	0.14
25	Jentera/ *Machinery*	2,467.44	0.12
26	Pertanian/ *Agriculture*	2,367.10	0.12
27	Berasaskan Kayu/ *Wood Base*	2,041.83	0.10
28	Simen/ *Cement*	1,197.64	0.06
29	Gudang/ *Warehouse*	1,055.32	0.05
30	Kilang Getah/ *Rubber Factory*	616.95	0.03
31	Tekstil/ *Textiles*	463.72	0.02
32	Peralatan Sukan Dan Permainan/ *Sports Equipment and Games*	457.99	0.02
33	Loji Pengolahan Kumbahan (IWK, Majari, PBT)/ *Sewage Treatment Plant (IWK,Majari,PBT)*	393.90	0.02
34	Hotel	322.73	0.02
35	Peralatan Pejabat dan Alat Tulis/ *Office Supplies and Stationery*	288.52	0.01
36	Perkhidmatan/ *Services*	217.39	0.01
37	Kulit/ *Leather*	187.93	0.01
38	Rokok dan Tembakau/ *Cigarettes and Tobacco*	114.94	0.01

Jadual 5.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2017
Table 5.2 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2017

NO	JENIS INDUSTRI/ *TYPE OF INDUSTRY*	JUMLAH BUANGAN/ *QUANTITY OF WASTE*	
		(MT/TAHUN) *(MT/YEAR)*	PERATUS (%) *PERCENTAGE (%)*
39	Loji Pengolahan Kumbahan Persendirian/ *Private Sewage Treatment Plant*	87.09	0.00
40	Tapak Pelupusan Sampah/ *Sanitary Landfill*	57.00	0.00
41	Makanan Ternakan/ *Livestock Food*	13.73	0.00
42	Kilang Padi/ *Rice Mill*	5.05	0.00
43	Perikanan/ *Fishery*	1.33	0.00
	JUMLAH/ *TOTAL*	**2,017,280.76**	**100.00**



Rajah 5.16 Malaysia: Penghasilan Buangan Terjadual mengikut Negeri, 2017
Figure 5.16 Malaysia: Distribution of Scheduled Waste Generated by State ,2017



Rajah 5.17 Malaysia: Trend Pengurusan Buangan Terjadual , 2011 -2017
Figure 5.17 Malaysia: The trend of Scheduled Waste Managemnet from, 2011 - 2017

Jadual 5.3 Malaysia: Kemudahan Yang Mengendalikan Buangan Terjadual, 2017
Table 5.3 Malaysia: Facilities Handling Scheduled Wastes, 2017

NO	KEMUDAHAN/ *FACILITY*	METRIK TAN/ *METRIC TONNES*	PERATUSAN (%) / *PERCENTAGE(%)*
1	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan/ *Local Off-site Recovery Facilities*	661,557.87	32.79
2	Pengolahan DalamTapak/ *On-Site Treatment*	510,724.45	25.32
3	Pengurusan Khas/ *Special Waste Management*	510,206.65	25.29
4	Penstoran Dalam Tapak/ *On-Site Storage*	152,161.45	7.54
5	Kualiti Alam Sdn Bhd	133,507.97	6.62
6	Kemudahan Buangan Klinikal (Penunu Buangan Klinikal, Gelombang Mikro dan Tapak Pelupusan Selamat)/ *Off-site Clinical Waste Facilities (Incinerator, Microwave and Sanitary Landfill)*	28,375.24	1.41
7	Trienekens (Sarawak) Sdn Bhd	11,393.47	0.56
8	Kemudahan Luar Negara (Export)/ *Foreign Facilities (Export)*	9,353.67	0.46
	JUMLAH/ *TOTAL*	**2,017,280.76**	**100.00**

Jadual 5.4 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas
Table 5.4 Malaysia: Generated Scheduled Waste Manage Under Special Management

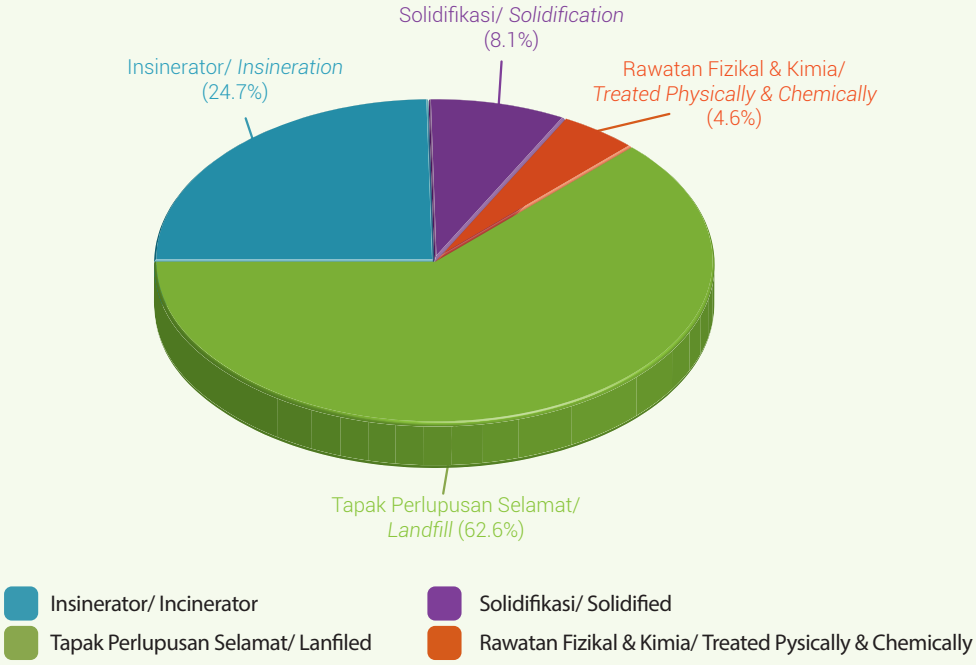
NO.	KATEGORI BUANGAN/ *WASTE CATEGORY*	KOD BUANGAN/ *WASTE CODE*	SUMBER/ *SOURCE*	METRIK TAN/ *TONNES*	PERATUS/ *PERCENTAGE (%)*	KAEDAH PELUPUSAN/ *METHOD OF DISPOSAL)*
1	*Fly Ash & Bottom Ash*	SW 104	Loji Janakuasa elektrik/ *Coal-Fired Power Plant*	363,087.02	71.16	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
			Indusri/ *Industry*	18,515.50	3.63	
2	Enap cemar Logam Berat/ *Heavy Metal Sludge*	SW 204	Loji Rawatan Air Minuman/ *Drinking Water Treatment Plant*	26,032.33	5.10	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
			Indusri/ *Industry*	63,822.59	12.51	
				30,515.88	5.98	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
3	Abu dari enapcemar kertas/ *Ash of Paper Sludge*	SW 406	Indusri/ *Industry*	4,824.78	0.95	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
4	Enap Cemar Mineral/ *Mineral sludge*	SW 427	Indusri/ *Industry*	1,954.05	0.38	Gunasemula sebagai agen peneutralan/ *Reuse as neutralizing agent*
5	Buangan yang mengandungi formaldehid, resin, serbuk epoksi terbuang/ *Waste Containing Formaldehyde, resin, discarded epoxy powder*	SW 320, 325, 418	Indusri/ *Industry*	885.78	0.17	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
6	Campuran buangan terjadual/ *Mixture Of scheduled waste*	SW 421	Indusri/ *Industry*	501.35	0.10	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
7	Kelengkapan yang dicemari dengan buangan terjadual/ *Equipment contaminated with scheduled waste*	SW409	Indusri/ *Industry*	23.40	0.00	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
8	Buangan daripada pengilangan bahan letupan/ *Waste from manufacturing of explosive*	SW431	Indusri/ *Industry*	10.39	0.00	Kaedah Slow Burning/ *Slow Burning method*

Jadual 5.4 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas
Table 5.4 Malaysia: Generated Scheduled Waste Manage Under Special Management

NO.	KATEGORI BUANGAN/ *WASTE CATEGORY*	KOD BUANGAN/ *WASTE CODE*	SUMBER/ *SOURCE*	METRIK TAN/ *TONNES*	PERATUS/ *PERCENTAGE (%)*	KAEDAH PELUPUSAN/ *METHOD OF DISPOSAL)*
9	Produk farmasi terbuang, Produk terbuang/ *Discarded Pharmaceutical Product, Discarded Product*	SW 405, 429	Indusri/ *Industry*	10.00	0.00	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
JUMLAH/ *TOTAL*				**510,206.65**	**100.00**	

Kategori buangan terjadual yang dihantar ke premis berlesen (Kualiti Alam Sdn Bhd dan Trienekens (Sarawak) Sdn Bhd) untuk pelupusan akhir adalah seperti enapcemar yang mengandungi satu atau beberapa logam berat, campuran buangan terjadual, debu/ sanga/ dros atau abu yang mengandungi arsenik/ merkuri dan asid bukan organik terpakai. Buangan tersebut sama ada dibakar, dirawat secara fizikal dan kimia, distabilkan atau dilupuskan di tapak pelupusan selamat bergantung kepada ciri-ciri tertentu. Seperti yang ditunjukkan dalam **Rajah 5.18**, kebanyakan sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah ke tapak pelupusan (62.6%), diikuti dibakar (24.7%), solidifikasi (8.1%) dan rawatan secara fizikal dan kimia (4.6%).

*The categories of wastes sent to the licensed premises (Kualiti Alam Sdn Bhd and Trienekens (Sarawak) Sdn Bhd) for final disposal are sludge containing one or several heavy metals, mixed wastes, dust/slag/dross or ash containing arsenic/ mercury and spent inorganic acid. Such wastes were either incinerated, treated physically and chemically, solidified or disposed off in secured landfill depending on their characteristics. As shown in **Figure 5.18**, most wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were landfilled (62.6%), followed by incinerated (24.7%), solidified (8.1%) and treated physically and chemically (4.6%).*



Rajah 5.18 Kualiti Alam and Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2017
Figure 5.18 Kualiti Alam and Trienekens: Types of Treatment and Disposal of Waste, 2017

ANNEX

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS				
		I	IIA/IIB	III#	IV	V
Al	mg/l	NATURAL LEVEL OR ABSENT	-	(0.06)	0.5	LEVELS ABOVE IV
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr (IV)	mg/l		0.05	1.4 (0.05)	0.1	
Cr (III)	mg/l		-	2.5	-	
Cu	mg/l		0.02	-	0.2	
Hardness	mg/l		250	-	-	
Ca	mg/l		-	-	-	
Mg	mg/l		-	-	-	
Na	mg/l		-	-	3 SAR	
K	mg/l		-	-	-	
Fe	mg/l		1	1	1 (Leaf) 5 (Others)	
Pb	mg/l		0.05	0.02* (0.01)	5	
Mn	mg/l		0.1	0.1	0.2	
Hg	mg/l		0.001	0.004 (0.0001)	0.002	
Ni	mg/l		0.05	0.9*	0.2	
Se	mg/l		0.01	0.25 (0.04)	0.02	
Ag	mg/l		0.05	0.0002	-	
Sn	mg/l		-	0.004	-	
U	mg/l		-	-	-	
Zn	mg/l		5	0.4*	2	
B	mg/l		1	(3.4)	0.8	
Cl	mg/l		200	-	80	
Cl_2	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO_2	mg/l		0.4	0.4 (0.03)	-	
NO_3	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Silica	mg/l		50	-	-	
SO_4	mg/l		250	-	-	
S	mg/l		0.05	(0.001)	-	
CO_2	mg/l		-	-	-	
Gross-α	Bq/l		0.1	-	-	
Gross-β	Bq/l		1	-	-	
Ra-226	Bq/l		< 0.1	-	-	
Sr-90	Bq/l		< 1	-	-	
CCE	µg/l		500	-	-	-
MBAS/BAS	µg/l		500	5000 (200)	-	-
O & G (Mineral)	µg/l		40; N	N	-	-
O & G (Emulsified Edible)	µg/l		7000; N	N	-	-
PCB	µg/l	NATURAL LEVEL OR ABSENT	0.1	6 (0.05)	-	-
Phenol	µg/l		10	-	-	-
Aldrin/Dieldrin	µg/l		0.02	0.2 (0.01)	-	-
BHC	µg/l		2	9 (0.1)	-	-
Chlordane	µg/l		0.08	2 (0.02)	-	-
t-DDT	µg/l		0.1	(1)	-	-
Endosulfan	µg/l		10	-	-	-
Heptachlor/Epoxide	µg/l		0.05	0.9 (0.06)	-	-
Lindane	µg/l		2	3 (0.4)	-	-
2,4-D	µg/l		70	450	-	-
2,4,5-T	µg/l		10	160	-	-
2,4,5-TP	µg/l		4	850	-	-
Paraquat	µg/l		10	1800	-	-

Notes :

** = At hardness 50 mg/l CaCO3*
 # = Maximum (unbracketed) and 24-hour average (bracketed) concentrations
N = Free from visible film sheen, discolouration and deposits

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III#	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Dissolved Oxygen	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5 - 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	S/cm	1000	1000	-	-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solid	mg/l	500	1000	-	-	4000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Temperature	oC	-	Normal + 2 oC	-	Normal + 2 oC	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Coliform**	count/100 ml	10	100	400	5000 (20000)a	5000 (20000)a	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000

Notes :

N : No visible floatable materials or debris, no objectional odour or no objectional taste
** : Related parameters, only one recommended for use*
*** : Geometric mean*
a : Maximum not to be exceeded

WATER CLASSES AND USES

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

DOE WATER QUALITY CLASSIFICATION BASED ON WATER QUALITY INDEX

SUB INDEX& WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand (BOD)	91 - 100	80 - 90	0 - 79
Ammoniacal Nitrogen (NH_3-N)	92 - 100	71 - 91	0 - 70
Suspended Solids (SS)	76 - 100	70 - 75	0 - 69
Water Quality Index (WQI)	81 - 100	60 - 80	0 - 59

DOE WATER QUALITY INDEX CLASSIFICATION

PARAMETER	UNIT	CLASS				
		I	II	III	IV	V
Ammoniacal Nitrogen	mg/l	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	> 2.7
Biochemical Oxygen Demand	mg/l	< 1	1 – 3	3 – 6	6 – 12	> 12
Chemical Oxygen Demand	mg/l	< 10	10 – 25	25 – 50	50 – 100	> 100
Dissolved Oxygen	mg/l	> 7	5 – 7	3 – 5	1 – 3	< 1
pH	-	> 7.0	6.0 – 7.0	5.0 – 6.0	< 5.0	> 5.0
Total Suspended Solid	mg/l	< 25	25 – 50	50 – 150	150 – 300	> 300
Water Quality Index (WQI)		> 92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	< 31.0

WQI FORMULA AND CALCULATION

FORMULA

WQI = (0.22 * SIDO) + (0.19 * SIBOD) + (0.16 * SICOD) + (0.15 * SIAN) + (0.16 * SISS) + (0.12 * SIpH)

where;
SIDO = Subindex DO (% saturation)
SIBOD = Subindex BOD
SICOD = Subindex COD
SIAN = Subindex NH3-N
SISS = Subindex SS
SIpH = Subindex pH
0 ≤ WQI ≤ 100

BEST FIT EQUATIONS FOR THE ESTIMATION OF VARIOUS SUBINDEX VALUES

Subindex for DO (in % saturation)

SIDO = 0	for x ≤ 8
SIDO = 100	for x ≥ 92
SIDO = -0.395 + 0.030x2 - 0.00020x3	for 8 < x < 92

Subindex for BOD

SIBOD = 100.4 - 4.23x	for x ≤ 5
SIBOD = 108 * exp(-0.055x) - 0.1x	for x > 5

Subindex for COD

SICOD = -1.33x + 99.1	for x ≤ 20
SICOD = 103 * exp(-0.0157x) - 0.04x	for x > 20

Subindex for NH3-N

SIAN = 100.5 - 105x	for x ≤ 0.3
SIAN = 94 * exp(-0.573x) - 5 * I x – 2 I	for 0.3 <x< 4
SIAN = 0	for x ≥ 4

Subindex for SS

SISS = 97.5 * exp(-0.00676x) + 0.05x	for x ≤ 100
SISS = 71 * exp(-0.0061x) - 0.015x	for 100 < x < 1000
SISS = 0	for x ≥ 1000

Subindex for pH

SIpH = 17.2 - 17.2x + 5.02x2	for x < 5.5
SIpH = -242 + 95.5x - 6.67x2	for 5.5 ≤ x< 7
SIpH = -181 + 82.4x - 6.05x2	for 7 ≤ x < 8.75
SIpH = 536 - 77.0x + 2.76x2	for x ≥ 8.75

Note:
** means multiply with*

WQI FORMULA AND CALCULATION

MWQI = SI DO0.2 x SI NH30.16 x SI FC0.14 x SI TSS0.14 x SI O&G0.13 x SI NO30.12 x SI PO40.11

where;
SIDO = Subindex Dissolved Oxygen
SINH3 = Subindex Unionized Ammonia
SIFC = Subindex Faecal Coliform
SITSS = Subindex Total Suspended Solids
SIO&G = Subindex Oil and Grease
SINO3 = Subindex Nitrate
SIPO4 = Subindex Phosphate
0 ≤ MWQI ≥ 100

BEST FIT EQUATIONS FOR THE ESTIMATION OF VARIOUS SUBINDEX VALUES

Dissolved Oxygen (DO) in mg/L
For DO between 3 and 7
$SI(DO) = -85.816 + 55.476(DO) – 4.142(DO)2$
If DO is less than 3, or more than 10, SI = 10%
Ammonia (Unionized) (NH3) in mg-N/L*
$SI(NH3) = 100exp^{-4.6(NH3)}$
* If Ammoniacal Nitrogen (NH3+-N) is measured, convert the value into unionized ammonia.
Faecal Coliform (FC) in MPN/100ml
$SI(FC) = 100exp^{-0.005(FC)}$
If FC ≥ 500 MPN, SI = 8%
Total Suspended Solids (TSS) in mg/L
$SI(TSS) = 95.8exp^{-0.0043(TSS)}$
If TSS > 100 mg/L, SI = 20%
Oil & Grease (OG) in mg/L
$SI(OG) = 98exp^{-0.21(OG)}$
Nitrate (NO3) in mg-N/L
$SI(NO3) = 94.83exp^{-0.35(NO3)}$
Phosphate (PO4) in mg-P/L
$SI(PO4) = 95.2exp^{-0.002(PO4*1000)}$

UNIONIZED AMMONIA CALCULATION

In order to convert the concentration of total ammoniacal nitrogen into unionized ammonia, calculate (a), (b), (c) and (d). Substitute the results into equation 1.

a. Calculation of Ionic Strength (IS)

$$IS = \frac{19,9273*Salinity}{(1000-1.005109*Salinity)}$$

Salinity in part per thousand (ppt)

b. Calculation of PKa

$$PKa = (0.0901821 + \frac{272,92}{(Temp+273,15)}) + IS(0.1552-0.000314*Temp)$$

Temperature in ^{O}C

c. Calculation of working pH

pHsw = pH – (0.0007 x IS) – 0.131

d. Calculation of mole fraction for unionized ammonia

$$\text{Mole Fraction} = \frac{1}{1+10^{(PKa-pHsw)}}$$

Equation:

Unionized ammonia =
Total ammoniacal nitrogen x mole fraction

Total ammoniacal nitrogen should be measured in ug/l