



Laporan **KUALITI ALAM SEKELING**
ENVIRONMENTAL QUALITY REPORT

2018

JABATAN ALAM SEKITAR

KEMENTERIAN TENAGA, SAINS, TEKNOLOGI, ALAM SEKITAR DAN PERUBAHAN IKLIM
MINISTRY OF ENERGY, SCIENCE, TECHNOLOGY, ENVIRONMENT AND CLIMATE CHANGE



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Department of Environment, Malaysia

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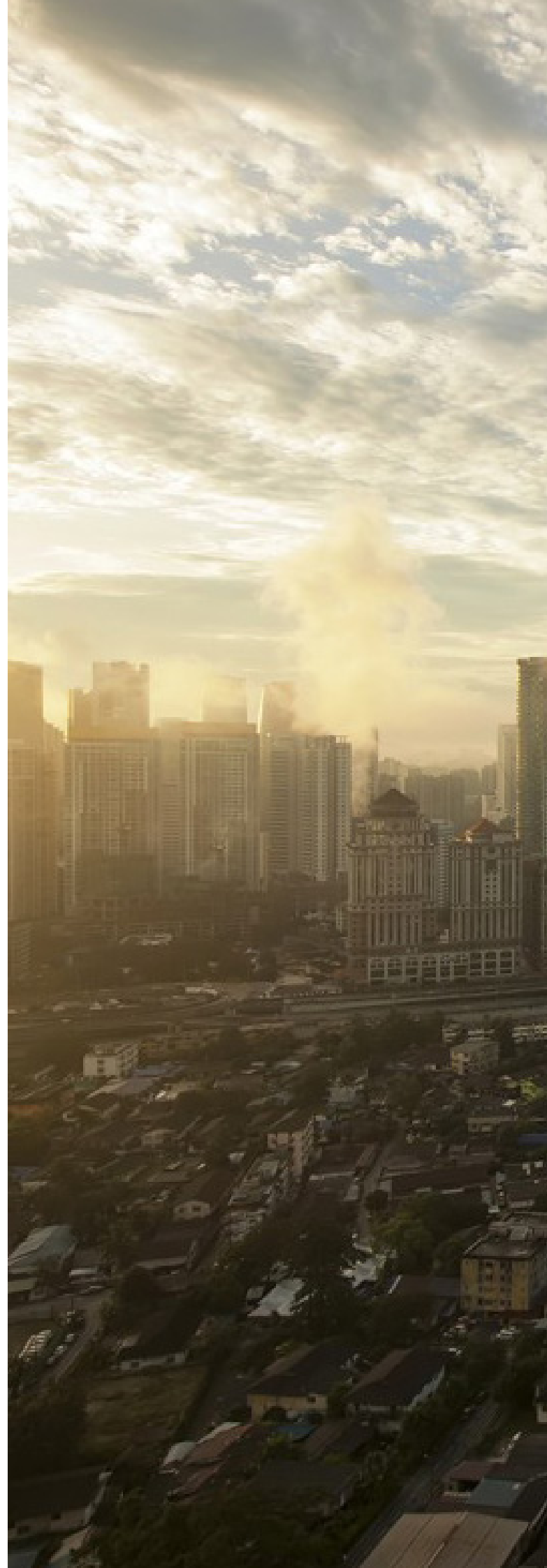
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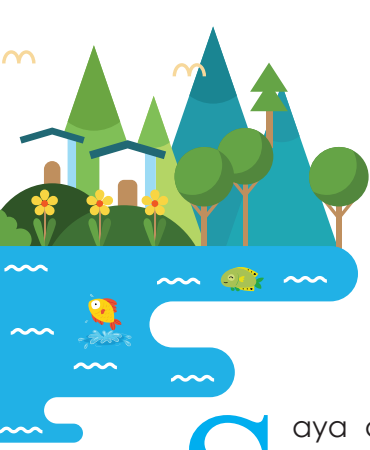
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PRAKATA

FOREWORD

Saya amat berbesar hati untuk membentangkan Laporan Kualiti Alam Sekeliling 2018 seperti yang dikehendaki di bawah Seksyen 3(1)(i) Akta Kualiti Alam Sekeliling 1974.

Pada pertengahan bulan Ogos 2018, Malaysia mengalami keadaan yang agak sedikit berjerebu akibat daripada jerebu setempat dan jerebu merentas sempadan. Walaubagaimanapun, jerebu tersebut adalah di dalam tempoh yang singkat saja.

Berdasarkan Indeks Pencemar Udara (IPU), kualiti udara keseluruhan bagi Malaysia pada tahun 2018 adalah berstatus sederhana. Peningkatan ketara IPU yang disebabkan oleh PM2.5 menyebabkan bilangan hari yang tidak sihat meningkat pada tahun 2018 dibandingkan dengan tahun 2017.

Kualiti persekitaran marin kawasan pantai, kuala dan pulau menunjukkan peningkatan pada tahun 2018. Sementara itu, kualiti air sungai yang ditentukan dari segi IKA telah menunjukkan peningkatan pada tahun 2018. Peratus bilangan sungai yang dikategorikan sebagai bersih telah sedikit meningkat kepada 56% pada tahun 2018 berbanding 46% pada tahun sebelumnya. Peratus bilangan sungai yang dikategorikan sebagai tercemar telah sedikit menurun daripada 11% pada tahun 2017 kepada 8% pada tahun 2018.

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

It is my pleasure to present the Environmental Quality Report 2018 as required under Section 3(1)(i) of the Environmental Quality Act 1974.

In mid-August 2018, Malaysia experienced slight haze episode due to local and transboundary haze. However, the haze episode lasted for a short period of time only.

Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2018 was at moderate levels. Drastic increase in API reading was mainly due to PM2.5 and caused an increase in the number of unhealthy days recorded in 2018 compared to 2017.

The quality of the marine environment with respect to coastal, estuarine and island areas has increased in year 2018. Meanwhile, the river water quality in terms of WQI had shown an improvement in 2018. The percentage of clean rivers has slightly increased to 56% in 2018 compared to 46% in the previous year. The percentage of polluted river has slightly decreased from 11% in 2017 to 8% in 2018.

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

“Alam Sekitar,
Tanggungjawab Bersama”
“Environment, Our
Shared Responsibility”

NORLIN

Norlin Jaafar

NORLIN BT JAAFAR

Ketua Pengarah
Kualiti Alam Sekeliling Malaysia
*Director-General Of
Environmental Quality Malaysia*



Kualitas Udara

Air Quality



BAB 1

Chapter



PENGAWASAN KUALITI UDARA

Bermula pada pertengahan April 2017, JAS telah menaiktaraf rangkaian pengawasan kualiti udara di seluruh negara dengan penambahan bilangan stesen pengawasan kualiti udara automatik kepada 65 stesen di bawah Program Pengawasan Kualiti Alam Sekitar (EQMP) yang baru. 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 akan memberi kesan terhadap kesihatan awam dan alam sekitar.

Status kualiti udara di Malaysia adalah ditunjukkan menerusi bacaan Indeks Pencemar Udara (IPU) dan bacaan IPU seluruh negara sentiasa dipaparkan di laman web APIMS. IPU adalah dikira berdasarkan kepekatan enam bahan pencemar utama iaitu ozon di permukaan bumi (O_3), karbon monoksida (CO), nitrogen dioksida (NO_2), sulfur dioksida (SO_2), habuk halus bersaiz kurang dari 10 mikron (PM_{10}) dan habuk halus bersaiz kurang dari 2.5 mikron ($PM_{2.5}$). IPU ini dikategorikan sebagai baik, sederhana, tidak sihat, sangat tidak sihat dan berbahaya (**Jadual 1.1**). Bermula pada 16 Ogos 2018, pengiraan IPU Malaysia telah mengambil kira kepekatan habuk halus yang bersaiz diameter 2.5 mikron dan ke bawah ($PM_{2.5}$).

AIR QUALITY MONITORING

In mid-April 2017, DOE has upgraded the air quality monitoring network by increasing the number of stations to 65 continuous monitoring stations under the new Environmental Quality Monitoring Programme (EQMP). These stations are strategically located in urban, suburban and industrial areas to monitor any significant changes in the air quality which may impact the human health and the environment.

The air quality status is reported as Air Pollution Index (API) and always been displayed in Air Pollutant Index Management System (APIMS) website. The API is calculated based on the concentration of six major pollutants which are ground level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter 10 microns or less in diameter (PM_{10}) and particulate matter 2.5 microns or less in diameter ($PM_{2.5}$). The API is categorized as good, moderate, unhealthy, very unhealthy and hazardous according to its range as presented in **Table 1.1**. From 16th August 2018, the particulate matter 2.5 microns or less in diameter ($PM_{2.5}$) was included in the API calculation for the country.

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

IPU/API	STATUS KUALITI UDARA/AIR QUALITY STATUS
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 2018 adalah berstatus sederhana. Bacaan IPU yang dikira berdasarkan kepada parameter habuk halus $PM_{2.5}$. Parameter $PM_{2.5}$ adalah sangat halus dan stabil dalam udara. Peningkatan ketara IPU yang disebabkan oleh $PM_{2.5}$ menyebabkan bilangan hari yang tidak sihat meningkat pada tahun 2018 dibandingkan dengan tahun 2017.

Pada pertengahan bulan Ogos bagi tahun 2018, Malaysia mengalami keadaan yang agak sedikit berjerebu akibat daripada jerebu setempat dan jerebu merentas sempadan dari negara jiran sehingga menyebabkan beberapa tempat mencatatkan bacaan IPU yang sangat tidak sihat iaitu di ILP Miri, Sarawak dengan mencatatkan bacaan IPU 229 dan Klang, Selangor dengan bacaan IPU 227. Ini adalah kerana terdapat beberapa kejadian kebakaran belukar setempat yang menyebabkan kualiti udara di dalam negara merosot dan jerebu yang merentas sempadan akibat kebakaran tanah dan hutan di negara jiran. Walau bagaimanapun, jerebu tersebut adalah di dalam tempoh yang singkat akibat faktor cuaca lembap sepanjang tahun di rantau ini.

Habuk halus bersaiz kurang dari 2.5 mikron, $PM_{2.5}$ adalah merupakan pencemar utama apabila berlakunya kebakaran hutan dan tanah gambut. Tren kepekatan harian $PM_{2.5}$ di kawasan Klang pada tahun 2018 adalah lebih tinggi berbanding tahun 2017 terutama pada musim panas iaitu di antara bulan Julai hingga Oktober 2018. Ini seperti yang ditunjukkan di dalam **Rajah 1.1(a)**.

AIR QUALITY STATUS

Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2018 was at moderate levels. This was due to the inclusion of $PM_{2.5}$ in API calculation. $PM_{2.5}$ are very fine particles which are very stable in the air. Drastic increase in API reading was mainly due to $PM_{2.5}$ and caused an increase in the number of unhealthy days recorded in 2018 compared to 2017.

In mid-August 2018, Malaysia experienced slight haze episode due to local and transboundary haze from neighboring countries which resulted in a number of very unhealthy API readings at ILP Miri, Sarawak which recorded API reading at 229 and Klang, Selangor at 227. There were a few incidents of local bush fires that caused deterioration in local air quality in the country as well as transboundary haze caused by land and forest fires in neighboring countries. However, the haze episode lasted for a short period of time due to the humid weather condition in the region.

$PM_{2.5}$ was known as the predominant pollutant from forest and peatland fires. The daily $PM_{2.5}$ concentration trend in 2018 at Klang was slightly higher compared to 2017 especially during hot weather period between July and August 2018 as shown in **Figure 1.1(a)**.

Rajah 1.1(b) menunjukkan kepekatan harian $PM_{2.5}$ bagi ketiga-tiga jenis kategori stesen terpilih di kawasan bandar (Klang), sub-bandar (Kuantan) dan luar bandar (Kapit). Tren menunjukkan paras yang menghampiri dan lebih daripada standard kualiti udara ambien terutama bagi stesen di kawasan bandar adalah Klang dan juga di kawasan sub-bandar adalah Kuantan di mana banyak pembakaran terbuka berlaku di kawasan tersebut pada musim panas. Standard kualiti udara ambien bagi tahun 2018 adalah menggunakan Standard Kualiti Udara Ambien Malaysia IT-2 (**Jadual 1.2.**)

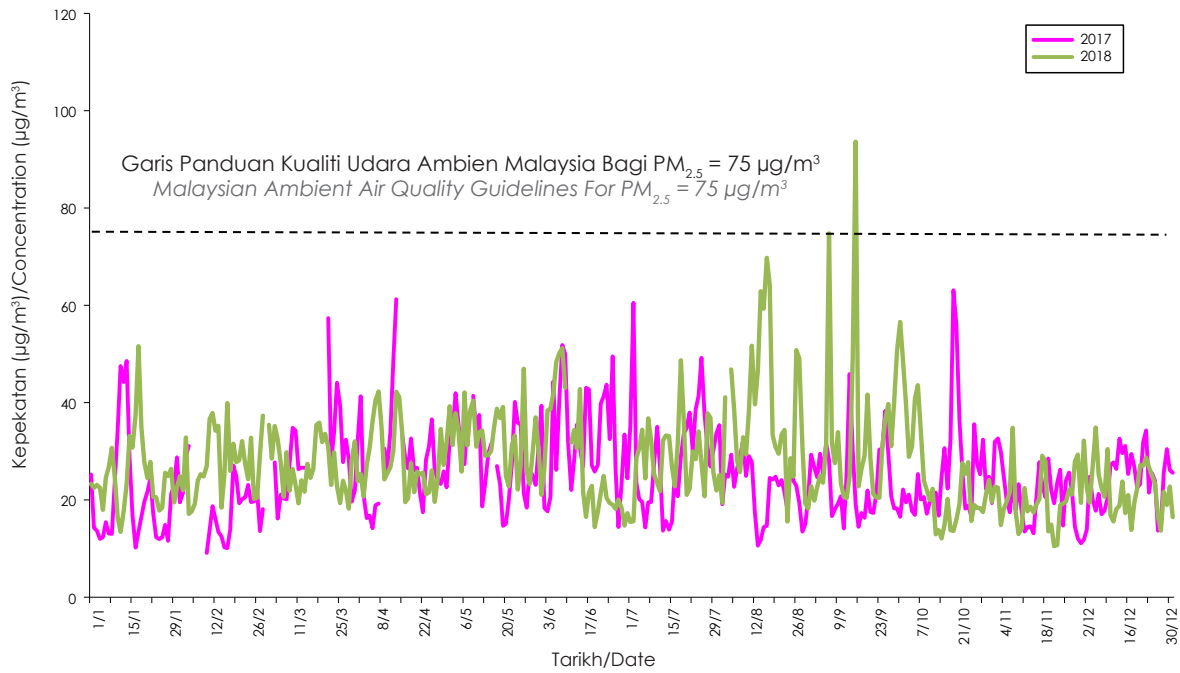
Selain pencemar $PM_{2.5}$, ozon di permukaan bumi (O_3) merupakan pencemar udara yang menjadi perhatian. Ia terhasil akibat tindak balas sebatian-sebatian organik meruap (Volatile Organic Compounds, VOCs) dan oksid-oksida nitrogen (NO_x) dengan kehadiran cahaya matahari. Cuaca panas terik menggalakkan lagi pembentukan pencemar O_3 . Punca utama VOCs dan NO_x 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.

Kadangkala terdapat kepekatan maksimum harian bagi parameter O_3 dalam tempoh 1 jam adalah melebihi Standard Kualiti Udara Ambien Malaysia terutamanya di beberapa kawasan di Lembah Klang, Negeri Perak dan Negeri Sembilan [**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.

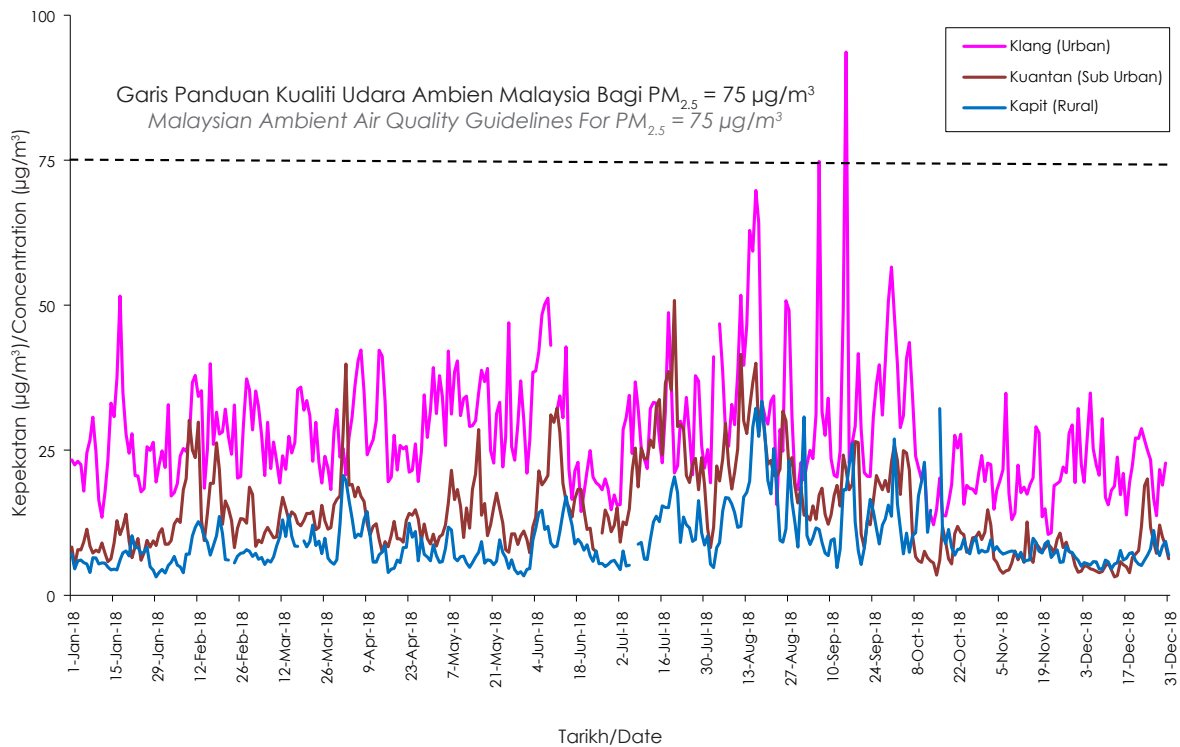
Figure 1.1(b) presented the daily concentrations of $PM_{2.5}$ from three categories of stations namely urban (Klang), suburban (Kuantan) and rural (Kapit). The trend showed that the levels of $PM_{2.5}$ concentrations were high and some even exceeded the ambient air quality standards especially in urban (Klang) and suburban area (Kuantan), which may be due to open burning activities during the hot weather season. The ambient air quality standard for 2018 falls under the IT-2 of MAAQS. (**Table 1.2.**)

Other than $PM_{2.5}$, ground level ozone (O_3) was identified as pollutant of concern. O_3 is formed from the chemical reaction between Volatile Organic Compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. Formation of O_3 is further elevated during clear sunny day. Major sources of VOCs and NO_x were mainly from industries and motor vehicles especially in urban areas. Several unhealthy days recorded at various locations in the Klang Valley, Perak and Negeri Sembilan.

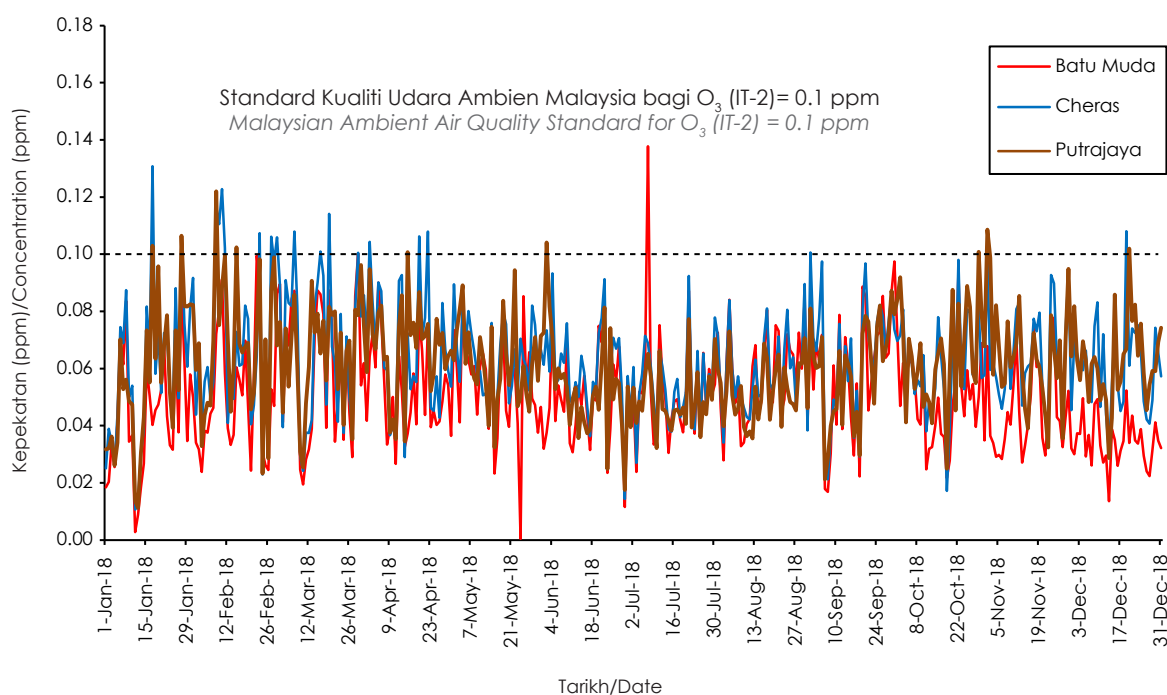
Occasionally, the daily maximum 1-hour concentration of O_3 exceeded the Malaysian Ambient Air Quality Standard at several stations in the Klang Valley, Perak and Negeri Sembilan [**Figure 1.1(c), Figure 1.1(d) and Figure 1.1(e)**]. These conditions led to a number of unhealthy days recorded in some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



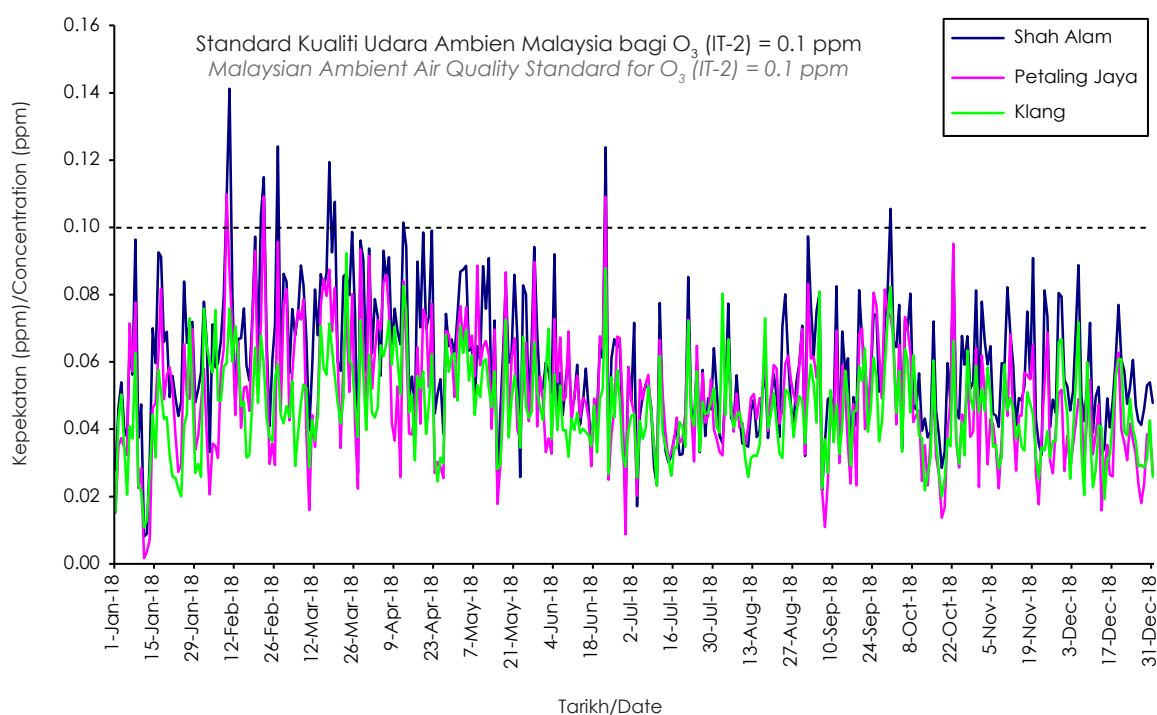
Rajah 1.1 (a) : Tren Kepekatan 24 jam bagi Pepejal Terampai ($PM_{2.5}$), Klang, 2017 dan 2018
 Figure 1.1 (a) : Trend of 24-hour Concentration of Particulate Matter ($PM_{2.5}$), Klang, 2017 and 2018



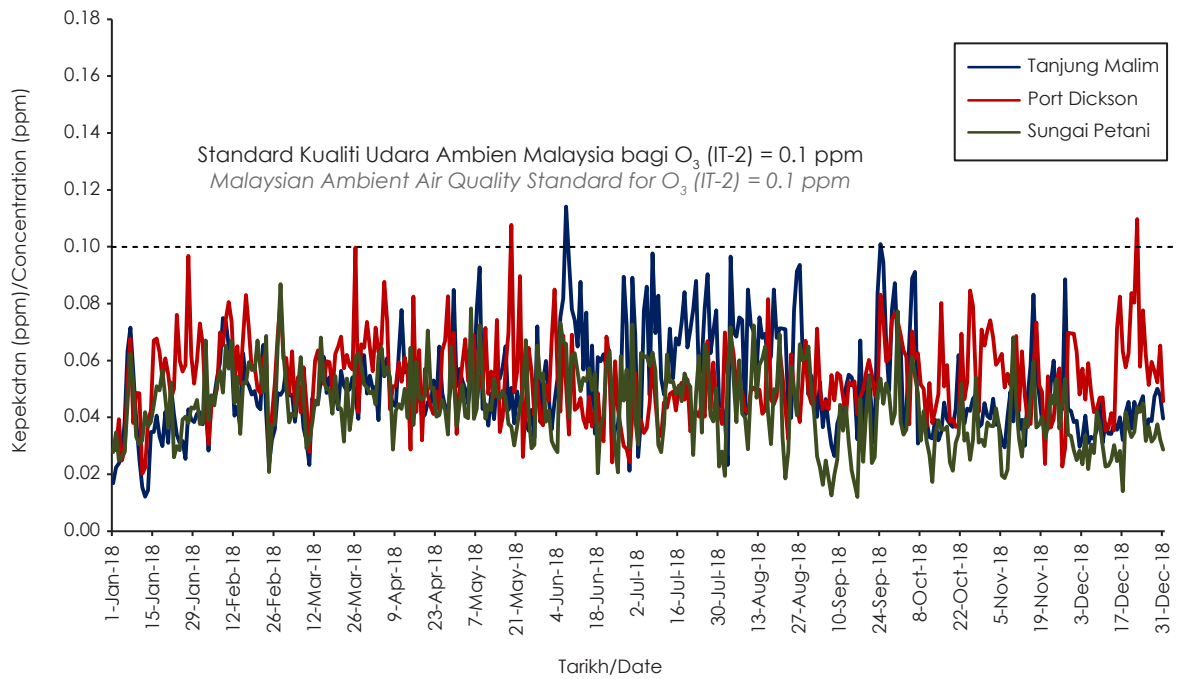
Rajah 1.1 (b) : Tren Kepekatan 24 jam bagi Pepejal Terampai ($PM_{2.5}$), Malaysia, 2018
 Figure 1.1 (b) : Trend of 24-hour Concentration of Particulate Matter ($PM_{2.5}$), Malaysia, 2018



Rajah 1.1 (c) :Tren Kepekatan Maksimum 1 Jam Harian Ozon (O₃), Lembah Klang, 2018
 Figure 1.1 (c) : Trend of Daily Maximum 1-hour Concentration of Ozone (O₃), Klang Valley, 2018



Rajah 1.1 (d) :Tren Kepekatan Maksimum 1 Jam Harian Ozon (O₃), Lembah Klang, 2018
 Figure 1.1 (d) : Trend of Daily Maximum 1-hour Concentration of Ozone (O₃), Klang Valley, 2018



Rajah 1.1 (e) : Tren Kepekatan Maksimum 1 Jam Harian Ozon (O₃), 2018
 Figure 1.1 (e) : Trend of Daily Maximum 1-hour Concentration of Ozone (O₃), 2018



STATUS KUALITI UDARA DI WILAYAH TENGAH

Lembah Klang

Pada tahun 2018, status kualiti udara di Lembah Klang merekodkan semua stesen mencatatkan bacaan hari sederhana sepanjang masa. Status kualiti udara di Lembah Klang secara keseluruhannya di mana Kuala Selangor mencatatkan hari bersih tertinggi iaitu sebanyak 35 hari bagi tahun 2018. **(Rajah 1.2)**

Semua stesen di Lembah Klang mencatatkan bilangan hari yang tidak sihat kecuali di stesen Batu Muda, Klang mencatatkan bacaan hari yang sangat tidak sihat (bacaan IPU di antara 201-300) selama dua (2) hari manakala Shah Alam, Selangor dan Cheras, Kuala Lumpur mencatatkan bilangan hari paras tidak sihat (bacaan IPU di antara 101 – 200) yang tertinggi iaitu sepuluh (10) hari yang disebabkan oleh pencemar ozon aras bumi (O_3). **Rajah 1.2(a)** menunjukkan rekod bilangan hari berdasarkan kepada tahap IPU bagi stesen tersebut.

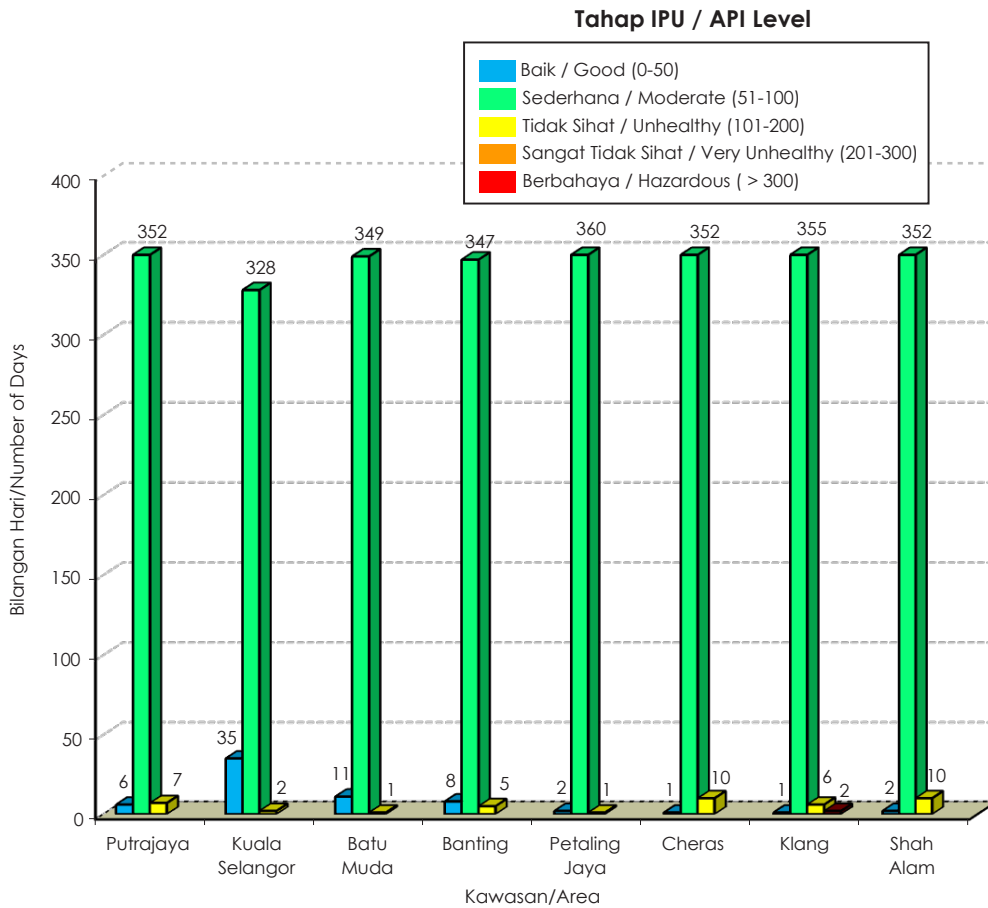
AIR QUALITY STATUS IN CENTRAL REGION

Klang Valley

In 2018, the overall air quality in Klang Valley were at moderate level. Kuala Selangor recorded the highest number of good air quality days at 35 days in 2018. **(Figure 1.2).**

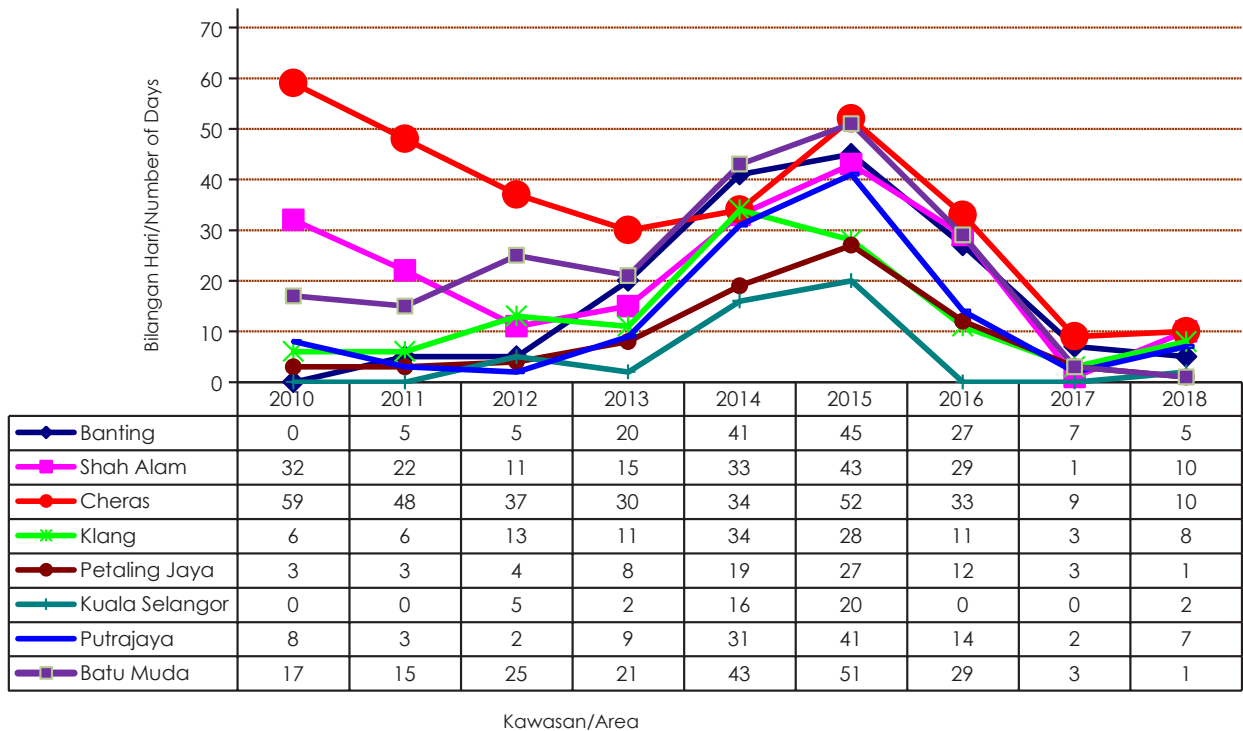
All stations in Klang Valley had recorded unhealthy days except Batu Muda station. Klang station recorded the number of very unhealthy days (API readings between 201 – 300) for 2 days while Shah Alam, Selangor and Cheras, Kuala Lumpur stations recorded the highest number of unhealthy days (API readings between 101 – 200) which were 10 days due to the ground level ozone (O_3). The number of days recorded based on the API level at the aforementioned stations are shown in **Figure 1.2(a).**





Rajah 1.2 : Status Kualiti Udara di Lembah Klang, 2018
Figure 1.2 : Air Quality Status in Klang Valley, 2018

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



Rajah 1.2 (a) : Bilangan Hari Tidak Sihat, Lembah Klang, (2010-2018)
Figure 1.2 (a) : Number of Unhealthy Days, Klang Valley, (2010-2018)

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

STATUS KUALITI UDARA DI WILAYAH UTARA

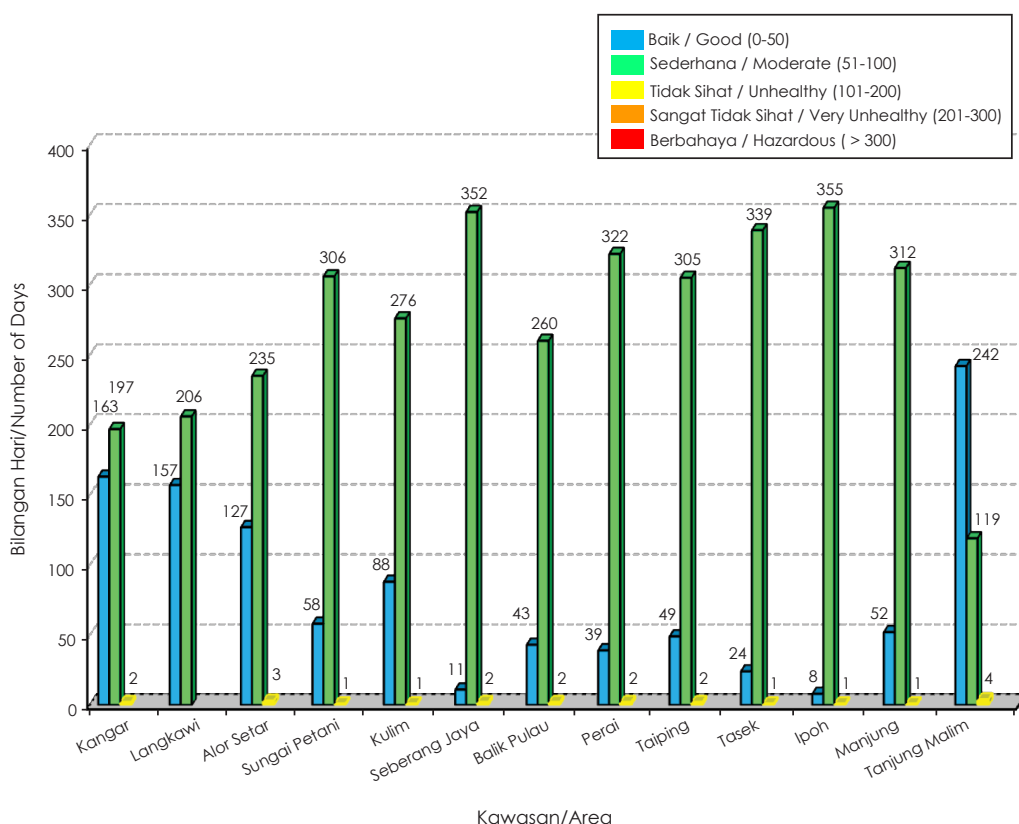
Secara keseluruhan, status kualiti udara di utara Pantai Barat Semenanjung Malaysia yang meliputi Perlis, Kedah, Pulau Pinang dan Perak adalah sederhana sepanjang masa. Semua stesen di wilayah utara telah merekodkan status kualiti udara tidak sihat kecuali Langkawi. Stesen tertinggi yang mencatatkan bacaan hari tidak sihat adalah di Tanjung Malim (4) yang disebabkan oleh O₃ dan Alor Setar (3) yang disebabkan oleh PM_{2.5}. Walau bagaimanapun, stesen di Tanjung Malim mencatatkan bacaan hari bersih yang tertinggi di wilayah utara (242 hari) dan diikuti oleh stesen Kangar (163 hari) dan Langkawi (157 hari).

Rajah 1.3 menunjukkan status kualiti udara keseluruhan bagi wilayah utara Semenanjung Malaysia.

AIR QUALITY STATUS IN NORTHERN REGION

The overall air quality status in the northern region (Perlis, Kedah, Pulau Pinang and Perak), was at moderate level. All stations in the northern region experienced unhealthy air quality status in 2018 except in Langkawi. Stations that recorded the highest number of unhealthy days were in Tanjung Malim (4 days) due to O₃ and Alor Setar (3 days) due to PM_{2.5}. On the other hand, Tanjung Malim station recorded the highest number of healthy days in the northern region (242 days) followed by Kangar (163 days) and Langkawi (157 days).

Figure 1.3 shows the overall air quality status for the northern region of Peninsular Malaysia.



Rajah 1.3 : Status Kualiti Udara, Wilayah Utara Pantai Barat Semenanjung Malaysia, 2018
Figure 1.3 : Air Quality Status in the Northern Region of The West Coast Peninsular Malaysia, 2018

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

STATUS KUALITI UDARA DI WILAYAH SELATAN

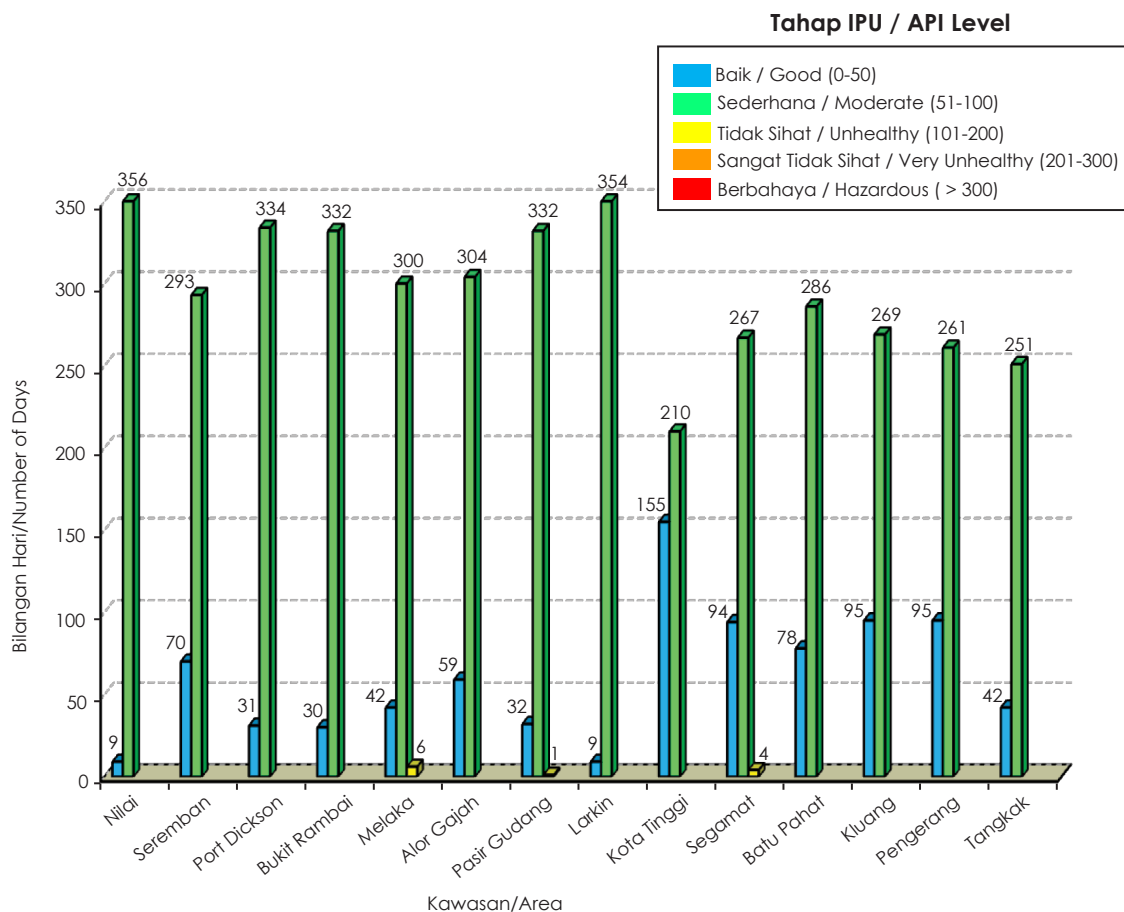
Kualiti udara di Wilayah Selatan Pantai Barat Semenanjung Malaysia yang meliputi Negeri Sembilan, Melaka dan Johor adalah sederhana pada kebanyakan masa. Wilayah selatan menunjukkan (figa) 3 stesen sahaja yang mencatatkan bacaan hari yang tidak sihat iaitu Bandaraya Melaka (6), Segamat (4) dan Pasir Gudang (1) yang disebabkan oleh pencemar ozon, O₃. Manakala stesen Kota Tinggi mencatatkan hari bersih tertinggi di wilayah ini iaitu 155 hari dan diikuti oleh Kluang dan Segamat iaitu masing-masing 95 dan 94 hari.

AIR QUALITY STATUS IN SOUTHERN REGION

In the southern region of Peninsular Malaysia (Negeri Sembilan, Melaka and Johor), the overall air quality status was moderate level. Southern region had only three (3) stations recorded unhealthy days which were Bandaraya Melaka (6 days), Segamat (4 days) and Pasir Gudang (1 days) due to O₃ pollutant. Kota Tinggi station recorded the highest number of healthy days in this region (155 days) followed by Kluang (95 days) and Segamat (94 days).

Rajah 1.4 menunjukkan status kualiti udara secara keseluruhan bagi wilayah selatan Semenanjung Malaysia.

Figure 1.4 shows the overall air quality status for southern region of Peninsular Malaysia.



Rajah 1.4 : Status Kualiti Udara, Wilayah Selatan Pantai Barat Semenanjung Malaysia, 2018
Figure 1.4 : Air Quality Status, Southern Region of The West Coast Peninsular Malaysia, 2018

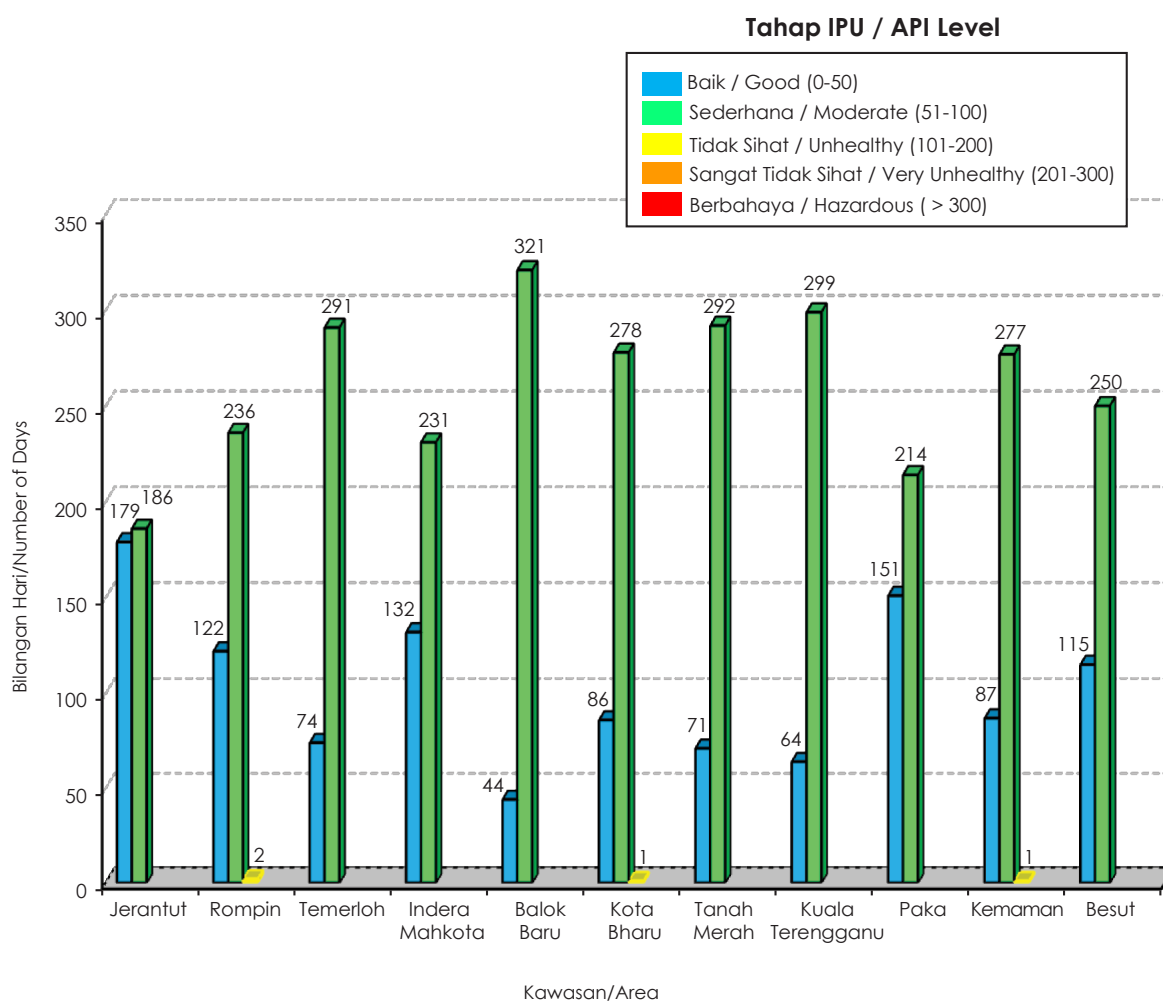
*Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API*

STATUS KUALITI UDARA DI PANTAI TIMUR

Kualiti udara di Pantai Timur Semenanjung Malaysia meliputi Pahang, Terengganu dan Kelantan kekal berstatus baik dan sederhana pada kebanyakan masa, tiga (3) stesen yang mencatatkan status kualiti udara tidak sihat sepanjang tahun 2018 iaitu di Rompin (2), Kemaman (1) dan Kota Bharu (1) yang disebabkan oleh habuk halus PM_{2.5}. Bacaan hari bersih tertinggi dicatatkan di Jerantut (179) dan diikuti oleh Paka (151) dan Indera Mahkota (132) (**Rajah 1.5**)

AIR QUALITY STATUS IN THE EAST COAST

In the East Coast of Peninsular Malaysia (Pahang, Terengganu and Kelantan) the overall air quality was between good to moderate levels most of the time only three (3) stations recorded unhealthy days in 2018, which were Rompin (2 days), Kemaman (1 day) and Kota Bharu (1 day) due to PM_{2.5}. The highest number of healthy days were recorded in Jerantut (179 days) followed by Paka (151 days) and Indera Mahkota (132 days). (**Figure 1.5**).



Rajah 1.5 : Status Kualiti Udara, Pantai Timur Semenanjung Malaysia, 2018
Figure 1.5 : Air Quality Status in the East Coast Peninsular Malaysia, 2018

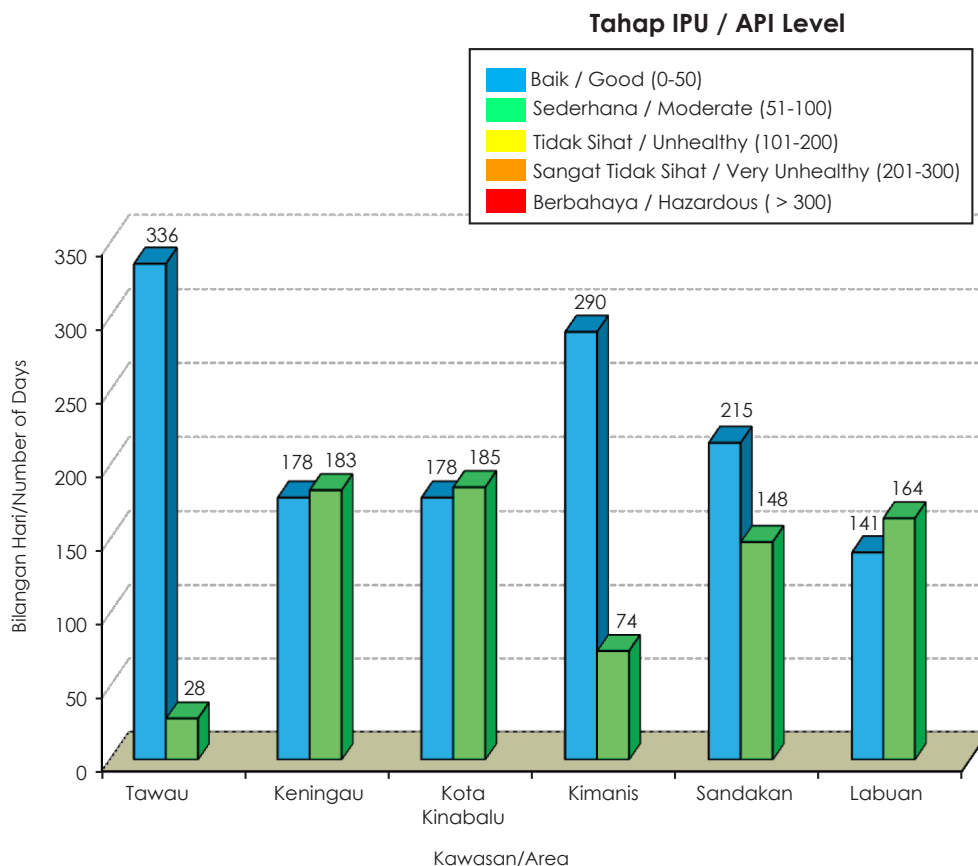
Nota: Bacaan adalah berdasarkan IPU Maksimum Harian
Note: Reading based on daily Maximum API

STATUS KUALITI UDARA DI SABAH, LABUAN DAN SARAWAK

Kualiti udara di Sabah dan Labuan adalah pada tahap baik dan sederhana di kebanyakan masa (**Rajah 1.6**). Walau bagaimanapun, Kualiti udara di Sarawak mencatatkan bacaan 2 hari yang sangat tidak sihat di ILP Miri dan empat (4) stesen di Sarawak yang mencatatkan bacaan hari yang tidak sihat iaitu di Mukah (5), Sibul (2), Kuching (2) dan Bintulu (1) (**Rajah 1.7**). Keadaan ini adalah disebabkan oleh berlakunya kebakaran di kawasan belukar dan ladang setempat serta jerebu merentas sempadan dari Kalimantan, Indonesia.

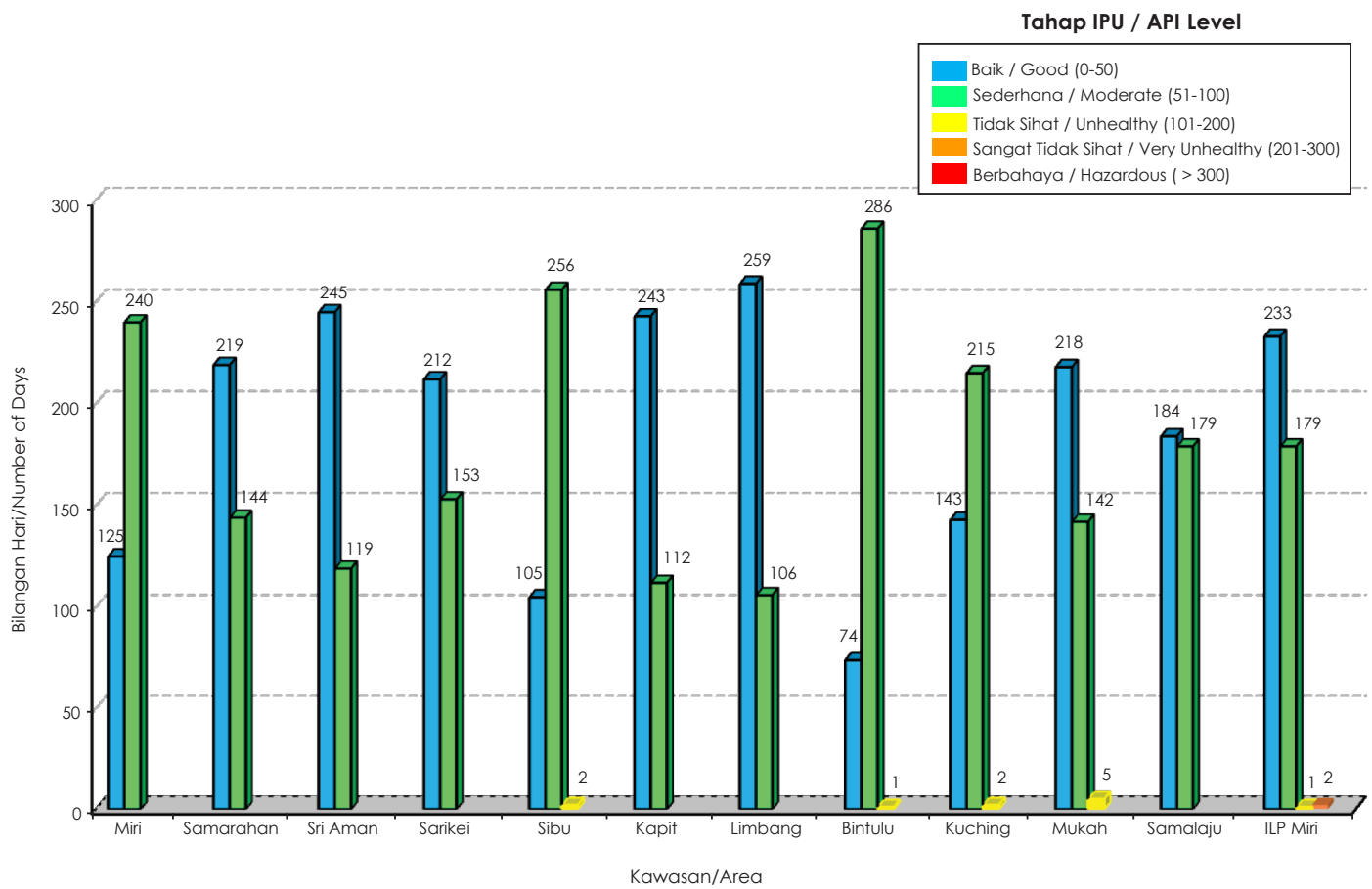
AIR QUALITY STATUS IN SABAH, LABUAN AND SARAWAK

The overall air quality in Sabah, Labuan and Sarawak were in good to moderate level most of the days as presented in Figure 1.6 and Figure 1.7. Four stations in Sarawak experienced unhealthy days which were Mukah (5 days), Sibul (2 days), Kuching (2 days) and Bintulu (1 day). This was due to local bush and orchard fires and transboundary haze from Kalimantan, Indonesia.



Rajah 1.6: Status Kualiti Udara, Sabah dan Labuan, 2018
Figure 1.6 : Air Quality Status, Sabah and Labuan, 2018

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



Rajah 1.7 : Status Kualiti Udara Sarawak, 2018
 Figure 1.7 : Air Quality Status in Sarawak, 2018

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



TREN KUALITI UDARA

Enam (6) pencemar udara iaitu kumin pepejal bersaiz 10 mikron (PM_{10}), kumin pepejal bersaiz 2.5 mikron ($PM_{2.5}$), ozon permukaan bumi (O_3), sulfur dioksida (SO_2), nitrogen dioksida (NO_2) dan karbon monoksida (CO) dipantau secara berterusan di 65 buah lokasi. Parameter $PM_{2.5}$ mula dipantau sepenuhnya pada tahun 2018. Tren kualiti udara dari tahun 2010 hingga 2018 ditentukan dengan mengambilkira purata data kualiti udara tahunan daripada stesen-stesen pengawasan dan merujuk kepada Standard Kualiti Udara Ambien Malaysia. Bagi tahun 2018, Standard Kualiti Udara Ambien Malaysia mengguna pakai IT-2 (Jadual 1.2).

AIR QUALITY TREND

Six (6) air pollutants, namely particulate matter PM_{10} , particulate matter $PM_{2.5}$, ground level ozone (O_3), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) were monitored continuously at 65 locations throughout the country. $PM_{2.5}$ were fully monitored in the year 2018. The air quality trend for the period of 2010 to 2018 was determined by averaging the annual air quality concentrations monitored from monitoring stations and compared to Malaysia. Ambient Air Quality Standard . For 2018, the IT-2 standards were adopted and used as references for all ambient air quality parameters.(Table 1.2)

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

PARAMETER	MASA PURATA/ AVERAGING TIME	UNIT	GARIS PANDUAN SEDIA ADA/ EXISTING GUIDELINES	STANDARD KUALITI UDARA AMBIEN MALAYSIA/ MALAYSIAN AMBIENT AIR QUALITY STANDARD		
				IT-1 (2015)	IT-2 (2018)	STANDARD (2020)
PM_{10}	1 Tahun/Year	$\mu g/m^3$	50	50	45	40
	24 Jam/Hour	$\mu g/m^3$	150	150	120	100
$PM_{2.5}$	1 Tahun/Year	$\mu g/m^3$	-	35	25	15
	24 Jam/Hour	$\mu g/m^3$	-	75	50	35
SO_2	1 Jam/Hour	$\mu g/m^3$	350	350	300	250
		ppm	0.135	0.135	0.115	0.095
	24 Jam/Hour	$\mu g/m^3$	105	105	90	80
		ppm	0.040	0.040	0.035	0.030
*CO	1 Jam/Hour	mg/m^3	35	35	35	30
		ppm	30.6	30.6	30.6	26.2
	8 Jam/Hour	mg/m^3	10	10	10	10
		ppm	8.75	8.75	8.75	8.75
NO_2	1 Jam/Hour	$\mu g/m^3$	320	320	300	280
		ppm	0.170	0.170	0.160	0.150
	24 Jam/Hour	$\mu g/m^3$	75	75	75	70
		ppm	0.040	0.040	0.040	0.037
O_3	1 Jam/Hour	$\mu g/m^3$	200	200	200	180
		ppm	0.100	0.100	0.100	0.090
	8 Jam/Hour	$\mu g/m^3$	120	120	120	100
		ppm	0.060	0.060	0.060	0.050

Nota: * mg/m^3 IT-Interim Tier (tahun)
Note: * mg/m^3 IT-Interim Tier (year)

Kumin Pepejal (PM₁₀)

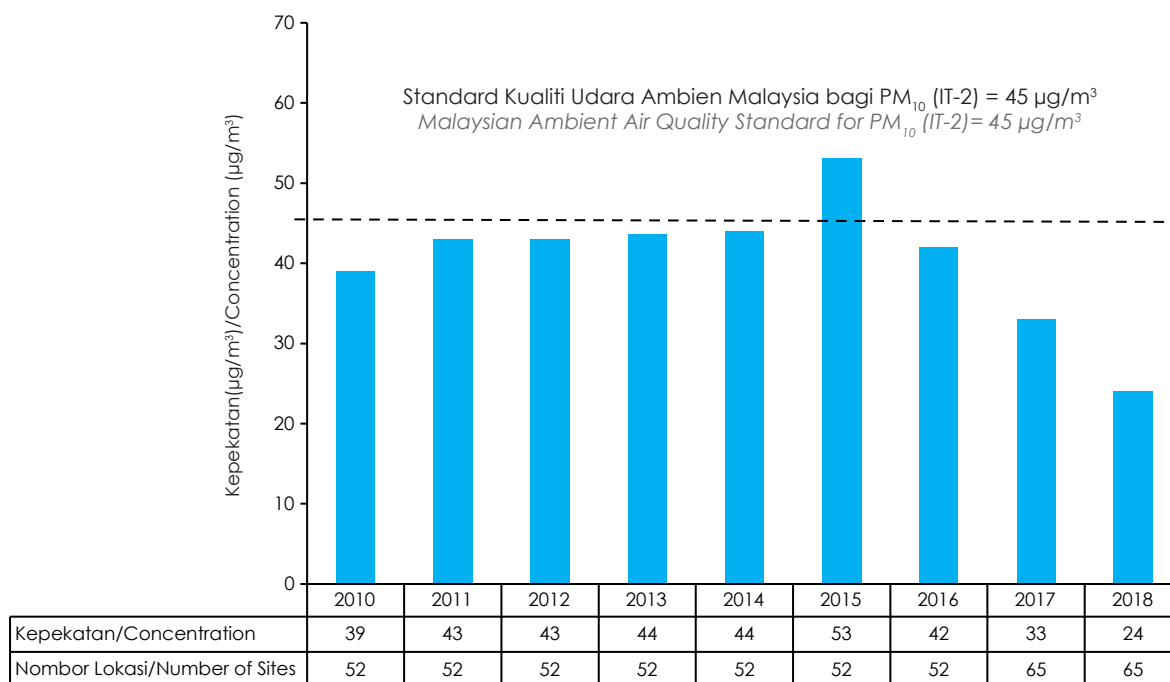
Pada tahun 2018, nilai purata tahunan PM₁₀ dalam udara ambien adalah 24 µg/m³ iaitu masih belum melebihi had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu sebanyak 45 µg/m³. Ini merupakan pengurangan yang paling rendah bagi PM₁₀ yang pernah dicatatkan semenjak dari tahun 2010. Keadaan ini dipengaruhi oleh keadaan cuaca yang lembap sepanjang tahun di Malaysia.

Tren purata tahunan kepekatan PM₁₀ dalam udara ambien bagi tahun 2010 hingga tahun 2018 adalah seperti yang ditunjukkan dalam **Rajah 1.8**. Berdasarkan kategori guna tanah, nilai kepekatan PM₁₀ pada tahun 2018 adalah mematuhi Standard Kualiti Udara Ambien Malaysia bagi IT-2 seperti yang ditunjukkan dalam **Rajah 1.8 (a)**.

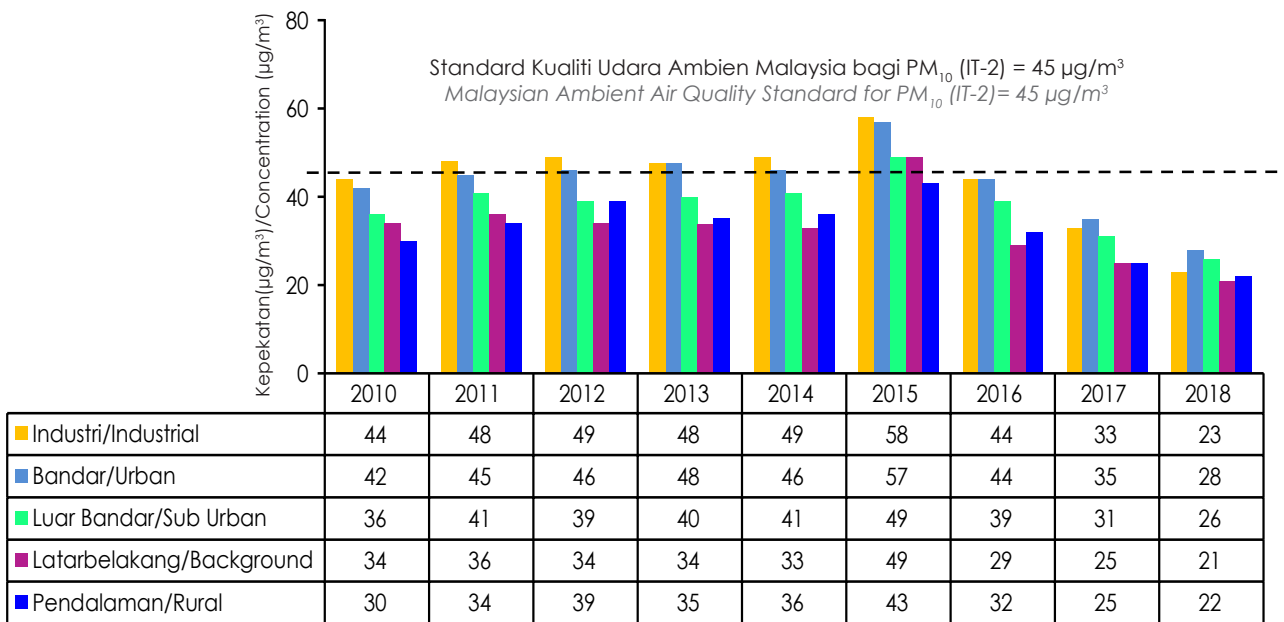
Particulate Matter (PM₁₀)

In 2018, the annual average value of ambient PM₁₀ concentration was 24 µg/m³ which was lower than the IT-2 value of Malaysian Ambient Air Quality Standard value at 45 µg/m³. It was the lowest annual average of PM₁₀ concentration recorded from year 2010 due to the wet and humid weather conditions throughout the year in Malaysia.

The annual average trend of ambient PM₁₀ concentration from 2010 until 2018 were given in **Figure 1.8**. Based on **Figure 1.8(a)**, annual average level of ambient PM₁₀ concentration in 2018 complied with the Malaysia Ambient Air Quality Standard IT-2 for all land use categories.



Rajah 1.8 : Purata Kepekatan Tahunan Kumin Pepejal (PM₁₀), 2010-2018
 Figure 1.8 : Annual Average Concentration of Particulate Matter (PM₁₀), 2010-2018



Rajah 1.8 (a) : Purata Kepekatan Tahunan Kumin Pepejal (PM₁₀) Mengikut Guna Tanah, 2010-2018

Figure 1.8(a) : Annual Average Concentration of Particulate Matter (PM₁₀) by Land Use, 2010-2018

Kumin Pepejal (PM_{2.5})

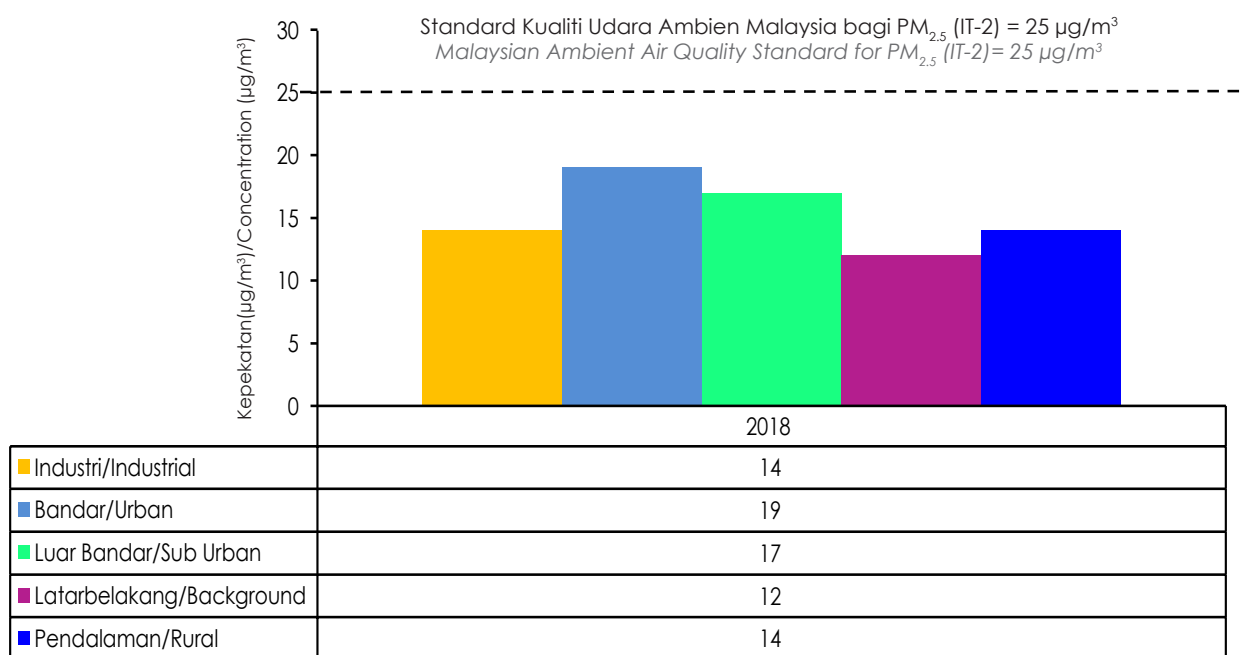
PM_{2.5} mula diukur dan dianalisis bermula pada pertengahan tahun 2017. Walau bagaimanapun, analisis bagi PM_{2.5} dilaporkan di dalam Laporan Kualiti Alam Sekitar bermula pada tahun 2018. Nilai purata tahunan PM_{2.5} dalam udara ambien bagi tahun 2018 adalah 16 µg/m³ iaitu masih belum melebihi had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu sebanyak 25 µg/m³.

Berdasarkan kategori guna tanah, nilai kepekatan PM_{2.5} pada tahun 2018 adalah mematuhi Standard Kualiti Udara Ambien Malaysia bagi IT-2 seperti yang ditunjukkan dalam **Rajah 1.8 (b)**. Daripada rajah tersebut, kepekatan PM_{2.5} tertinggi mengikut guna tanah adalah di kawasan bandar dan diikuti dengan kawasan sub-bandar.

Particulate Matter (PM_{2.5})

The monitoring of PM_{2.5} was started in mid 2017. However, the reporting only starts in 2018. In 2018, the annual average of PM_{2.5} concentration was 16 µg/m³ which was lower than the IT-2 value of Malaysian Ambient Air Quality Standard.

Based on the land use categories, PM_{2.5} concentrations in 2018 was in compliance with Malaysia Ambient Air Quality Standard IT-2 as shown in **Figure 1.8(b)**. The highest PM_{2.5} concentration was at urban followed by suburban.



Rajah 1.8 (b) : Purata Kepekatan Tahunan Kumin Pepejal (PM_{2.5}) Mengikut Guna Tanah, 2018

Figure 1.8(b) : Annual Average Concentration of Particulate Matter (PM_{2.5}) by Land Use, 2018

Ozon Permukaan Bumi (O₃)

Pada tahun 2018, purata tahunan kepekatan maksimum harian ozon didapati sedikit menurun berbanding dengan tahun 2017. Secara keseluruhannya, tren purata tahunan kepekatan maksimum ozon dalam udara ambien dari tahun 2010 hingga 2018 adalah mematuhi had sebanyak 0.1 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 dan tren tersebut adalah seperti yang ditunjukkan dalam **Rajah 1.9**.

Rajah 1.9(a) menunjukkan kepekatan ozon aras bumi untuk pelbagai kategori guna tanah dari tahun 2010 hingga 2018. Bermula tahun 2018, tiada pemantauan ozon dilakukan di kawasan industri kerana untuk memberi keutamaan pemantauan ozon di kawasan bandar. Kawasan bandar mencatatkan bacaan

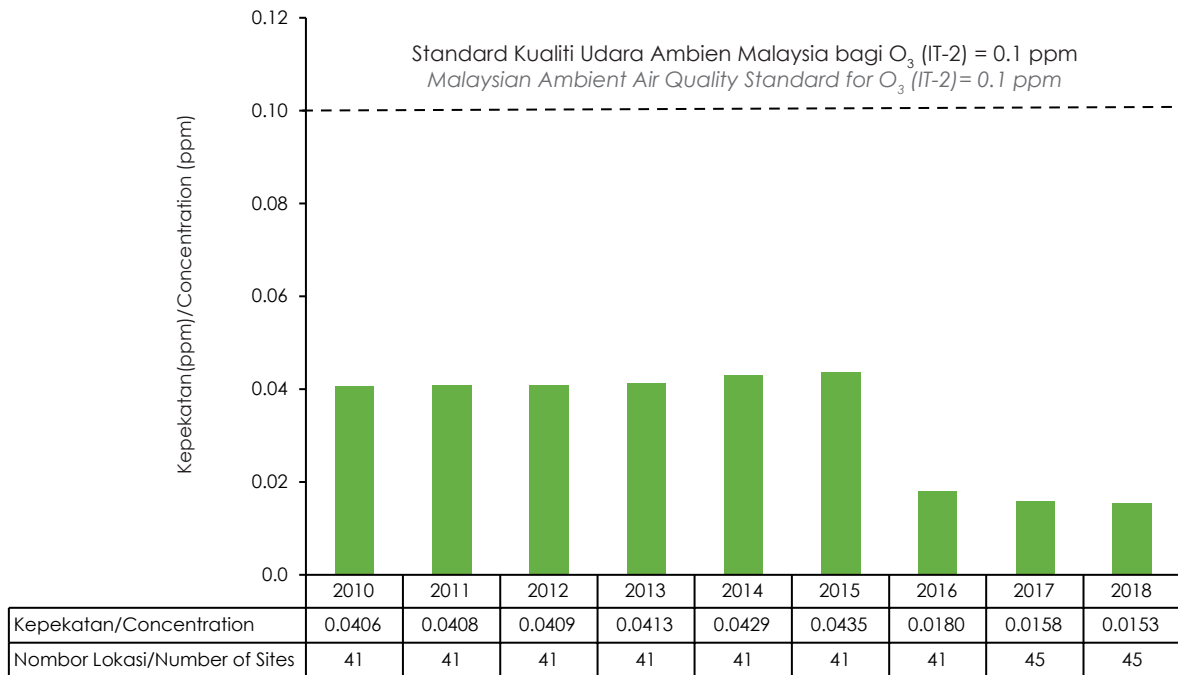
Ground Level Ozone (O₃)

In 2018, the annual average daily maximum one-hour ozone concentrations was slightly lower when compare to 2017. The overall trend of the annual average daily maximum one-hour ozone concentrations from 2010 to 2018 were below the limit of 0.1 ppm as stipulated in the Malaysia Ambient Quality Standard IT-2. The trend is shown in **Figure 1.9**.

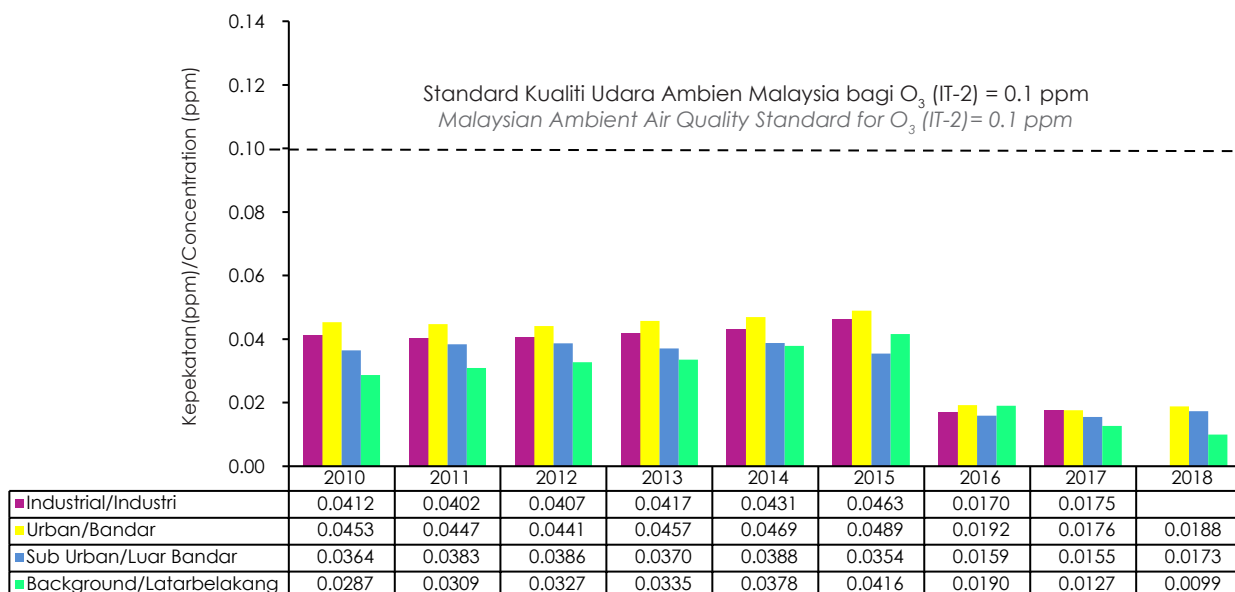
Figure 1.9(a) presents the ground level ozone concentration for various land use categories between 2010 and 2018. Starting in 2018, O₃ parameter was not monitored in industrial area as the priority was given to the urban area. Historically, urban areas has recorded higher levels of ground level ozone in this country which is due to

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-oksida nitrogen (NO_x) dan sebatian organik meruap (VOC) yang kebanyakannya dilepaskan daripada kenderaan bermotor dan industri.

high traffic volume coupled with a conducive atmospheric condition for ground level ozone formation. Ground level ozone pollution was also dominant in some suburban and rural areas due to horizontal transport of ground level ozone precursors, namely oxides of nitrogen (NO_x) and volatile organic compounds (VOC) which were emitted mainly from motor vehicles and industries.



Rajah 1.9 : Purata Kepekatan Tahunan Ozon (O_3), 2010-2018
Figure 1.9 : Annual Average Concentration of Ground Level Ozone (O_3), 2010-2018



Rajah 1.9 (a) : Purata Kepekatan Tahunan Ozon (O₃) Mengikut Guna Tanah, 2010-2018
 Figure 1.9(a) : Annual Average Concentration of Ground Level Ozone (O₃) by Land Use, 2010-2018

Sulfur Dioksida (SO₂)

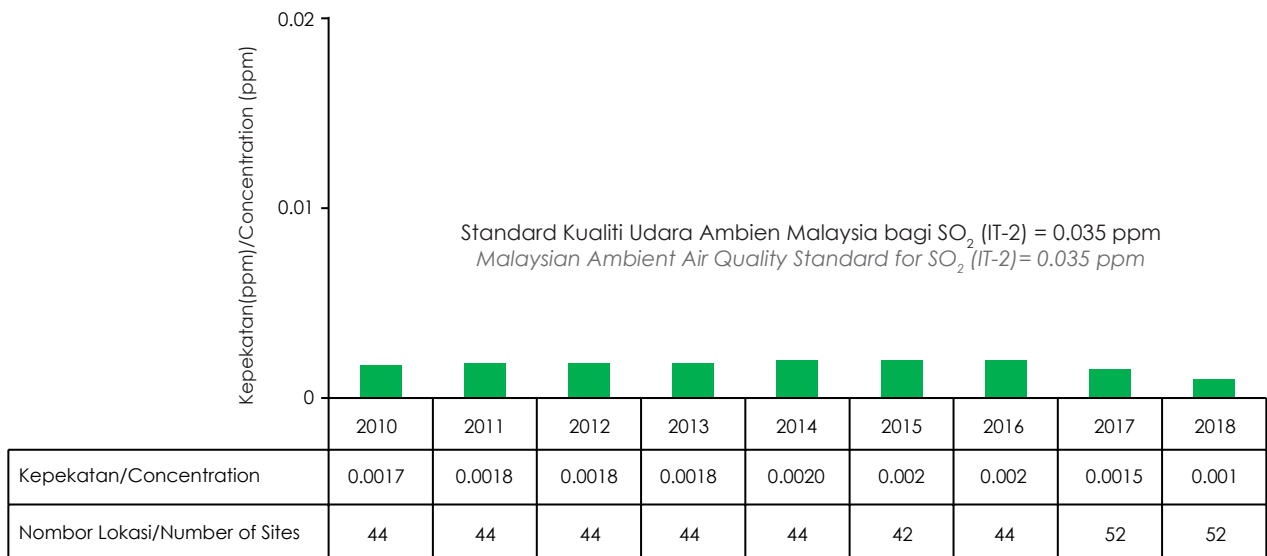
Secara umumnya, purata kepekatan tahunan SO₂ menunjukkan tren penurunan dari tahun 2010 hingga 2018 (**Rajah 1.10**) dan ia adalah jauh di bawah had sebanyak 0.035 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2. Ini adalah disebabkan oleh penggunaan bahan api berkualiti (EURO2M) yang lebih baik di negara ini bermula dari bulan September 2009 dan penguatkuasaan yang lebih tegas oleh JAS serta penggunaan gas asli secara meluas dalam proses industri dan kegunaan kenderaan. Mulai 1 September 2015, EURO4M RON97 telah dilaksanakan dan pada November 2015 EURO5 Diesel yang mengandungi kandungan sulfur kurang dari 10 mg/l pula telah diperkenalkan di pasaran. Walaupun jumlah kenderaan yang menggunakan kedua bahan api tersebut masih lagi rendah

Sulphur Dioxide (SO₂)

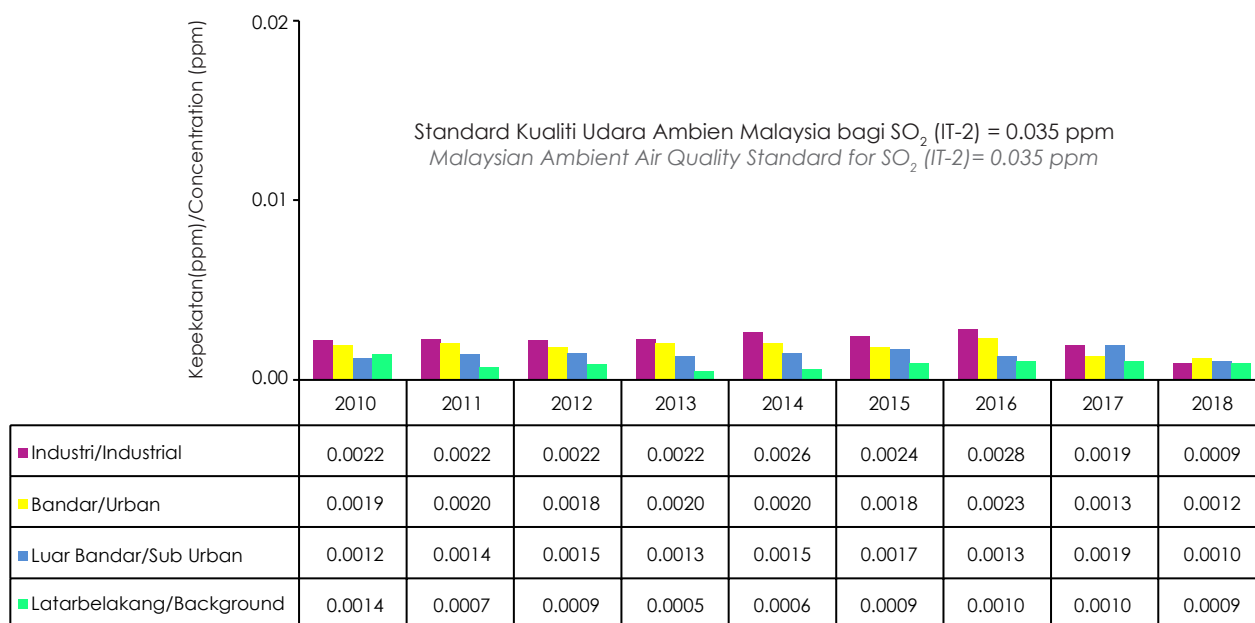
In general, the annual average of ambient SO₂ concentration showed a declining trend from 2000 to 2018 (**Figure 1.10**) and it is well below the limit of 0.035 ppm as stipulated in the Malaysian Ambient Air Quality Standard IT-2. This was attributed by the use of better fuel quality (EURO2M) in this country starting from September 2009 complied with stricter enforcement activities by the DOE and the the use of natural gas in industries and motor vehicles. Toward the end of 2015, EURO4M petrol and EURO5 diesel quality fuel were introduce in the country with the aim to reduced pollution from motor vehicles. Eventhough the number of vehicles that used both types of fuels is lower compared to EURO2M vehicles but it was shown that the trend of SO₂ has decreased in urban and industrial areas. **Figure 1.10(a)** showed the annual average concentrations of

berbanding penggunaan EURO2M, sedikit sebanyak ia mempengaruhi tren pelepasan SO₂ di kawasan industri dan bandar yang menunjukkan semakin berkurangan pelepasan SO₂. **Rajah 1.10 (a)** menunjukkan kepekatan purata tahunan bagi sulfur dioksida mengikut kategori guna tanah. Berdasarkan kepada rajah tersebut, keadaan menunjukkan bahawa kepekatan SO₂ di kawasan-kawasan mengikut kategori tanah adalah lebih rendah berbanding dengan tahun-tahun sebelumnya termasuk di kawasan bandar. Ini menunjukkan keberkesanan ke atas penggunaan bahan api yang lebih berkualiti yang digunakan oleh kenderaan-kenderaan di Malaysia.

ambient sulphur dioxide based on different categories of land use. From the figure, it was observed that the SO₂ concentration in all categories of land use were slightly lower than previous years. This could be the results of using better fuel quality in Malaysia.



Rajah 1.10 : Purata Kepekatan Tahunan Sulfur Dioksida (SO₂), 2010-2018
 Figure 1.10 : Annual Average Concentration of Sulphur Dioxide (SO₂), 2010-2018



Rajah 1.10(a) : Purata Kepekatan Tahunan Sulfur Dioksida (SO₂) Mengikut Guna Tanah, 2010-2018

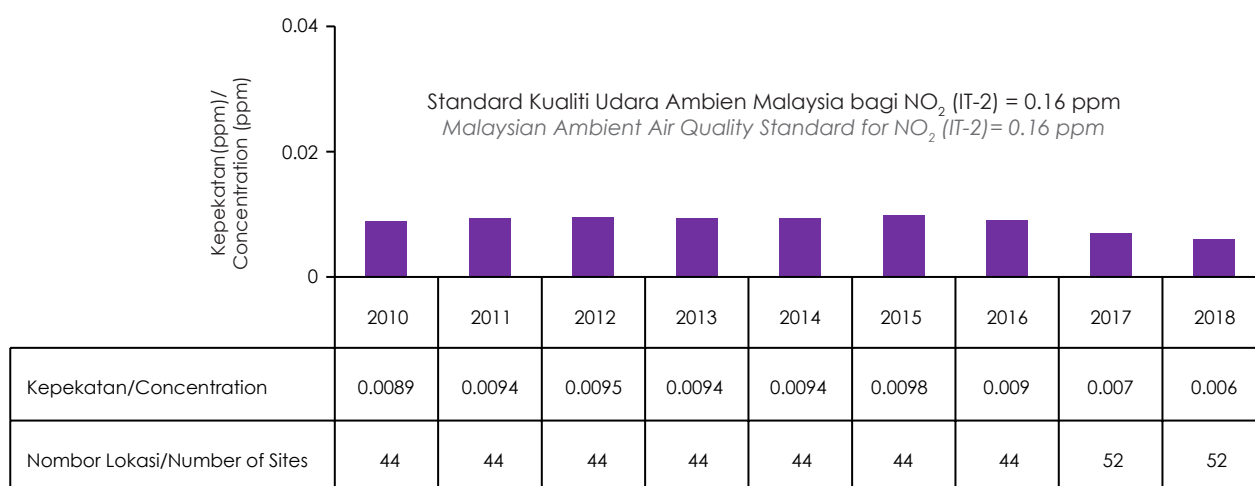
Figure 1.10(a) : Annual Average Concentration of Sulfur Dioxide (SO₂) by Land Use, 2010-2018

Nitrogen Dioksida (NO₂)

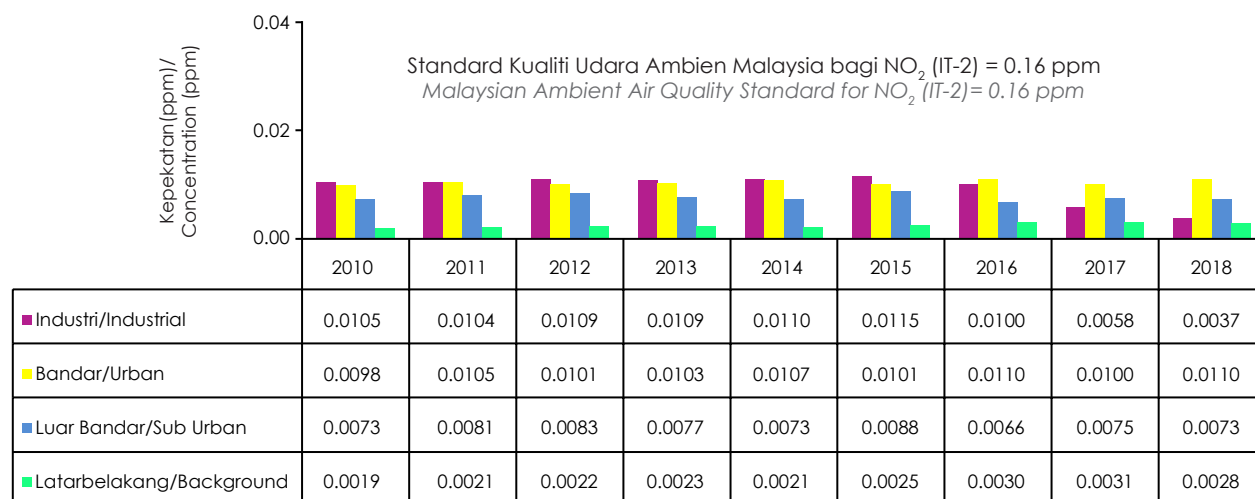
Pada tahun 2018, terdapat sedikit penurunan bagi kepekatan NO₂ berbanding tahun 2017. Kepekatan NO₂ kekal tinggi di kawasan bandar disebabkan oleh peningkatan yang ketara dalam bilangan kenderaan bermotor dan proses pembakaran. Anggaran beban pelepasan NO₂ menunjukkan sebanyak 66% adalah daripada loji janakuasa, 26% daripada pelepasan kenderaan bermotor, 7% daripada industri dan 1% daripada lain-lain sumber. Kepekatan purata tahunan NO₂ dalam udara ambien dari tahun 2010 hingga 2018 adalah stabil dan jauh berada di bawah had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2. (Rajah 1.11 dan Rajah 1.11 (a))

Nitrogen Dioxide (NO₂)

In 2018, there was a slight decrease of NO₂ concentration compared to 2017 level. The NO₂ concentrations remained high in urban area which may be due to a significant increase in the number of motor vehicles and combustion processes. Estimation on the NO₂ emission load indicated that 66% was from power plants while 26% from motor vehicles, 7% from industries and 1% from other sources. The annual average of ambient NO₂ concentration from 2010 to 2018 remained almost constant and well below the Malaysia Ambient Air Quality Standard IT-2. (Figure 1.11 and Figure 1.11(a))



Rajah 1.11 : Purata Kepekatan Tahunan Sulfur Dioksida (NO₂), 2010-2018
 Figure 1.11 : Annual Average Concentration of Sulphur Dioxide (NO₂), 2010-2018



Rajah 1.11(a) : Purata Kepekatan Tahunan Nitrogen Dioksida (NO₂) Mengikut Guna Tanah, 2010-2018

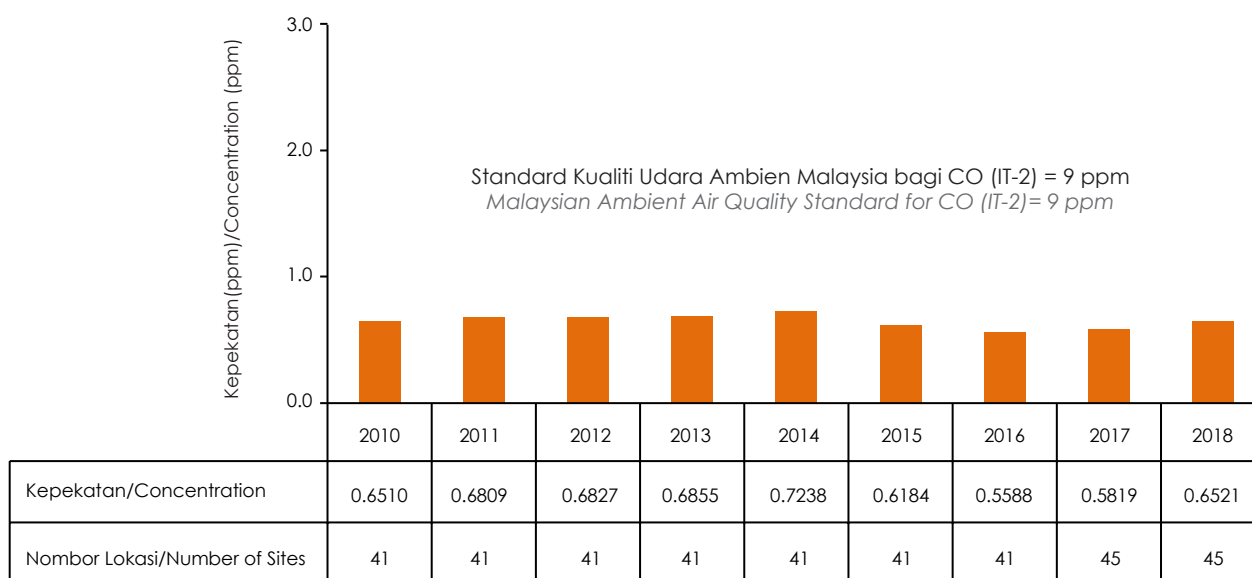
Figure 1.11(a) : Annual Average Concentration of Nitrogen Dioxide (NO₂) by Land Use, 2010-2018

Karbon Monoksida (CO)

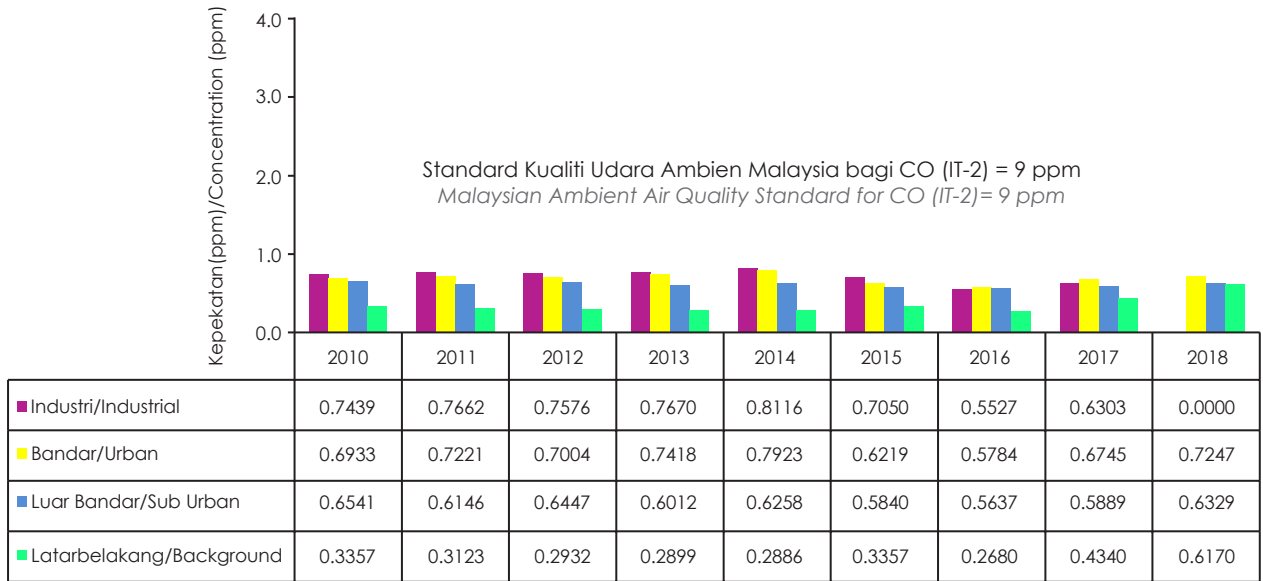
Kepekatan CO pada tahun 2018 menunjukkan sedikit peningkatan berbanding tahun 2017. Walau bagaimanapun, tren kepekatan CO dari tahun 2010 hingga 2018 adalah stabil. Tahap kepekatan yang dicatatkan juga mematuhi Standard Kualiti Udara Ambien Malaysia bagi IT-2 (**Rajah 1.12**). Bermula pada tahun 2018, pemantauan CO di kawasan industri tidak lagi dilakukan. Di kawasan bandar, kepekatan CO adalah lebih tinggi yang berpunca daripada pelepasan kenderaan bermotor dengan menyumbang sebanyak 96% daripada beban pelepasan CO pada tahun 2017. **Rajah 1.12 (a)** menunjukkan kepekatan CO untuk pelbagai kategori guna tanah.

Carbon Monoxide (CO)

There was a slight increase of ambient CO level in year 2018 compared to 2017. However the trend of CO concentration from 2010 to 2018 remained almost constant. The levels recorded were well below the Malaysian Ambient Air Quality Standard of IT-2 (**Figure 1.12**). Starting 2018, CO was not monitored in industrial area as the priority was given to the urban area as the concentration of CO was higher and the main source of CO emission was identified from motor vehicles with a total of 96% of CO emission load in 2018. **Figure 1.12(a)** showed the ambient CO concentrations based on land use categories.



Rajah 1.12 : Purata Kepekatan Tahunan Karbon Dioksida (CO), 2010-2018
 Figure 1.12 : Annual Average Concentration of Carbon Monoxide (CO), 2010-2018



Rajah 1.12(a) : Purata Kepekatan Tahunan Karbon Dioksida (CO) Mengikut Guna Tanah, 2010-2018

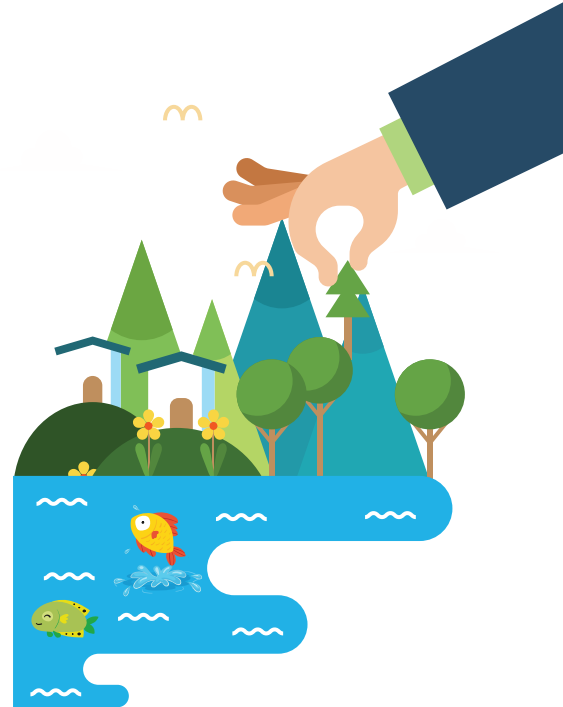
Figure 1.12(a) : Annual Average Concentration of Carbon Monoxide (CO) by Land Use, 2010-2018





Kualiti Air Sungai

River Water Quality



BAB 2

Chapter



PROGRAM PENGAWASAN KUALITI ALAM SEKITAR

Program Pengawasan Kualiti Alam Sekitar atau EQMP (*Environmental Quality Monitoring Programme*) merupakan satu program inisiatif kerajaan untuk memantapkan pemantauan kualiti alam sekitar. Program ini merangkumi pengumpulan data bagi kualiti udara, kualiti air sungai dan kualiti air marin di seluruh Malaysia bagi tujuan untuk melaporkan tahap sebenar kualiti alam sekitar Negara dalam usaha untuk memantau, mencegah dan mengawal pencemaran.

EQMP ini adalah penambahbaikan daripada sistem pengawasan kualiti alam sekitar yang telah digunakan oleh Jabatan Alam Sekitar sejak tahun 1995 sehingga 2015 bagi pengawasan kualiti air sungai.

Syarikat Pakar Scieno TW Sdn Bhd telah dilantik sebagai syarikat konsesi yang menjalankan Program Pengawasan Kualiti Alam Sekitar di bawah Kementerian melalui Jabatan Alam Sekitar bagi tempoh selama lima belas (15) tahun bermula tahun 2017 sehingga Januari 2032.

THE ENVIRONMENTAL QUALITY MONITORING PROGRAMME (EQMP)

The Environmental Quality Monitoring Programme or EQMP is a Government initiative to strengthen the monitoring of environmental quality. The programme includes data collection for air quality, river water quality and marine water quality throughout Malaysia for the purpose of reporting the actual level of environmental quality in the country in order to monitor, prevent and control pollution.

The EQMP is an improvement of the existing environmental quality monitoring system that has been adopted by the Department of Environment (DOE) from 1995 to 2015 for river water quality monitoring.

Pakar Scieno TW Sdn Bhd has been appointed as the concessionaire to conduct the Environmental Quality Monitoring Programme under the Ministry through the Department of Environment for a period of fifteen (15) years from 2017 to January 2032.



PENGAWASAN KUALITI AIR SUNGAI

Jabatan Alam Sekitar (JAS) meneruskan program pengawasan kualiti air sungai pada tahun 2018 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 mengambil kira parameter Oksigen Terlarut (DO), Keperluan Oksigen Biokimia (BOD), Keperluan Oksigen Kimia (COD), Ammonia Nitrogen ($\text{NH}_3\text{-N}$), Pepejal Terampai (SS) dan pH. Pada tahun 2018, kualiti air sungai telah dinilai berdasarkan sejumlah 8,118 sampel air sungai yang telah diambil daripada sejumlah 1,353 stesen pengawasan manual yang merangkumi 638 sungai.

RIVER WATER QUALITY MONITORING

The Department of Environment (DOE) continues the river water quality monitoring programme in 2018 to determine the status of river water quality and to detect changes in river water quality. Water samples were collected from designated stations for *in-situ* and laboratory analysis to determine its physico-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 Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Ammoniacal Nitrogen ($\text{NH}_3\text{-N}$), Suspended Solids (SS) and pH. In 2018, river water quality was assessed based on a total of 8,118 samples taken from a total of 1,353 manual monitoring stations covering 638 rivers out of a total 2,986 rivers in Malaysia.

STATUS KUALITI AIR SUNGAI

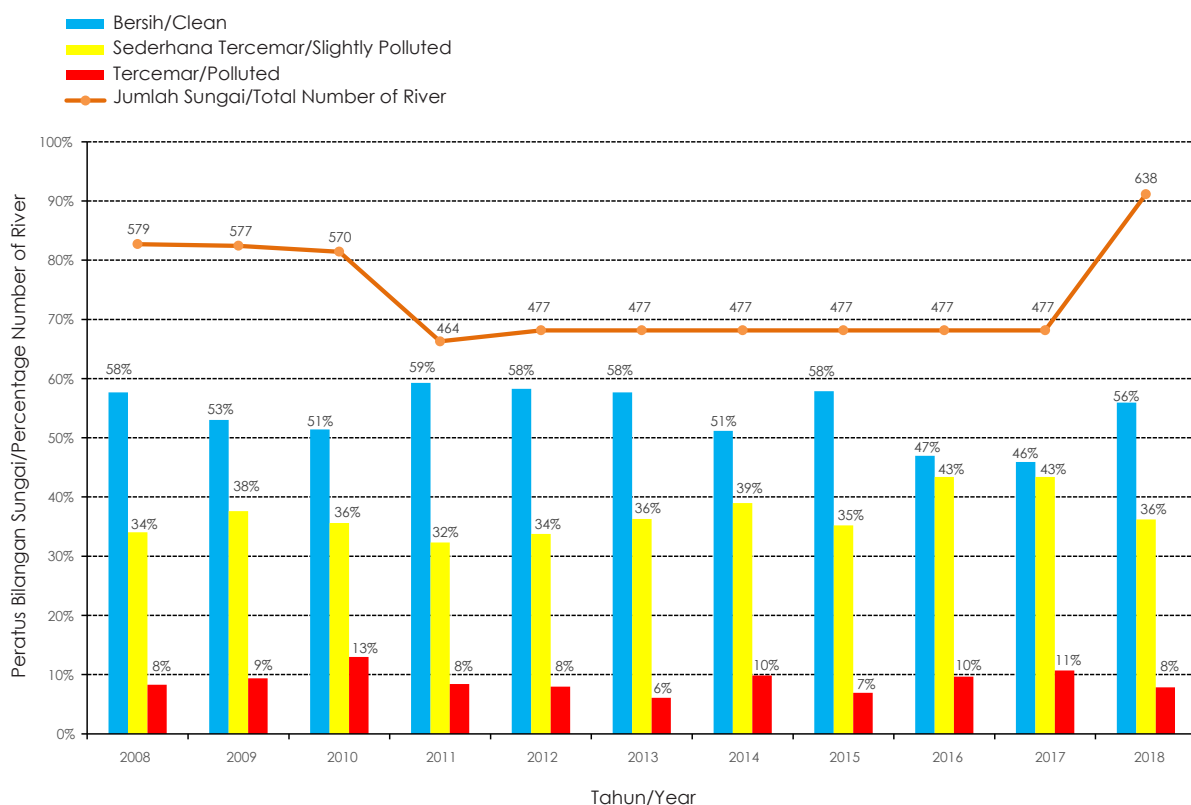
Sejumlah 357 (56%) sungai daripada 638 sungai yang diawasi telah menunjukkan indeks kualiti air bersih, 231 (36%) adalah sederhana tercemar dan 50 (8%) adalah tercemar (**Rajah 2.1**). Status kualiti air bagi sungai-sungai yang diawasi adalah seperti dalam **Jadual 2.1**, **Jadual 2.2** dan **Jadual 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 638 rivers monitored, 357 (56%) showed clean water quality, 231 (36%) were slightly polluted while 50 (8%) were polluted (**Figure 2.1**). The monitored rivers and their overall quality status are as in **Table 2.1**, **Table 2.2** and **Table 2.3**.

As in previous years, Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH₃-N) and Suspended Solids (SS) remained 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 may be attributed from animal farming and domestic sewage, while the sources for SS were mainly due to improper earthworks and land clearing activities.



Rajah 2.1 : Tren Kualiti Air Sungai, 2008-2018
Figure 2.1 : River Water Quality Trend, 2008-2018

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Perlis	Sg. Perlis	Sg. Wang Kelian	1	89	B/C	II	93	B/C	I
		Sg. Arau	2	New			82	B/C	II
		Sg. Serai	1	New			81	B/C	II
		Sg. Empangan Timah Tasoh	1	New			88	B/C	II
		Sg. Ngulang	1	79	ST/SP	II	85	B/C	II
		Sg. Jarum	1	81	B/C	II	84	B/C	II
		Sg. Kok Mak	1	New			84	B/C	II
		Sg. Pelarit	1	89	B/C	II	91	B/C	II
		Sg. Jemih	1	82	B/C	II	86	B/C	II
Kedah (Langkawi)	Sg. Kisap	Sg. Kisap	1	91	B/C	II	91	B/C	II
	Sg. Melaka	Sg. Melaka	5	81	B/C	II	85	B/C	II
		Sg. Tuba	1	New			90	B/C	II
		Sg. Petang	1	92	B/C	II	93	B/C	III
Kedah	Sg. Kedah	Sg. Janing	1	91	B/C	II	90	B/C	II
		Sg. Sintok	1	New			82	B/C	II
		Sg. Terusan Lengkuas	1	New			87	B/C	II
		Sg. Terusan Mada Selatan	1	New			85	B/C	II
		Sg. Terusan Tengah	1	New			87	B/C	II
		Sg. Tekai	1	80	ST/SP	II	83	B/C	II
		Sg. Pedu	1	88	B/C	II	87	B/C	II
	Sg. Merbok	Sg. Tupah	1	91	B/C	II	92	B/C	II
		Sg. Bukit Nanas	1	New			91	B/C	II
		Sg. Tok Pawang	1	80	ST/SP	II	88	B/C	II
Kedah/ P.Pinang	Sg. Muda	Sg. Chepir	1	86	B/C	II	87	B/C	II
		Sg. Karangian	1	81	B/C	II	81	B/C	II
		Sg. Muda	4	81	B/C	II	85	B/C	II
		Sg. Gunung Inas	1	New			90	B/C	II
		Sg. Tawar	2	New			85	B/C	II
		Sg. Ketil	2	83	B/C	II	84	B/C	II
		Sg. Sedim	1	81	B/C	II	82	B/C	II
		Sg. Pegang	1	81	B/C	II	90	B/C	II
P.Pinang	Sg. Pinang	Sg. Air Terjun	1	92	B/C	II	93	B/C	I
		Sg. Batu Feringghi	2	New			84	B/C	II
	Sg. Kluang	Sg. Ara	2	80	ST/SP	II	82	B/C	II
P.Pinang/ Kedah	Sg. Perai	Sg. Kulim	4	79	ST/SP	II	85	B/C	II
P.Pinang/ Kedah/Perak	Sg. Kerian	Sg. Kechil	1	84	B/C	II	82	B/C	II
		Sg. Selama	2	76	ST/SP		86	B/C	II
		Sg. Kerian	4	81	B/C	II	82	B/C	II
		Sg. Terusan Bagan Serai	1	New			91	B/C	II
Perak	Sg. Bruas	Sg. Rotan	1	87	B/C	II	91	B/C	II
		Sg. Licin	1	New			93	B/C	III
		Sg. Bruas	3	83	B/C	II	85	B/C	II
		Sg. Dandang	1	88	B/C	II	89	B/C	II

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Perak	Sg. Kurau	Sg. Ara	2	88	B/C	II	91	B/C	II
		Sg. Perak							
	Sg. Perak	Sg. Chepor	1	90	B/C	II	94	B/C	I
		Sg. Chenderiang	1	87	B/C	II	87	B/C	II
		Sg. Behrang	1	New			92	B/C	II
		Sg. Berok	1	New			92	B/C	II
		Sg. Cuar	1	New			83	B/C	II
		Sg. Ibol	1	New			93	B/C	I
		Sg. Kerbau	2	New			92	B/C	II
		Sg. Klian Gunung	1	New			93	B/C	I
		Sg. Pelus	2	79	ST/SP	II	86	B/C	II
		Sg. Pulau	1	New			91	B/C	II
		Sg. Rui	2	New			87	B/C	II
		Sg. Tapah	1	New			94	B/C	I
		Sg. Kuang	1	83	B/C	II	84	B/C	II
		Sg. Klah	1	89	B/C	II	88	B/C	II
		Sg. Kinjang	1	92	B/C	II	93	B/C	I
		Sg. Kampar	2	86	B/C	II	87	B/C	II
		Sg. Batang Padang	3	82	B/C	II	82	B/C	II
		Sg. Kangsar	1	81	B/C	II	87	B/C	II
		Sg. Sungkai	2	85	B/C	II	85	B/C	II
		Sg. Raia	2	81	B/C	II	85	B/C	II
	Sg. Perak	8	85	B/C	II	87	B/C	II	
	Sg. Raja Hitam	Sg. Nyior	1	93	B/C	I	92	B/C	II
		Sg. Manjong	2	74	ST/SP	III	81	B/C	II
	Sg. Sepetang	Sg. Nyior	2	New			88	B/C	II
		Sg. Temerloh	2	New			84	B/C	II
		Sg. Jana	1	84	B/C	II	81	B/C	II
		Sg. Limau	1	86	B/C	II	90	B/C	II
		Sg. Trong	1	89	B/C	II	90	B/C	II
		Sg. Batu Tegoh	3	83	B/C	II	81	B/C	II
	Selangor/Perak	Sg. Bernam	Sg. Inki	1	91	B/C	II	91	B/C
Sg. Dusun			1	New			87	B/C	II
Sg. Slim			2	85	B/C	II	85	B/C	II
Sg. Trolak			1	88	B/C	II	87	B/C	II
Selangor	Sg. Selangor	Sg. Kerling	1	86	B/C	II	90	B/C	II
		Sg. Rangkap	1	New			91	B/C	II
		Sg. Selangor	4	79	ST/SP	II	82	B/C	II
		Sg. Kanching	1	85	B/C	II	84	B/C	II
		Sg. Serendah	1	86	B/C	II	85	B/C	II
		Sg. Batang Kali	1	82	B/C	II	87	B/C	II
	Sg. Tenggi	Sg. Tenggi	3	77	ST/SP	II	83	B/C	II
		Sg. Rumpit	1	New			90	B/C	II
		Sg. Semelah	1	80	ST/SP		82	B/C	II
Selangor/ Putrajaya/ N.Sembilan	Sg. Langat	Sg. Rinching	2	New			82	B/C	II
		Sg. Chuau	2	87	B/C	II	86	B/C	II

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Melaka/ N.Sembilan	Sg. Melaka	Sg. Tampin	1	86	B/C	II	83	B/C	II
		Sg. Dusun	1	86	B/C	II	87	B/C	II
		Sg. Kemunting	1	85	B/C	II	82	B/C	II
	Sg. Linggi	Sg. Batang Penar	1	82	B/C	II	82	B/C	II
		Sg. Jelai	1	New		I	83	B/C	II
		Sg. Keparong	1	72	ST/SP	III	81	B/C	II
		Sg. Batu Hampar	1	New		I	85	B/C	II
		Sg. Muar	1	New		I	86	B/C	II
		Sg. Simpang Ampat	1	New		I	81	B/C	II
		Sg. Siput	1	79	ST/SP	II	84	B/C	II
		Sg. Kundur Besar	1	86	B/C	II	88	B/C	II
		Sg. Pedas	1	84	B/C	II	83	B/C	II
		Sg. Rembau	2	85	B/C	II	85	B/C	II
		Sg. Chembong	1	82	B/C	II	83	B/C	II
Melaka	Sg. Kesang	Sg. Chohong	2	84	B/C	II	85	B/C	II
	Sg. Seri Melaka	Sg. Udang	1	New			86	B/C	II
	Sg. Duyong	Sg. Gapam	1	82	B/C	II	85	B/C	II
Johor	Sg. Batu Pahat	Sg. Kahang	1	New			82	B/C	II
		Sg. Merek	1	79	ST/SP	II	82	B/C	II
		Sg. Merpo	1	72	ST/SP	III	81	B/C	II
		Sg. Bantang	1	92	B/C	II	93	B/C	I
	Sg. Johor	Sg. Pelepah	2	89	B/C	II	86	B/C	II
		Sg. Telor	1	86	B/C	II	85	B/C	II
		Sg. Bukit Besar	1	75	ST/SP	III	83	B/C	II
		Sg. Lebam	1	71	ST/SP	III	84	B/C	II
		Sg. Papan	1	70	ST/SP	III	81	B/C	II
		Sg. Peggeli	2	80	ST/SP	II	83	B/C	II
		Sg. Sening	1	New			86	B/C	II
		Sg. Linggiu	1	84	B/C	II	84	B/C	II
		Sg. Layang	1	87	B/C	II	87	B/C	II
		Sg. Remis	1	85	B/C	II	83	B/C	II
		Sg. Semangar	1	84	B/C	II	81	B/C	II
		Sg. Sayong	4	83	B/C	II	81	B/C	II
		Sg. Santi	1	82	B/C	II	85	B/C	II
		Sg. Layau Kiri	1	82	B/C	II	89	B/C	II
		Sg. Belitong	1	81	B/C	II	83	B/C	II
		Sg. Mersing	Sg. Mersing	2	77	ST/SP	II	86	B/C
	Sg. Paloi	Sg. Paloi	1	78	ST/SP	II	85	B/C	II
	Sg. Sedili Besar	Sg. Dohol	1	84	B/C	II	84	B/C	II
		Sg. Ambat	1	79	ST/SP	II	86	B/C	II
		Sg. Pasir Panjang	1	75	ST/SP	III	85	B/C	II
		Sg. Sedili Besar	5	77	ST/SP	II	81	B/C	II
		Sg. Temubor Kanan	1	75	ST/SP	III	89	B/C	II
	Sg. Jemaluang	Sg. Jemaluang	2	77	ST/SP	II	81	B/C	II

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Johor/ N.Sembilan/ Pahang	Sg. Muar	Sg. Air Panas	1	91	B/C	II	90	B/C	II
		Sg. Belemang	1	New			87	B/C	II
		Sg. Labis	1	79	ST/SP	II	83	B/C	II
		Sg. Meda	1	77	ST/SP	II	86	B/C	II
		Sg. Pendol	1	New			84	B/C	II
		Sg. Segamat	1	79	ST/SP	II	86	B/C	II
		Sg. Juasseh	1	90	B/C	II	89	B/C	II
Pahang/Johor	Sg. Endau	Sg. Jasin	1	91	B/C	II	94	B/C	I
		Sg. Dengar	1	New			81	B/C	II
		Sg. Empangan Labong	1	New			91	B/C	II
		Sg. Lenggong	1	80	ST/SP	II	83	B/C	II
		Sg. Mamai	1	79	ST/SP	II	84	B/C	II
		Sg. Tamok	1	82	B/C	II	86	B/C	II
		Sg. Selai	1	88	B/C	II	89	B/C	II
		Sg. Endau	3	84	B/C	II	87	B/C	II
		Sg. Kahang	1	84	B/C	II	87	B/C	II
Pahang/ N.Sembilan	Sg. Pahang	Sg. Teranum	1	92	B/C	II	89	B/C	II
		Sg. Anak Sg. Lepar	1	New			84	B/C	II
		Sg. Batu	1	New			82	B/C	II
		Sg. Belayar	1	New			91	B/C	II
		Sg. Berkelah	1	New			92	B/C	II
		Sg. Bilut	2	New			84	B/C	II
		Sg. Jengka	2	80	ST/SP	II	85	B/C	II
		Sg. Kecau	3	New			81	B/C	II
		Sg. Krau	1	New			87	B/C	II
		Sg. Maran	1	85	B/C	II	85	B/C	II
		Sg. Mentiga	1	78	ST/SP	II	81	B/C	II
		Sg. Penjuring	1	New			91	B/C	II
		Sg. Pertang	2	New			83	B/C	II
		Sg. Raub	1	New			88	B/C	II
		Sg. Retang	1	New			85	B/C	II
		Sg. Salak	1	New			85	B/C	II
		Sg. Tasik Bera	1	78	ST/SP	II	84	B/C	II
		Sg. Telemong	3	New			88	B/C	II
		Sg. Teras	1	91	B/C	II	89	B/C	II
		Sg. Jempol	2	83	B/C	II	84	B/C	II
		Sg. Telang	1	87	B/C	II	87	B/C	II
		Sg. Maran	1	85	B/C	II	85	B/C	II
		Sg. Teris	3	82	B/C	II	87	B/C	II
		Sg. Benus	2	89	B/C	II	86	B/C	II
		Sg. Kelau	1	89	B/C	II	83	B/C	II
		Sg. Lipis	3	89	B/C	II	85	B/C	II
		Sg. Tembeling	1	87	B/C	II	84	B/C	II
		Sg. Perting	1	87	B/C	II	89	B/C	II
		Sg. Tahan	1	87	B/C	II	84	B/C	II
		Sg. Teh	1	82	B/C	II	84	B/C	II
Sg. Pahang	8	84	B/C	II	83	B/C	II		

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Pahang/ N.Sembilan	Sg. Pahang	Sg. Tanglir	1	85	B/C	II	83	B/C	II
		Sg. Koyan	1	85	B/C	II	86	B/C	II
		Sg. Lepar	3	86	B/C	II	86	B/C	II
		Sg. Luit	1	85	B/C	II	84	B/C	II
		Sg. Bentong	1	82	B/C	II	84	B/C	II
		Sg. Tasik Chini	1	87	B/C	II	88	B/C	II
		Sg. Semantan	4	82	B/C	II	84	B/C	II
		Sg. Tekal	1	83	B/C	II	83	B/C	II
		Sg. Kertam	1	81	B/C	II	83	B/C	II
		Sg. T. Paya Bungor	1	84	B/C	II	84	B/C	II
		Sg. Triang	2	82	B/C	II	84	B/C	II
		Sg. Jelai	2	84	B/C	II	84	B/C	II
Pahang	Sg. Bertam	Sg. Habu	1	89	B/C	II	89	B/C	II
		Sg. Lenggok	1	88	B/C	II	89	B/C	II
		Sg. Bertam	1	80	ST/SP	II	83	B/C	II
		Sg. Burung	1	91	B/C	II	90	B/C	II
		Sg. Ringlet	1	82	B/C	II	82	B/C	II
		Sg. Tringkap	1	86	B/C	II	82	B/C	II
		Sg. Terla	1	86	B/C	II	91	B/C	II
		Sg. Telom	2	81	B/C	II	83	B/C	II
	Sg. Anak Endau	Sg. Anak Endau	2	80	ST/SP	II	83	B/C	II
	Sg. Cherating	Sg. Cherating	1	82	B/C	II	82	B/C	II
	Sg. Kuantan	Sg. Kenau	1	81	B/C	II	88	B/C	II
		Sg. Belat	1	79	ST/SP	II	82	B/C	II
		Sg. Charu	1	80	ST/SP	II	85	B/C	II
		Sg. Kuantan	5	79	ST/SP	II	84	B/C	II
		Sg. Pinang	1	New			85	B/C	II
		Sg. Reman	1	New			81	B/C	II
		Sg. Riau	1	77	ST/SP	II	83	B/C	II
		Sg. Pandan	1	83	B/C	II	84	B/C	II
	Sg. Rompin	Sg. Pukin	1	83	B/C	II	81	B/C	II
		Sg. Jekatih	2	New			83	B/C	II
		Sg. Jeram	1	New			85	B/C	II
		Sg. Keratong	4	80	ST/SP	II	83	B/C	II
		Sg. Sepayang	1	New			81	B/C	II
Sg. Pontian		1	85	B/C	II	84	B/C	II	
Sg. Aur		1	83	B/C	II	84	B/C	II	
Terengganu	Sg. Besut	Sg. Besut	2	86	B/C	II	87	B/C	II
		Sg. Jerfih	1	New			84	B/C	II
	Sg. Dungun	Sg. Dungun	4	85	B/C	II	89	B/C	II
	Sg. Kemaman	Sg. Cherul	1	81	B/C	II	85	B/C	II
		Sg. Perasing	1	New			83	B/C	II
		Sg. Kemaman	2	82	B/C	II	84	B/C	II
	Sg. Chukai	Sg. Ibok	1	79	ST/SP	II	82	B/C	II
	Sg. Kertih	Sg. Kertih	1	78	ST/SP	II	83	B/C	II
	Sg. Kluang	Sg. Kluang	1	75	ST/SP	III	82	B/C	II
	Sg. Marang	Sg. Marang	1	75	ST/SP	III	85	B/C	II
Sg. Temala		1	New			85	B/C	II	

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Terengganu	Sg. Setiu	Sg. Bari	1	New			89	B/C	II
		Sg. Chalok	2	79	ST/SP	II	85	B/C	II
		Sg. Tarom	1	New			88	B/C	II
		Sg. Setiu	2	83	B/C	II	87	B/C	II
	Sg. Paka	Sg. Besul	1	New			85	B/C	II
		Sg. Paka	1	79	ST/SP	II	85	B/C	II
		Sg. Rengat	1	New			87	B/C	II
	Sg. Terengganu	Sg. Berang	1	88	B/C	II	89	B/C	II
		Sg. Nerus	1	81	B/C	II	84	B/C	II
		Sg. Telemong	1	88	B/C	II	83	B/C	II
		Sg. Terengganu	3	83	B/C	II	86	B/C	II
	Kelantan	Sg. Golok	Sg. Golok	5	88	B/C	II	83	B/C
Sg. Jedok			1	New			84	B/C	II
Sg. Lanas			1	88	B/C	II	85	B/C	II
Sg. Kelantan		Sg. Chiku	1	New			85	B/C	II
		Sg. Kenkren	1	New			85	B/C	II
		Sg. Ketil	1	New			86	B/C	II
		Sg. Murung	1	New			88	B/C	II
		Sg. Pelaur	1	New			89	B/C	II
		Sg. Penangau	1	New			81	B/C	II
		Sg. Tuang	1	89	B/C	II	88	B/C	II
		Sg. Pergau	6	90	B/C	II	90	B/C	II
		Sg. Lebir	3	83	B/C	II	82	B/C	II
		Sg. Galas	5	85	B/C	II	84	B/C	II
		Sg. Betis	1	88	B/C	II	83	B/C	II
		Sg. Kerilla	1	87	B/C	II	89	B/C	II
		Sg. Nal	2	84	B/C	II	82	B/C	II
		Sg. Relai	1	84	B/C	II	85	B/C	II
Sg. Sokor		1	82	B/C	II	85	B/C	II	
Sg. Kemasin		Sg. Semerak	2	81	B/C	II	84	B/C	II
Sabah		Sg. Apas	Sg. Apas	1	83	B/C	II	88	B/C
	Sg. Balung	Sg. Balung	1	83	B/C	II	89	B/C	II
	Sg. Bongawan	Sg. Bongawan	1	82	B/C	II	89	B/C	II
	Sg. Bengkoka	Sg. Bengkoka	2	86	B/C	II	87	B/C	II
	Sg. Bingkongan	Sg. Menggaris	2	89	B/C	II	92	B/C	II
		Sg. Bandau	1	88	B/C	II	91	B/C	II
		Sg. Bingkongan	2	88	B/C	II	92	B/C	II
		Sg. Tandek	1	87	B/C	II	91	B/C	II
	Sg. Kalabakan	Sg. Kalabakan	3	82	B/C	II	84	B/C	II
	Sg. Brantian	Sg. Brantian	1	85	B/C	II	85	B/C	II
	Sg. Kalumpang	Sg. Kalumpang	3	79	ST/SP	II	84	B/C	II
		Sg. Pang Burong 1	1	New			84	B/C	II
	Sg. Kedamaian	Sg. Kedamaian	1	89	B/C	II	91	B/C	II
		Sg. Wariu	1	88	B/C	II	91	B/C	II
		Sg. Tempasuk	2	87	B/C	II	91	B/C	II
Sg. Kimanis	Sg. Kimanis	1	77	ST/SP	II	91	B/C	II	

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Sabah	Sg. Kinabatangan	Sg. Koyah	1	86	B/C	II	86	B/C	II
		Sg. Menanggal	1	83	B/C	II	84	B/C	II
		Sg. Pin	1	New			84	B/C	II
		Sg. Takala	1	New			83	B/C	II
		Sg. Leepang	1	New			84	B/C	II
		Sg. Kinabatangan	3	82	B/C	II	83	B/C	II
		Sg. Karamuak	1	89	B/C	II	89	B/C	II
	Sg. Labok	Sg. Kinipir	2	89	B/C	II	90	B/C	II
		Sg. Liwagu	2	89	B/C	II	90	B/C	II
		Sg. Maliau	1	90	B/C	II	91	B/C	II
		Sg. Labok	1	85	B/C	II	89	B/C	II
		Sg. Tungud	1	86	B/C	II	88	B/C	II
	Sg. Lakutan	Sg. Lakutan	1	87	B/C	II	90	B/C	II
	Sg. Likas	Sg. Menggatal	2	85	B/C	II	89	B/C	II
		Sg. Darau	1	New			84	B/C	II
		Sg. Inanam	3	79	ST/SP	II	86	B/C	II
	Sg. Lingkungan	Sg. Lingkungan	1	88	B/C	II	91	B/C	II
		Sg. Bukau	1	88	B/C	II	90	B/C	II
	Sg. Membakut	Sg. Membakut	1	80	ST/SP	II	89	B/C	II
	Sg. Menggalong	Sg. Menggalong	2	88	B/C	II	89	B/C	II
	Sg. Merotai	Sg. Merotai	3	86	B/C	II	89	B/C	II
	Sg. Mounad	Sg. Mounad	2	86	B/C	II	87	B/C	II
	Sg. Moyog	Sg. Moyog	4	88	B/C	II	91	B/C	II
	Sg. Padas	Sg. Bunsit	1	92	B/C	II	90	B/C	II
		Sg. Liawan	1	90	B/C	II	90	B/C	II
		Sg. Padas	3	82	B/C	II	88	B/C	II
		Sg. Pegalan	3	88	B/C	II	88	B/C	II
		Sg. Tandulu	1	90	B/C	II	93	B/C	I
	Sg. Paitan	Sg. Paitan	1	82	B/C	II	88	B/C	II
	Sg. Papar	Sg. Papar	3	85	B/C	II	91	B/C	II
	Sg. Sapi	Sg. Sapi	3	81	B/C	II	85	B/C	II
		Sg. Sualong	1	88	B/C	II	88	B/C	II
	Sg. Segama	Sg. Segama	3	85	B/C	II	84	B/C	II
	Sg. Segaliud	Sg. Segaliud	2	81	B/C	II	81	B/C	II
	Sg. Silabukan	Sg. Silabukan	2	87	B/C	II	88	B/C	II
	Sg. Sugut	Sg. Merali	1	92	B/C	II	88	B/C	II
		Sg. Bongkud	1	91	B/C	II	92	B/C	II
		Sg. Lohan	1	92	B/C	II	91	B/C	II
		Sg. Sugut	3	89	B/C	II	89	B/C	II
	Sg. Tawau	Sg. Tawau	4	85	B/C	II	84	B/C	II
	Sg. Tenghilan	Sg. Tenghilan	1	87	B/C	II	91	B/C	II
	Sg. Tingkayu	Sg. Tingkayu	2	83	B/C	II	84	B/C	II
	Sg. Tuaran	Sg. Tuaran	2	88	B/C	II	91	B/C	II
Sg. Song Sai		1	87	B/C	II	89	B/C	II	
Sg. Damit		2	82	B/C	II	88	B/C	II	
Sg. Umas-Umas	Sg. Umas-Umas	1	80	ST/SP	II	83	B/C	II	
Sg. Tungku	Sg. Tungku	2	86	B/C	II	88	B/C	II	

Jadual 2.1 : Status Kualiti Air bagi Sungai Bersih, 2018
Table 2.1 : Water Quality Status of Clean Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Sarawak	Sg. Baram	Sg. Tutuh	1	81	B/C	II	86	B/C	II
		Sg. Baram	4	79	ST/SP	II	84	B/C	II
	Sg. Balingian	Sg. Balingian	2	78	ST/SP	II	82	B/C	II
	Sg. Lawas	Sg. Lawas	3	83	B/C	II	86	B/C	II
	Sg. Kemena	Sg. Kemena	3	77	ST/SP	II	85	B/C	II
		Sg. Sibiu	1	76	ST/SP	III	86	B/C	II
	Sg. Kerian	Sg. Kerian	2	79	ST/SP	II	83	B/C	II
	Sg. Lawas	Sg. Lawas	3	83	B/C	II	86	B/C	II
	Sg. Limbang	Sg. Limbang	5	81	B/C	II	86	B/C	II
	Sg. Lupar	Sg. Lupar	3	78	ST/SP	II	83	B/C	II
		Sg. Sekerang	1	80	ST/SP	II	89	B/C	II
		Sg. Seterap	1	80	ST/SP	II	87	B/C	II
		Sg. Undup	1	80	ST/SP	II	91	B/C	II
		Sg. Ai	2	86	B/C	II	91	B/C	II
	Sg. Niah	Sg. Niah	2	80	ST/SP	II	88	B/C	II
	Sg. Rajang	Sg. Binatang	1	83	B/C	II	89	B/C	II
		Sg. Baloi	1	79	ST/SP	II	84	B/C	II
		Sg. Meradong	1	77	ST/SP	II	83	B/C	II
		Sg. Rajang	11	77	ST/SP	II	83	B/C	II
		Sg. Sarikei	2	80	ST/SP	II	86	B/C	II
		Sg. Julau	1	81	B/C	II	90	B/C	II
	Sg. Sarawak	Sg. Kanowit	1	82	B/C	II	86	B/C	II
		Sg. Semadang	1	87	B/C	II	93	B/C	I
		Sg. Kelantan	1	New			84	B/C	II
		Sg. Kuap	1	77	ST/SP	II	86	B/C	II
		Sg. Sarawak Kiri	1	80	ST/SP	II	92	B/C	II
		Sg. Tapah	1	New			90	B/C	II
		Sg. Sarawak	6	81	B/C	II	88	B/C	II
	Sg. Sarawak Kanan	Sg. Sarawak Kanan	1	81	B/C	II	86	B/C	II
		Sg. Sibuti	Sg. Kejapil	1	80	ST/SP	II	85	B/C
	Sg. Sibuti	Sg. Sibuti	2	80	ST/SP	II	82	B/C	II
		Sg. Similajau	Sg. Similajau	2	79	ST/SP	II	89	B/C
Sg. Trusan	Sg. Trusan	1	83	B/C	II	88	B/C	II	
Sg. Suai	Sg. Suai	1	76	ST/SP	III	84	B/C	II	
Sg. Tatau	Sg. Tatau	1	80	ST/SP	II	87	B/C	II	
Sg. Semunsam	Sg. Semunsam	1	84	B/C	II	87	B/C	II	
Sg. Sadong	Sg. Tarat	5	81	B/C	II	92	B/C	II	

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

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/NUMBER OF STATIONS	2017			2018		
				IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS	IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS
Perlis	Sg. Perlis	Sg. Korok	1	New			73	ST/SP	III
		Sg. Perlis	1	69	ST/SP	III	72	ST/SP	III
Kedah	Sg. Kedah	Sg. Changlun	1	New			79	ST/SP	II
		Sg. Kedah	1	66	ST/SP	III	66	ST/SP	III
		Sg. Napoh	1	New			78	ST/SP	II
		Sg. Padang Terap	3	84	B/C	II	80	ST/SP	II
		Sg. Pendang	1	74	ST/SP	III	77	ST/SP	II
		Sg. Merbok	1	71	ST/SP	III	74	ST/SP	III
	Sg. Merbok	Sg. Korok	1	New			70	ST/SP	III
		Sg. Bongkok	1	61	ST/SP	III	71	ST/SP	III
		Sg. Kuah	1	New			65	ST/SP	III
Kedah (Langkawi)	Sg. Kuah	Sg. Kuah	1	New			65	ST/SP	III
Kedah/P.Pinang	Sg. Muda	Sg. Jerong	1	71	ST/SP	III	68	ST/SP	III
P.Pinang	Sg. Bayan Lepas	Sg. Tiram	2	69	ST/SP	III	74	ST/SP	III
		Sg. Bayan Lepas	1	65	ST/SP	III	70	ST/SP	III
	Sg. Jawi	Sg. Machang Bubok	1	71	ST/SP	III	72	ST/SP	III
		Sg. Junjong	1	70	ST/SP	III	67	ST/SP	III
	Sg. Juru	Sg. Ara	1	New			70	ST/SP	III
		Sg. Permatang Rawa	1	New			74	ST/SP	III
		Sg. Kilang Ubi	4	63	ST/SP	III	68	ST/SP	III
	Sg. Kluang	Sg. Relau	1	69	ST/SP	III	79	ST/SP	III
		Sg. Dua Besar	1	New			65	ST/SP	III
		Sg. Kluang	1	New			70	ST/SP	III
P.Pinang/Kedah	Sg. Pinang	Sg. Dondang	1	69	ST/SP	III	71	ST/SP	III
		Sg. Pinang	2	57	T/P	III	70	ST/SP	III
		Sg. Jelutong	1	49	T/P	IV	67	ST/SP	III
		Sg. Titi Kerawang	1	New			65	ST/SP	III
		Sg. Air Itam	5	67	ST/SP	III	76	ST/SP	III
P.Pinang/Kedah/Perak	Sg. Perai	Sg. Jarak	3	68	ST/SP	III	70	ST/SP	III
		Sg. Kubang Semang	1	New			61	ST/SP	III
		Sg. Seluang	1	New			62	ST/SP	III
		Sg. Keladi	1	70	ST/SP	III	76	ST/SP	III
	Sg. Kerian	Sg. Semang	1	New			80	ST/SP	II
		Sg. Serdang	1	New			75	ST/SP	III
Perak	Sg. Kurau	Sg. Kurau	4	80	ST/SP	II	80	ST/SP	II
	Sg. Perak	Sg. Kerdah	1	70	ST/SP	III	75	ST/SP	III
		Sg. Bidor	3	82	B/C	II	78	ST/SP	II
		Sg. Kinta	6	74	ST/SP	III	76	ST/SP	III
		Sg. Kepayang	2	72	ST/SP	III	75	ST/SP	III
		Sg. Pinji	2	61	ST/SP	III	65	ST/SP	III
		Sg. Pari	1	66	ST/SP	III	71	ST/SP	III
		Sg. Seluang	1	65	ST/SP	III	64	ST/SP	III
		Sg. Serokai	1	58	T/P	III	61	ST/SP	III
		Sg. Sintang	1	New			65	ST/SP	III
		Sg. Sungkai Mafi	1	New			72	ST/SP	III

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/NUMBER OF STATIONS	2017			2018		
				IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS	IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS
Perak	Sg. Perak	Sg. Nyamok	1	55	T/P	III	76	ST/SP	III
		Sg. Teja	1	New			76	ST/SP	III
		Sg. Tumboh	1	62	ST/SP	III	70	ST/SP	III
	Sg. Raja Hitam	Sg. Raja Hitam	2	49	T/P	IV	69	ST/SP	III
	Sg. Sepetang	Sg. Lidin	1	New			78	ST/SP	II
		Sg. Malai	2	New			68	ST/SP	III
		Sg. Sepetang	2	73	ST/SP	III	76	ST/SP	III
		Sg. Wangi	2	New			76	ST/SP	III
	Sg. Wangi	Sg. Deralik	1	65	ST/SP	III	71	ST/SP	III
Selangor	Sg. Selangor	Sg. Sembah	1	69	ST/SP	III	74	ST/SP	III
		Sg. Air Hitam	2	New			76	ST/SP	III
		Sg. Guntong	1	New			74	ST/SP	III
		Sg. Kundang	1	New			64	ST/SP	III
		Sg. Rawang	1	New			70	ST/SP	III
	Sg. Sepang	Sg. Sepang	2	77	ST/SP	II	78	ST/SP	II
Selangor/Perak	Sg. Bernam	Sg. Bernam	4	82	B/C	II	77	ST/SP	II
Selangor/ Putrajaya/ N.Sembilan	Sg. Langat	Sg. Semenyih	1	76	ST/SP	III	78	ST/SP	II
		Sg. Anak Chuau	1	70	ST/SP	III	74	ST/SP	III
		Sg. Balak	1	New			61	ST/SP	III
		Sg. Batang Benar	1	New			73	ST/SP	III
		Sg. Batang Labu	1	New			72	ST/SP	III
		Sg. Beranang	1	New			79	ST/SP	II
		Sg. Buan	1	New			73	ST/SP	III
		Sg. Limau Manis	1	New			80	ST/SP	II
		Sg. Sering	1	New			63	ST/SP	III
		Sg. Jijan	1	76	ST/SP	III	80	ST/SP	II
		Sg. Pajam	1	67	ST/SP	III	64	ST/SP	III
		Sg. Batang Nilai	1	62	ST/SP	III	69	ST/SP	III
		Sg. Langat	7	64	ST/SP	III	70	ST/SP	III
Selangor/WPKL	Sg. Klang	Sg. Batu	4	75	ST/SP	III	75	ST/SP	III
		Sg. Anak Air Batu	1	72	ST/SP	III	73	ST/SP	III
		Sg. Bunos	3	57	T/P	III	61	ST/SP	III
		Sg. Penchala	1	82	B/C	II	64	ST/SP	III
		Sg. Pusu	1	New			68	ST/SP	III
		Sg. Keroh	2	71	ST/SP	III	67	ST/SP	III
		Sg. Gombak	3	72	ST/SP	III	66	ST/SP	III
		Sg. Damansara	2	64	ST/SP	III	64	ST/SP	III
		Sg. Jinjang	3	61	ST/SP	III	67	ST/SP	III
		Sg. Klang	8	60	ST/SP	III	61	ST/SP	III
		Sg. Rasau	1	72	ST/SP	III	73	ST/SP	III
		Sg. Toba	1	61	ST/SP	III	64	ST/SP	III
Melaka	Sg. Duyong	Sg. Duyong	3	64	ST/SP	III	66	ST/SP	III
	Sg. Kesang	Sg. Kesang	3	75	ST/SP	III	74	ST/SP	III
		Sg. ChiChin	2	New			74	ST/SP	III
		Sg. Tangkak	1	New			62	ST/SP	III
	Sg. Seri Melaka	Sg. Air Salak	1	New			70	ST/SP	III
		Sg. Seri Melaka	1	56	T/P	III	61	ST/SP	III

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Melaka/ N.Sembilan	Sg. Melaka	Sg. Batang Melaka	2	81	B/C	II	79	ST/SP	II
		Sg. Putat	2	New			61	ST/SP	III
		Sg. Rembia	1	61	ST/SP	III	70	ST/SP	III
		Sg. Durian Tunggal	1	73	ST/SP	III	76	ST/SP	III
		Sg. Melaka	1	69	ST/SP	III	72	ST/SP	III
Negeri Sembilan	Sg. Lukut	Sg. Lukut	1	New			71	ST/SP	III
	Sg. Baru	Sg. Baru	1	New			70	ST/SP	III
Melaka/ N.Sembilan	Sg. Linggi	Sg. Empangan Terip	1	New			72	ST/SP	III
		Sg. Kayu Ara	1	New			69	ST/SP	III
		Sg. Kenaboi	1	New			78	ST/SP	II
		Sg. Ngoi-Ngoi	1	New			72	ST/SP	III
		Sg. Paroi	1	New			75	ST/SP	III
		Sg. Senawang	1	New			74	ST/SP	III
		Sg. Temiang	2	New			66	ST/SP	III
		Sg. Tuang	1	New			70	ST/SP	III
		Sg. Simin	1	77	ST/SP	II	75	ST/SP	III
		Sg. Linggi	5	74	ST/SP	III	76	ST/SP	III
Johor	Sg. Batu Pahat	Sg. Amran	1	67	ST/SP	III	69	ST/SP	III
		Sg. Bekok	5	76	ST/SP	III	77	ST/SP	II
		Sg. Lenik	1	77	ST/SP	II	79	ST/SP	II
		Sg. Chaah	1	81	B/C	II	78	ST/SP	II
		Sg. Panchor	1	New			61	ST/SP	III
		Sg. Semberong	2	59	T/P	III	67	ST/SP	III
		Sg. Simpang Kiri	3	61	ST/SP	III	65	ST/SP	III
		Sg. Berlian	1	70	ST/SP	III	76	ST/SP	III
	Sg. Benut	Sg. Ulu Benut	1	74	ST/SP	III	77	ST/SP	II
		Sg. Parit Hj. Yassin	1	74	ST/SP	III	80	ST/SP	II
		Sg. Pinggan	1	65	ST/SP	III	60	ST/SP	III
		Sg. Benut	4	69	ST/SP	III	71	ST/SP	II
	Sg. Johor	Sg. Anak Sg. Sayong	1	68	ST/SP	III	75	ST/SP	II
		Sg. Seluyut	1	76	ST/SP	III	76	ST/SP	II
		Sg. Tiram	4	73	ST/SP	III	77	ST/SP	II
		Sg. Panti	1	79	ST/SP	II	79	ST/SP	II
		Sg. Berangan	1	New			63	ST/SP	III
		Sg. Chemangar	1	58	T/P	III	70	ST/SP	III
		Sg. Johor	4	81	B/C	II	80	ST/SP	II
		Sg. Semenchu	1	54	T/P	III	61	ST/SP	III
		Sg. Serai	1	New			61	ST/SP	III
		Sg. Sebol	1	65	ST/SP	III	75	ST/SP	III
	Kaw. Pasir Gudang	Sg. Latoh	1	52	T/P	III	64	ST/SP	III
	Sg. Skudai	Sg. Melana	2	52	T/P	III	71	ST/SP	III
		Sg. Skudai	9	59	T/P	III	63	ST/SP	III
	Sg. Mersing	Sg. Empangan Congok	1	New			77	ST/SP	II

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Johor	Sg. Pontian Besar	Sg. Air Hitam	1	64	ST/SP	III	72	ST/SP	III
		Sg. Pontian Besar	5	60	ST/SP	III	69	ST/SP	III
	Sg. Pontian Kecil	Sg. Pontian Kecil	2	72	ST/SP	III	78	ST/SP	II
		Sg. Pulau	2	64	ST/SP	III	72	ST/SP	III
	Sg. Rambah	Sg. Ulu Choh	1	49	T/P	IV	64	ST/SP	III
		Sg. Rambah	2	66	ST/SP	III	70	ST/SP	III
	Sg. Sanglang	Sg. Sanglang	1	57	T/P	III	63	ST/SP	III
	Sg. Sedili Kecil	Sg. Sedili Kecil	2	73	ST/SP	III	80	ST/SP	II
		Sg. Anak Sedili Kecil	1	53	T/P	III	76	ST/SP	III
Sg. Bahan		2	67	ST/SP	III	60	ST/SP	III	
Johor/ N.Sembilan/ Pahang	Sg. Muar	Sg. Gemas	2	New			66	ST/SP	III
		Sg. Kelamah	1	New			74	ST/SP	III
		Sg. Merbudu	1	New			68	ST/SP	III
		Sg. P. Mengkuang	1	New			80	ST/SP	II
		Sg. Pagoh	1	New			69	ST/SP	III
		Sg. Palong	2	New			79	ST/SP	II
		Sg. Sarang Buaya	1	57	T/P	III	63	ST/SP	III
		Sg. Senarut	1	New			71	ST/SP	III
		Sg. Simpang Loi	1	New			76	ST/SP	III
		Sg. Tenang	1	New			66	ST/SP	III
		Sg. Gemencheh	1	80	ST/SP	II	80	ST/SP	II
		Sg. Muar	8	80	ST/SP	II	79	ST/SP	II
Pahang	Sg. Balok	Sg. Balok	2	71	ST/SP	III	70	ST/SP	III
		Sg. Panjang	1	69	ST/SP	III	77	ST/SP	II
	Sg. Bebar	Sg. Merba	1	78	ST/SP	II	76	ST/SP	III
		Sg. Bebar	1	73	ST/SP	III	79	ST/SP	II
		Sg. Serai	2	74	ST/SP	III	79	ST/SP	II
	Sg. Kuantan	Sg. Talam	1	79	ST/SP	II	77	ST/SP	II
		Sg. Galing Besar	2	New			63	ST/SP	III
Sg. Merchong	Sg. Merchong	1	77	ST/SP	II	78	ST/SP	II	
Pahang/Johor	Sg. Rompin	Sg. Kepasing	1	New			80	ST/SP	II
		Sg. Bakar	1	New			79	ST/SP	II
		Sg. Rompin	4	80	ST/SP	II	80	ST/SP	II
	Sg. Endau	Sg. Paloh	1	76	ST/SP	III	77	ST/SP	II
		Sg. Anak Sg. Semberong	1	New			76	ST/SP	III
		Sg. Jebong	1	58	T/P	III	71	ST/SP	III
		Sg. Lenga	1	New			74	ST/SP	III
		Sg. Melatai	1	58	T/P	III	68	ST/SP	III
		Sg. Semberong	5	77	ST/SP	II	78	ST/SP	II
		Sg. Mengkibol	3	70	ST/SP	III	73	ST/SP	III
	Sg. Pamol	1	61	ST/SP	III	68	ST/SP	III	
Sg. Tonggok	Sg. Tonggok	1	73	ST/SP	III	71	ST/SP	III	

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Pahang/ N.Sembilan	Sg. Pahang	Sg. Chini	1	81	B/C	II	80	ST/SP	II
		Sg. Tehh	1	New			79	ST/SP	II
		Sg. Bera	2	79	ST/SP	II	80	ST/SP	II
		Sg. Serfing	2	74	ST/SP	III	77	ST/SP	II
Terengganu	Sg. Chukai	Sg. Chukai	1	79	ST/SP	II	80	ST/SP	II
		Sg. Bungkus	1	76	ST/SP	III	80	ST/SP	II
		Sg. Ruang	1	71	ST/SP	III	74	ST/SP	III
	Sg. Merang	Sg. Merang	1	68	ST/SP	III	77	ST/SP	II
	Sg. Merchang	Sg. Merchang	1	71	ST/SP	III	71	ST/SP	III
		Sg. Landas	1	New			70	ST/SP	III
	Sg. Terengganu	Sg. Pueh	1	88	B/C	II	71	ST/SP	III
	Sg. Ibai	Sg. Ibai	3	70	ST/SP	III	77	ST/SP	II
	Sg. Kemaman	Sg. Ransan	1	68	ST/SP	III	75	ST/SP	III
		Sg. Neram	1	New			74	ST/SP	III
	Sg. Marang	Sg. Kerak	1	New			70	ST/SP	III
	Sg. Paka	Sg. Rasau	1	72	ST/SP	III	78	ST/SP	II
Kelantan	Sg. Kelantan	Sg. Kelantan	3	79	ST/SP	II	80	ST/SP	II
		Sg. Belatop	2	87	B/C	II	80	ST/SP	II
		Sg. Ber	1	88	B/C	II	78	ST/SP	II
		Sg. Berok	3	85	B/C	II	77	ST/SP	II
		Sg. Nenggiri	3	84	B/C	II	78	ST/SP	II
		Sg. Rasau	1	New			78	ST/SP	II
		Sg. Isos	1	New			69	ST/SP	III
	Sg. Kemasin	Sg. Gali	1	New			74	ST/SP	III
		Sg. Kemasin	2	76	ST/SP	III	78	ST/SP	II
	Sg. Pengkalan Chepa	Sg. Raja Gali	1	78	ST/SP	II	73	ST/SP	III
		Sg. Alor Lintah	1	58	T/P	III	63	ST/SP	III
		Sg. Pengkalan Chepa	2	70	ST/SP	III	65	ST/SP	III
		Sg. Keladi	1	76	ST/SP	III	80	ST/SP	II
	Sg. Pengkalan Datu	Sg. Pengkalan Datu	3	77	ST/SP	II	78	ST/SP	II
		Sg. Pasir Hor	1	New			75	ST/SP	III
	Sabah	Sg. Sembulan	Sg. Sembulan	2	67	ST/SP	III	73	ST/SP
Sg. Pang Burong 2			1	New			70	ST/SP	III
Sg. Likas			2	72	ST/SP	III	76	ST/SP	III
Sg. Telipok	Sg. Telipok	2	79	ST/SP	II	80	ST/SP	II	
Sarawak	Sg. Kayan	Sg. Kayan	3	79	ST/SP	II	79	ST/SP	II
	Sg. Kerian	Sg. Seblak	1	79	ST/SP	II	80	ST/SP	II
	Sg. Miri	Sg. Lutong	1	75	ST/SP	III	71	ST/SP	III
		Sg. Miri	2	75	ST/SP	III	61	ST/SP	III
		Sg. Padang Liku	1	82	B/C	II	80	ST/SP	II
		Sg. Dalam	1	75	ST/SP	III	72	ST/SP	III
	Sg. Mukah	Sg. Mukah	4	76	ST/SP	III	79	ST/SP	II
	Sg. Niah	Sg. Sekaloh	1	74	ST/SP	III	78	ST/SP	II
	Sg. Oya	Sg. Oya	3	77	ST/SP	II	79	ST/SP	II
Sg. Rajang	Sg. Salim	1	72	ST/SP	III	77	ST/SP	II	

Jadual 2.2 : Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2018
Table 2.2 : Water Quality Status of Slightly Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Sarawak	Sg. Sarawak	Sg. Semenggoh	1	68	ST/SP	III	66	ST/SP	III
		Sg. Tabuan	1	73	ST/SP	III	78	ST/SP	II
		Sg. Samarahan	2	79	ST/SP	II	73	ST/SP	III
		Sg. Maong Kiri	1	64	ST/SP	III	69	ST/SP	III
	Sg. Sariabas	Sg. Layar	2	82	B/C	II	80	ST/SP	II
		Sg. Sariabas	1	74	ST/SP	III	77	ST/SP	II
	Sg. Sibuti	Sg. Kabuloh	2	67	ST/SP	III	72	ST/SP	III
		Sg. Satap	1	78	ST/SP	II	78	ST/SP	II
	Sg. Sadong	Sg. Sadong	4	79	ST/SP	II	80	ST/SP	II
		Sg. Karangan	2	77	ST/SP	II	75	ST/SP	III

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



Jadual 2.3 : Status Kualiti Air bagi Sungai Tercemar, 2018
Table 2.3 : Water Quality Status of Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/NUMBER OF STATIONS	2017			2018		
				IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS	IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS
P.Pinang	Sg. Jawi	Sg. Jawi	1	44	T/P	IV	47	T/P	IV
		Sg. Tengah	1	New		49	T/P	IV	
		Sg. Chempedak	1	New		39	T/P	IV	
	Sg. Juru	Sg. Juru	2	53	T/P	III	58	T/P	III
		Sg. Pasir	1	62	ST/SP	III	59	T/P	III
		Sg. Rambai	1	49	T/P	IV	54	T/P	III
P.Pinang/ Kedah	Sg. Perai	Sg. Perai	2	57	T/P	III	59	T/P	III
		Sg. Seluang Bawah	2	New		59	T/P	III	
		Sg. Kereh	2	50	T/P	IV	56	T/P	III
		Sg. Pertama	1	49	T/P	IV	54	T/P	III
Kedah	Sg. Merbok	Sg. Bakar Arang	1	New		55	T/P	III	
		Sg. Petani	1	60	ST/SP	III	56	T/P	III
Kedah (Langkawi)	Sg. Ulu Melaka	Sg. Chenang	1	New		54	T/P	III	
Selangor/WPKL	Sg. Klang	Sg. Air Busuk	1	56	T/P	III	58	T/P	III
		Sg. Belongkong	1	55	T/P	III	57	T/P	III
		Sg. Ampang	2	62	ST/SP	III	58	T/P	III
		Sg. Untut	1	60	ST/SP	III	55	T/P	III
		Sg. Kuyoh	1	48	T/P	III	50	T/P	IV
		Sg. Kerayong	2	52	T/P	III	54	T/P	III
Selangor	Sg. Buloh	Sg. Buloh	4	58	T/P	III	53	T/P	III
	Sg. Sepang	Sg. Rambai	1	New		31	T/P	IV	
Melaka	Sg. Merlimau	Sg. Merlimau	2	53	T/P	III	52	T/P	III
	Sg. Duyong	Sg. Punggur	1	New		48	T/P	IV	
Melaka/ N.Sembilan	Sg. Melaka	Sg. Malim	1	New		54	T/P	III	
Johor	Sg. Air Balo	Sg. Air Balo	3	61	ST/SP	III	53	T/P	III
	Sg. Batu Pahat	Sg. Simpang Kanan	2	56	T/P	III	59	T/P	III
		Sg. Temehel	1	New		44	T/P	IV	
		Sg. Batu Pahat	1	61	ST/SP	III	59	T/P	III
	Sg. Johor	Sg. Temoh	1	62	ST/SP	III	58	T/P	III
	Sg. Danga	Sg. Danga	2	44	T/P	IV	47	T/P	IV
	Kawasan Pasir Gudang	Sg. Perembi	1	49	T/P	IV	42	T/P	IV
		Sg. Masai	1	48	T/P	IV	56	T/P	III
		Sg. Buluh	1	34	T/P	IV	26	T/P	V
		Sg. Tukang Batu	1	30	T/P	V	22	T/P	V
	Sg. Kempas	Sg. Kempas	2	47	T/P	IV	46	T/P	IV
	Sg. Kim-Kim	Sg. Kim-Kim	2	57	T/P	III	58	T/P	III
	Sg. Sedili Besar	Sg. Mupur	1	New		48	T/P	IV	
	Sg. Pontian Besar	Sg. Ayer Merah	1	43	T/P	IV	51	T/P	IV
	Sg. Segget	Sg. Segget	5	46	T/P	IV	59	T/P	III
	Sg. Tebrau	Sg. Bala	1	48	T/P	IV	45	T/P	IV
Sg. Sebulung		1	49	T/P	IV	44	T/P	IV	
Sg. Plentong		1	46	T/P	IV	54	T/P	III	
Sg. Tebrau		4	41	T/P	IV	51	T/P	IV	

Jadual 2.3 : Status Kualiti Air bagi Sungai Tercemar, 2018
Table 2.3 : Water Quality Status of Polluted Rivers, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/RIVER	BILANGAN STESEN/ NUMBER OF STATIONS	2017			2018		
				IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Johor	Sg. Tebrau	Sg. Pandan	1	42	T/P	IV	42	T/P	IV
		Sg. Tampoi	1	41	T/P	IV	45	T/P	IV
		Sg. Sengkuang	1	40	T/P	IV	30	T/P	V
Johor/ N. Sembilan	Sg. Muar	Sg. Merlimau	1	New			55	T/P	III
		Sg. Serom	1	New			54	T/P	III
Sarawak	Sg. Miri	Sg. Adong	1	74	ST/SP	III	59	T/P	III
Kelantan	Sg. Pengkalan Chepa	Sg. Alor B	1	52	T/P	III	57	T/P	III

Nota/Note:

B/C : Bersih/Clean

ST/SP : Sederhana Tercemar/Slightly Polluted

T/P : Tercemar/Polluted



Jadual 2.4 menunjukkan sebanyak 30 daripada 50 sungai tercemar masih tergolong dalam Kelas III, 16 sungai adalah dalam Kelas IV, manakala 4 sungai adalah Kelas V. Berdasarkan BOD, satu sungai diklasifikasikan sebagai Kelas II, 3 sungai dalam Kelas III, 20 sungai sebagai Kelas IV manakala 26 adalah Kelas V. Dari segi NH₃-N pula, satu sungai tergolong dalam Kelas II, dua sungai dalam Kelas III, 16 sungai Kelas IV, dan 31 sungai adalah Kelas V. Dari segi SS, sebanyak lima sungai telah diklasifikasikan sebagai Kelas II, 21 sungai Kelas III, dan 24 adalah Kelas III manakala tiga adalah Kelas IV.

Table 2.4 shows that out of the 50 polluted rivers, 30 rivers were classified as Class III, while 16 rivers as Class IV, and 4 river as Class V. In terms of BOD, one river was classified as Class II, 3 rivers as Class III, 20 rivers were classified as Class IV and 26 rivers as Class V. In terms of NH₃-N, one river was classified as Class II, two rivers as Class III, 16 rivers as Class IV and 31 rivers as Class V. In terms of SS, 5 rivers were classified as Class I, 21 rivers as Class II, 24 rivers as Class III while 3 rivers as Class IV.

Jadual 2.4 : Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2018
Table 2.4 : The Polluted Rivers and Classes Based on BOD, AN and SS, 2018

BIL./NO.	NEGERI/STATE	LEMBANGAN SUNGAI/RIVER BASIN	SUNGAI/RIVER	STATUS 2018		KELAS BERDASARKAN:/ CLASS BASED ON:		
				IKA/WQI	KELAS/CLASS	BOD	AN	SS
1.	Johor	Air Baloi	Sg. Air Baloi	53	III	V	II	IV
		Batu Pahat	Sg. Batu Pahat	59	III	III	IV	II
			Sg. Simpang Kanan	59	III	III	IV	I
			Sg. Temehel	44	IV	IV	V	II
		Danga	Sg. Danga	47	IV	V	V	III
		Johor	Sg. Temoh	58	III	IV	III	III
		Kaw. Pasir Gudang	Sg. Buluh	26	V	V	V	III
			Sg. Masai	56	III	IV	V	II
			Sg. Perembi	42	IV	V	V	III
		Kempas	Sg. Tukang Batu	22	V	V	V	III
			Sg. Kempas	46	IV	V	V	II
			Sg. Kim-Kim	58	III	IV	IV	III
		Pontian Besar	Sg. Ayer Merah	51	IV	IV	IV	II
		Sedili Besar	Sg. Mupur	48	IV	V	IV	III
		Segget	Sg. Segget	59	III	IV	V	II
		Tebrau	Sg. Bala	45	IV	V	V	III
			Sg. Pandan	42	IV	V	V	II
			Sg. Plentong	54	III	IV	V	III
			Sg. Sebulung	44	IV	V	V	I
			Sg. Sengkuang	30	V	V	V	II
Sg. Tampoi	45		IV	V	V	II		
		Sg. Tebrau	51	IV	IV	V	III	

Jadual 2.4 : Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2018
Table 2.4 : The Polluted Rivers and Classes Based on BOD, AN and SS, 2018

BIL./ NO.	NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STATUS 2018		KELAS BERDASARKAN:/ CLASS BASED ON:		
				IKA/ WQI	KELAS/ CLASS	BOD	AN	SS
2.	Johor/ N.Sembilan/ Pahang	Muar	Sg. Merlimau	55	III	IV	IV	IV
			Sg. Serom	54	III	III	IV	I
3.	Kedah	Merbok	Sg. Bakar Arang	55	III	V	V	III
			Sg. Petani	56	III	V	IV	II
4.	Kedah (Langkawi)	Ulu Melaka	Sg. Chenang	54	III	IV	IV	III
5.	Kelantan	Pengkalan Chepa	Sg. Alor B	57	III	IV	V	II
6.	Melaka	Duyong	Sg. Punggur	48	IV	IV	IV	II
		Merlimau	Sg. Merlimau	52	III	IV	IV	II
7.	Melaka/ Negeri Sembilan	Melaka	Sg. Malim	54	III	V	IV	III
8.	Pulau Pinang	Jawi	Sg. Chempedak	39	IV	V	V	III
			Sg. Jawi	47	IV	V	V	III
			Sg. Tengah	49	IV	V	V	III
		Juru	Sg. Juru	58	III	IV	V	II
			Sg. Pasir	59	III	V	IV	I
			Sg. Rambai	54	III	IV	V	II
9.	Pulau Pinang/ Kedah	Perai	Sg. Kereh	56	III	IV	V	III
			Sg. Perai	59	III	IV	IV	III
			Sg. Pertama	54	III	IV	IV	III
			Sg. Seluang Bawah	59	III	IV	V	II
10.	Sarawak	Miri	Sg. Adong	59	III	II	III	I
11.	Selangor	Buloh	Sg. Buloh	53	III	V	IV	II
		Sepang	Sg. Rambai	31	V	V	V	III
12.	Selangor/ WPKL	Klang	Sg. Air Busuk	58	III	V	V	II
			Sg. Ampang	58	III	V	V	III
			Sg. Belongkong	57	III	V	V	II
			Sg. Kerayong	54	III	V	V	II
			Sg. Kuyoh	50	IV	IV	V	IV
			Sg. Untut	55	III	V	V	II

STATUS PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

Rajah 2.2 menunjukkan lokasi 30 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. Julat DO yang rendah didapati bagi stesen CR03K, CR06A dan CR28S, manakala julat BOD juga adalah setara bagi stesen CR06A, CR08B, CR11B, CR22C, CR25T, CR27S dan CR29Q.

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. Julat bagi ammoniacal-N pada umumnya adalah rendah kecuali bacaan yang didapati di stesen CR08B, CR09B, CR11B dan CR12W.

pH adalah ukuran bagi keasidan dan kealkalian mengikut skala pH. Julat bagi pH yang tinggi diperhatikan di CR05A, CR11B, CR12W, CR17M, CR18J dan CR21J.

Kekeruhan digunakan sebagai penunjuk kehadiran pepejal terampai di dalam sungai. Bagi Julat TSS yang direkodkan secara amnya adalah tinggi kecuali stesen CR01K, CR02K, CR03K, CR05A, CR19J, CR22C, CR23C, CR24T, CR25T dan CR28S.

CONTINUOUS RIVER WATER QUALITY MONITORING STATUS

Figure 2.2 shows the location of the 30 automatic continuous river monitoring stations and corresponding water intakes as listed in **Table 2.5**.

Dissolved oxygen is one of the indicators of BOD presence exerted by organic pollutants. Low range of DO were observed at CR03K, CR06A and CR28S, while relatively narrow BOD ranges were observed at CR06A, CR08B, CR11B, CR22C, CR25T, CR27S and CR29Q.

Ammonium is an ionized form of ammonia. The measurement of ammonium indicates the potential presence of ammonia or ammoniacal nitrogen pollutants in rivers which is also improved pH and temperature changes. Ammoniacal-N range was generally low except for reading observed at CR08B, CR09B, CR11B and CR12W stations.

pH is a measurement of acidity and alkalinity based on pH scale. Relatively high pH ranges were observed at CR05A, CR11B, CR12W, CR17M, CR18J and CR21J.

Turbidity is used as an indicator of suspended solids presence in a river. The range of TSS recorded were generally high except for CR01K, CR02K, CR03K, CR05A, CR19J, CR22C, CR23C, CR24T, CR25T and CR28S stations

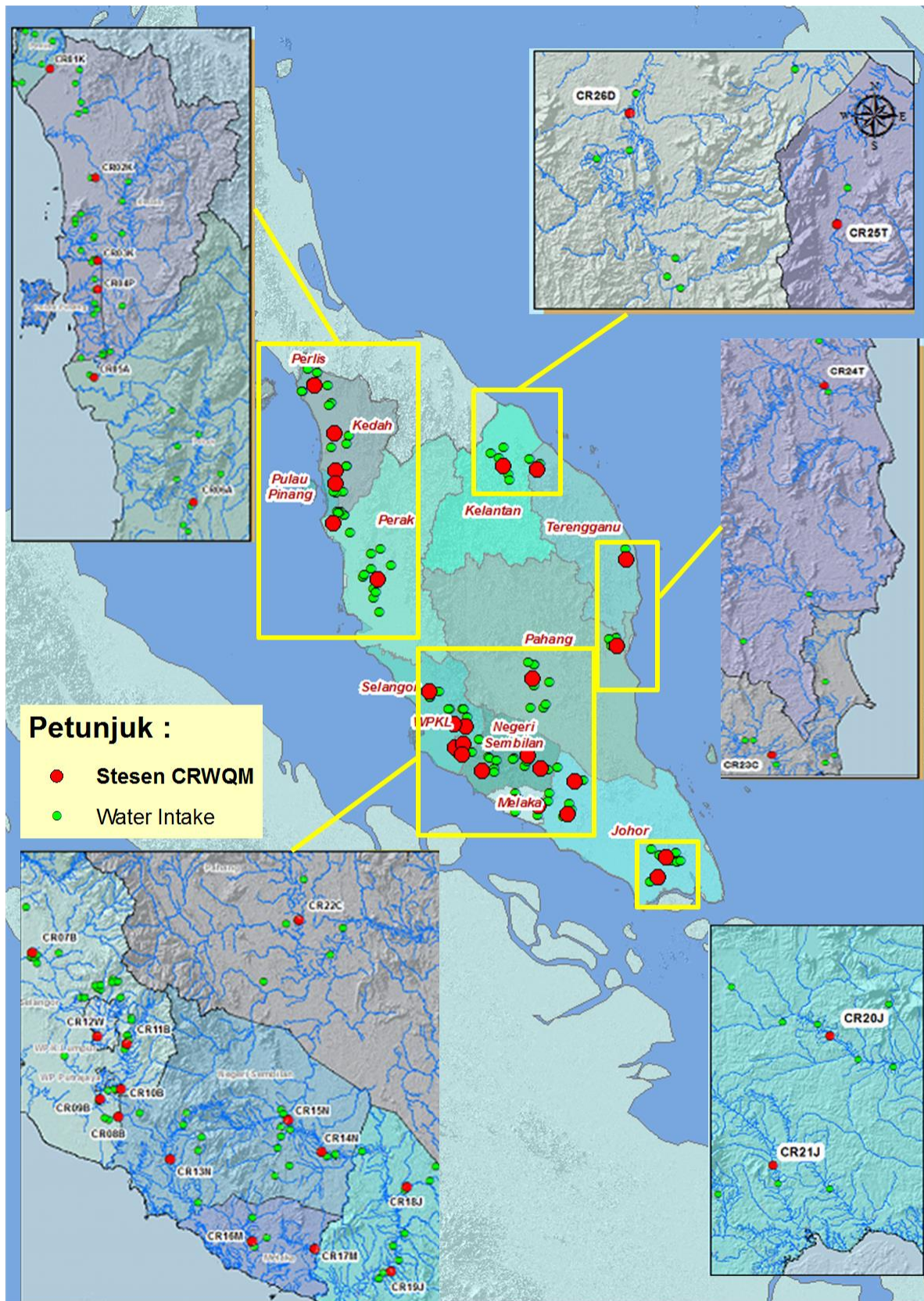
Jadual 2.5 : CRWQMS Lokasi: ID Stesen, Longitud dan Latitud bagi Stesen dan Takat Pengambilan Air

Table 2.5 : CRWQMS Location: Station ID, Longitude and Latitude of the Station and Water Intake

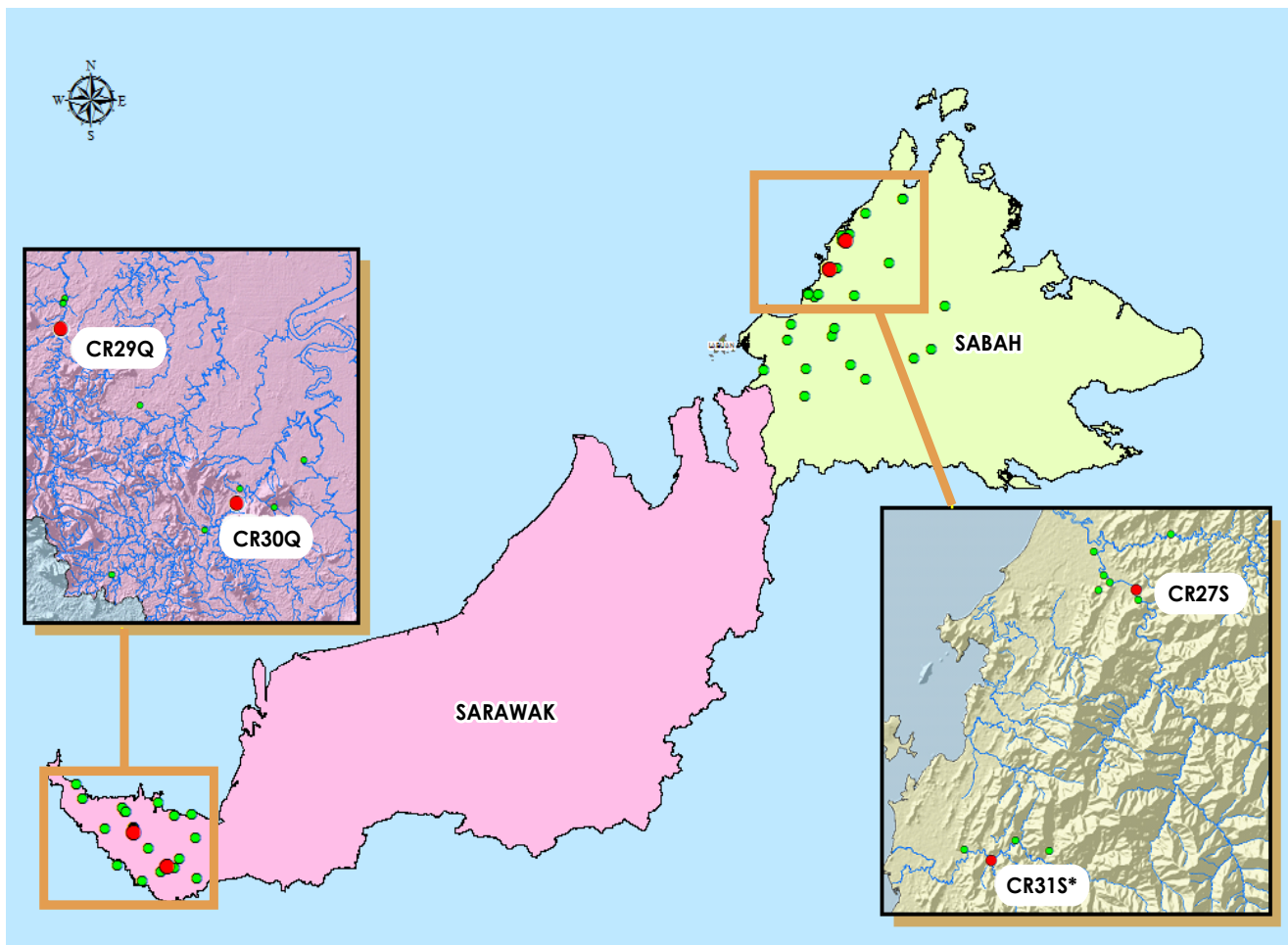
NEGERI/STATE	ID STESEN/ ID STATION (CR)	SUNGAI/RIVER	TAKAT PENGAMBILAN AIR/ WATER INTAKE
Perlis	01K	Terusan MADA	Arau Fasa IV
Kedah	02K	Terusan MADA	Bukit Jenun
	03K	Sungai Muda	Kulim Hi-Tech
Penang	04P	Sungai Kulim	Toh Along
Perak	05A	Sungai Bogak	Parit Buntar
	06A	Sungai Perak	Sultan Idris
Selangor	07B	Sungai Selangor	Sg. Selangor Fasa 1,2,3
	08B	Sungai Langat	Bukit Tampo
	09B	Sungai Semenyih	Jenderam
	10B	Sungai Labu	Labu Lanjut
	11B	Sungai Langat	Cheras Batu 11
Wilayah Kuala Lumpur	12W	Sungai Klang	NA
Negeri Sembilan	13N	Sungai Linggi	Linggi
	14N	Sungai Muar	Pasir Besar
	15N	Sungai Muar	Jelai Jempol
Melaka	16M	Sungai Melaka	Durian Tunggal
	17M	Sungai Kesang	Chin Chin
Johor	18J	Sungai Segamat	Segamat
	19J	Sungai Muar	Panchor
	20J	Sungai Johor	Semanggar
	21J	Sungai Sekudai	Skudai
Pahang	22C	Sungai Pahang	Lubuk Kawah
	23C	Sungai Kuantan	Semambu
Terengganu	24T	Sungai Paka	Bulit Bauk
	25T	Sungai Besut	Nukit Bunga
Kelantan	26D	Sungai Kelantan	Sokor
Sabah	27S	Sungai Tuaran	Telibong
	28S*	Sungai Padas	Beufort
	31S*	Sungai Moyog	Kasigui
Sarawak	29Q	Sungai Sarawak	Sarawak Kiri
	30Q	Sungai Batang Sadong	Tebekang

*CR28S telah dipindahkan ke CR31S

*CR28S was relocated to CR31S



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



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



TREN PENCEMARAN AIR SUNGAI

Kualiti air sungai yang ditentukan dari segi IKA telah menunjukkan peningkatan pada tahun 2018. Peratus bilangan sungai yang dikategorikan sebagai bersih telah sedikit meningkat kepada 56% pada tahun 2018 berbanding 46% pada tahun sebelumnya. Peratus bilangan sungai yang dikategorikan sebagai tercemar telah sedikit menurun daripada 11% pada tahun 2017 kepada 8% pada tahun 2018. **(Rajah 2.1)**

Berdasarkan sub-indeks BOD, 110 sungai yang dikategorikan sebagai bersih pada tahun 2018 **(Rajah 2.3)**. Bilangan sungai yang tercemar dari segi sub-indeks BOD telah menurun daripada 336 pada tahun 2017 kepada 257 sungai pada tahun 2018. 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 $\text{NH}_3\text{-N}$ pula, bilangan sungai bersih telah meningkat daripada 87 pada tahun 2017 kepada 109 pada tahun 2018 **(Rajah 2.4)**. Bilangan sungai yang tercemar dari segi sub-indeks $\text{NH}_3\text{-N}$ telah meningkat daripada 158 pada tahun 2017 kepada 238 sungai pada tahun 2018. Kemerosotan kualiti air sungai yang disebabkan oleh $\text{NH}_3\text{-N}$ boleh dikaitkan dengan pelepasan air sisa kumbahan manusia dan haiwan yang tidak diolah dan diolah ke dalam air sungai secara berterusan.

Dari segi sub-indeks SS pula, bilangan sungai yang dikategorikan bersih telah meningkat daripada 245 pada tahun 2017 kepada 320 pada tahun

TREND IN RIVER WATER POLLUTION

The river water quality in terms of WQI had shown an improvement in 2018. The percentage of clean rivers has slightly increased to 56% in 2018 compared to 46% in the previous year. The percentage of polluted river has slightly decreased from 11% in 2017 to 8% in 2018. **(Figure 2.1).**

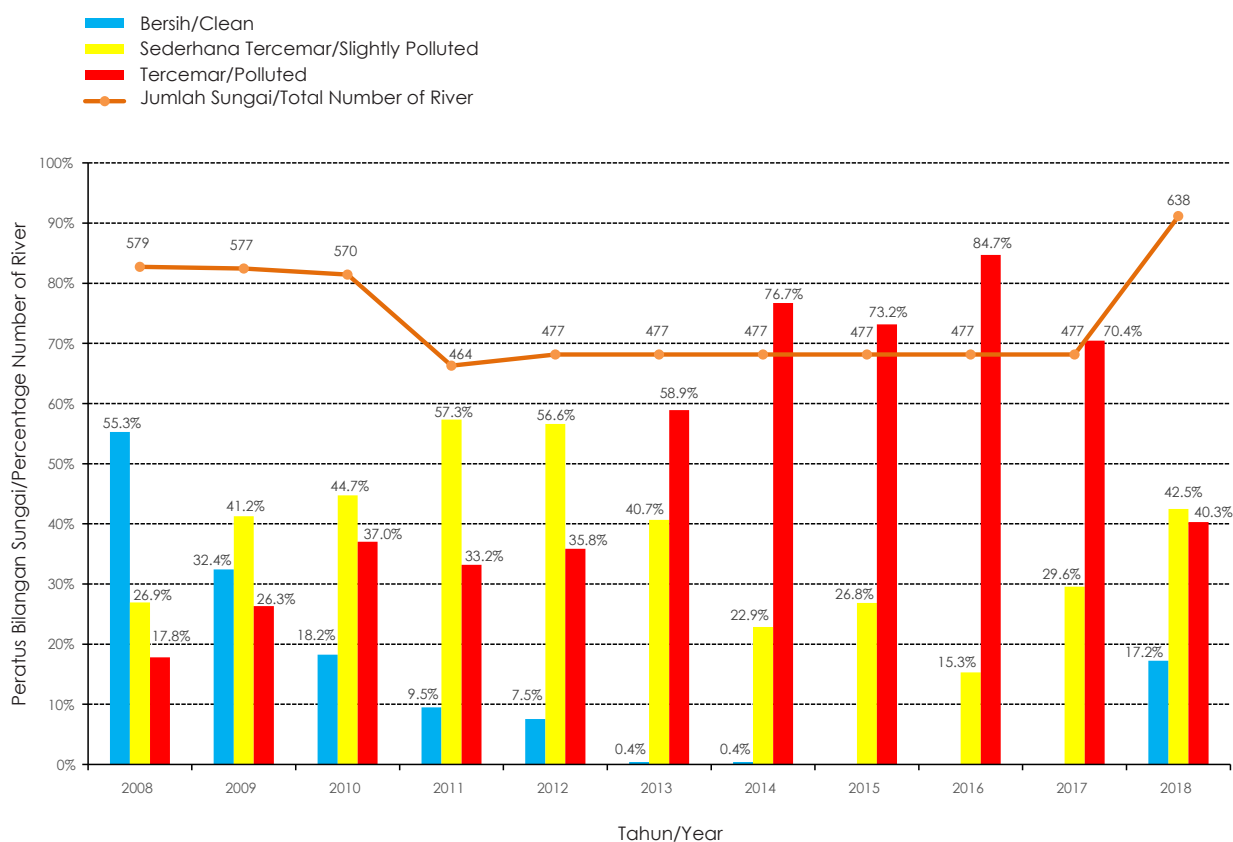
In terms of BOD sub-index, 110 of the monitored rivers has been categorized as clean in 2018 **(Figure 2.3)**. The number of polluted rivers in terms of BOD sub-index has decreased from 336 in 2017 to 257 rivers in 2018. Degradation of river water quality in terms of BOD is attributed to various sources of organic pollutants including wastewater from industrial, domestic and commercial activities.

In term of $\text{NH}_3\text{-N}$ sub-index, the number of clean rivers has increased from 87 in 2017 to 109 rivers in 2018 **(Figure 2.4)**. The number of polluted rivers in terms of $\text{NH}_3\text{-N}$ sub-index has increased from 158 in 2017 to 238 rivers in 2018. The degradation of river water quality caused by $\text{NH}_3\text{-N}$ can be associated with the discharge of treated and untreated sewage into the rivers.

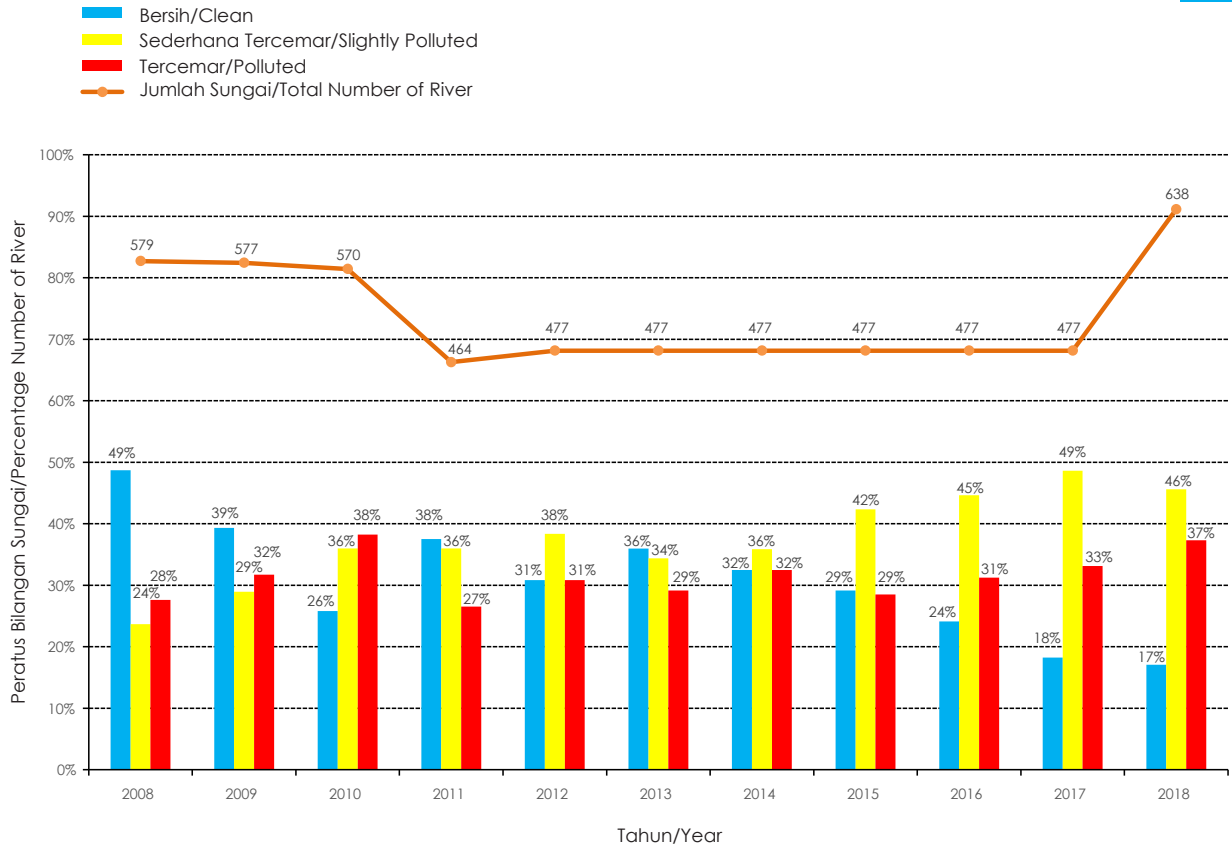
In term of SS sub-index, the number of clean rivers has increased from 245 in 2017 to 320 in 2018 **(Figure 2.5)**. The number of polluted rivers in terms

2018 (**Rajah 2.5**). Bilangan sungai yang dikategorikan sebagai tercemar dari segi sub-indeks SS pula telah meningkat kepada 209 berbanding 127 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.

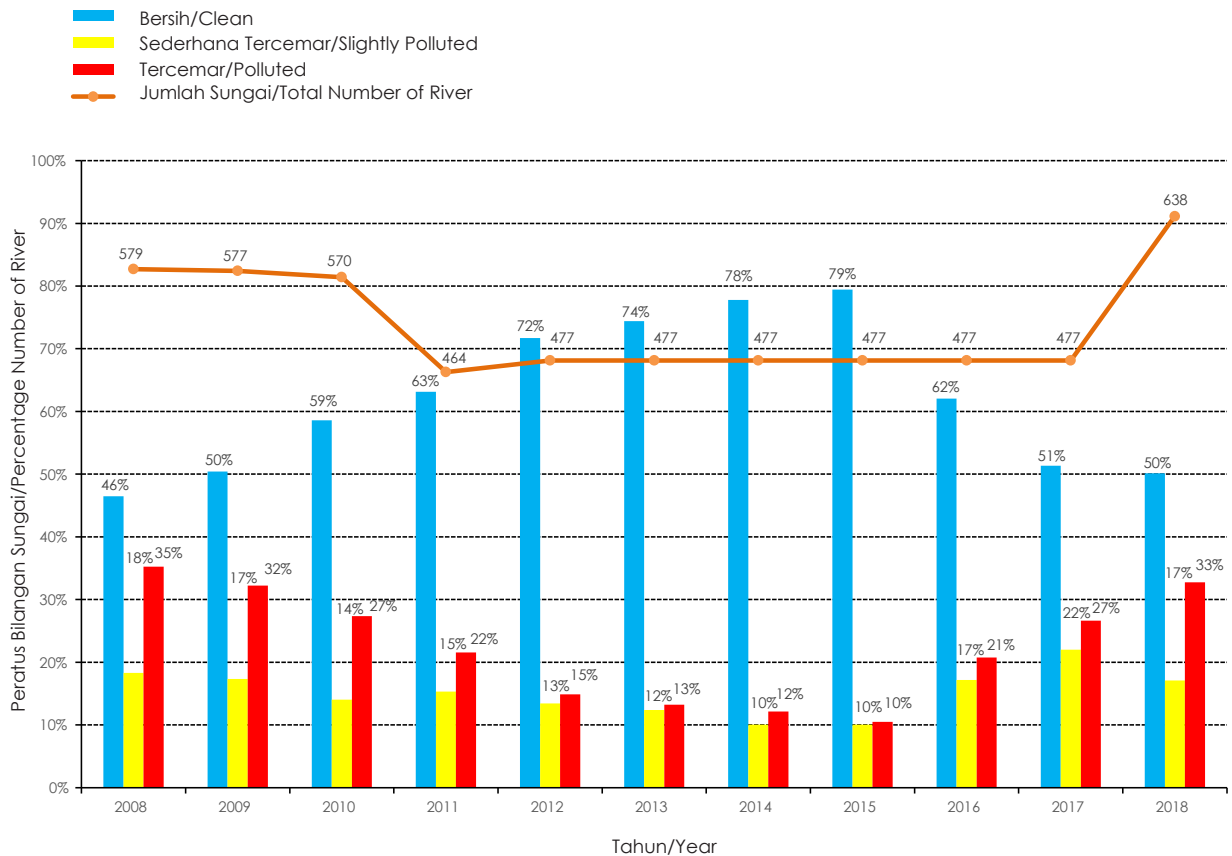
of SS sub-index has increased to 209 compared to 127 rivers in the previous year. The deteriorations in river water quality due to the suspended solids can be attributed by inefficient control against improper earthworks and land clearing activities in certain areas.



Rajah 2.3 : Tren Kualiti Air Sungai Berdasarkan Sub-Indeks BOD (2008-2018)
Figure 2.3 : River Water Quality Trend Based on BOD Sub-Index (2008-2018)



Rajah 2.4 : Tren Kualiti Air Sungai Berdasarkan Sub-Indeks AN (2008-2018)
Figure 2.4 : River Water Quality Trend Based on AN Sub-Index (2008-2018)



Rajah 2.5 : Tren Kualiti Air Sungai Berdasarkan Sub-Indeks SS (2008-2018)
Figure 2.5 : River Water Quality Trend Based on SS Sub-Index (2008-2018)

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 2018 kesemua sampel air sungai telah menunjukkan kandungan logam As pada tahap Kelas II. Sebanyak 99.9% daripada sampel air sungai yang diuji telah menunjukkan kandungan Zn dalam Kelas II, diikuti dengan Pb (99.7%), Cr, Cd dan Hg masing-masing 99.9%.

KUALITI AIR SUNGAI DI HULU MUKA SAUK

Pada tahun 2018, 47 (85%) daripada 55 stesen pengawasan kualiti air di hulu muka sauk telah menunjukkan indeks kualiti air bersih sementara 8 (15%) stesen dikategorikan sebagai sederhana tercemar. Berdasarkan IKA juga, dua (4%) stesen telah dikategorikan sebagai kelas I dan 49 (89%) adalah Kelas II, manakala empat (7%) adalah Kelas III. **Jadual 2.6** menunjukkan status kualiti air di stesen hulu muka sauk terpilih berdasarkan IKA.

HEAVY METALS IN RIVERS

Heavy metals analysed in river where were Mercury (Hg), Arsenic (As), Cadmium (Cd), Chromium (Cr), Plumbum (Pb), and Zinc (Zn). In 2018, all of the water samples had shown that the concentration of As was within Class II limit. About 99.9% of water samples had shown that the concentrations of Zn were within Class II limit followed by Pb (99.97%), Cr, Cd and Hg at 99.9% respectively.

RIVER WATER QUALITY UPSTREAM WATER INTAKES

In 2018, 47 (85%) from 55 monitoring stations located upstream of water intakes had shown clean water quality while 8 (15%) stations were categorized as slightly polluted. Based on overall WQI, two (4%) stations were categorized as Class I, 49 (89%) were Class II, while four (7%) was Class III. **Table 2.6** shows the water quality of the selected water intake stations based on WQI.

Jadual 2.6 : Status Kualiti Air di Hulu Muka Sauk, 2018
Table 2.6 : Water Quality Status of Upstream Water Intakes, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS	IKA/ WQI	KATEGORI/ CATEGORY	KELAS/ CLASS
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	83	B/C	III	83	B/C	II
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	83	B/C	III	86	B/C	II
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	85	B/C	II	83	B/C	II
		Sg. Saga	2LG06	Padang Saga	85	B/C	II	84	B/C	II
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	87	B/C	II	86	B/C	II
		Sg. Padang Terap	2KD12	Kuala Nerang	89	B/C	II	88	B/C	II
		Sg. Temin	2KD10	Changloon	88	B/C	II	78	ST/SP	II
	Muda	Sg. Muda	2MD16	Jeneri	85	B/C	II	86	B/C	II
			2MD17	Jeniang	83	B/C	II	85	B/C	II
			2MD18	Bukit Selambau	82	B/C	II	85	B/C	II
		2MD20	Pinang Tunggal	80	ST/SP	II	84	B/C	II	
	Sg. Nami	2MD21	Nami	83	B/C	II	87	B/C	II	
Sg. Sedim	2MD19	Bikan	83	B/C	II	86	B/C	II		
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	88	B/C	II	91	B/C	II
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	88	B/C	II	88	B/C	II
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	90	B/C	II	88	B/C	II
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	83	B/C	II	92	B/C	II
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	92	B/C	II	92	B/C	II
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	92	B/C	II	89	B/C	II
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	91	B/C	II	94	B/C	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	92	B/C	II	92	B/C	II
	Seputang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	95	B/C	II	94	B/C	I
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	94	B/C	I	91	B/C	II
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	64	ST/SP	III	73	ST/SP	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	67	ST/SP	III	77	ST/SP	III
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	83	B/C	II	85	B/C	II
	Benut	Sg. Machap Dam	3BN10	Machap Dam	82	B/C	II	84	B/C	II
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	86	B/C	II	87	B/C	II
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	85	B/C	II	84	B/C	II
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	93	B/C	I	88	B/C	II

Jadual 2.6 : Status Kualiti Air di Hulu Muka Sauk, 2018
Table 2.6 : Water Quality Status of Upstream Water Intakes, 2018

NEGERI/STATE	LEMBANGAN SUNGAI/RIVER BASIN	SUNGAI/RIVER	STESEN ID/ID STATIONS	MUKA SAUK/WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS	IKA/WQI	KATEGORI/CATEGORY	KELAS/CLASS
Johor	Muar	Sg. Muar	3MR38	Loji Rawatan Air Gombang	78	ST/SP	II	78	ST/SP	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	91	B/C	II	91	B/C	II
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauik Loji Rawatan Air Chin-chin	69	ST/SP	IV	83	B/C	III
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	96	B/C	I	92	B/C	II
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	90	B/C	II	92	B/C	II
		Sg. Ulong	2CH16	Brinchang Dam	93	B/C	I	92	B/C	II
	Pahang	Sg. Gapoi	4PH95	Muka sauik Loji Rawatan Air Gapoi	93	B/C	I	89	B/C	II
		Sg. Jempol	4PH96	Loji Air Sg Jerik	74	ST/SP	III	86	B/C	II
			4PH97	Loji Air Jengka 3	84	B/C	II	83	B/C	III
		Sg. Mentiga	4PH98	Loji Air Chini	88	B/C	II	86	B/C	II
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	88	B/C	II	82	B/C	III
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	84	B/C	II	87	B/C	II
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	86	B/C	II	88	B/C	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	87	B/C	II	86	B/C	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	77	ST/SP	II	79	ST/SP	II
		Sg. Pehi	4KE67	Loji Air Pahi	84	B/C	II	83	B/C	III
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	84	B/C	II	88	B/C	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandailpau	92	B/C	II	92	B/C	II
			75PP05	Water Intake Kogopon	89	B/C	II	92	B/C	II
Sarawak	Kerian	Sg. Selalang	55SG01	Selangang Water Intake	85	B/C	II	91	B/C	II
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	80	ST/SP	II	85	B/C	II
	Rajang	Sg. Daro	56DR01	Daro Water Intake	70	ST/SP	III	64	ST/SP	III
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	84	B/C	II	63	ST/SP	III
		Sg. Pakan	56PN01	Pakan Water Intake	82	B/C	II	89	B/C	II
		Sg. Pila Parit	56PL01	Igan Water Intake	74	ST/SP	III	71	ST/SP	III

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

Dari segi BOD, 26 (47%) stesen telah menunjukkan kualiti air pada Kelas II and 29 (53%) stesen Kelas III. Berdasarkan NH₃-N pula, sebanyak 29 (53%) stesen menunjukkan kualiti air Kelas I, 20 (36%) Kelas II, lima (9%) stesen Kelas III, dan satu stesen (2%) adalah Kelas IV. Dari segi SS, 23 (42%) stesen telah dikategorikan sebagai Kelas I, 12 (22%) stesen Kelas II, 15 (27%) stesen Kelas III, empat (7%) stesen Kelas IV manakala satu (2%) stesen Kelas V.

Rajah 2.6 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.

In terms of BOD, 26 (47%) station have shown Class II water quality and 29 (53%) stations as Class III. In terms of NH₃-N, 29 (53%) stations showed Class I, 20 (36%) as Class II, five (9%) as Class III, and one (2%) station as Class IV. Meanwhile in terms of SS, 23 (42%) stations were categorized as Class I, 12 (22%) as Class II, 15 (27%) as Class III, four (7%) as Class IV, and one (2%) station as Class V.

Figure 2.6 shows the percentage of water quality upstream of water intake stations in term of classes based on main parameters. **Table 2.7**, **Table 2.8** and **Table 2.9** shows the water quality at upstream stations of water intake points based on BOD, AN and SS sub-indexes respectively.

Jadual 2.7 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2018
Table 2.7 : Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					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	78	T/P	III	83	ST/SP	III
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	79	T/P	III	82	ST/SP	III
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	86	ST/SP	III	77	T/P	III
		Sg. Saga	2LG06	Padang Saga	79	T/P	III	78	T/P	III
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	79	T/P	III	82	ST/SP	III
		Sg. Padang Terap	2KD12	Kuala Nerang	80	ST/SP	III	81	ST/SP	III
		Sg. Temin	2KD10	Changloon	88	ST/SP	II	80	ST/SP	III
	Muda	Sg. Muda	2MD16	Jeneri	74	T/P	IV	84	ST/SP	III
			2MD17	Jeniang	73	T/P	IV	82	ST/SP	III
		2MD18	Bukit Selambau	78	T/P	III	83	ST/SP	III	
		2MD20	Pinang Tunggal	77	T/P	III	80	ST/SP	III	
		Sg. Nami	2MD21	Nami	83	ST/SP	III	80	ST/SP	III
Sg. Sedim	2MD19	Bikan	82	ST/SP	III	84	ST/SP	III		
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	77	T/P	III	86	ST/SP	III
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	77	T/P	III	83	ST/SP	III
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	76	T/P	IV	84	ST/SP	III
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	84	ST/SP	III	87	ST/SP	III

Jadual 2.7 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2018
Table 2.7 : Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS BOD/ BOD SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS BOD/ BOD SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Perak	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	82	ST/SP	III	83	ST/SP	III
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	77	T/P	III	82	ST/SP	III
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	78	T/P	III	87	ST/SP	III
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	80	ST/SP	III	83	ST/SP	III
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	76	T/P	IV	87	ST/SP	III
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	86	ST/SP	III	86	ST/SP	III
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	59	T/P	IV	80	ST/SP	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	70	T/P	IV	80	ST/SP	III
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauks Loji Rawatan Air Chin-chin	78	T/P	III	81	ST/SP	III
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	67	T/P	IV	82	ST/SP	III
	Benut	Sg. Machap Dam	3BN10	Machap Dam	75	T/P	IV	88	ST/SP	II
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	80	ST/SP	III	86	ST/SP	III
	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	79	T/P	III	83	ST/SP	III
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	81	ST/SP	III	78	T/P	III
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	74	T/P	IV	78	T/P	III
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	84	ST/SP	III	83	ST/SP	III
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	89	ST/SP	II	88	ST/SP	II
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	74	T/P	IV	86	ST/SP	III
		Sg. Ulong	2CH16	Brinchang Dam	79	T/P	III	86	ST/SP	III
	Pahang	Sg. Gapoi	4PH95	Muka sauks Loji Rawatan Air Gapoi	88	ST/SP	II	82	ST/SP	III
		Sg. Jempol	4PH96	Loji Air Sg. Jerik	41	T/P	V	81	ST/SP	III
			4PH97	Loji Air Jengka 3	83	ST/SP	III	82	ST/SP	III
		Sg. Mentiga	4PH98	Loji Air Chini	83	ST/SP	III	81	ST/SP	III
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	88	ST/SP	II	82	ST/SP	III
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	82	ST/SP	III	82	ST/SP	III

Jadual 2.7 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2018
Table 2.7 : Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS BOD/ BOD SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS BOD/ BOD SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	83	ST/SP	III	81	ST/SP	III
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	81	ST/SP	III	79	T/P	III
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	79	T/P	III	79	T/P	III
		Sg. Pehi	4KE67	Loji Air Pahi	77	T/P	III	79	T/P	III
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	94	B/C	II	96	B/C	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	88	ST/SP	II	95	B/C	II
			75PP05	Water Intake Kogopon	93	B/C	II	95	B/C	II
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	92	B/C	II	95	B/C	II
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	91	B/C	II	96	B/C	II
	Rajang	Sg. Daro	56DR01	Daro Water Intake	89	ST/SP	II	95	B/C	II
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	86	ST/SP	III	95	B/C	II
		Sg. Pakan	56PN01	Pakan Water Intake	87	ST/SP	III	95	B/C	II
		Sg. Pila Parit	56PL01	Igan Water Intake	89	ST/SP	II	95	B/C	II

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



Jadual 2.8 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2018
Table 2.8 : Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS AN/AN SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS AN/AN SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	88	ST/SP	II	92	B/C	I
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	81	ST/SP	II	90	ST/SP	II
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	90	ST/SP	II	92	B/C	I
		Sg. Saga	2LG06	Padang Saga	96	B/C	I	79	ST/SP	II
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	87	ST/SP	II	96	B/C	I
		Sg. Padang Terap	2KD12	Kuala Nerang	90	ST/SP	II	84	ST/SP	II
		Sg. Temin	2KD10	Changloon	70	T/P	II	70	T/P	II
	Muda	Sg. Muda	2MD16	Jeneri	94	B/C	I	89	ST/SP	II
			2MD17	Jeniang	92	B/C	I	95	B/C	I
			2MD18	Bukit Selambau	90	ST/SP	II	92	B/C	I
			2MD20	Pinang Tunggal	91	ST/SP	I	83	ST/SP	II
			2MD21	Nami	98	B/C	I	96	B/C	I
Sg. Sedim	2MD19	Bikan	89	ST/SP	II	92	B/C	I		
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	86	ST/SP	II	96	B/C	I
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	96	B/C	I	97	B/C	I
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	96	B/C	I	92	B/C	I
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	75	ST/SP	II	93	B/C	I
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	98	B/C	I	98	B/C	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	91	ST/SP	I	79	ST/SP	II
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	98	B/C	I	98	B/C	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	98	B/C	I	97	B/C	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	99	B/C	I	97	B/C	I
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	99	B/C	I	97	B/C	I
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	45	T/P	IV	41	T/P	IV
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	56	T/P	III	66	T/P	III
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauks Loji Rawatan Air Chin-chin	63	T/P	III	87	ST/SP	II
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	91	ST/SP	I	92	B/C	I
	Benut	Sg. Machap Dam	3BN10	Machap Dam	73	ST/SP	II	61	T/P	III
	Endau	Sg. Kahang	3ED38	Jalan Felde Kahang Timur, Kluang	84	ST/SP	II	74	ST/SP	II

Jadual 2.8 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2018
Table 2.8 : Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS AN/AN SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS AN/AN SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Johor	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	91	ST/SP	I	92	B/C	I
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	97	B/C	I	97	B/C	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	82	ST/SP	II	90	ST/SP	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	90	ST/SP	II	93	B/C	I
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	100	B/C	I	94	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	97	B/C	I	98	B/C	I
		Sg. Ulong	2CH16	Brinchang Dam	100	B/C	I	93	B/C	I
	Pahang	Sg. Gapoi	4PH95	Muka sauK Loji Rawatan Air Gapoi	98	B/C	I	86	ST/SP	II
		Sg. Jempol	4PH96	Loji Air Sg Jerik	97	B/C	I	92	B/C	I
			4PH97	Loji Air Jengka 3	96	B/C	I	84	ST/SP	II
		Sg. Mentiga	4PH98	Loji Air Chini	92	B/C	I	92	B/C	I
Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	99	B/C	I	88	ST/SP	II		
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	82	ST/SP	II	87	ST/SP	II
Kelantan	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	71	ST/SP	II	87	ST/SP	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	90	ST/SP	II	92	B/C	I
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	84	ST/SP	II	93	B/C	I
		Sg. Pehi	4KE67	Loji Air Pahi	91	ST/SP	I	94	B/C	I
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	89	ST/SP	II	90	ST/SP	II
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	91	ST/SP	I	90	ST/SP	II
			75PP05	Water Intake Kogon	78	ST/SP	II	91	ST/SP	I
Sarawak	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	67	T/P	III	83	ST/SP	II
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	66	T/P	III	83	ST/SP	II
	Rajang	Sg. Daro	56DR01	Daro Water Intake	60	T/P	III	58	T/P	III
			56JG01	Jemoreng Water Intake	65	T/P	III	61	T/P	III
			56PN01	Pakan Water Intake	65	T/P	III	73	ST/SP	II
			56PL01	Igan Water Intake	65	T/P	III	64	T/P	III

Nota/Note:

B/C : Bersih/Clean

ST/SP : Sederhana Tercemar/Slightly Polluted

T/P : Tercemar/Polluted

Jadual 2.9 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2018
Table 2.9 : Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2018

NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS SS/SS SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS SS/SS SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Perlis	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	59	T/P	III	65	T/P	III
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	61	T/P	III	73	ST/SP	II
Kedah (Langkawi)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	53	T/P	IV	76	B/C	II
		Sg. Saga	2LG06	Padang Saga	75	ST/SP	II	82	B/C	II
Kedah	Kedah	Sg. Ahning	2KD11	Padang Sanai	67	T/P	III	60	T/P	III
		Sg. Padang Terap	2KD12	Kuala Nerang	86	B/C	I	86	B/C	I
		Sg. Temin	2KD10	Changloon	83	B/C	II	56	T/P	III
	Muda	Sg. Muda	2MD16	Jeneri	36	T/P	V	63	T/P	III
			2MD17	Jeniang	50	T/P	IV	59	T/P	III
			2MD18	Bukit Selambau	39	T/P	IV	61	T/P	III
			2MD20	Pinang Tunggal	32	T/P	V	70	ST/SP	III
	Sg. Nami	2MD21	Nami	34	T/P	V	71	ST/SP	III	
Sg. Sedim	2MD19	Bikan	59	T/P	III	64	T/P	III		
P.Pinang	Pinang	Sg. Satu	2PG12	Batu Feringgi	92	B/C	I	87	B/C	I
Perak	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	65	T/P	III	74	ST/SP	II
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	83	B/C	II	77	B/C	II
	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	77	B/C	II	93	B/C	I
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	90	B/C	I	93	B/C	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	96	B/C	I	94	B/C	I
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	86	B/C	I	93	B/C	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	88	B/C	I	91	B/C	I
Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	97	B/C	I	96	B/C	I	
Selangor	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	92	B/C	I	91	B/C	I
	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	56	T/P	III	62	T/P	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	52	T/P	IV	50	T/P	IV
Johor	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	84	B/C	II	88	B/C	I
	Benut	Sg. Machap Dam	3BN10	Machap Dam	79	B/C	II	66	T/P	III
	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	80	B/C	II	90	B/C	I

Jadual 2.9 : Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2018
Table 2.9 : Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2018

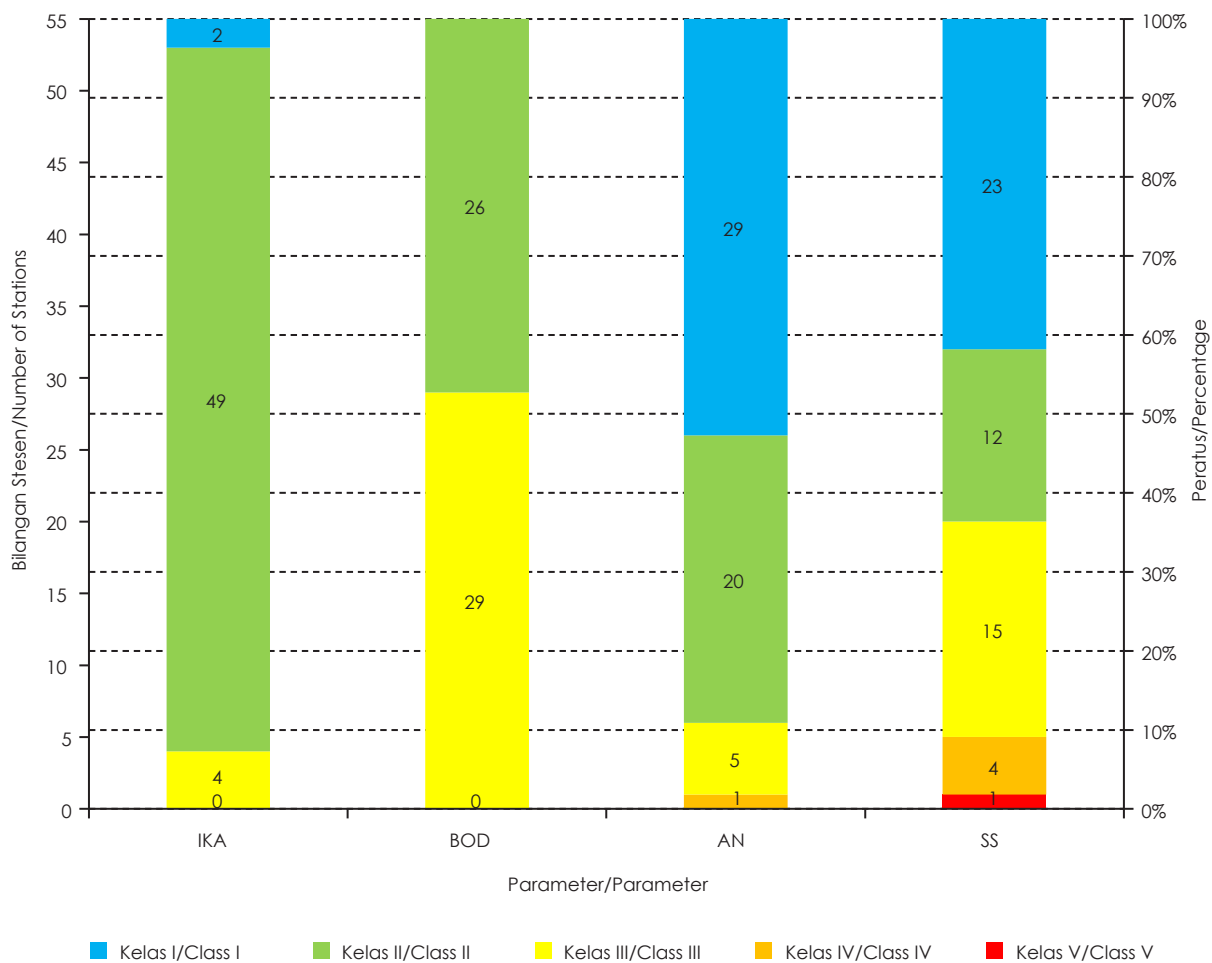
NEGERI/ STATE	LEMBANGAN SUNGAI/ RIVER BASIN	SUNGAI/ RIVER	STESEN ID/ID STATIONS	MUKA SAUK/ WATER INTAKE	KUALITI AIR, 2017/ WATER QUALITY 2017			KUALITI AIR, 2018/ WATER QUALITY 2018		
					SUB- INDEKS SS/SS SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS	SUB- INDEKS SS/SS SUB- INDEX	KATEGORI/ CATEGORY	KELAS/ CLASS
Johor	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	62	T/P	III	51	T/P	IV
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	90	B/C	I	81	B/C	II
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	73	ST/SP	II	83	B/C	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	86	B/C	I	93	B/C	I
Melaka	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	57	T/P	III	67	T/P	III
Pahang	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	93	B/C	I	90	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	81	B/C	II	87	B/C	I
		Sg. Ulong	2CH16	Brinchang Dam	93	B/C	I	93	B/C	I
	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	96	B/C	I	92	B/C	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	84	B/C	II	75	ST/SP	II
			4PH97	Loji Air Jengka 3	70	ST/SP	III	71	ST/SP	III
		Sg. Mentiga	4PH98	Loji Air Chini	85	B/C	I	77	B/C	II
	Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	56	T/P	III	52	T/P	IV	
Terengganu	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	81	B/C	II	92	B/C	I
Kelantan	Golak	Sg. Jeduk	4GL10	Syarikat Air Kelantan	93	B/C	I	82	B/C	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	76	B/C	II	78	B/C	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	35	T/P	V	27	T/P	V
		Sg. Pehi	4KE67	Loji Air Pahi	62	T/P	III	49	T/P	IV
Sabah	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	36	T/P	V	63	T/P	III
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	91	B/C	I	90	B/C	I
			75PP05	Water Intake Kogopon	90	B/C	I	85	B/C	I
Sarawak	Kerian	Sg. Selalang	55SG01	Selangang Water Intake	96	B/C	I	89	B/C	I
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	71	ST/SP	III	69	T/P	III
	Rajang	Sg. Daro	56DR01	Daro Water Intake	89	B/C	I	87	B/C	I
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	84	B/C	II	93	B/C	I
		Sg. Pakan	56PN01	Pakan Water Intake	84	B/C	II	84	B/C	II
		Sg. Pila Parit	56PL01	Igan Water Intake	76	B/C	II	88	B/C	I

Nota/Note:

B/C : Bersih/Clean

ST/SP : Sederhana Tercemar/Slightly Polluted

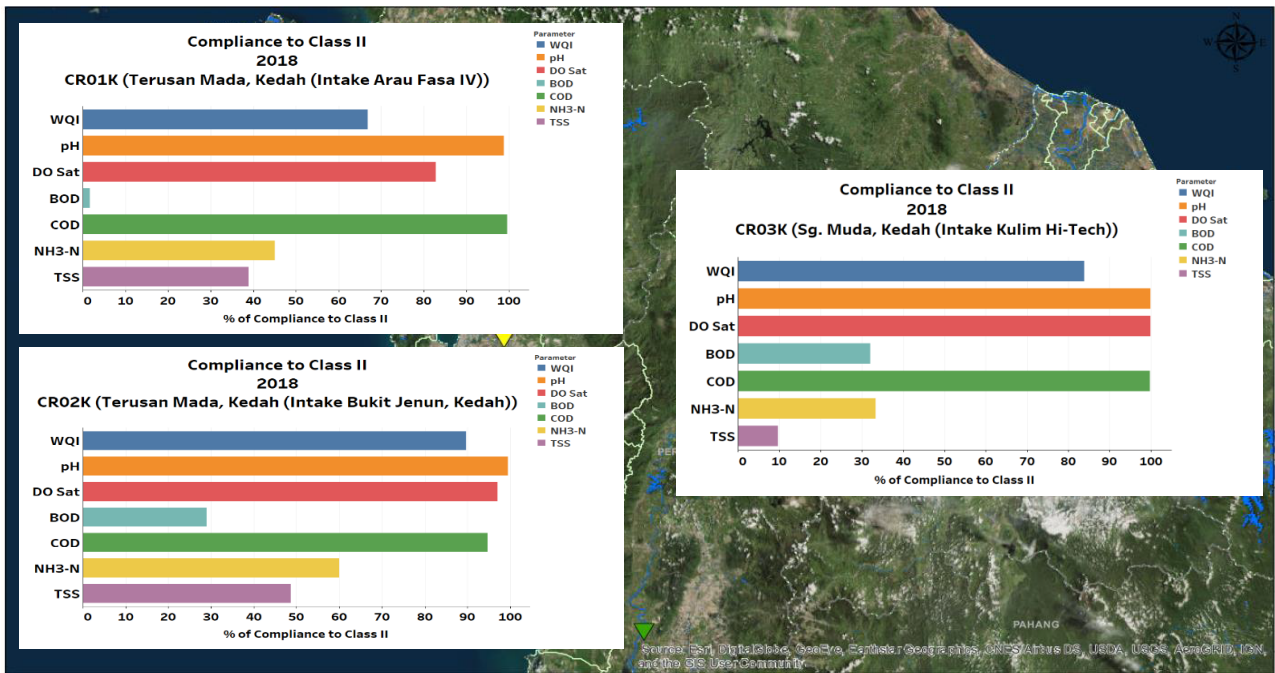
T/P : Tercemar/Polluted



Rajah 2.6 : Kualiti Air Sungai di Stesen di Hulu Muka Sauk, 2018
 Figure 2.6 : River Water Quality at Upstream Stations of Water Intakes, 2018



CRWQM-WILAYAH UTARA
CRWQM-NORTHERN REGION

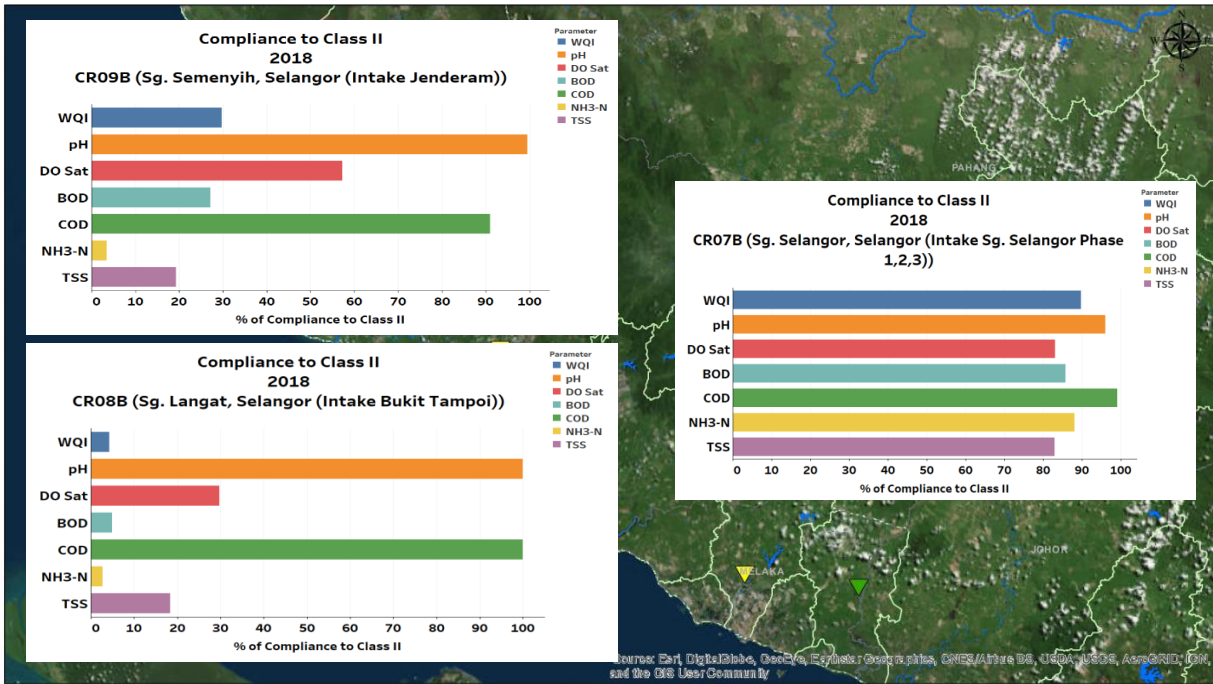


Peratus Pematuhan Kelas II (Utara)
Percentage of Compliance to Class II (Northern)

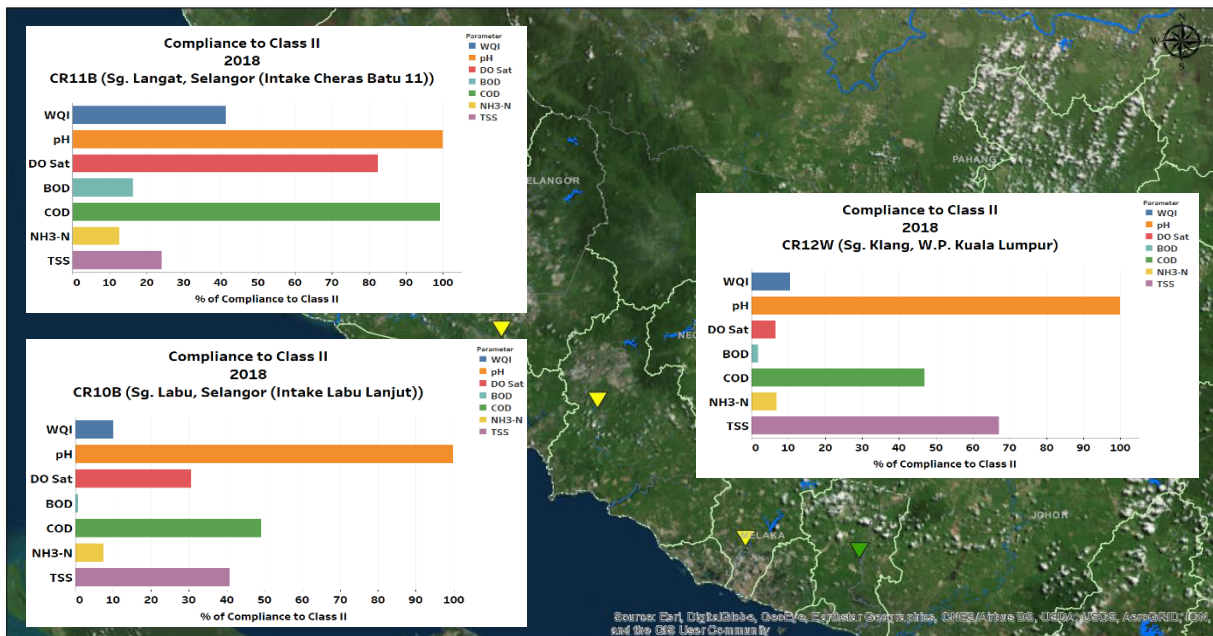


Peratus Pematuhan Kelas II (Utara)
Percentage of Compliance to Class II (Northern)

CRWQM-WILAYAH TENGAH
CRWQM-CENTRAL REGION

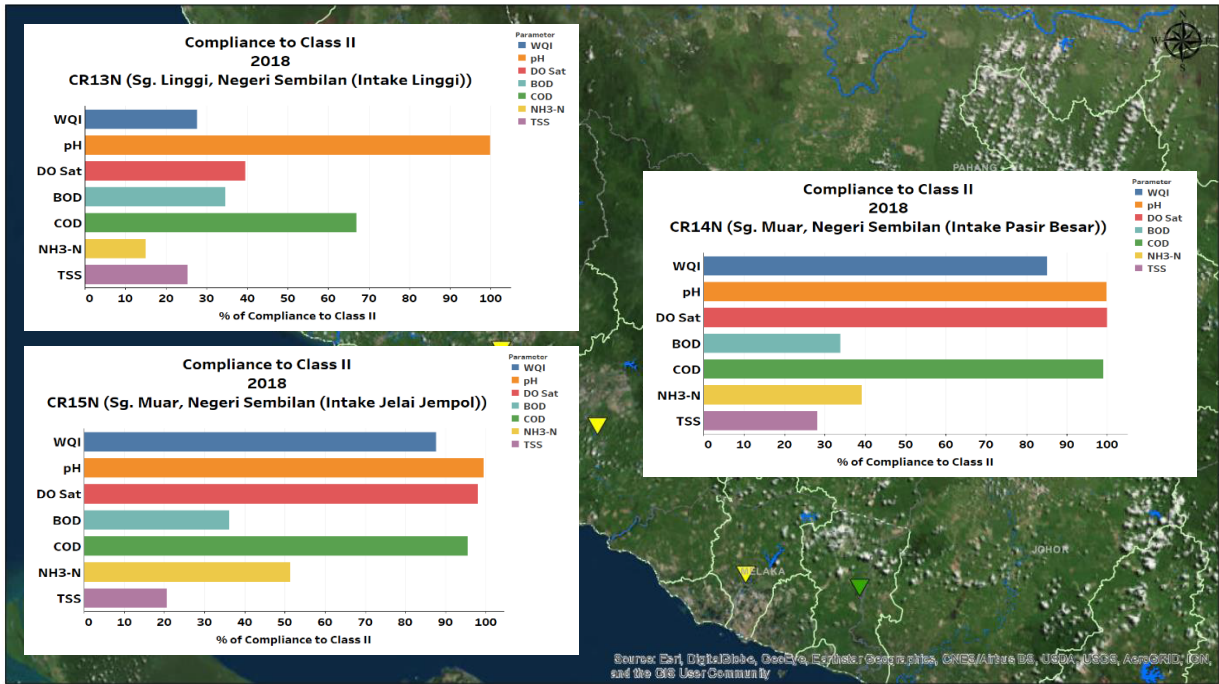


Peratus Pematuhan Kelas II (Sentral)
Percentage of Compliance to Class II (Central)

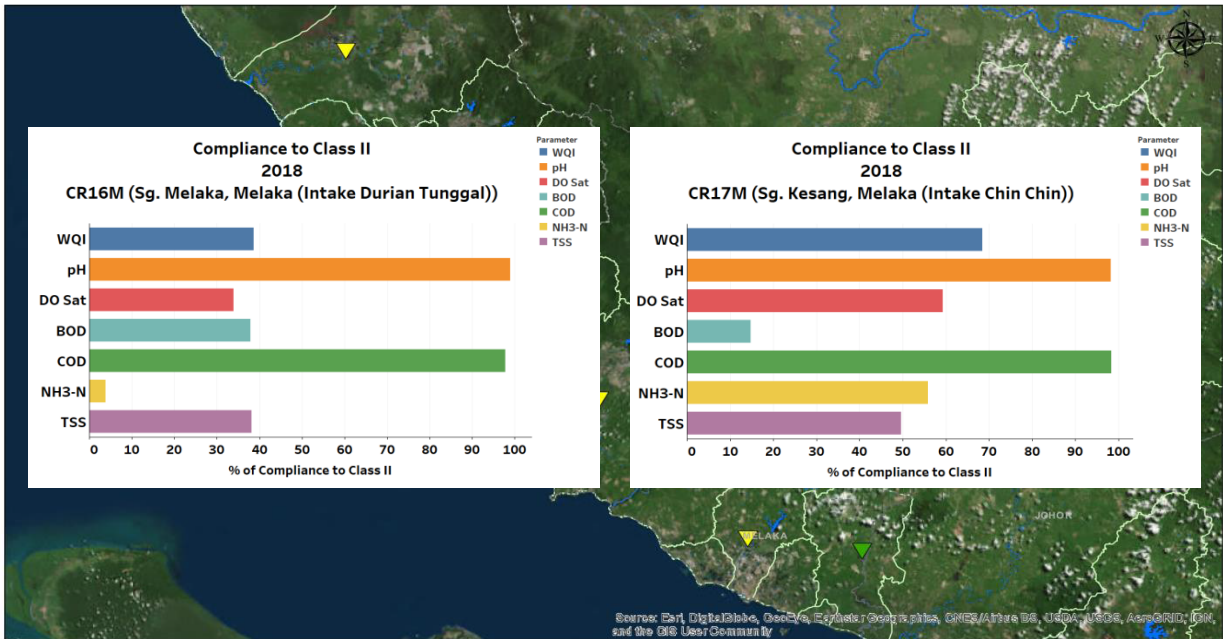


Peratus Pematuhan Kelas II (Sentral)
Percentage of Compliance to Class II (Central)

CRWQM-WILAYAH TENGAH
CRWQM-CENTRAL REGION

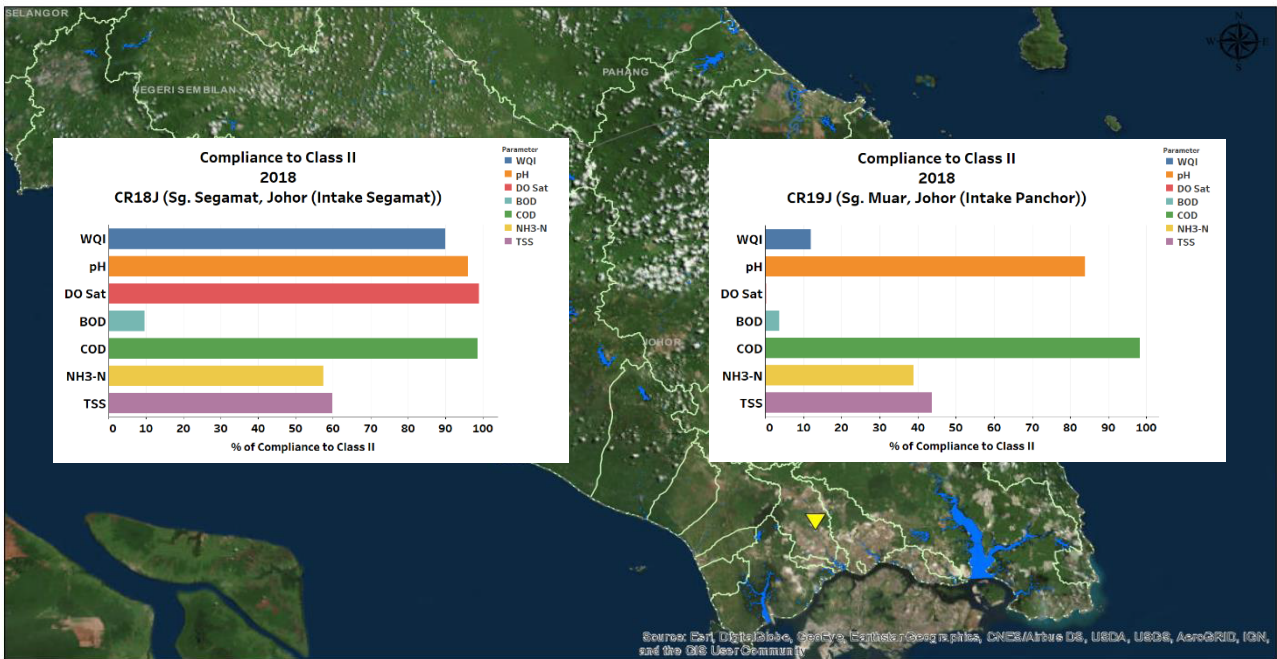


Peratus Pematuhan Kelas II (Sentral)
Percentage of Compliance to Class II (Central)

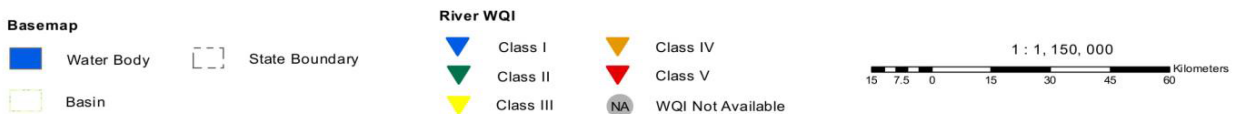
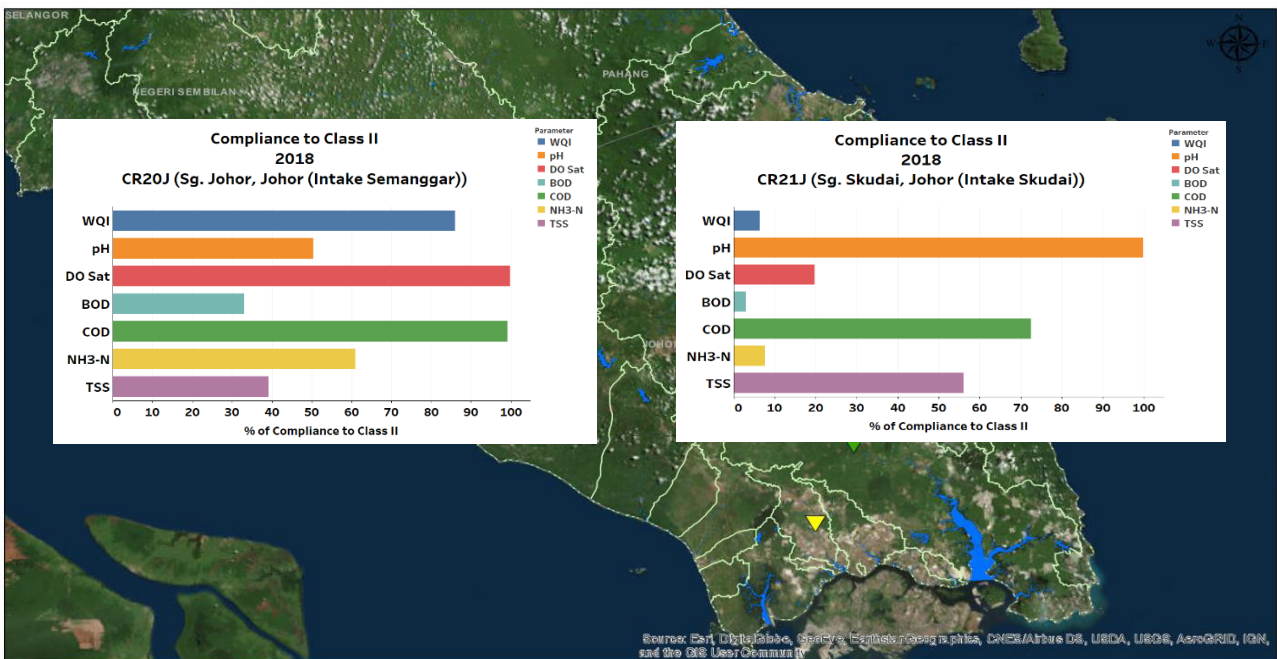


Peratus Pematuhan Kelas II (Sentral)
Percentage of Compliance to Class II (Central)

CRWQM-WILAYAH SELATAN
CRWQM-SOUTHERN REGION

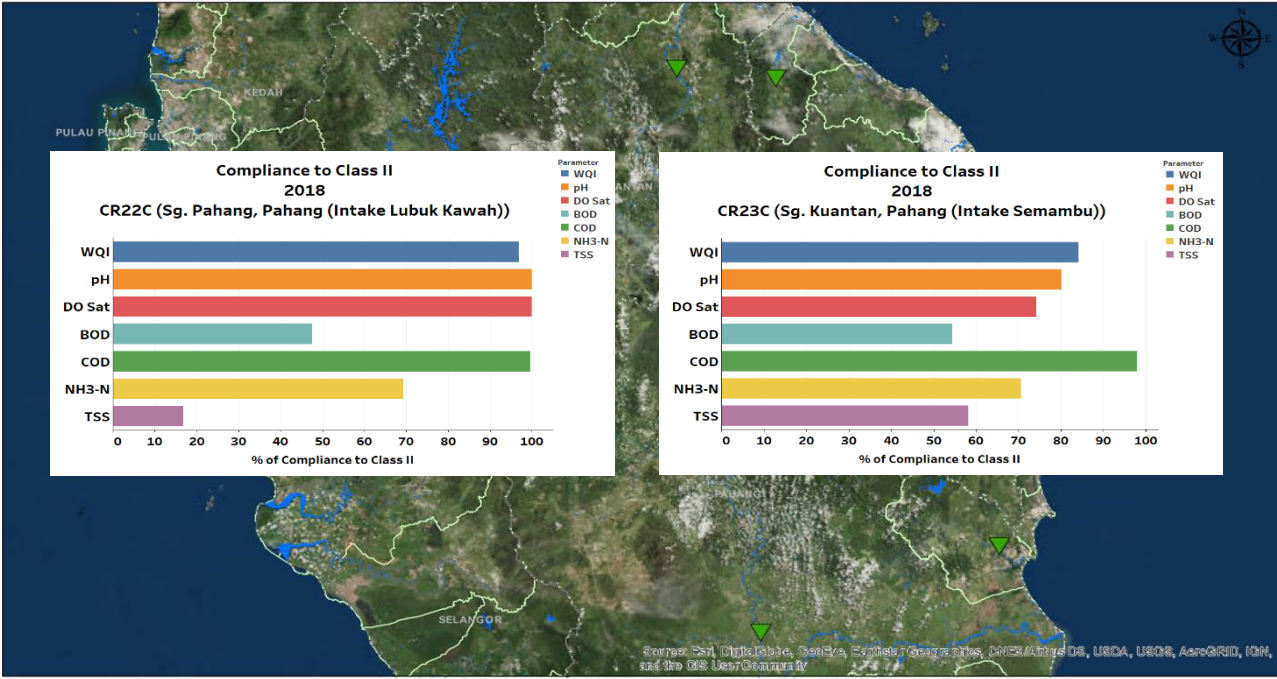


Peratus Pematuhan Kelas II (Selatan)
Percentage of Compliance to Class II (Southern)

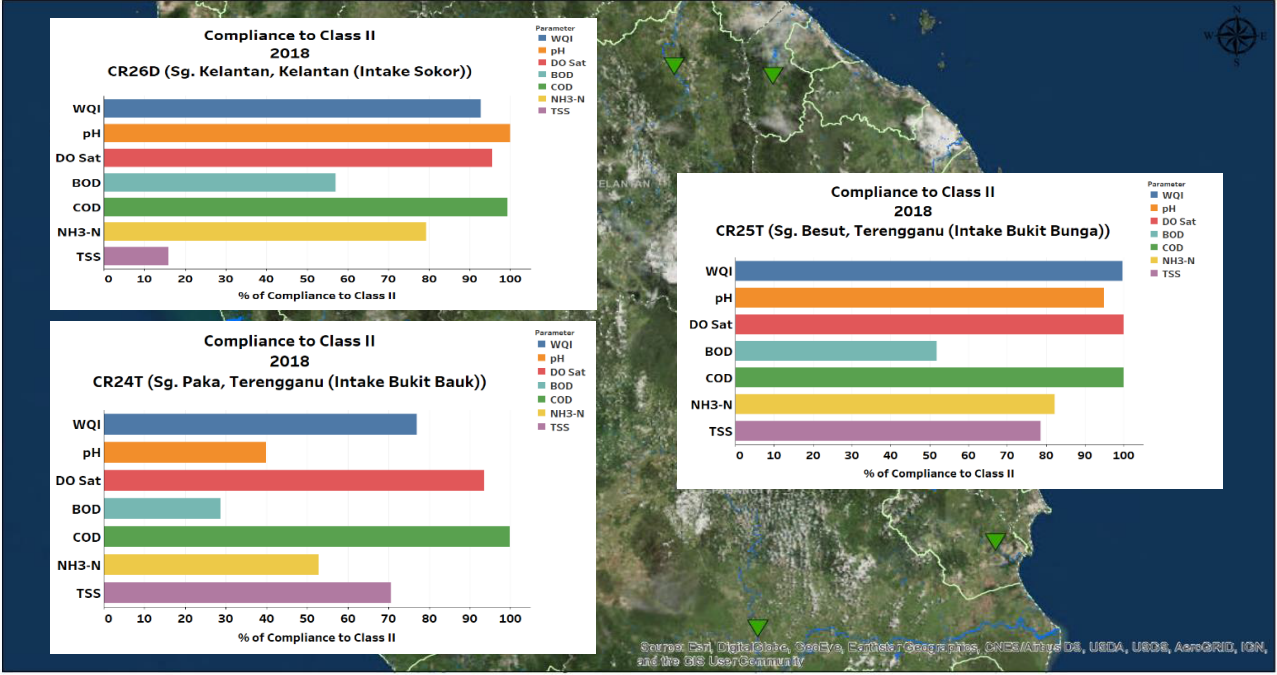


Peratus Pematuhan Kelas II (Selatan)
Percentage of Compliance to Class II (Southern)

CRWQM-WILAYAH TIMUR
CRWQM-EASTERN REGION

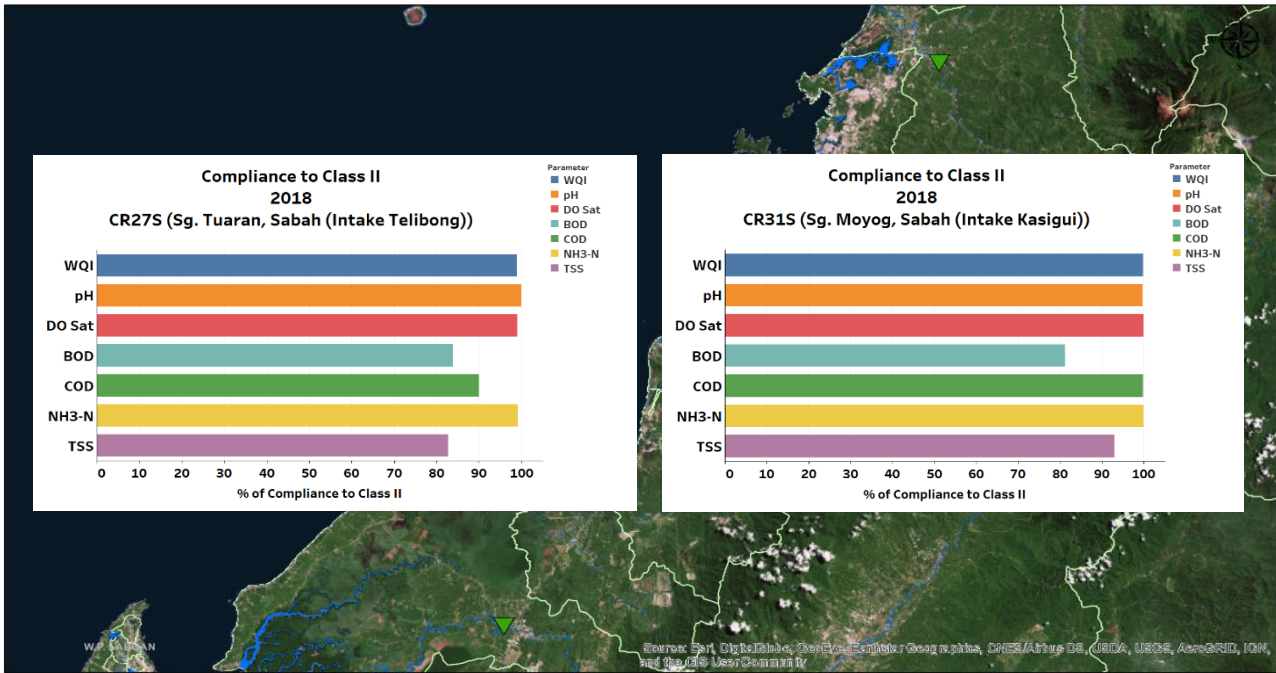


Peratus Pematuhan Kelas II (Timur)
Percentage of Compliance to Class II (Eastern)

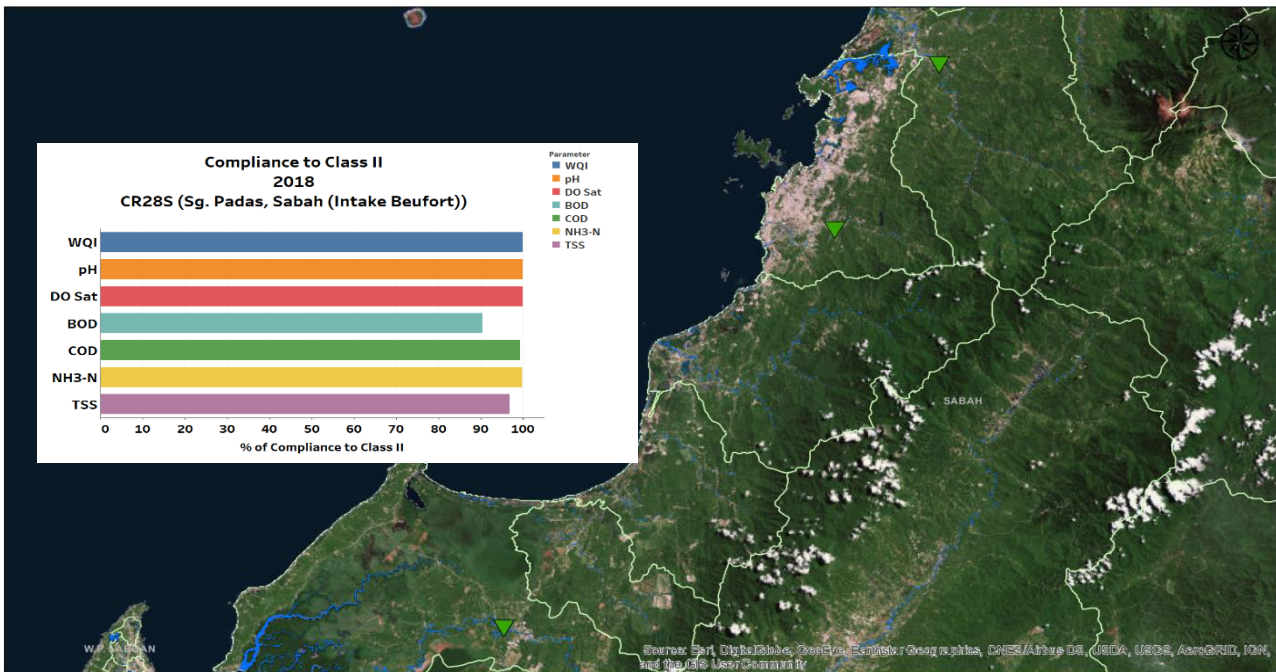


Peratus Pematuhan Kelas II (Timur)
Percentage of Compliance to Class II (Eastern)

CRWQM-KAWASAN SABAH
CRWQM-SABAH REGION

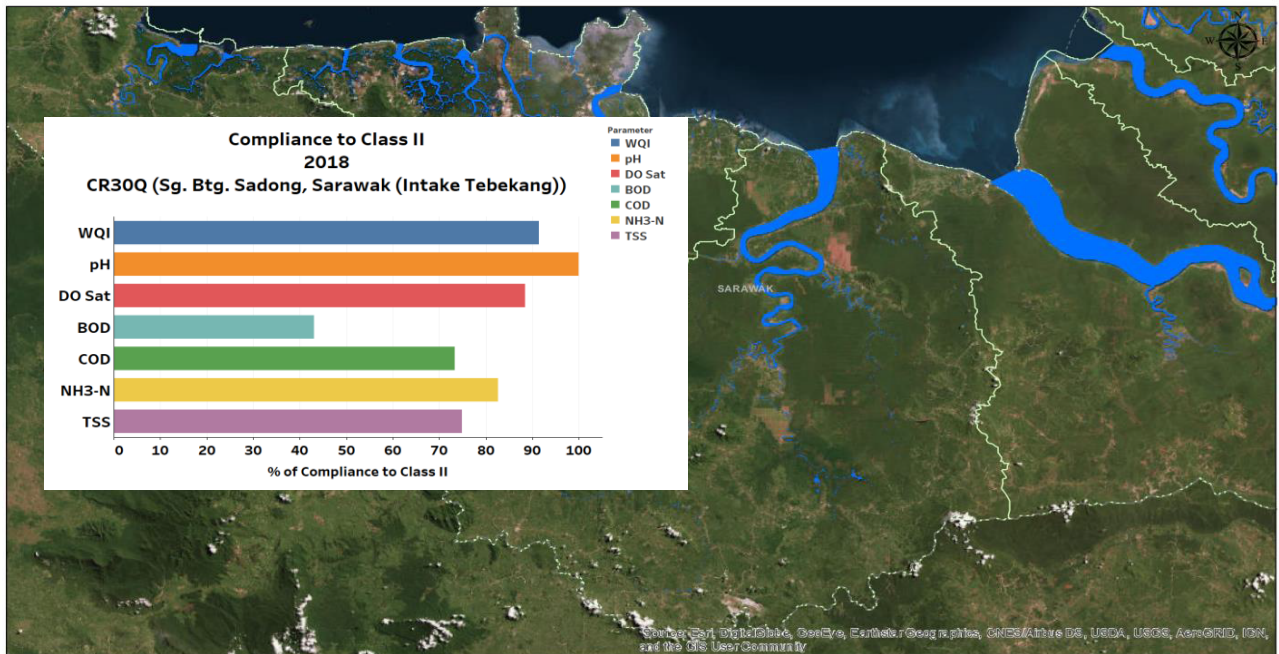


Peratus Pematuhan Kelas II (Sabah)
Percentage of Compliance to Class II (Sabah)

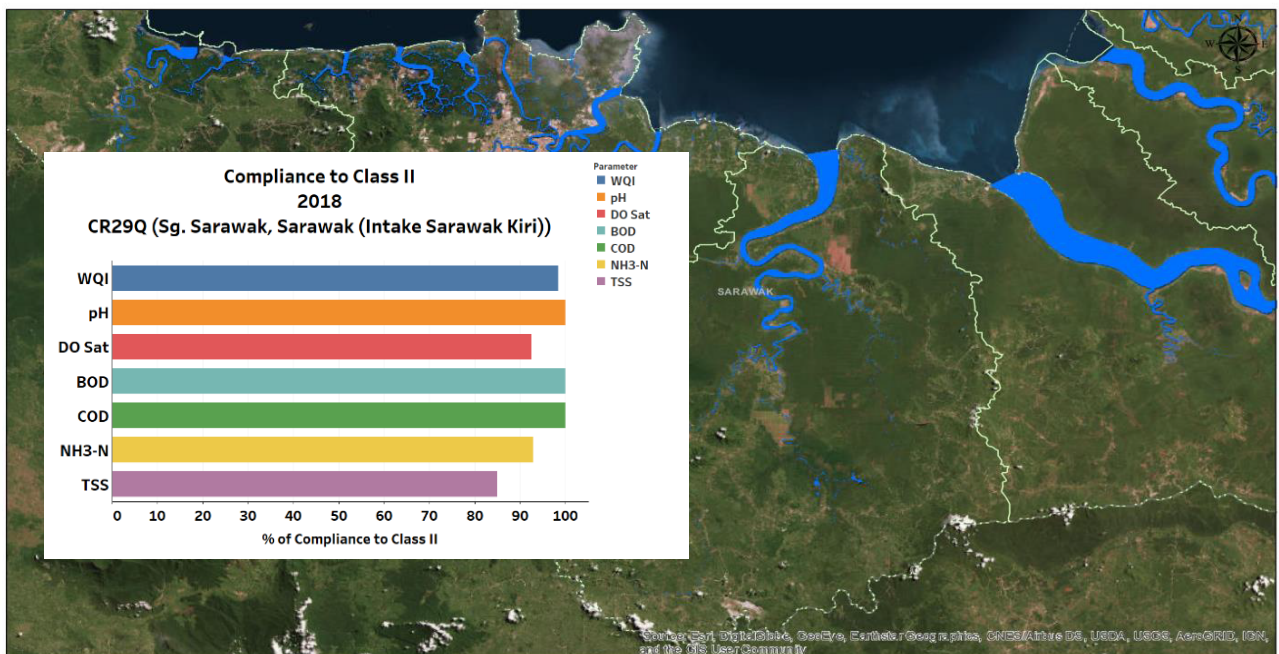


Peratus Pematuhan Kelas II (Sabah)
Percentage of Compliance to Class II (Sabah)

CRWQM-KAWASAN SARAWAK
CRWQM-SARAWAK REGION



Peratus Pematuhan Kelas II (Sarawak)
Percentage of Compliance to Class II (Sarawak)



Peratus Pematuhan Kelas II (Sarawak)
Percentage of Compliance to Class II (Sarawak)



Kualiti Air Tanah

Groundwater Quality



BAB 3

Chapter



PENGAWASAN KUALITI AIR TANAH

Program Pengawasan Kualiti Air Tanah Kebangsaan telah dimulakan pada tahun 1997. Tapak telaga yang telah dipilih adalah mewakili jenis guna tanah spesifik. Program pengawasan telah dijalankan terhadap 109 telaga pengawasan di seluruh negara. **Jadual 3.2** menunjukkan taburan telaga pemantauan air tanah seluruh Malaysia mengikut jenis kategori guna tanah, 2018.

Pada tahun 2018, sebanyak 392 sampel telah dianalisa untuk organik meruap (VOCs), racun perosak, logam berat, anion, bakteria (koliform), sebatian berfenol, jumlah keliatan, jumlah pepejal terlarut, pH, suhu, konduktiviti dan oksigen terlarut (DO)

Indeks Kualiti Air Tanah Malaysia (IKAT) digunakan sebagai satu kaedah menentukan kategori dan status kualiti air tanah. IKAT dibangunkan berdasarkan 7 parameter utama iaitu pH, besi, jumlah pepejal terlarut, nitrat, E.coli, fenol dan sulfat. IKAT yang berskala 0 hingga 100 akan menentukan kategori kualiti air tanah dari Sangat Tercemar hingga Terbaik (**Jadual 3.1**).

GROUNDWATER QUALITY MONITORING

The National Groundwater Quality Monitoring Programme was established in 1997. The sites were selected based on specific land use. The groundwater monitoring program encompasses at 109 wells throughout the country. **Table 3.2** shows the distribution of groundwater monitoring wells in Malaysia by land use category.

In 2018, 392 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).

The Malaysia Groundwater Quality Index (MGQI) is used as a method to represent the groundwater quality status and its category. MGQI was developed based on the main parameters which are pH, iron, total dissolved solids, nitrate, E.coli, phenol and sulphate. The categorization of the groundwater quality for the MGQI is based on the scale ranging from 0 to 100 which represented from Very Poor to Excellent (**Table 3.1**).

Jadual 3.1 : Klasifikasi Indeks Kualiti Air Tanah
Table 3.1 : Groundwater Quality Index Classification

KATEGORI/CATEGORY	NILAI INDEKS/INDEX VALUE
Terbaik/Excellent	90 – 100
Baik/Good	70 – 89
Sederhana/Moderate	40 – 69
Tercemar/Poor	16 – 39
Sangat Tercemar/Very Poor	0 – 15

Jadual 3.2 : Taburan Telaga Pemantauan Air Tanah Di Seluruh Negeri Di Malaysia Mengikut Jenis Kategori Guna Tanah, 2018

Table 3.2 : Distribution Of Groundwater Monitoring Wells Throughout State In Malaysia By Land Use Category, 2018

KATEGORI/CATEGORY	BILANGAN TELAGA/NUMBER OF WELLS	NEGERI/STATE	BILANGAN TELAGA/NUMBER OF WELLS
Kawasan Pertanian/Agricultural	13	Sabah	2
		Terengganu	4
		Pahang	1
		Kedah	2
		Perlis	1
		Kelantan	2
		Selangor	1
Bandar & Pinggir Bandar/ Urban & Suburban	12	Sabah	1
		Terengganu	2
		Pahang	1
		Kedah	1
		Perlis	2
		Kelantan	2
		Selangor	3
Tapak Perindustrian/ Industrial Sites	19	Sabah	1
		Terengganu	4
		Johor	2
		Kedah	1
		Kelantan	2
		Melaka	1
		Selangor	3
		Pulau Pinang	3
		Negeri Sembilan	1
Perak	1		
Tapak Pelupusan Sampah/ Solid Waste Landfills	23	Sabah	7
		Sarawak	2
		Terengganu	2
		Johor	1
		Kelantan	3
		Perak	1
		Kuala Lumpur	5
		Negeri Sembilan	2
Padang Golf/Golf Courses	7	Sabah	2
		Kelantan	4
		Kuala Lumpur	1
Luar Bandar/Rural Areas	4	Terengganu	1
		Kelantan	2
		Melaka	1
Bekas Lombong Emas/Ex Mining Areas (Gold Mines)	3	Sarawak	3
Bekalan Air Tempatan/ Municipal Water Supply	5	Sabah	1
		Sarawak	4
Tapak Pelupusan Bangkai Haiwan/Animal Burial Areas	14	Sarawak	2
		Johor	3
		Perak	3
		Selangor	3
		Pulau Pinang	3
Kolam Akuakultur/ Aquaculture Farms	7	Pahang	6
		Terengganu	1
Tapak Pelupusan Radioaktif/ Radioactive Landfill	1	Perak	1
Peranginan/Resorts	1	Sabah	1

STATUS KUALITI AIR TANAH BAGI GUNATANAH PERTANIAN

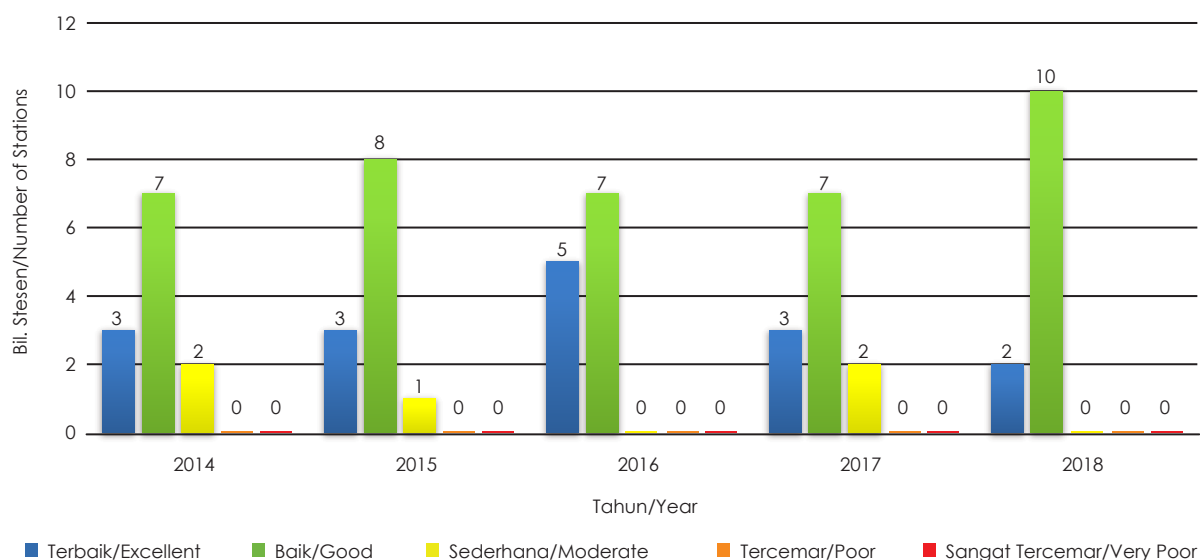
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah pertanian adalah seperti yang ditunjukkan dalam **Rajah 3.1**. Berdasarkan rajah tersebut, didapati bilangan stesen Terbaik telah menurun dibandingkan tahun sebelumnya. Bilangan stesen Baik pula telah meningkat dan tiada stesen dalam kategori Sederhana, Tercemar dan Sangat Tercemar, pada tahun 2018.

Pada tahun 2018, sebanyak 12 stesen gunatanah pertanian telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 2 stesen (16.7%) dikategorikan sebagai Terbaik dan 10 stesen (83.3%) dikategorikan sebagai Baik. (**Jadual 3.3**)

GROUNDWATER QUALITY STATUS FOR AGRICULTURE LAND USE

Groundwater Quality Index for agriculture land use from year 2014 to 2018 is shown in **Figure 3.1**. Based on the figure, the number of Excellent stations decreased compared to the year before. The number of Good stations increased while no station is categorized as Moderate, Poor and Very Poor in year 2018.

In 2018, a total of 12 stations under agriculture land use were monitored. The monitoring result indicate that 2 stations (16.7%) are categorized as Excellent and 10 stations (83.3%) as Good. (**Table 3.3**)



Rajah 3.1 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Pertanian (2014-2018)
Figure 3.1 : Groundwater Quality Index Trend for Agriculture Land Use (2014-2018)

Jadual 3.3 : Status Indeks Kualiti Air Tanah bagi Gunatanah Pertanian
Table 3.3 : Groundwater Quality Index Status for Agriculture Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Perlis	Pertanian/ Agriculture	• Rimba Mas, Padang Besar	MW(7)-R3-1-15.72	87	92	97	90	83	Baik/Good
Kedah	Pertanian/ Agriculture	• Padang Mat Sirat, Langkawi	MW(7)-KV-1-5.80	99	94	82	82	81	Baik/Good
		• Padang Mat Sirat, Langkawi	MW(7)-KV-1-12.09	95	88	80	80	79	Baik/Good
Pahang	Pertanian/ Agriculture	• Sek. Keb. Lepar	MW(7)-C7-1-6.64	78	86	98	81	95	Terbaik/ Excellent
Kelantan	Pertanian/ Agriculture	• Kampong Jembal Kota Bharu	MW(7)-D6-1-7.58	81	84	89	96	80	Baik/Good
		• Sek. Keb. Beris Lalang Bachok	MW(7)-D15-1-4.05	79	86	97	76	75	Baik/Good
Terengganu	Pertanian/ Agriculture	• Kg. Merang, Setiu	MW(7)-T8-1-8.56	88	88	81	81	82	Baik/Good
		• Sek. Keb. Alor Peroi Kg. Gajah Mati	T21-1-45.82	57	68	81	66	82	Baik/Good
		• Sek. Keb. Alor Peroi Kg. Gajah Mati	T21-1-22.13	60	74	81	66	83	Baik/Good
		• Sek. Keb. Alor Peroi Kg. Gajah Mati	T21-1-6.16	79	79	81	80	82	Baik/Good
SABAH	Pertanian/ Agriculture	• Limbawang Agriculture Stesen, Beaufort	MW(7)-H511511-1-7.50	84	88	91	86	81	Baik/Good
		• Yongs Farm, Tawau	MW(7)-H411712-1-16.2	98	96	93	93	93	Terbaik/ Excellent

STATUS KUALITI AIR TANAH GUNATANAH BAGI KAWASAN BANDAR DAN PINGGIR BANDAR

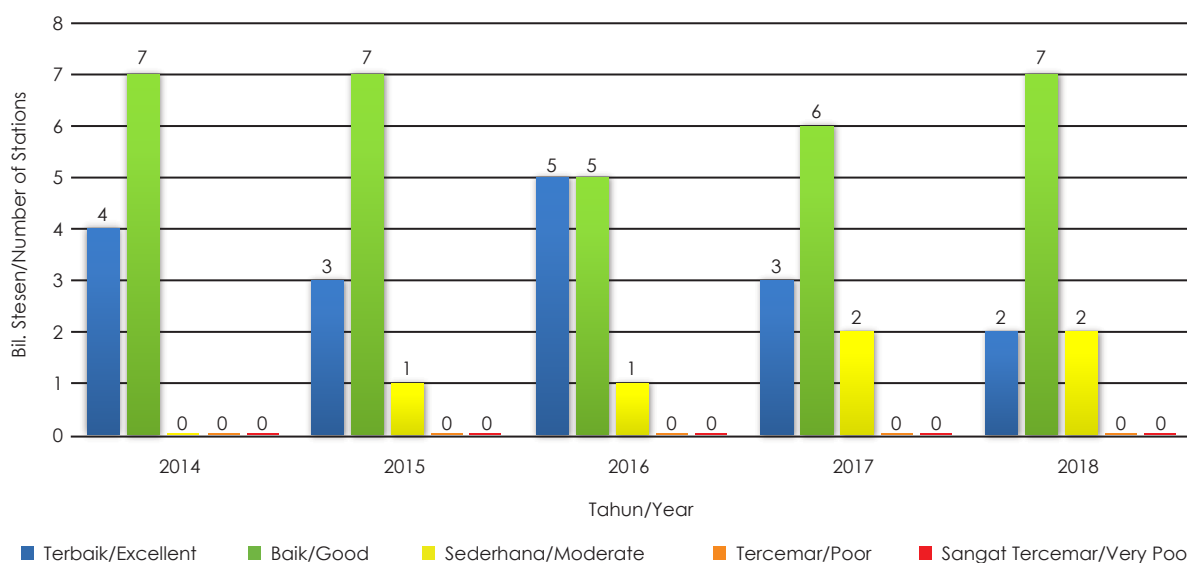
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah bandar dan pinggir bandar adalah seperti yang ditunjukkan dalam **Rajah 3.2**. Berdasarkan rajah tersebut, didapati bilangan stesen Terbaik telah menurun dibandingkan tahun sebelumnya. Bilangan stesen Baik pula telah meningkat. Bilangan stesen Sederhana masih sama dan tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 11 stesen gunatanah bandar dan pinggir bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 2 stesen (18.1%) dikategorikan sebagai Terbaik, 7 stesen (63.6 %) sebagai Baik dan 2 stesen (18.1%) dikategorikan sebagai Sederhana. (**Jadual 3.4**)

GROUNDWATER QUALITY STATUS FOR URBAN AND SUBURBAN LAND USE

Groundwater Quality Index trend for urban and suburban land use from year 2014 to 2018 is shown in **Figure 3.2**. Based on the figure, the number of Excellent stations decreased compared to the previous year. The number of stations categorized as Good increased. The number of Moderate stations remained unchanged since 2017, while no station is categorized as Poor and Very Poor in year 2018.

In 2018, a total of 11 stations under urban and suburban land use were monitored. The monitoring results indicated that 2 stations (18.1%) are categorized as Excellent, 7 stations (63.6 %) as Good and 2 stations (18.1%) as Moderate. (**Table 3.4**)



Rajah 3.2 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Bandar dan Pinggir Bandar (2014-2018)
Figure 3.2 : Groundwater Quality Index Trend for Urban And Suburban Land Use (2014-2018)

Jadual 3.4 : Status Indeks Kualiti Air Tanah bagi Gunatanah Bandar dan Pinggir Bandar
Table 3.4 : Groundwater Quality Index Status for Urban And Suburban Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Perlis	Urban & Suburban	• Arau , Perlis	MW(7)-R4-1-5.41	83	80	80	80	77	Baik/Good
		• Arau , Perlis	MW(7)-R4-1-19.80	97	97	96	95	93	Terbaik/ Excellent
Kedah	Urban & Suburban	• SK Darul Uloom Kepala Batas	MW(7)-K2-1-6.22	79	65	59	59	55	Sederhana/ Moderate
Selangor	Urban & Suburban	• Saujana Golf Resort, Subang	MW(7)-S13-1-5.45	99	96	93	82	69	Sederhana/ Moderate
		• Saujana Golf Resort, Subang	MW(7)-S13-1-12.67	97	96	96	88	78	Baik/Good
Pahang	Urban & Suburban	• Nenasi	MW(7)-C13-1-45.97	70	82	88	85	90	Terbaik/ Excellent
Kelantan	Urban & Suburban	• Sek.Men. Keb. Rantau Panjang	MW(7)-D7-1-5.50	79	88	95	91	82	Baik/Good
		• Sek.Men. Keb. Rantau Panjang	MW(7)-D7-1-20.23	87	88	90	92	81	Baik/Good
Terengganu	Urban & Suburban	• Kg. Raja, Besut	MW(7)-T1-1-7.25	78	80	82	83	84	Baik/Good
		• Kg. Raja, Besut	MW(7)-T1-1-31.79	74	82	82	67	85	Baik/Good
Sabah	Urban & Suburban	• SK Inanam	MW(7)-H511601-9-7.50	91	85	74	78	80	Baik/Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN PERINDUSTRIAN

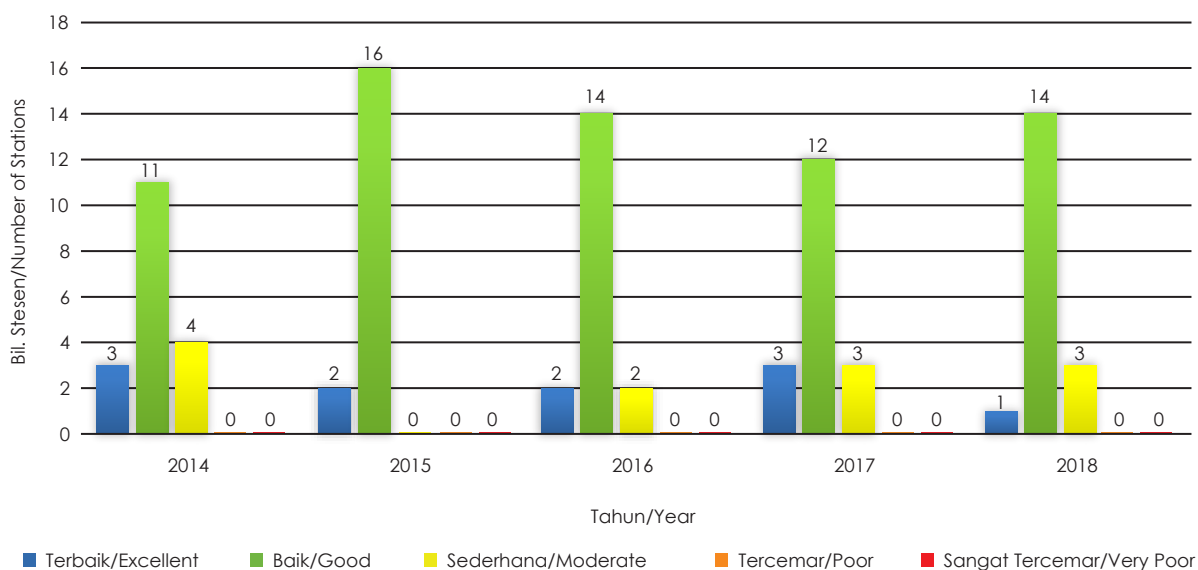
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah kawasan perindustrian adalah seperti yang ditunjukkan dalam **Rajah 3.3**. Berdasarkan rajah tersebut **Rajah 3.3** didapati bilangan stesen Terbaik telah menurun sebaliknya bilangan stesen Baik telah meningkat dibandingkan tahun sebelumnya. Bilangan stesen Sederhana masih sama dan tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 18 stesen gunatanah kawasan perindustrian telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 1 stesen (5.6%) dikategorikan sebagai Terbaik dan 14 stesen (77.8%) dikategorikan sebagai Baik dan 3 stesen (16.7%) dikategorikan sebagai Sederhana. (**Jadual 3.5**)

GROUNDWATER QUALITY STATUS FOR INDUSTRIAL SITES LAND USE

Groundwater Quality Index trend for industrial land use from year 2014 to 2018 is shown in **Figure 3.3**. Based on **Figure 3.3**, the number of Excellent station decreased while the number for Good station increased compared to the previous year. The number of Moderate station remained unchanged since 2017, while no station is categorized as Poor and Very Poor in year 2018.

In 2018, a total of 18 stations under industrial land use were monitored. The monitoring results indicated that 1 station (5.6%) is categorized as Excellent, 14 stations (77.8 %) as Good and 3 stations (16.7%) as Moderate. (**Table 3.5**)



Rajah 3.3 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Perindustrian (2014-2018)
Figure 3.3 : Groundwater Quality Index Trend for Industrial Land Use (2014-2018)

Jadual 3.5 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Perindustrian
Table 3.5 : Groundwater Quality Index Status for Industrial Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Kedah	Tapak Perindustrian/ Industrial Sites	• Kulim Hi-Tech	MW(7)-K3-1-8.45	82	74	65	68	70	Baik/Good
Pulau Pinang	Tapak Perindustrian/ Industrial Sites	• Mak Mandin (MAGRI)	MW(7)-P1-2-4.50	85	80	76	86	76	Baik/Good
		• Mak Mandin (KASTAM)	MW(7)-P1-1-6.50	91	82	76	91	77	Baik/Good
		• Bayan Lepas	MW(7)-P2-1-4.34	93	93	91	89	87	Baik/Good
Selangor	Tapak Perindustrian/ Industrial Sites	• SK Seksy. 20, Shah Alam	MW(7)-S9A-1-8.20	70	76	82	74	67	Sederhana/ Moderate
		• CIAST, Seksy. 19, Shah Alam	MW(7)-S9-1-20.21	81	81	81	77	67	Sederhana/ Moderate
		• CIAST, Seksy. 19, Shah Alam	MW(7)-S9-1-5.97	68	72	77	72	66	Sederhana/ Moderate
Negeri Sembilan	Tapak Perindustrian/ Industrial Sites	• Senawang Edible Oil	MW(7)-N4-1-6.44	76	77	72	71	71	Baik/Good
Melaka	Tapak Perindustrian/ Industrial Sites	• Petronas Oil Refinery, Melaka	MW(7)-M1-1-8.10	75	70	73	75	71	Baik/Good
Johor	Tapak Perindustrian/ Industrial Sites	• Tg. Puteri, Pasir Gudang	MW(7)-J5-1-7.34	87	87	88	92	99	Terbaik/ Excellent
		• Tg. Puteri, Pasir Gudang	MW(7)-J5-2-7.49	74	79	77	74	72	Baik/Good
Kelantan	Tapak Perindustrian/ Industrial Sites	• Eastern Garment MFG. Pkln. Chepa	MW(7)-D6-2-51.38	63	74	82	81	70	Baik/Good
		• Eastern Garment MFG. Pkln. Chepa	MW(7)-D6-2-4.24	84	85	87	90	80	Baik/Good
Terengganu	Tapak Perindustrian/ Industrial Sites	• TCOT Kerteh, Kemaman	MW(7)-T15-1-5.68	90	92	99	81	82	Baik/Good
		• TCOT Kerteh, Kemaman	MW(7)-T15-1-24.89	77	72	65	68	85	Baik/Good
		• KSB Telok Kalong, Kemaman	MW(7)-T16-1-5.57	64	74	81	70	87	Baik/Good
		• KSB Telok Kalong, Kemaman	MW(7)-T16-1-18.76	64	81	81	66	83	Baik/Good
Labuan	Tapak Perindustrian/ Industrial Sites	• Asian Supply Base W. P. Labuan	MW(7)-H511509-1-6.80	85	86	83	83	81	Baik/Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN TAPAK PELUPUSAN SAMPAH

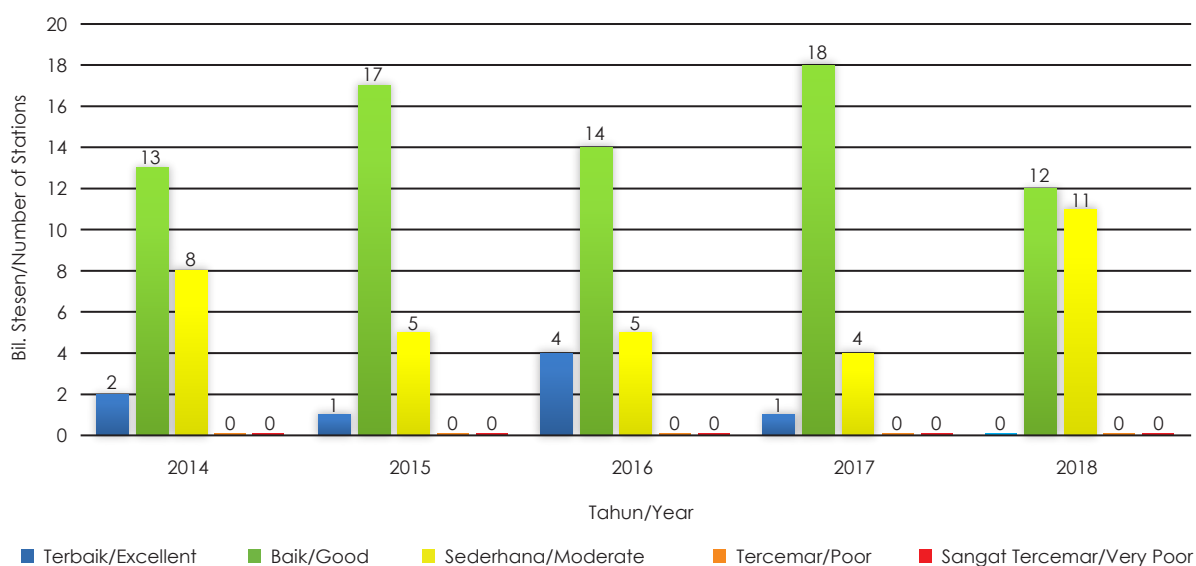
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah kawasan tapak pelupusan sampah adalah seperti yang ditunjukkan dalam **Rajah 3.4**. Berdasarkan rajah tersebut, didapati bilangan stesen Terbaik telah tiada dibandingkan tahun sebelumnya. Bilangan stesen Baik juga telah menurun manakala bilangan stesen Sederhana telah meningkat. Tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 23 stesen gunatanah kawasan tapak pelupusan sampah telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 12 stesen (52.2%) dikategorikan sebagai Baik dan 11 (47.83%) dikategorikan sebagai Sederhana. (**Jadual 3.6**)

GROUNDWATER QUALITY STATUS FOR SOLID WASTE LANDFILLS LAND USE

Groundwater Quality Index trend for Solid Waste Landfills land use from year 2014 to 2018 is shown in **Figure 3.4**. Based on the figure, no station is categorized as Excellent in year 2018 compared to the year before. The number of Good station decreased while the number of Moderate station increased. No station is categorized as Poor and Very Poor in 2018.

In 2018, a total of 23 stations under Solid Waste Landfills land use were monitored. The monitoring results indicated that 12 stations (52.2%) are categorized as Good and 11 stations (47.83%) as Moderate (**Table 3.6**)



Rajah 3.4 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekas Tapak Pelupusan Sampah (2014-2018)

Figure 3.4 : Groundwater Quality Index Trend for Ex Solid Waste Landfills Land Use (2014-2018)

Jadual 3.6 : Status Indeks Kualiti Air Tanah bagi Gunat tanah Bekas Tapak Pelupusan Sampah
Table 3.6 : Groundwater Quality Index Status for Ex Solid Waste Landfills Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Perak	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Pusing, Batu Gajah	MW(7)-A11-1-6.05	64	68	70	70	70	Baik/Good
Kuala Lumpur	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Jln Sg. Besi	MW(7)-S11-1-5.50	64	72	82	70	51	Sederhana/ Moderate
		• Jln Sg. Besi	MW(7)-S11-1-5.54	43	64	81	68	59	Sederhana/ Moderate
		• Jln Sg. Besi	MW(7)-S11-1-5.57	43	76	98	72	65	Sederhana/ Moderate
		• Tmn Beringin, Kepong	MW(7)-S13-1-7.26	83	88	96	72	58	Sederhana/ Moderate
		• Tmn Beringin, Kepong	MW(7)-S13-2-6.10	81	80	75	64	56	Sederhana/ Moderate
Negeri Sembilan	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Kualiti Alam	MW(7)-N5-1-8	96	95	95	82	64	Sederhana/ Moderate
		• Kualiti Alam	MW(7)-N5-1-7.55	82	83	79	70	64	Sederhana/ Moderate
Johor	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Kg. Batu 4, Kota Tinggi	MW(7)-J4-1-6.94	73	67	73	76	82	Baik/Good
Kelantan	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-13.43	89	89	90	88	83	Baik/Good
		• Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-5.34	79	86	89	88	80	Baik/Good
		• P. Mas Landfill, Kg.Pusu 40, P.Mas	MW(7)-D8-1-5.22	69	76	87	90	76	Baik/Good
Terengganu	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-5.45	86	84	80	80	67	Sederhana/ Moderate
		• Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-22.89	94	86	76	81	81	Baik/Good

Jadual 3.6 : Status Indeks Kualiti Air Tanah bagi Gunatanah Bekas Tapak Pelupusan Sampah
Table 3.6 : Groundwater Quality Index Status for Ex Solid Waste Landfills Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Sabah	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-1- 8.80	82	72	68	70	70	Baik/Good
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-2- 14.0	82	80	68	74	82	Baik/Good
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-3-8	68	68	69	78	85	Baik/Good
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-4- 17.3	85	79	71	78	84	Baik/Good
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-5- 19.0	82	74	70	74	76	Baik/Good
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-6- 10.2	82	82	81	72	69	Sederhana/ Moderate
		• ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-7- 10.3	67	76	82	80	73	Baik/Good
Sarawak	Bekas Tapak Pelupusan Sampah/ Ex Solid Waste Landfills	• Kemuyang, No.1	MW(7)-QS-K1-11.10	66	56	48	56	58	Sederhana/ Moderate
		• Kemuyang, No.2	MW(7)-QS-K2-10.78	76	72	68	62	51	Sederhana/ Moderate



STATUS KUALITI AIR TANAH BAGI GUNATANAH PADANG GOLF

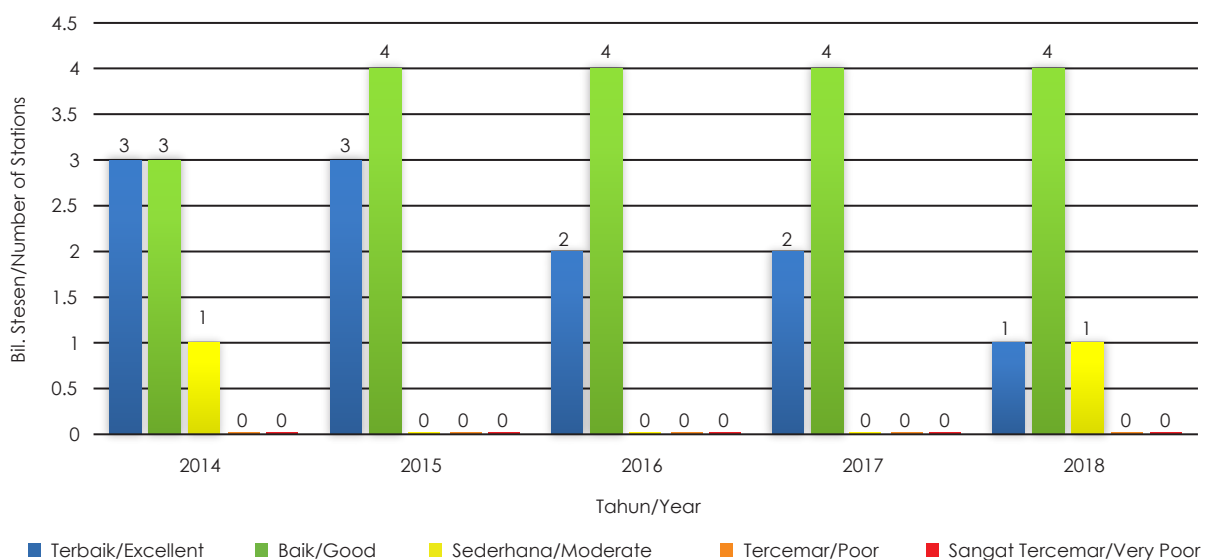
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah padang golf adalah seperti yang ditunjukkan dalam **Rajah 3.5**. Berdasarkan rajah tersebut, didapati bilangan stesen Terbaik telah menurun dibandingkan tahun sebelumnya. Bilangan stesen Baik pula masih sama dan terdapat satu (1) stesen yang berada dalam kategori Sederhana. Tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2014 dan 2015 sebanyak 7 stesen yang dipantau, walaubagaimanapun bermula pada tahun 2016 hanya 6 stesen yang dipantau memandangkan 1 stesen di Kuala Lumpur telah kering (Jadual 4.7). Hasil program pengawasan yang telah dijalankan menunjukkan satu (1) stesen di kategorikan sebagai Terbaik dan 4 stesen dikategorikan sebagai Baik dan 1 stesen sebagai Sederhana (**Jadual 3.7**)

GROUNDWATER QUALITY STATUS FOR GOLF COURSES LAND USE

Groundwater Quality Index trend for golf courses land use from year 2014 to 2018 is shown in **Figure 3.5**. Based on the figure, the number of Excellent station decreased compared to the previous year. The number of Good station remained unchanged, while one (1) station is categorized as Moderate. No station is categorized as Poor and Very Poor in year 2018.

In year 2014 and 2015, seven (7) stations were monitored, however, only six (6) stations were monitored since year 2016 because one (1) station in Kuala Lumpur has run dry (Table 4.7). The monitoring programme showed 1 station is categorized as Excellent, 4 stations as Good and 1 station as Moderate (**Table 3.7**)



Rajah 3.5 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Padang Golf (2014-2018)
Figure 3.5 : Groundwater Quality Index Trend for Golf Courses Land Use (2014-2018)

Jadual 3.7 : Status Kualiti Air Tanah bagi Kawasan Padang Golf
Table 3.7 : Groundwater Quality Index Status for Golf Courses Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Kuala Lumpur	Padang Golf/ Golf Courses	• Royal Selangor Golf Club	MW(7)-S12-1-5.37	92	90	-	-	-	Tiada Data/ No data
Kelantan	Padang Golf/ Golf Courses	• Kelab Golf & Desa Pkln.Chepa	MW(7)-D3-1-6.90	75	77	83	84	82	Baik/Good
		• Kelab Golf & Desa Pkln.Chepa	MW(7)-D3-1-6.37	73	79	88	90	71	Baik/Good
		• Kelab Golf D'Raja Kubang Kerian	MW(7)-D6-4-31.29	65	73	82	82	65	Sederhana/ Moderate
		• Kelab Golf D'Raja Kubang Kerian	MW(7)-D6-4-9.05	73	75	78	89	75	Baik/Good
Sabah	Padang Golf/ Golf Courses	• Sandakan Golf Club, Sandakan	MW(7)-H511801-1-8.82	98	95	93	86	79	Baik/Good
		• Sandakan Golf Club, Sandakan	MW(7)-H511801-2-8.60	98	96	93	96	96	Terbaik/ Excellent

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN LUAR BANDAR

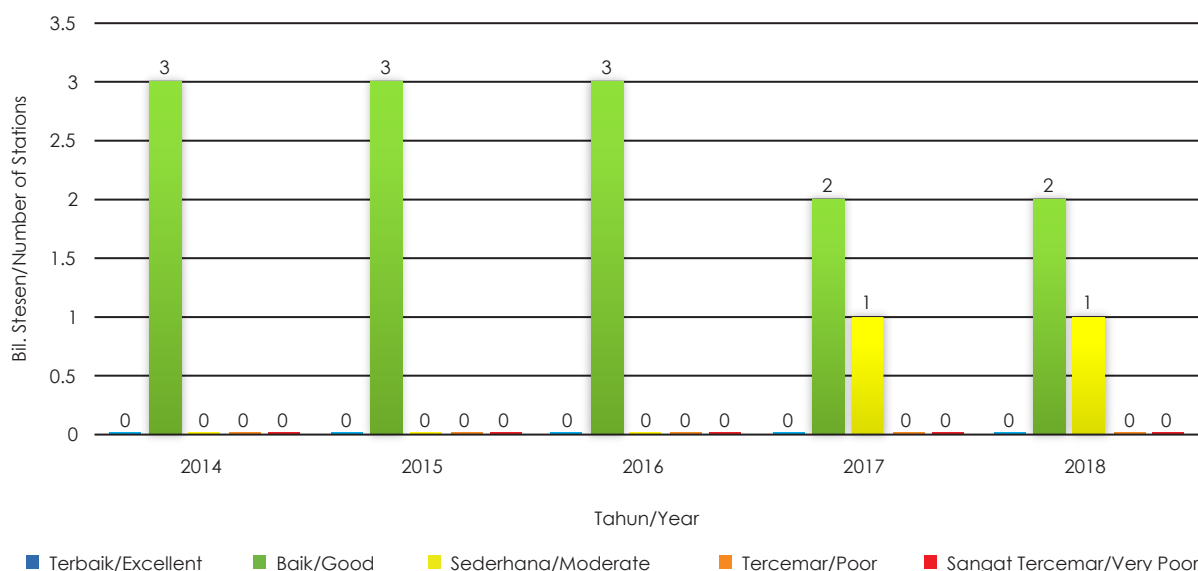
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah kawasan luar bandar adalah seperti yang ditunjukkan dalam **Rajah 3.6**. Berdasarkan rajah tersebut, didapati tiada stesen Terbaik sejak tahun 2014. Bilangan stesen Baik dan Sederhana masih sama dibandingkan tahun 2017. Tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

GROUNDWATER QUALITY STATUS FOR RURAL AREAS LAND USE

Groundwater Quality Index trend for rural areas land use from year 2014 to 2018 is shown in **Figure 3.6**. Based on the figure, no stations is in Excellent category since year 2014. The number of station for Good and Moderate category remained unchanged compared to year 2017. No station is categorized as Poor and Very Poor in year 2018.

Pada tahun 2018, sebanyak 3 stesen gunatanah kawasan luar bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 2 stesen dikategorikan sebagai Baik dan 1 stesen dikategorikan sebagai Sederhana. **(Jadual 3.8)**

In 2018, a total of 3 stations under rural areas land use were monitored. The monitoring programme showed two (2) stations are in Good category and one (1) station is in Moderate category. **(Table 3.8)**



Rajah 3.6 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Luar Bandar (2014-2018)
Figure 3.6 : Groundwater Quality Index Trend for Rural Areas Land Use (2014-2018)

Jadual 3.8 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Luar Bandar
Table 3.8 : Status Of Groundwater Quality Index Status for Rural Areas Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Kelantan	Luar Bandar/ Rural Areas	• Sek. Keb. Jelawat Bachok	MW(7)-D11- 1-6.10	81	85	88	81	81	Baik/Good
		• Sek. Men. Keb. Jelawat Bachok	MW(7)-D11- 2-5.09	71	74	82	74	65	Sederhana/ Moderate
Terengganu	Luar Bandar/ Rural Areas	• Kg.Padang Pak Wan, Bkt. Payung, Marang	MW(7)-T14- 1-6.99	86	82	81	80	81	Baik/Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN BEKAS LOMBONG EMAS

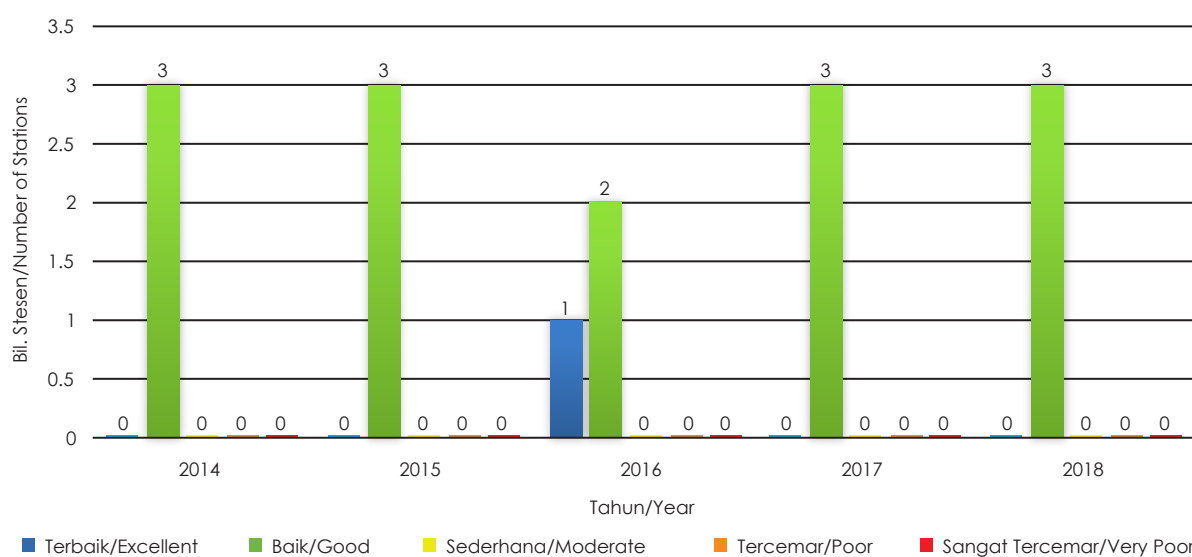
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah kawasan bekas lombong emas adalah seperti yang ditunjukkan dalam **Rajah 3.7**. Berdasarkan rajah tersebut, didapati kesemua stesen berada dalam kategori Baik.

Pada tahun 2018, sebanyak 3 station gunatanah kawasan bekas lombong emas telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan kesemua stesen (100%) dikategorikan sebagai Baik. (**Jadual 3.9**)

GROUNDWATER QUALITY STATUS FOR EX-MINING AREAS (GOLD MINE) LAND USE

Groundwater Quality Index trend for ex-mining areas (gold mine) land use from year 2014 to 2018 is shown in **Figure 3.7**. Based on the figure, all stations are in Good category.

In 2018, a total of 3 stations under ex-mining areas (gold mine) land use were monitored. The monitoring result indicated that the groundwater quality category for all stations (100) are Good (**Table 3.9**)



Rajah 3.7 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekas Lombong Emas (2014-2018)

Figure 3.7 : Groundwater Quality Index Trends for Ex-Mining Areas (Gold Mine) Land Use (2014-2018)

Jadual 3.9 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekas Lombong Emas
Table 3.9 : Groundwater Quality Index Status for Ex-Mining Areas (Gold Mine) Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Sarawak	Bekas Lombong Emas/Ex-Mining (Gold Mine)	• Bau, No. 1	MW(7)-QK-B1- 27.27	83	85	85	82	82	Baik/Good
		• Bau, No. 2	MW(7)-QK-B2- 29.50	85	85	85	85	82	Baik/Good
		• Bau	MW(7)-QK-B3- 29	82	88	97	82	73	Baik/Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN BEKALAN AIR TEMPATAN

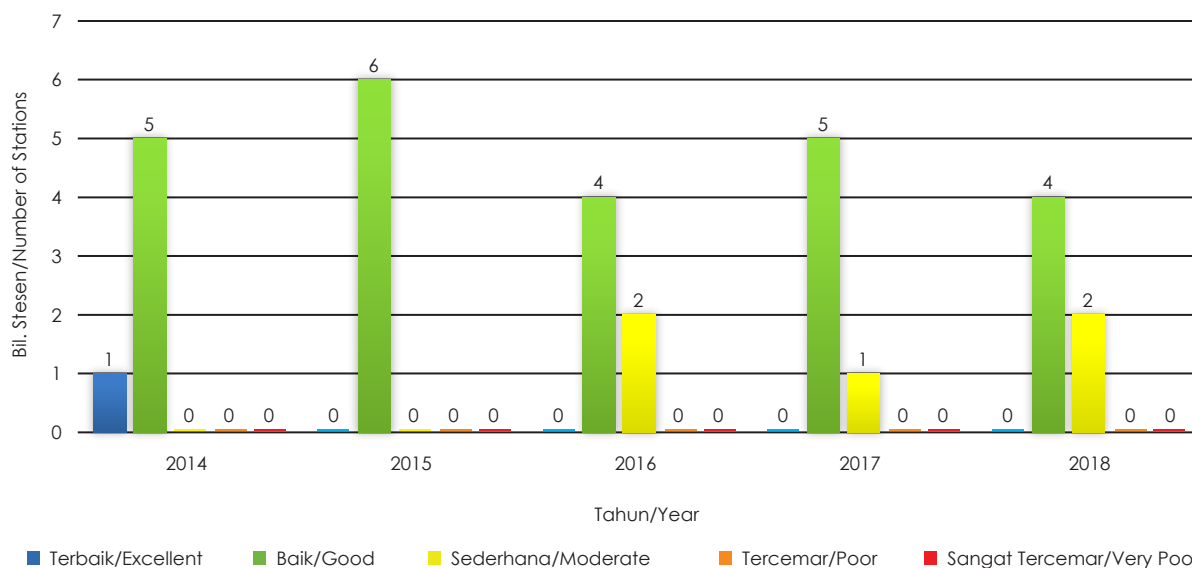
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi guna tanah kawasan bekalan air tempatan adalah seperti yang ditunjukkan dalam **Rajah 3.8**. Berdasarkan rajah tersebut, didapati tiada stesen dalam kategori Terbaik sejak tahun 2015. Bilangan stesen kategori Baik menurun dibandingkan tahun 2017 manakala kategori Sederhana meningkat dari tahun sebelumnya. Tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 6 station gunatanah kawasan bekalan air tempatan telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 4 stesen dikategorikan sebagai Baik dan 2 stesen dikategorikan sebagai Sederhana. (**Jadual 3.10**)

GROUNDWATER QUALITY STATUS FOR MUNICIPAL WATER SUPPLY LAND USE

Groundwater Quality Index for municipal water supply land use trend from year 2014 to 2018 is shown in **Figure 3.8**. Based on the figure, no station is in Excellent category since year 2015. The number of Good category station decreased while the number for Moderate category station increased compared to year 2017. No station showed Poor and Very Poor groundwater quality index in year 2018.

In 2018, a total of 6 stations under Municipal Water Supply land use were monitored. The monitoring results indicated four (4) stations is in Good category and two (2) stations is in moderate category. (**Table 3.10**)



Rajah 3.8 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekalan Air Tempatan (2014-2018)

Figure 3.8 : Groundwater Quality Index Trend for Municipal Water Supply Land Use (2014-2018)

Jadual 3.10 : Status Indeks Kualiti Air Tanah Bagi Gunatanah Kawasan Bekalan Air Tempatan

Table 3.10 : Groundwater Quality Index Status for Municipal Water Supply Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Sabah	Bekalan Air Tempatan/ Municipal Water Supply	• Kg. Tajau Laut, Kudat	MW(7)-H511604-1-4.5	90	88	84	80	75	Baik/ Good
Sarawak	Bekalan Air Tempatan/ Municipal Water Supply	• Kabong, No. 1	MW(7)-QB-K1-6.70	80	80	81	81	79	Baik/ Good
		• Pusat Rawatan Air.JKR, No. 1, Miri	MW(7)-QL-L1-7.53	81	81	81	72	56	Sederhana/ Moderate
		• Pusat Rawatan Air.JKR, No. 2, Miri	MW(7)-QL-L2-7.90	80	73	70	72	70	Baik/ Good
		• LAKU (Lambir), No. 1, Miri	MW(7)-QM-L1-30.50	89	75	68	62	59	Sederhana/ Moderate
		• Kg. Lusut Kiri, No. 3, Miri	MW(7)-QM-L3-28.30	89	70	62	72	82	Baik/ Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN BEKAS TAPAK PELUPUSAN BANGKAI BINATANG

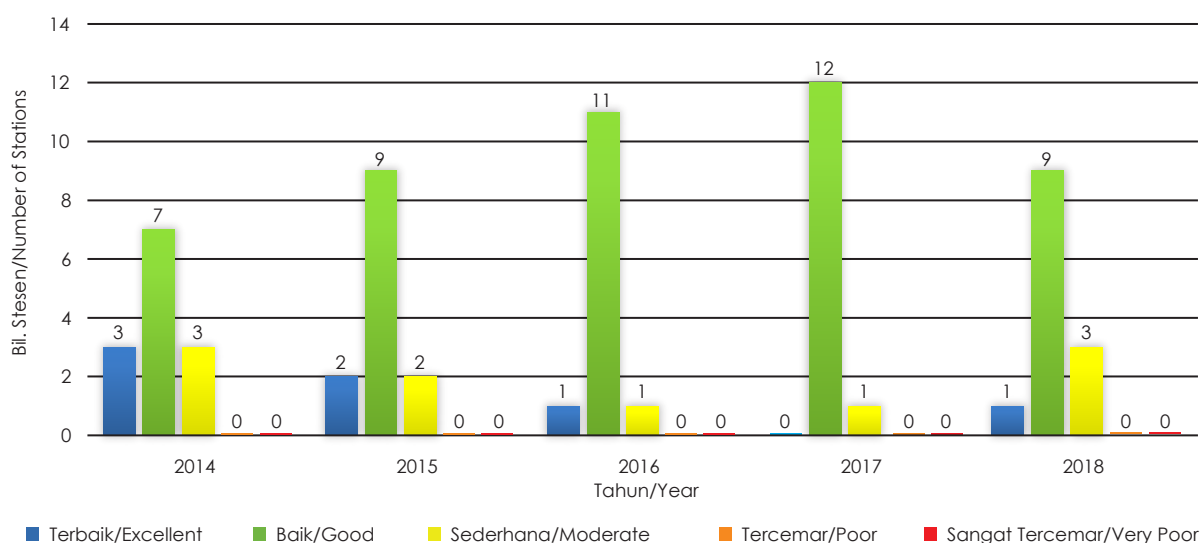
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah kawasan bekas tapak pelupusan bangkai binatang adalah seperti yang ditunjukkan dalam **Rajah 3.9**. Berdasarkan rajah tersebut, didapati terdapat satu (1) stesen dalam kategori Terbaik dibandingkan tahun sebelumnya di mana tiada stesen dalam kategori ini. Bilangan stesen Baik pula menurun manakala stesen dalam kategori Sederhana meningkat dibandingkan pada tahun 2017. Tiada stesen dalam kategori Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 13 stesen yang dipantau melibatkan negeri Perak, Pulau Pinang, Johor, Selangor dan Sarawak (**Jadual 3.11**). Hasil program pengawasan yang telah dijalankan menunjukkan 1 stesen (7.7%) dikategorikan sebagai Terbaik, 9 stesen (69.2%) dikategorikan sebagai Baik dan 3 stesen (23.1%) sebagai Sederhana (**Jadual 3.11**)

GROUNDWATER QUALITY STATUS FOR EX ANIMAL BURIAL AREAS LAND USE

Groundwater Quality Index trend for ex animal burial areas land use from year 2014 to 2018 is shown in **Figure 3.9**. Based on the figure, only one (1) station in the Excellent category in 2018 and none in the previous year. The number station with Good category decreased while the number for Moderate category increased compared to year 2017. No station under Poor and Very Poor category in year 2018.

In year 2018, 13 stations were monitored included Perak, Pulau Pinang, Johor, Selangor and Sarawak (**Table 3.11**). The monitoring result indicated that one (1) station (7.7%) is in Excellent category, nine (9) stations (69.2 %) is in Good category and three (3) stations (23.1%) is in Moderate category. (**Table 3.11**)



Rajah 3.9 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekas Tapak Pelupusan Bangkai Haiwan (2014-2018)

Figure 3.9 : Groundwater Quality Index Trend for Ex Animal Burial Areas Land Use (2014-2018)

Jadual 3.11 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Bekas Tapak Pelupusan Bangkai Haiwan

Table 3.11 : Groundwater Quality Index Status for Ex Animal Burial Areas Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Perak	Tapak Pelupusan Bangkai Haiwan/ Ex Animal Burial Areas Landfills	• Tapak Bazar Seramik Tambun	MW(7)-A(IP)-1-5.92	79	75	73	70	69	Sederhana/ Moderate
		• Tapak Bekas Wabak JE Jalong	MW(7)-A(SS)-1-7.65	78	80	84	85	85	Baik/Good
Pulau Pinang	Tapak Pelupusan Bangkai Haiwan/ Ex Animal Burial Areas Landfills	• Perkampungan Ldg Valdor (Kelapa)	MW(7)-P(LV)-1-7.45	95	88	78	73	89	Baik/Good
		• Perkampungan Ldg Valdor (Tengah)	MW(7)-P(LV)-2-6.78	95	91	85	73	88	Baik/Good
		• Perkampungan Ldg Valdor (Jalan)	MW(7)-P(LV)-3-7.30	95	86	76	80	91	Terbaik/ Excellent
Johor	Tapak Pelupusan Bangkai Haiwan/ Ex Animal Burial Areas Landfills	• Ulu Choh (Pintu)	MW(7)-JPN-1-6.90	73	69	73	74	82	Baik/Good
		• Ulu Choh (kolam)	MW(7)-JPN-2-6.10	70	72	70	74	81	Baik/Good
		• Ulu Choh (sungai)	MW(7)-JPN-3-6.71	77	76	77	78	82	Baik/Good
Selangor	Tapak Pelupusan Bangkai Haiwan/ Ex Animal Burial Areas Landfills	• Stesen Kg. Sg. Keroh, Sepang	MW(7)-S(SE)-1-5.67	62	72	82	72	63	Sederhana/ Moderate
		• TNB Sepang	MW(7)-S(SE)-2-6.95	87	90	94	87	71	Baik/Good
		• Ladang Sepang	MW(7)-S(SE)-3-5.60	68	72	84	82	78	Baik/Good
Sarawak	Tapak Pelupusan Bangkai Haiwan/ Ex Animal Burial Areas Landfills	• Oya Road, No. 1, Sibul	MW(7)-QS-Y1-10	82	70	69	64	55	Sederhana/ Moderate
		• Oya Road, No. 2, Sibul	MW(7)-QS-Y2-9.17	66	68	74	72	71	Baik/Good

STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN AKUAKULTUR

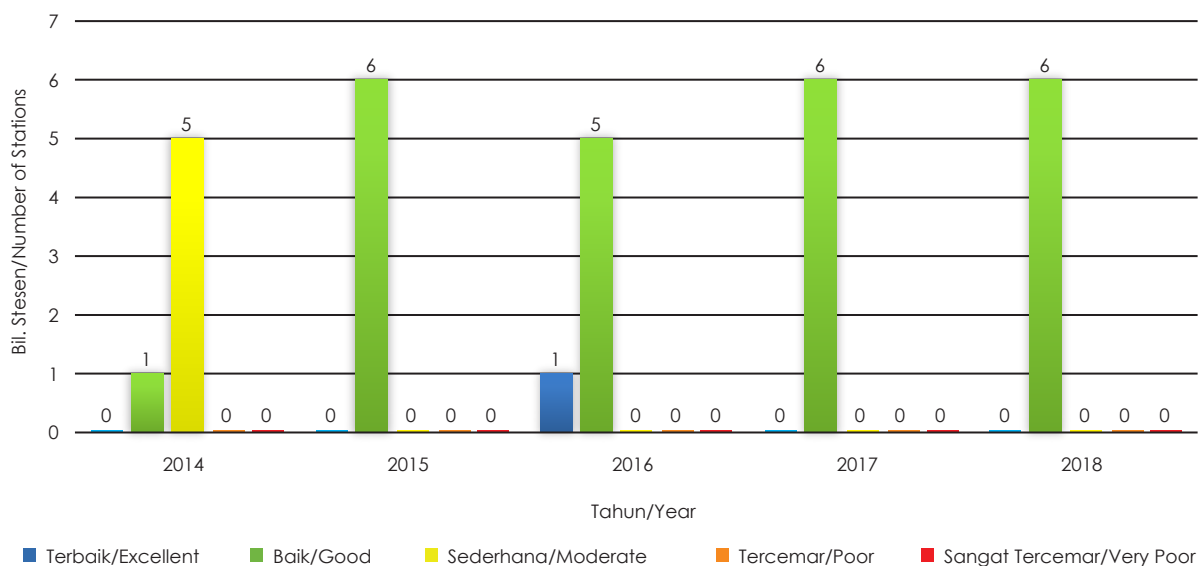
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah bagi kawasan akuakultur adalah seperti yang ditunjukkan dalam **Rajah 3.10**. Berdasarkan rajah tersebut, didapati tiada stesen Terbaik pada tahun 2018. Bilangan stesen Baik masih sama dibandingkan tahun 2017. Tiada stesen dalam kategori Sederhana, Tercemar dan Sangat Tercemar pada tahun 2018.

Pada tahun 2018, sebanyak 6 stesen gunatanah bagi kawasan akuakultur telah dipantau di Pahang. Hasil program pengawasan yang telah dijalankan menunjukkan kesemua stesen (100%) dikategorikan sebagai Baik. (**Jadual 3.12**)

GROUNDWATER QUALITY STATUS FOR AQUACULTURE LAND USE

Groundwater Quality Index trend for aquaculture land use from year 2014 to 2018 is shown in **Figure 3.10**. Based on the figure, no station showed Excellent category of groundwater quality index in year 2018. The number of Good category station remained unchanged compared to the year before. No station is under Moderate, Poor and Very Poor category in year 2018.

In 2018, a total of 6 stations in Pahang under aquaculture land use were monitored. The monitoring results indicated that all stations (100 %) has Good groundwater quality index. (**Table 3.12**)



Rajah 3.10 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Akuakultur (2014-2018)
Figure 3.10 : Groundwater Quality Index Trends for Aquaculture Land Use (2014-2018)

Jadual 3.12 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Akuakultur
Table 3.12 : Groundwater Quality Index Status for Aquaculture Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Pahang	Kolam Akuakultur/ Aquaculture Farms	• Nenasi (Agrobest)	MW(7)-C16-2- 10.5	67	73	81	80	81	Baik/ Good
		• Nenasi (Agrobest)	MW(7)-C16-3- 43	61	72	79	79	80	Baik/ Good
		• Nenasi (Agrobest)	MW(7)-C16-4- 38	64	73	83	82	83	Baik/ Good
		• Nenasi (Agrobest)	MW(7)-C16-5- 10	67	79	92	84	79	Baik/ Good
		• Nenasi (Agrobest)	MW(7)-C16-6- 10	64	77	82	73	82	Baik/ Good
		• Nenasi (Agrobest)	MW(7)-C16-7- 29	74	82	87	87	88	Baik/ Good



STATUS KUALITI AIR TANAH BAGI GUNATANAH KAWASAN PERANGINAN

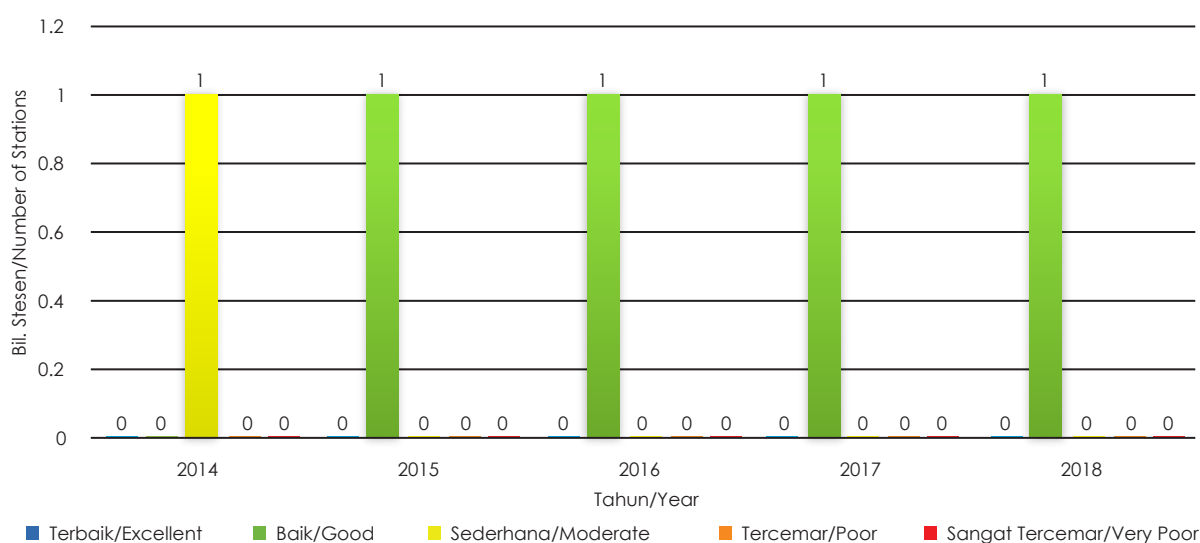
Tren Indeks Kualiti Air Tanah mulai tahun 2014 hingga 2018 bagi gunatanah bagi kawasan peranginan adalah seperti yang ditunjukkan dalam **Rajah 3.11**. Berdasarkan rajah tersebut, didapati tiada stesen Terbaik yang ditunjukkan selama tahun 2014 hingga 2018. Bilangan stesen Baik masih sama sejak tahun 2015. Tiada stesen dalam kategori Sederhana, Tercemar dan Sangat Tercemar sejak tahun 2015.

Pada tahun 2018, sebanyak 1 stesen gunatanah bagi kawasan peranginan telah dipantau di Sabah. Hasil program pengawasan yang telah dijalankan menunjukkan kesemua stesen dikategorikan sebagai Baik. **(Jadual 3.13)**

GROUNDWATER QUALITY STATUS FOR RESORT LAND USE

Ground Water Quality Index trend for resort land use from year 2014 to 2018 is shown in **Figure 3.11**. Based on the figure, no station is in Excellent category from year 2014 to 2018. The number of Good station remained unchanged since year 2015. No station under Moderate, Poor and Very Poor category since 2015.

In 2018, one (1) station in Sabah under resort land use was monitored. The monitoring results indicated that the station has Good groundwater quality index. **(Table 3.13)**



Rajah 3.11 : Tren Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Peranginan (2014-2018)
Figure 3.11 : Groundwater Quality Index Trend for Resorts Land Use (2014-2018)

Jadual 3.13 : Status Indeks Kualiti Air Tanah bagi Gunatanah Kawasan Peranginan
Table 3.13 : Groundwater Quality Index Status for Resorts Land Use

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN/ STATION NUMBER	NILAI IKAT/GWQI VALUE					KATEGORI/ CATEGORY (2018)
				2014	2015	2016	2017	2018	
Sabah	Peranginan / Resort	• Pulau Manukan	MW(7)-H511601-8- 6.50	67	79	82	83	85	Baik/ Good



Kualiti Air Marin dan Pulau-Pulau

*Marine and Island
Marine Water Quality*



BAB 4 Chapter 4



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 mengganggu kestabilan serta kepelbagaian ekosistem marin.

Pada tahun 2018, sebanyak 188 stesen pantai, 85 stesen kuala dan 95 stesen pulau telah dipantau. Sebanyak 1128 sampel di kawasan pantai, 510 di kuala dan 570 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 (NO₃), Fosfat (PO₄), Ammonia Tidak Terion (NH₃), *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

Department of Environment (DOE) has been monitoring the marine water quality since 1978 in Peninsular Malaysia and 1985 in Sabah and Sarawak with the main objective to establish the marine water quality status and to determine the degree of pollution from both the land-based as well as the sea based sources. These sources may pose threats to the marine resources which would upset the stability and diversity of the marine ecosystem.

In year 2018, a total of 188 coastal, 85 estuary and 95 island stations were monitored. As many as 1128 samples from coastal, 510 samples from estuary and 570 samples from island monitoring stations were collected for analyses and reported based on the Marine Water Quality Index (MWQI).

The MWQI was used to reflect the marine water quality status and its category. The index was developed based on seven (7) main parameters which are Dissolved Oxygen (DO), Nitrate (NO₃), Phosphate (PO₄), Unionized Ammonia (NH₃), *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

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
Arsenik (III)* (µg/L)/ Arsenic (III)* (µg/L)	3	20 (3)	50	20 (3)
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 2018, sebanyak 188 stesen pantai telah dipantau dan dianalisis serta dilaporkan dalam Indeks Kualiti Air Marin. Hasil pengawasan menunjukkan 124 stesen (65.96%) dikategorikan sebagai Terbaik, 37 stesen (19.68%) sebagai Baik, 27 stesen (14.36%) sebagai Sederhana dan tiada stesen sebagai Tercemar (**Jadual 4.3**).

COASTAL WATER QUALITY STATUS

In year 2018, a total of 188 coastal stations was monitored, analysed and reported in term of the Marine Water Quality Index. The monitoring results indicated that 124 stations (65.96%) as Excellent, 37 stations (19.68%) as Good, 27 stations (14.36%) as Moderate and no station categorized as Poor (**Table 4.3**).

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : 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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kedah	Pantai/Coastal	Pantai Merdeka	5603905	MMKC001	65	68	76	79	91	Terbaik/ Excellent
		Langkawi Island Resort	6399914	MMKC002	80	71	66	90	94	Terbaik/ Excellent
		Pantai Kok	6397922	MMKC003	82	72	66	83	94	Terbaik/ Excellent
		Pantai Kuah	6398925	MMKC004	80	71	71	91	94	Terbaik/ Excellent
		Pantai Pasir Tengkorak	6499701	MMKC005	82	85	68	93	94	Terbaik/ Excellent
		Pantai Teluk Burau	6396923	MMKC006	88	70	64	85	94	Terbaik/ Excellent
		Pantai Teluk Nibong	6497915	MMKC007	79	74	63	91	84	Baik/Good
		Pantai Tengah	6297903	MMKC008	70	68	60	87	94	Terbaik/ Excellent
		Pantai Beras Basah*	NA	MMKC009	-	-	-	93	94	Terbaik/ Excellent
Pulau Pinang	Pantai/Coastal	Gertak Sanggul	5201919	MMPC001	55	53	53	71	81	Baik/Good
		Kawasan Perindustrian Bayan Lepas 1	5303932	MMPC002	55	-	-	67	59	Sederhana/ Moderate
		Kawasan Perindustrian Bayan Lepas 2**	5303933	NA	54	-	-	-	-	Stesen tutup/Close station
		Kawasan Perindustrian Bayan Lepas 3**	5302939	NA	54	53	50	-	-	Stesen tutup/Close station
		Pantai Bersih	5403906	MMPC003	61	52	76	50	66	Sederhana/ Moderate
		Pantai Miami	5502901	MMPC004	65	69	61	68	93	Terbaik/ Excellent
		Pantai Pasir Panjang	5201938	MMPC005	66	70	63	86	93	Terbaik/ Excellent
		Batu Feringgi (Casuarina)	5402904	MMPC006	69	66	79	67	67	Sederhana/ Moderate
		Luar Pantai Teluk Bahang	5402930	MMPC007	66	65	88	85	93	Terbaik/ Excellent

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : 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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Pulau Pinang	Pantai/Coastal	Persiaran Gurney	5403902	MMPC008	66	48	83	63	66	Sederhana/ Moderate
		Rumah Pam Baru Perai	5304927	MMPC009	55	52	66	59	64	Sederhana/ Moderate
		Rumah Pam Lama Perai	5303926	MMPC010	59	55	61	64	65	Sederhana/ Moderate
		Selat PP Selatan (Jelutong)	5303911	MMPC011	51	49	60	49	59	Sederhana/ Moderate
		Tanjung Bungah	5402937	MMPC012	67	61	83	84	67	Sederhana/ Moderate
		Teluk Tempoyak	5202923	MMPC013	61	52	51	61	75	Sederhana/ Moderate
		Batu Maung	5202901	MMPC014	57	52	46	59	62	Sederhana/ Moderate
		Pantai Sungai Batu Feringhi 3*	NA	MMPC015	-	-	-	62	93	Terbaik/ Excellent
		Pantai Sungai Batu Feringhi 2*	NA	MMPC016	-	-	-	61	93	Terbaik/ Excellent
		Pantai Sungai Batu Feringhi 1*	NA	MMPC017	-	-	-	51	85	Baik/Good
Perak	Pantai/Coastal	Pantai Pasir Bogak	4205908	MMAC001	80	55	58	91	92	Terbaik/ Excellent
		Pantai Teluk Dalam	4205928	MMAC002	70	54	75	91	93	Terbaik/ Excellent
		Pantai Teluk Batik	4205932	MMAC003	71	73	51	89	92	Terbaik/ Excellent
		Pantai Tanjung Batu	4406927	MMAC004	84	69	53	92	94	Terbaik/ Excellent
		Pantai Teluk Rubiah*	NA	MMAC005	-	-	-	93	92	Terbaik/ Excellent
		Pantai Damai Laut*	NA	MMAC006	-	-	-	91	92	Terbaik/ Excellent
		Pantai Teluk Senangin*	NA	MMAC007	-	-	-	92	93	Terbaik/ Excellent
		Pantai Pasir Panjang	4205924	MMAC008	85	51	52	93	93	Terbaik/ Excellent
Selangor	Pantai/Coastal	Pantai Bagan Lalang	2616927	MMBC001	85	89	90	92	88	Baik/Good
		Pantai Morib	2712902	MMBC002	87	70	62	89	87	Baik/Good
		Selat Pulau Babi	3012929	MMBC003	93	87	75	72	90	Terbaik/ Excellent
		Selat Klang Utara	3013908	MMBC004	94	68	78	64	62	Sederhana/ Moderate
		Pantai Remis*	NA	MMBC005	-	-	-	67	90	Terbaik/ Excellent
		Pantai Klanang*	NA	MMBC006	-	-	-	91	82	Baik/Good
Negeri Sembilan	Pantai/Coastal	Bagan Pinang	2518915	MMNC001	92	87	97	68	91	Terbaik/ Excellent
		Telok Sinting	2419908	MMNC002	88	90	97	87	88	Baik/Good
		Port Dickson Bandar	2517907	MMNC003	70	84	97	68	68	Sederhana/ Moderate
		Port Dickson Batu 4	2518937	MMNC004	93	91	97	67	90	Terbaik/ Excellent

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : 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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Negeri Sembilan	Pantai/Coastal	Port Dickson Batu 5	2418906	MMNC005	67	88	97	79	68	Sederhana/ Moderate
		Port Dickson Batu 6	2418916	MMNC006	81	88	97	68	92	Terbaik/ Excellent
		Port Dickson Batu 7	2418905	MMNC007	90	86	97	67	88	Baik/Good
		Port Dickson Batu 8	2418912	MMNC008	93	77	97	75	87	Baik/Good
		Port Dickson Batu 10	2418914	MMNC009	90	93	97	68	89	Baik/Good
		Port Dickson Janakuasa TNB	2517909	MMNC010	91	79	97	68	68	Sederhana/ Moderate
		Telok Pelanduk	2419917	MMNC011	91	93	97	81	90	Terbaik/ Excellent
		Pantai Cermin	2416918	MMNC012	88	89	97	68	92	Terbaik/ Excellent
		Pantai Teluk Kemang*	NA	MMNC013	-	-	-	68	67	Sederhana/ Moderate
		Pantai Seri Purnama*	NA	MMNC014	-	-	-	85	93	Terbaik/ Excellent
Melaka	Pantai/Coastal	Pantai Rombang	2221916	MMMC001	55	58	68	85	85	Baik/Good
		Pantai Kundur	2221908	MMMC002	55	55	57	84	82	Baik/Good
		Pantai Tanjung Bidara	2320909	MMMC003	52	53	57	82	93	Terbaik/ Excellent
		Teluk Gong	2320902	MMMC004	51	55	57	88	93	Terbaik/ Excellent
		Pulau Melaka Point A1	2121915	MMMC005	-	78	72	64	67	Sederhana/ Moderate
		Pulau Melaka Point A2	2121915	MMMC006	-	-	-	72	81	Baik/Good
		Pulau Melaka Point B1	2121916	MMMC007	-	84	63	63	62	Sederhana/ Moderate
		Pulau Melaka Point B2	2121916	MMMC008	-	-	-	66	58	Sederhana/ Moderate
		Pantai Klebang*	NA	MMMC009	-	-	-	67	81	Baik/Good
Johor	Pantai/Coastal	Tanjung Bin	1336975	MMJC001	90	90	84	92	92	Terbaik/ Excellent
		Pelabuhan Tanjung Pelepas	1438943	MMJC002	85	89	85	90	92	Terbaik/ Excellent
		Hadapan Jabatan Laut	1438918	MMJC003	87	62	84	80	88	Baik/Good
		Pantai Stulang Laut	1437951	MMJC004	61	58	76	61	63	Sederhana/ Moderate
		Jeti Teluk Jawa	1438918	MMJC005	84	64	53	62	62	Sederhana/ Moderate
		Pelabuhan Pasir Gudang	1428939	MMJC006	64	75	75	64	65	Sederhana/ Moderate
		Hadapan HSAJB	1437920	MMJC007	55	64	44	59	59	Sederhana/ Moderate
		Pantai Lido	1437921	MMJC008	63	59	66	55	52	Sederhana/ Moderate

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : 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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Johor	Pantai/Coastal	Pantai Teluk Mahkota	1841911	MMJC009	85	85	89	92	94	Terbaik/ Excellent
		Pantai Tanjung Leman	2140694	MMJC010	87	88	88	94	93	Terbaik/ Excellent
		Pantai Sri Pantai	2339960	MMJC011	87	87	88	94	94	Terbaik/ Excellent
		Tanjung Merak	1441968	MMJC012	61	73	89	93	73	Sederhana/ Moderate
		Tanjung Pengelih	1441967	MMJC013	85	88	88	93	93	Terbaik/ Excellent
		Pantai Tanjong Stapa	1341961	MMJC014	57	88	89	93	93	Terbaik/ Excellent
		Pantai Teluk Gorek	2538958	MMJC015	79	89	88	93	94	Terbaik/ Excellent
		Pantai Air Papan	2538959	MMJC016	86	89	89	93	94	Terbaik/ Excellent
		Jefi Kukup	1334925	MMJC017	64	62	87	88	89	Baik/Good
		Pasir Gogok	1441966	MMJC018	79	89	90	94	93	Terbaik/ Excellent
		Tanjung Buai	1340973	MMJC019	89	88	80	92	92	Terbaik/ Excellent
		Pantai Desaru	1542914	MMJC020	71	65	89	94	94	Terbaik/ Excellent
		Tanjung Sepang	1443969	MMJC021	83	64	87	94	93	Terbaik/ Excellent
		Tanjung Penyusup	1444920	MMJC022	77	62	86	92	93	Terbaik/ Excellent
		Pantai Sungai Lurus	1730962	MMJC023	86	64	89	90	91	Terbaik/ Excellent
		Punggur	1531974	MMJC024	52	87	88	84	87	Baik/Good
		Pantai Penyabung*	NA	MMJC025	-	-	-	93	93	Terbaik/ Excellent
		Tanjung Resang*	NA	MMJC026	-	-	-	94	94	Terbaik/ Excellent
		Tanjung Balau*	NA	MMJC027	-	-	-	93	93	Terbaik/ Excellent
		Batu Layar*	NA	MMJC028	-	-	-	93	94	Terbaik/ Excellent
Tanjung Sengat*	NA	MMJC029	-	-	-	92	91	Terbaik/ Excellent		
Pahang	Pantai/Coastal	Pantai Cherating (Club Med A)	4133903 (A)	MMCC001	91	85	60	92	94	Terbaik/ Excellent
		Pantai Cherating (Club Med B)	4133903 (B)	MMCC002	94	85	61	93	94	Terbaik/ Excellent
		Pantai Cherating (Legend A)	4133942 (A)	MMCC003	67	87	81	92	94	Terbaik/ Excellent
		Pantai Cherating (Legend B)	4133942 (B)	MMCC004	92	87	61	89	94	Terbaik/ Excellent
		Pantai Muhibbah Balok A	3933901 (A)	MMCC005	87	77	58	68	89	Baik/Good

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
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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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Pahang	Pantai/Coastal	Pantai Muhibbah Balok B	3933901 (B)	MMCC006	86	75	59	65	83	Baik/Good
		Pantai Batu Hitam A	3833915 (A)	MMCC007	93	85	62	68	87	Baik/Good
		Pantai Batu Hitam B	3833915 (B)	MMCC008	91	87	56	81	91	Terbaik/Excellent
		Pantai Berserah A	3933941 (A)	MMCC009	93	90	65	80	90	Terbaik/Excellent
		Pantai Berserah B	3933941 (B)	MMCC010	71	78	63	67	90	Terbaik/Excellent
		Pantai Teluk Cempedak A	3833910 (A)	MMCC011	93	78	59	67	88	Baik/Good
		Pantai Teluk Cempedak B	3833910 (B)	MMCC012	94	67	59	88	91	Terbaik/Excellent
		Pantai Teluk Gelora A	3833909 (A)	MMCC013	71	62	64	67	77	Sederhana/Moderate
		Pantai Teluk Gelora B	3833909 (B)	MMCC014	78	64	59	66	76	Sederhana/Moderate
		Pantai Sepat A	3737915	MMCC015	93	62	88	91	93	Terbaik/Excellent
		Pantai Sepat B	3633916	MMCC016	94	85	80	91	93	Terbaik/Excellent
		Pantai Legenda A	3534943 (A)	MMCC017	94	82	85	93	94	Terbaik/Excellent
		Pantai Legenda B	3534943 (B)	MMCC018	94	64	79	94	94	Terbaik/Excellent
		Pantai Kuala Api-Api	3235917	MMCC019	93	66	79	90	93	Terbaik/Excellent
		Pantai Tanjung Batu	3334915	MMCC020	93	83	79	90	94	Terbaik/Excellent
		Pantai Chendor*	NA	MMCC021	-	-	-	86	94	Terbaik/Excellent
		Pantai Lanjut*	NA	MMCC022	-	-	-	93	92	Terbaik/Excellent
		Terengganu	Pantai/Coastal	Pantai Batu Buruk	5331935	MMTC001	66	58	78	94
Pantai Bukit Keluang	5825903			MMTC002	69	52	64	94	94	Terbaik/Excellent
Pantai Chendering	5231934			MMTC003	69	53	61	89	94	Terbaik/Excellent
Pantai Rantau Abang	4833917			MMTC004	70	60	61	90	94	Terbaik/Excellent
KIPC Utara	4634954			MMTC005	62	62	74	91	94	Terbaik/Excellent
KIPC Tengah	4534955			MMTC006	63	73	77	89	94	Terbaik/Excellent
KIPC Selatan	4534956			MMTC007	66	75	74	89	94	Terbaik/Excellent
Pantai Rhu 10*	NA			MMTC008	-	-	-	94	94	Terbaik/Excellent
Pantai Tok Jembal*	NA			MMTC009	-	-	-	94	94	Terbaik/Excellent
Pantai Kelului*	NA			MMTC010	-	-	-	94	94	Terbaik/Excellent
Pantai Teluk Ketapang*	NA			MMTC011	-	-	-	94	94	Terbaik/Excellent

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
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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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Terengganu	Pantai/Coastal	Pantai Kuala Abang*	NA	MMTC012	-	-	-	94	94	Terbaik/ Excellent
		Pantai Teluk Kalong*	NA	MMTC013	-	-	-	94	94	Terbaik/ Excellent
		Pantai Sura*	NA	MMTC014	-	-	-	94	94	Terbaik/ Excellent
		Pantai Tanjung Bidara*	NA	MMTC015	-	-	-	94	94	Terbaik/ Excellent
		Pantai Kemasik*	NA	MMTC016	-	-	-	93	88	Baik/Good
Kelantan	Pantai/Coastal	Pantai Seri Tujuh	6221910	MMDC001	71	63	66	88	93	Terbaik/ Excellent
		Pantai Cahaya Bulan	6122903	MMDC002	74	61	78	87	93	Terbaik/ Excellent
		Pantai Sabak	6123909	MMDC003	72	61	66	81	93	Terbaik/ Excellent
		Pantai Irama Bachok	6024908	MMDC004	69	62	66	86	93	Terbaik/ Excellent
		Pantai Bisikan Bayu	5825905	MMDC005	67	64	66	89	94	Terbaik/ Excellent
		Pantai Melawi*	NA	MMDC006	-	-	-	93	94	Terbaik/ Excellent
Sarawak	Pantai/Coastal	Pantai Sematan	1898902	MMQC001	91	76	74	88	90	Terbaik/ Excellent
		Pantai Pandan	1824918	MMQC002	94	87	75	87	91	Terbaik/ Excellent
		Pantai Pasir Putih	1604910	MMQC003	67	67	88	80	87	Baik/Good
		Pantai Bako	1704906	MMQC004	94	88	74	88	89	Baik/Good
		Pantai Damai	1702904	MMQC005	91	76	89	86	91	Terbaik/ Excellent
		Pantai Tanjung Kembang	1810923	MMQC006	73	87	85	69	85	Baik/Good
		Pantai Harmoni Mukah	2920921	MMQC007	53	54	85	72	86	Baik/Good
		Pantai Tanjung Batu	3132602	MMQC008	70	67	82	84	89	Baik/Good
		Pantai Likau	3230915	MMQC009	63	89	79	85	89	Baik/Good
		Pantai Emas	3331903	MMQC010	63	88	90	87	90	Terbaik/ Excellent
		Pantai Piasau	4539918	MMQC011	88	82	68	86	89	Baik/Good
		Pantai Brighton	4449917	MMQC012	91	94	68	81	88	Baik/Good
		Pantai Esplaned	4339920	MMQC013	89	97	68	86	82	Baik/Good
		Pantai Beraya	4238921	MMQC014	89	97	68	87	88	Baik/Good
		Pantai Bungai	4137922	MMQC015	91	82	94	88	87	Baik/Good
		Pantai Belawai	2212913	MMQC016	65	83	73	84	88	Baik/Good
		Pantai Mukah*	NA	MMQC017	-	-	-	84	88	Baik/Good

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
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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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sarawak	Pantai/Coastal	Tanjung Kidurong*	NA	MMQC018	-	-	-	85	90	Terbaik/ Excellent
		Pasir Pandak*	NA	MMQC019	-	-	-	86	90	Terbaik/ Excellent
		Rambungan*	NA	MMQC020	-	-	-	89	90	Terbaik/ Excellent
		Sri Tanjung Lawas*	NA	MMQC021	-	-	-	92	86	Baik/Good
		Pantai Luak*	NA	MMQC022	-	-	-	88	78	Sederhana/ Moderate
		Pasir Panjang*	NA	MMQC023	-	-	-	87	88	Baik/Good
Sabah	Pantai/Coastal	Pantai Teluk Brunei 1	5053901	MMSC001	80	82	66	70	92	Terbaik/ Excellent
		Pantai Teluk Brunei 2	5053902	MMSC002	79	83	59	65	93	Terbaik/ Excellent
		Pantai Teluk Brunei 3	5053903	MMSC003	73	85	67	65	92	Terbaik/ Excellent
		Pantai Teluk Brunei 4	5053904	MMSC004	75	86	66	69	93	Terbaik/ Excellent
		Pantai Teluk Brunei 5	5053905	MMSC005	71	85	65	69	93	Terbaik/ Excellent
		Pantai Teluk Brunei 6	5053906	MMSC006	80	83	67	70	93	Terbaik/ Excellent
		Borneo Golf Seawater	5355901	MMSC007	80	79	68	68	92	Terbaik/ Excellent
		Pantai Manis Papar	5555901	MMSC008	81	83	66	69	91	Terbaik/ Excellent
		Pantai Melinsung	5565902	MMSC009	77	83	67	73	93	Terbaik/ Excellent
		Pantai Tanjung Aru (Roll Skating)	5656902	MMSC010	70	67	63	86	93	Terbaik/ Excellent
		Pantai Tanjung Aru (No. 3)	5656903	MMSC011	67	66	67	82	93	Terbaik/ Excellent
		Pantai Lok Kawi	5656904	MMSC012	59	69	62	85	93	Terbaik/ Excellent
		Pantai Dalit Tuaran	6161901	MMSC013	85	70	64	74	93	Terbaik/ Excellent
		Mangrove Paradise	6161902	MMSC014	86	67	68	86	93	Terbaik/ Excellent
		Pantai Sabandar	6161903	MMSC015	83	68	67	71	93	Terbaik/ Excellent
		Pantai Bak-Bak Kudat	6665901	MMSC016	85	65	63	70	93	Terbaik/ Excellent
		Pasir Putih Sandakan	5580901	MMSC017	83	84	67	66	92	Terbaik/ Excellent
		Pantai TLDM	5580902	MMSC018	81	87	69	69	92	Terbaik/ Excellent
		Pantai Batu Sapi	5580903	MMSC019	83	84	67	51	93	Terbaik/ Excellent
		Pantai Ulu Tungku	5085901	MMSC020	83	84	68	69	92	Terbaik/ Excellent
		Pantai Sarina Kunak	4481901	MMSC021	83	82	69	68	93	Terbaik/ Excellent
		Pantai Kg. Lamak	4581902	MMSC022	-	82	67	49	91	Terbaik/ Excellent

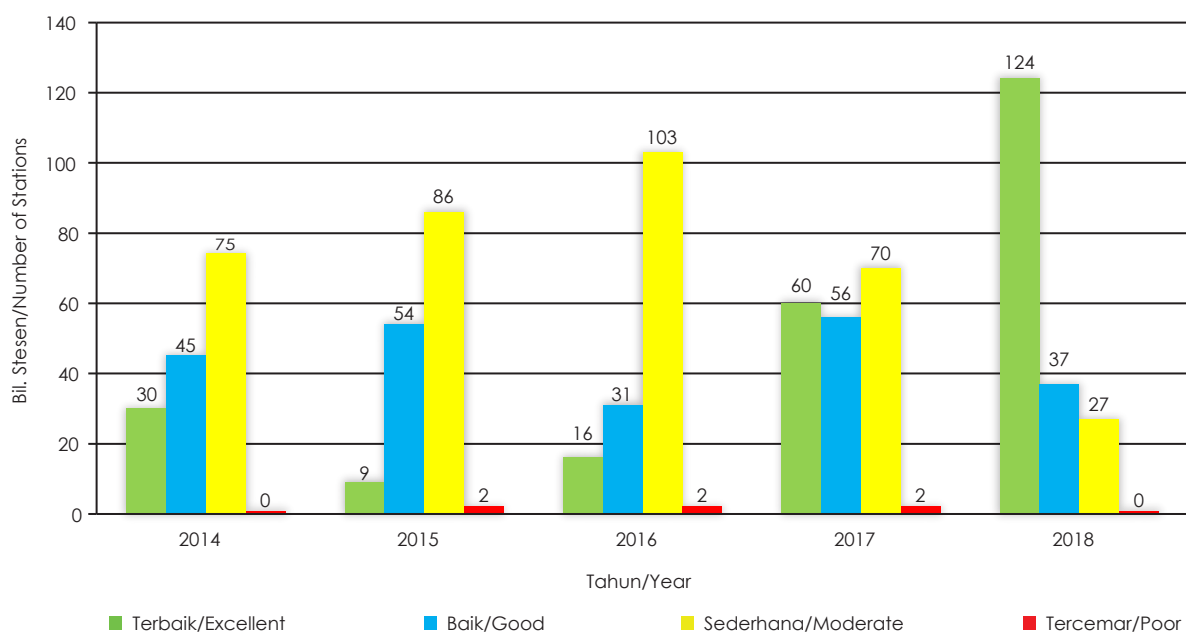
Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : Marine Water Quality Status for Coastal

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sabah	Pantai/Coastal	Pantai Tinagat	4473901	MMSC023	83	82	69	70	93	Terbaik/ Excellent
		Pantai Tanjung Aru (Rest Lido)	5656901	MMSC024	82	68	68	86	93	Terbaik/ Excellent
Labuan	Pantai/Coastal	Pulau Papan	5151905	MMLC001	51	76	75	73	92	Terbaik/ Excellent
		Kiamsam	5151906	MMLC002	67	77	76	73	93	Terbaik/ Excellent
		Sungai Pagar	5151907	MMLC003	79	77	78	71	92	Terbaik/ Excellent
		Layang-Layangan	5251902	MMLC004	79	76	77	73	92	Terbaik/ Excellent
		Tanjung Aru	5251903	MMLC005	75	78	72	73	91	Terbaik/ Excellent

Nota/Note:
* (Stesen baru/New station)
** (Stesen tutup/Close station)
- (Tiada data/No data)
NA (Tidak berkenaan/Not available)

Tren Indeks Kualiti Air Marin (IKAM) mulai tahun 2014 hingga 2018 adalah seperti ditunjukkan dalam **Rajah 4.1**. Bilangan stesen Terbaik menunjukkan peningkatan daripada 60 kepada 124 stesen (52%).

The Marine Water Quality Index (MWQI) trend for 2014 to 2018 is as shown in **Figure 4.1**. The number of stations recorded Excellent category increased from 60 to 124 stations (52%).



Rajah 4.1 : Tren Status Kualiti Air Marin Kawasan Pantai di Malaysia, 2014-2018
Figure 4.1 : The Trend of Marine Water Status for Coastal Area in Malaysia, 2014-2018

STATUS KUALITI AIR KUALA

Pada tahun 2018, sebanyak 85 stesen Kuala telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil program pengawasan yang telah dijalankan menunjukkan 18 stesen (21.18%) dikategorikan sebagai Terbaik, 21 stesen (24.71%) sebagai Baik, 41 stesen (48.24%) sebagai Sederhana dan 5 stesen (5.88%) sebagai Tercemar (**Jadual 4.4**).

ESTUARY WATER QUALITY STATUS

In year 2018, 85 estuary stations were monitored, analysed and reported as Marine Water Quality Index. The results from the monitoring programme indicated that 18 stations (21.18%) as Excellent, 21 stations (**24.71%**) as Good, 41 stations (48.24%) as Moderate and 5 stations (5.88%) as Poor (**Table 4.4**).

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perlis	Kuala/Estuary	Kuala Sungai Perlis	6401901	MMRE001	59	53	61	64	66	Sederhana/ Moderate
		Kuala Sungai Baru	6201902	MMRE002	76	56	60	64	70	Sederhana/ Moderate
Kedah	Kuala/Estuary	Kuala Kedah	6102908	MMKE001	53	50	77	62	61	Sederhana/ Moderate
		Kuala Jerlun	6302925	MMKE002	65	59	75	62	82	Baik/Good
		Kuala Segantang Garam*	NA	MMKE003	-	-	-	83	88	Baik/Good
		Kuala Sungai Muda*	NA	MMKE004	-	-	-	64	62	Sederhana/ Moderate
Pulau Pinang	Kuala/Estuary	Kuala Sungai Jawi	5204901	MMPE001	58	49	45	49	54	Sederhana/ Moderate
		Kuala Sungai Juru	5303904	MMPE002	63	59	70	49	47	Tercemar/ Poor
		Kuala Sungai Kerian	5104901	MMPE003	61	60	34	56	60	Sederhana/ Moderate
		Kuala Sungai Pinang	5403934	MMPE004	50	47	58	52	61	Sederhana/ Moderate
		Kuala Sungai Perai	5303908	MMPE005	53	56	64	52	59	Sederhana/ Moderate
		Kuala Sungai Tengah	5204935	MMPE006	60	67	65	58	37	Tercemar/ Poor
		Kuala Sungai Pinang (Balik Pulau)	5202929	MMPE007	67	46	60	55	64	Sederhana/ Moderate
Perak	Kuala/Estuary	Kuala Sungai Manjung	4205930	MMAE001	70	67	78	88	91	Terbaik/ Excellent
		Kuala Sungai Gula	4906926	MMAE002	68	60	67	82	84	Baik/Good
		Kuala Sungai Kurau	4994919	MMAE003	56	73	59	61	64	Sederhana/ Moderate
		Kuala Sungai Tanjung Piandang	5003921	MMAE004	75	73	57	59	61	Sederhana/ Moderate
		Kuala Sungai Sepetang	4806925	MMAE005	53	66	56	60	58	Sederhana/ Moderate

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perak	Kuala/Estuary	Kuala Sungai Perak	4007901	MMAE006	62	70	64	61	81	Baik/Good
Selangor	Kuala/Estuary	Kuala Sungai Sepang	2517922	MMBE001	71	78	85	92	89	Baik/Good
		Kuala Sungai Sepang (Kecil)	2612928	MMBE002	68	92	86	93	89	Baik/Good
		Kuala Sungai Sepang (Kawalan)	2616926	MMBE003	81	86	92	93	92	Terbaik/Excellent
		Kuala Sungai Langat (Jugra)	2814925	MMBE004	69	55	72	82	62	Sederhana/Moderate
		Kuala Sungai Klang	3013909	MMBE005	95	67	77	60	37	Tercemar/Poor
		Kuala Sungai Langat (Lumut)	2913903	MMBE006	93	67	81	60	39	Tercemar/Poor
		Kuala Sungai Buloh	3212930	MMBE007	64	66	67	64	62	Sederhana/Moderate
		Kuala Sungai Selangor	3312915	MMBE008	90	90	74	85	69	Sederhana/Moderate
		Kuala Sungai Tenggi	3311931	MMBE009	68	67	72	74	64	Sederhana/Moderate
		Kuala Sungai Bernam	3808924	MMBE010	67	55	72	56	86	Baik/Good
Negeri Sembilan	Kuala/Estuary	Kuala Sungai Linggi	2319901	MMNE001	93	81	97	75	65	Sederhana/Moderate
		Kuala Sungai Lukut	2517910	MMNE002	91	68	97	66	66	Sederhana/Moderate
Melaka	Kuala/Estuary	Kuala Sungai Melaka	2123903	MMME001	59	55	56	63	65	Sederhana/Moderate
		Kuala Sungai Sri Melaka	2121914	MMME002	59	52	53	57	59	Sederhana/Moderate
		Kuala Sungai Merlimau	2124912	MMME003	62	86	71	81	75	Sederhana/Moderate
		Kuala Sungai Kesang	2186905	MMME004	68	77	70	83	82	Baik/Good
		Kuala Sungai Sebatu	2186904	MMME005	61	58	69	86	87	Baik/Good
		Kuala Sungai Melaka 2*	NA	MMME006	-	-	-	64	64	Sederhana/Moderate
		Kuala Sungai Baru*	NA	MMME007	-	-	-	84	83	Baik/Good
		Kuala Sungai Lereh	2221922	MMME008	-	-	69	63	64	Sederhana/Moderate
Johor	Kuala/Estuary	Kuala Sungai Melayu	1437946	-	75	66	58	63	-	Stesen tutup/Close station
		Kuala Sungai Skudai	1437922	-	58	57	65	40	-	Stesen tutup/Close station
		Kuala Sungai Tebrau	1438943	-	61	59	56	62	-	Stesen tutup/Close station
		Kuala Sungai Segget	1437919	MMJE001	61	62	47	53	32	Tercemar/Poor
		Kuala Sungai Kim-Kim	1439965	MMJE002	64	87	82	61	61	Sederhana/Moderate

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Johor	Kuala/Estuary	Kuala Sungai Johor	1440916	MMJE003	82	88	85	92	92	Terbaik/ Excellent
		Kuala Sungai Batu Pahat	1729930	MMJE004	51	84	87	90	80	Baik/Good
		Kuala Sungai Muar	2024932	MMJE005	64	81	88	92	66	Sederhana/ Moderate
		Kuala Sungai Mersing	2438905	MMJE006	64	89	85	67	67	Sederhana/ Moderate
Pahang	Kuala/Estuary	Kuala Kuantan*	NA	MMCE001	-	-	-	66	67	Sederhana/ Moderate
		Kuala Rompin Kecil*	NA	MMCE002	-	-	-	89	93	Terbaik/ Excellent
		Kuala Pahang*	NA	MMCE003	-	-	-	92	73	Sederhana/ Moderate
		Kuala Nenas*	NA	MMCE004	-	-	-	93	94	Terbaik/ Excellent
		Kuala Sungai Balok*	NA	MMCE005	-	-	-	65	66	Sederhana/ Moderate
Terengganu	Kuala/Estuary	Kuala Sungai Besut	5825902	MMTE001	70	64	63	73	67	Sederhana/ Moderate
		Kuala Sungai Dungun	4734918	MMTE002	54	55	53	65	86	Baik/Good
		Kuala Sungai Ibai	5231949	MMTE003	70	63	61	90	93	Terbaik/ Excellent
		Kuala Sungai Kerteh	4534922	MMTE004	58	54	56	91	92	Terbaik/ Excellent
		Kuala Sungai Marang	5232911	MMTE005	67	63	72	90	91	Terbaik/ Excellent
		Kuala Sungai Paka	4634920	MMTE006	66	69	72	80	94	Terbaik/ Excellent
		Kuala Sungai Setiu	5627953	MMTE007	70	62	75	92	93	Terbaik/ Excellent
		Kuala Sungai Terengganu	5331907	MMTE008	57	72	55	66	67	Sederhana/ Moderate
		Kuala Sungai Kemaman/ Chukai	4234929	MMTE009	59	54	56	90	94	Terbaik/ Excellent
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	4234950	MMTE010	66	63	63	89	94	Terbaik/ Excellent
		Tioxide Tengah (Pupuk Semangat, Kijal)	4234951	MMTE011	70	62	61	90	94	Terbaik/ Excellent
		Tioxide Selatan (KSB, T. Kalong)	4234952	MMTE012	69	53	-	94	94	Terbaik/ Excellent
		Pulau Duyung	5231908	MMTE013	50	48	57	66	66	Sederhana/ Moderate
Kelantan	Kuala/Estuary	Kuala Sungai Golok	6220911	MMDE001	52	57	76	75	67	Sederhana/ Moderate
		Kuala Sungai Kelantan	6222901	MMDE002	51	52	74	79	65	Sederhana/ Moderate
		Kuala Sungai Pengkalan Chepa	6223912	MMDE003	54	63	72	89	67	Sederhana/ Moderate

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kelantan	Kuala/Estuary	Kuala Sungai Pengkalan Datu	6123913	MMDE004	60	63	61	86	81	Baik/Good
		Kuala Sungai Kemasin	5824914	MMDE005	67	58	57	63	67	Sederhana/ Moderate
		Kuala Sungai Semerak*	NA	MMDE006	-	-	-	87	67	Sederhana/ Moderate
Sarawak	Kuala/Estuary	Kuala Sungai Semantan	1898901	MMQE001	95	80	90	86	90	Terbaik/ Excellent
		Kuala Sungai Sarawak	1604907	MMQE002	80	62	70	85	86	Baik/Good
		Kuala Sungai Bako	1704905	MMQE003	65	69	66	55	90	Terbaik/ Excellent
		Kuala Sungai Santubong	1702903	MMQE004	75	87	89	87	88	Baik/Good
		Kuala Batang Krian (Kabong)	1710922	MMQE005	79	64	73	64	76	Sederhana/ Moderate
		Kuala Batang Rejang	2111909	MMQE006	82	82	87	83	85	Baik/Good
		Kuala Mukah	2920920	MMQE007	51	70	89	72	83	Baik/Good
		Kuala Batang Kemena	3130911	MMQE008	64	77	69	68	87	Baik/Good
		Kuala Tanjung Similajau	3431903	MMQE009	85	90	92	84	89	Baik/Good
		Kuala Sungai Panipah	3332904	MMQE010	89	91	92	86	89	Baik/Good
		Kuala Pantai Nyalau	3431903	MMQE011	55	93	86	84	79	Sederhana/ Moderate
		Kuala Sungai Baram	4539919	MMQE012	96	97	66	72	76	Sederhana/ Moderate
		Kuala Sungai Miri	4349915	MMQE013	84	72	68	61	78	Sederhana/ Moderate
		Kuala Sungai Trusan*	NA	MMQE014	-	-	-	70	87	Baik/Good
Sabah	Kuala/Estuary	Kuala Penyu	5453901	MMSE001	82	65	66	71	92	Terbaik/ Excellent
		Muara Sungai Inanam	5050905	MMSE002	60	88	45	86	91	Terbaik/ Excellent

Nota/Note:

* (Stesen baru/New station)

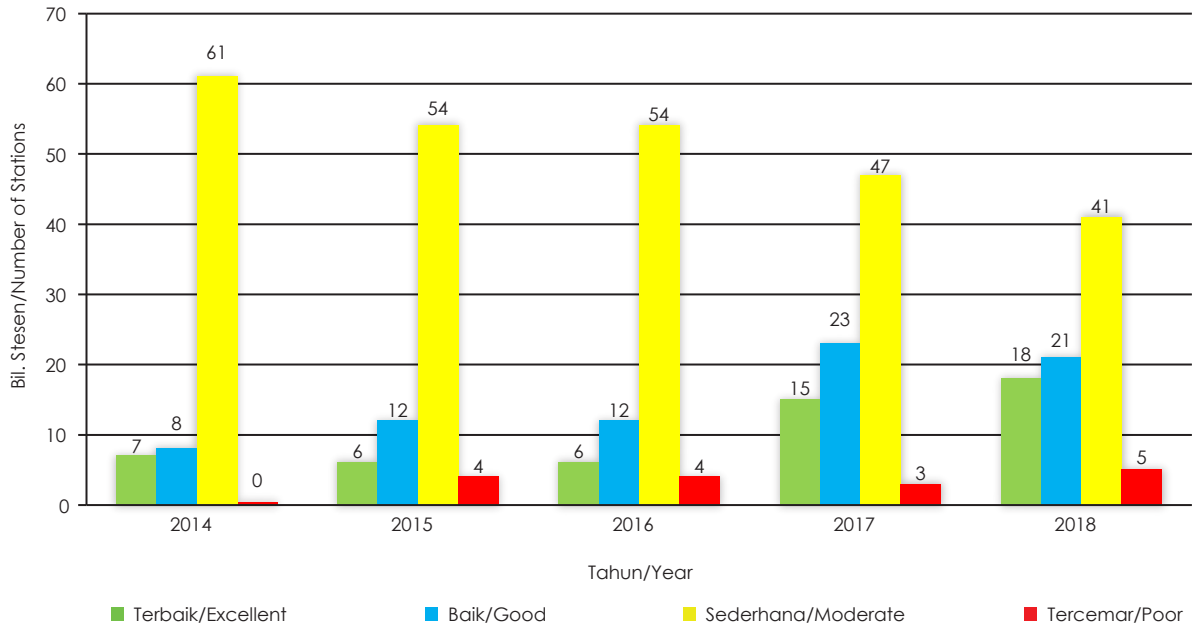
** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)

Berdasarkan Indeks Kualiti Air Marin (IKAM), bilangan stesen Terbaik menunjukkan peningkatan daripada 15 kepada 18 stesen (17%). Tren ini ditunjukkan dalam **Rajah 4.2**.

Based on Marine Water Quality Index (MWQI), the number of estuarine water quality that recorded Excellent increased from 15 to 18 stations (17%). These trends are shown in **Figure 4.2**.



Rajah 4.2 : Tren Status Kualiti Air Marin bagi Kawasan Kuala, 2014-2018
Figure 4.2 : The Trend Of Marine Water Quality Status for Estuary, 2014-2018



KUALITI AIR MARIN PULAU

ISLAND MARINE WATER QUALITY

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

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

Jadual 4.5 : Stesen-Stesen Pulau, 2018

Table 4.5 : Island Stations, 2018

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	10	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	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		

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

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		1	Kendi	7PR07	MMPR003	Peranginan/ Resort
		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
			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

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

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
Johor		1	Kukup	7JP17	MMJP001	Dilindungi/ Protected
		1	Pisang	7JP18	MMJP002	Dilindungi/ Protected
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

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

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
Sarawak	3	1	Satang	7QP01	MMQP001	Dilindungi/ Protected
		1	Talang- Talang Kecil	7QP02	MMQP002	Dilindungi/ Protected
		1	Talang- Talang Besar	7QP03	MMQP003	Dilindungi/ Protected
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

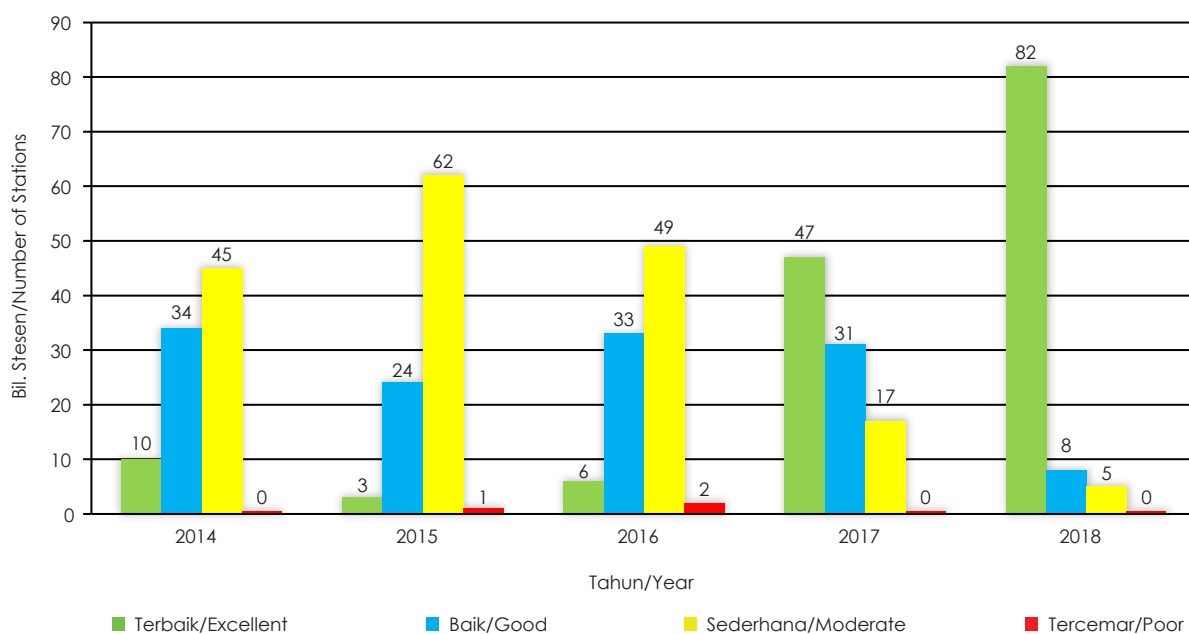
Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

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
Labuan		4	Pohon Batu	7LD01	MMLD001	Pembangunan/ Development
			Water Front	7LD02	MMLD002	Pembangunan/ Development
			Lubuk Temiang	7LD03	MMLD003	Pembangunan/ Development
			Ranca- Ranca	7LD04	MMLD004	Pembangunan/ Development

Nota/Note:
* (Stesen baru/New station)
** (Stesen tutup/Close station)
- (Tiada data/No data)
NA (Tidak berkenaan/Not available)

Perairan di sekeliling 79 buah pulau telah dipantau dalam tahun 2018. Sebanyak 95 stesen telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil analisis menunjukkan 82 stesen (86.32%) dikategorikan sebagai Terbaik, 8 stesen (8.42%) dikategorikan sebagai Baik, 5 stesen (5.26%) dikategorikan sebagai Sederhana dan tiada stesen dikategorikan sebagai Tercemar (Rajah 4.3).

The water bodies around 79 islands were monitored in 2018. A total of 95 island stations were monitored, analysed and reported as Marine Water Quality Index. The result indicated that 82 stations (86.32%) as *Excellent*, 8 stations (8.42%) as *Good*, 5 stations (5.26%) as *Moderate* and no station categorized as *Poor* (Figure 4.3).



Rajah 4.3 : Tren Status Kualiti Air Marin bagi Pulau, 2014-2018
Figure 4.3 : The Trend of Marine Water Quality Status for Island, 2014-2018

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kedah	Pulau/Island	Singa Besar	7KR01	MMKR001	83	73	61	90	93	Terbaik/ Excellent
		Dayang Bunting	7KR02	MMKR002	89	71	60	91	93	Terbaik/ Excellent
		Dayang Bunting 2*	NA	MMKR003	-	-	-	93	93	Terbaik/ Excellent
		Pulau Perak	7KP01	MMRP001	-	72	56	94	94	Terbaik/ Excellent
		Payar	7KM03	MMKM001	79	73	75	91	94	Terbaik/ Excellent
		Kaca	7KM04	MMKM002	82	75	74	93	94	Terbaik/ Excellent
		Segantang	7KM06	MMKM003	84	75	70	91	94	Terbaik/ Excellent
		Pantai Kuah	7KD07	MMKD001	75	69	51	92	94	Terbaik/ Excellent
		Pantai Chenang	7KD09	MMKD002	86	73	63	74	82	Baik/Good
		Tanjung Rhu	7KD010	MMKD003	86	88	67	92	94	Terbaik/ Excellent
		Teluk Ewa	7KD08	MMKD004	67	74	74	92	94	Terbaik/ Excellent
		Lembu**	7KM05	NA	85	75	71	-	-	Stesen tutup/Close station
		Pasir*	NA	MMKP001	-	-	-	93	94	Terbaik/ Excellent
		Gasing*	NA	MMKP002	-	-	-	94	94	Terbaik/ Excellent
		Dangli*	NA	MMKP003	-	-	-	92	94	Terbaik/ Excellent
Pulau Pinang	Pulau/Island	Tanjung Tokong*	NA	MMPP001	-	-	-	63	66	Sederhana/ Moderate
		Batu Maung	7PD01	MMPD001	70	52	46	64	62	Sederhana/ Moderate
		Padang Kota	7PD04	MMPD002	51	47	82	52	65	Sederhana/ Moderate
		Teluk Bahang*	7PD03	MMPD003	-	-	-	61	82	Baik/Good
		Aman	7PR05	MMPR001	61	69	72	72	88	Baik/Good
		Jerejak	7PR06	MMPR002	54	68	46	57	65	Sederhana/ Moderate
		Kendi	7PR07	MMPR003	67	72	76	83	93	Terbaik/ Excellent
		Rimau	7PR08	MMPR004	61	72	51	85	93	Terbaik/ Excellent
		Gedong	7PR09	MMPR005	57	66	71	63	86	Baik/Good
Perak	Pulau/Island	Pantai Teluk Gedong	7AR01	MMAR001	70	68	56	85	92	Terbaik/ Excellent
		Pantai Puteri Dewi	7AR02	MMAR002	50	68	79	92	94	Terbaik/ Excellent
		Pangkor Laut	7AR03	MMAR003	66	63	52	89	92	Terbaik/ Excellent

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perak	Pulau/Island	Sembilan	7AR04	MMAR004	70	63	58	93	94	Terbaik/ Excellent
		Tukun Perak	7AP05	MMAP001	73	62	69	93	93	Terbaik/ Excellent
Selangor	Pulau/Island	Ketam	7BR01	MMBR001	93	54	93	88	89	Baik/Good
		Angsa	7BR02	MMBR002	93	59	88	85	92	Terbaik/ Excellent
		Lumut	7BR03	MMBR003	61	58	87	61	54	Sederhana/ Moderate
Negeri Sembilan	Pulau/Island	Arang	7NP01	MMNP001	92	94	97	68	92	Terbaik/ Excellent
Melaka	Pulau/Island	Upeh (Point A)	7MR02	MMMMR001	60	56	58	65	85	Baik/Good
		Upeh (Point B)	7MR02	MMMMR002	57	54	67	82	84	Baik/Good
		Besar (Point A)	7MR01	MMMMR003	64	62	70	89	94	Terbaik/ Excellent
		Besar (Point B)	7MR01	MMMMR004	58	56	70	90	93	Terbaik/ Excellent
		Undan (Point A)	7MR03	MMMMR005	58	54	77	90	94	Terbaik/ Excellent
		Undan (Point B)	7MR03	MMMMR006	71	56	61	90	94	Terbaik/ Excellent
Johor	Pulau/Island	Sefindan	7JR01	MMJR001	88	89	89	94	94	Terbaik/ Excellent
		Babi Tengah	7JR02	MMJR002	89	89	89	94	94	Terbaik/ Excellent
		Dayang	7JM03	MMJM001	88	90	88	94	94	Terbaik/ Excellent
		Nanga Besar	7JM08	MMJM002	87	89	90	94	94	Terbaik/ Excellent
		Sibu Tengah	7JM11	MMJM003	88	89	88	94	94	Terbaik/ Excellent
		Pemanggil	7JM15	MMJM004	88	89	90	94	94	Terbaik/ Excellent
		Kukup	7JP17	MMJP001	81	87	83	91	87	Baik/Good
		Pisang	7JP18	MMJP002	87	89	86	93	93	Terbaik/ Excellent
Pahang	Pulau/Island	Tioman (Teluk Salang)	7CM02	MMCM001	85	76	78	92	94	Terbaik/ Excellent
		Tioman (Kg. Nipah)	7CM01	MMCM002	85	83	85	94	94	Terbaik/ Excellent
		Tulai	7CM05	MMCM003	84	88	85	93	94	Terbaik/ Excellent
		Labas	7CM07	MMCM004	86	85	86	93	94	Terbaik/ Excellent
		Cebah	7CM04	MMCM005	85	85	85	94	94	Terbaik/ Excellent
		Sepui	7CM06	MMCM006	85	79	83	93	94	Terbaik/ Excellent
		Sembilang	7CM08	MMCM007	85	58	75	93	94	Terbaik/ Excellent

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Pahang	Pulau/Island	Seri Buat	7CM03	MMCM008	86	57	84	94	94	Terbaik/ Excellent
		Tokong Bahara	7CM09	MMCM009	85	75	86	93	94	Terbaik/ Excellent
Terengganu	Pulau/Island	Gemia	7TR01	MMTR001	66	58	64	89	94	Terbaik/ Excellent
		Perhentian Besar (South)	7TM04	MMTM001	69	59	63	89	94	Terbaik/ Excellent
		Perhentian Besar (West)	7TM05	MMTM002	69	57	62	90	94	Terbaik/ Excellent
		Perhentian Kecil	7TM06	MMTM003	70	59	61	90	94	Terbaik/ Excellent
		Redang (North)	7TM07	MMTM004	72	58	78	90	94	Terbaik/ Excellent
		Redang (South)	7TM08	MMTM005	72	58	64	89	94	Terbaik/ Excellent
		Lang Tengah	7TM11	MMTM006	69	71	64	90	94	Terbaik/ Excellent
		Pinang	7TM12	MMTM007	71	59	63	90	94	Terbaik/ Excellent
		Ekor Tebu	7TM13	MMTM008	69	60	63	90	94	Terbaik/ Excellent
		Lima	7TM14	MMTM009	73	59	64	90	94	Terbaik/ Excellent
		Kapas	7TP16	MMTM010	67	58	76	90	93	Terbaik/ Excellent
Kelantan	Pulau/Island	Panjang	7DP01	MMDP001	67	65	66	88	93	Terbaik/ Excellent
		Kundur	7DP02	MMDP002	70	63	65	89	93	Terbaik/ Excellent
Sarawak	Pulau/Island	Satang	7QP01	MMQP001	83	75	90	87	90	Terbaik/ Excellent
		Talang-Talang Kecil	7QP02	MMQP002	84	87	77	87	91	Terbaik/ Excellent
		Talang-Talang Besar	7QP03	MMQP003	84	90	91	87	90	Terbaik/ Excellent
Sabah	Pulau/Island	Gaya	7SR01	MMSR001	81	85	85	73	93	Terbaik/ Excellent
		Mabul	7SR03	MMSR002	53	71	82	87	93	Terbaik/ Excellent
		Sipadan (N)	7SR04	MMSR003	58	70	84	88	93	Terbaik/ Excellent
		Sipadan (W)	7SR05	MMSR004	79	70	80	85	93	Terbaik/ Excellent
		Manukan	7SM09	MMSR005	80	84	82	70	93	Terbaik/ Excellent
		Tiga	7SR10	MMSR006	81	82	84	85	92	Terbaik/ Excellent
		Kapalai	7SR12	MMSR007	81	70	85	85	93	Terbaik/ Excellent
		Molleangan Besar	7SR14	MMSR008	79	83	83	88	93	Terbaik/ Excellent
		Banggi (South)	7SR15	MMSR009	76	82	84	87	93	Terbaik/ Excellent
		Banggi (East)	7SR20	MMSR010	79	83	83	88	93	Terbaik/ Excellent

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

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 (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sabah	Pulau/Island	Balambangan	7SR16	MMSR011	77	84	83	88	93	Terbaik/ Excellent
		Mantanani Besar	7SR21	MMSR012	83	82	83	85	93	Terbaik/ Excellent
		Sapi	7SM08	MMSM001	81	84	84	72	93	Terbaik/ Excellent
		Kalampunian Besar	7SM11	MMSM002	84	83	81	86	93	Terbaik/ Excellent
		Selingan	7SP17	MMSP001	55	66	84	89	93	Terbaik/ Excellent
		Gulisan	7SP18	MMSP002	59	87	85	89	93	Terbaik/ Excellent
		Bakungan Kecil	7SP19	MMSP003	54	50	83	87	93	Terbaik/ Excellent
Labuan	Pulau/Island	Kuraman	7LM05	MMLM001	97	68	73	89	93	Terbaik/ Excellent
		Rusukan Besar	7LM07	MMLM002	94	66	50	91	93	Terbaik/ Excellent
		Rusukan Kecil	7LM06	MMLM003	93	66	50	90	92	Terbaik/ Excellent
		Pohon Batu	7LD01	MMLD001	97	67	67	63	92	Terbaik/ Excellent
		Water Front	7LD02	MMLD002	97	64	76	66	92	Terbaik/ Excellent
		LubukTemiang	7LD03	MMLD003	97	65	74	72	92	Terbaik/ Excellent
		Ranca-Ranca	7LD04	MMLD004	91	66	52	91	92	Terbaik/ Excellent

Nota/Note:

* (Stesen baru/New station)

** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)



Jadual 4.7 : Stesen Marin dalam Kategori Tercemar dan Peratusan Sub-Indeks Mengikut Parameter
Table 4.7 : Marine Stations in Poor Category and Sub-Index Percentages by Parameter

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 (2018)/ CATEGORY (2018)	PERATUSAN SUB-INDEKS/SUB-INDEX PERCENTAGES (%)						
					2018			OKSIGEN TERLARUT/ DISSOLVED OXYGEN	AMONIA (TIDAK TERION)/ AMMONIA (UNIONIZED)	FAECAL COLIFORM	JUMLAH PEPEJAL TERAMPAL/ TOTAL SUSPENDED SOLID	MINYAK DAN GRIS/ OIL AND GREASE	NITRAT/ NITRATE	FOSFAT/ PHOSPHATE
P.Pinang	Kuala/Estuary	Kuala Sungai Juru	5303904	MMPE002	47		Tercemar/ Poor	44	89	10	89	79	84	19
			5204935	MMPE006	37		Tercemar/ Poor	10	96	10	89	79	81	36
Selangor	Kuala/Estuary	Kuala Sungai Klang	3013909	MMBE005	37		Tercemar/ Poor	10	92	10	86	79	86	39
			2913903	MMBE006	39		Tercemar/ Poor	10	97	10	90	79	74	63
Johor	Kuala/Estuary	Kuala Sungai Segget	1437919	MMJE001	32		Tercemar/ Poor	10	90	10	94	79	43	20

Jadual 4.7 menunjukkan sebanyak 5 stesen daripada 85 stesen kuala dikategorikan sebagai stesen tercemar pada tahun 2018. Pulau Pinang dan Selangor masing-masing merekodkan 2 stesen kuala yang tercemar manakala Johor merekodkan 1 stesen kuala yang tercemar dengan julat Indeks Kualiti Air Marin (IKAM) dari 32-47. Parameter oksigen terlarut (DO), faecal coliform (FC) dan fosfat (PO₄) adalah parameter utama yang telah memberi kesan terhadap nilai IKAM bagi kelima-lima stesen kuala tersebut. Selain itu, parameter nitrat (NO₃) juga didapati meningkat bagi stesen Kuala Sungai Segget di Johor dan Kuala Sungai Langat (Lumut) di Selangor. Manakala parameter minyak dan gris (O&G) kurang memberikan kesan pada nilai IKAM di stesen dalam rangkaian pengawasan kualiti air marin disebabkan oleh nilai bacaan / keputusan analisis kimia sering dilaporkan pada limit of reporting (LoR) iaitu had pelaporan yang paling minimum bagi analisis parameter O&G di makmal. Kesimpulannya, penurunan kualiti air marin di stesen kuala didapati dipengaruhi oleh pencemar nutrien yang berpunca daripada aktiviti kumbahan atau pertanian di daratan dan juga dipengaruhi oleh corak peredaran air yang turut menyumbang pada sifat dinamik perairan ini berbanding stesen-stesen jenis pantai dan pulau.

Table 4.7 shows that 5 stations out of 85 stations were categorized as polluted stations in 2018. Penang and Selangor recorded 2 polluted stations while Johor recorded 1 polluted station with a Marine Water Quality Index (IKAM) of 32 -47. The dissolved oxygen (DO), faecal coliform (FC) and phosphate (PO₄) are the main parameters that have affected the value of the IKAM for all five power stations. In addition, nitrate (NO₃) were also found in the Kuala Sungai Segget stations in Johor and Kuala Sungai Langat (Lumut) in Selangor. Whereas oil and grease (O&G) parameters have a slight impact on the value of IKAM at stations in marine water quality monitoring networks due to the readings / results of chemical analysis are reported in the limit of reporting (LoR) which is the minimum reporting limit for O&G parameter analysis in laboratory.

In conclusion, the decline in marine water quality at kuala stations was found to be influenced by nutrients contaminated by landfill or agricultural activities inland and also influenced by the water circulation pattern which also contributes to the dynamic nature of these waters compared to coastal and island type stations.

STATUS STESEN-STESEN KUALITI AIR MARIN

Jadual 4.8 dan Jadual 4.9 menunjukkan senarai stesen Pantai dan Kuala yang mencapai kategori Terbaik bagi tahun 2018.

STATUS OF MARINE WATER QUALITY STATIONS

Table 4.8 and Table 4.9 show the list of coastal and estuaries stations that indicated the *Excellent* Category in 2018.

Jadual 4.8 : Senarai Pantai Terbaik, 2018
Table 4.8 : List of Excellent Coastal, 2018

BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Pantai Kelului
2	Terengganu	Pantai Teluk Ketapang
3	Terengganu	KIPC Utara
4	Terengganu	Pantai Rhu 10
5	Terengganu	Pantai Tanjung Bidara
6	Terengganu	Pantai Teluk Kalong
7	Johor	Pantai Desaru
8	Terengganu	Pantai Kuala Abang
9	Johor	Pantai Sri Pantai
10	Terengganu	Pantai Rantau Abang

Jadual 4.9 : Senarai Kuala Kategori Terbaik, 2018
Table 4.9 : List of Excellent Estuaries, 2018

BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Tioxide Utara (Kg. Bukit Kuang, Kijal)
2	Terengganu	Kuala Sungai Paka
3	Terengganu	Tioxide Tengah (Pupuk Semangat, Kijal)
4	Pahang	Kuala Nenas*
5	Terengganu	Kuala Sungai Kemaman / Chukai
6	Terengganu	Tioxide Selatan (KSB, T. Kalong)
7	Terengganu	Kuala Sungai Setiu
8	Terengganu	Kuala Sungai Ibai
9	Pahang	Kuala Rompin Kecil
10	Terengganu	Kuala Sungai Kerteh

Stesen Pulau yang mencapai Kategori Terbaik bagi tahun 2018 adalah seperti di Jadual **4.10**.

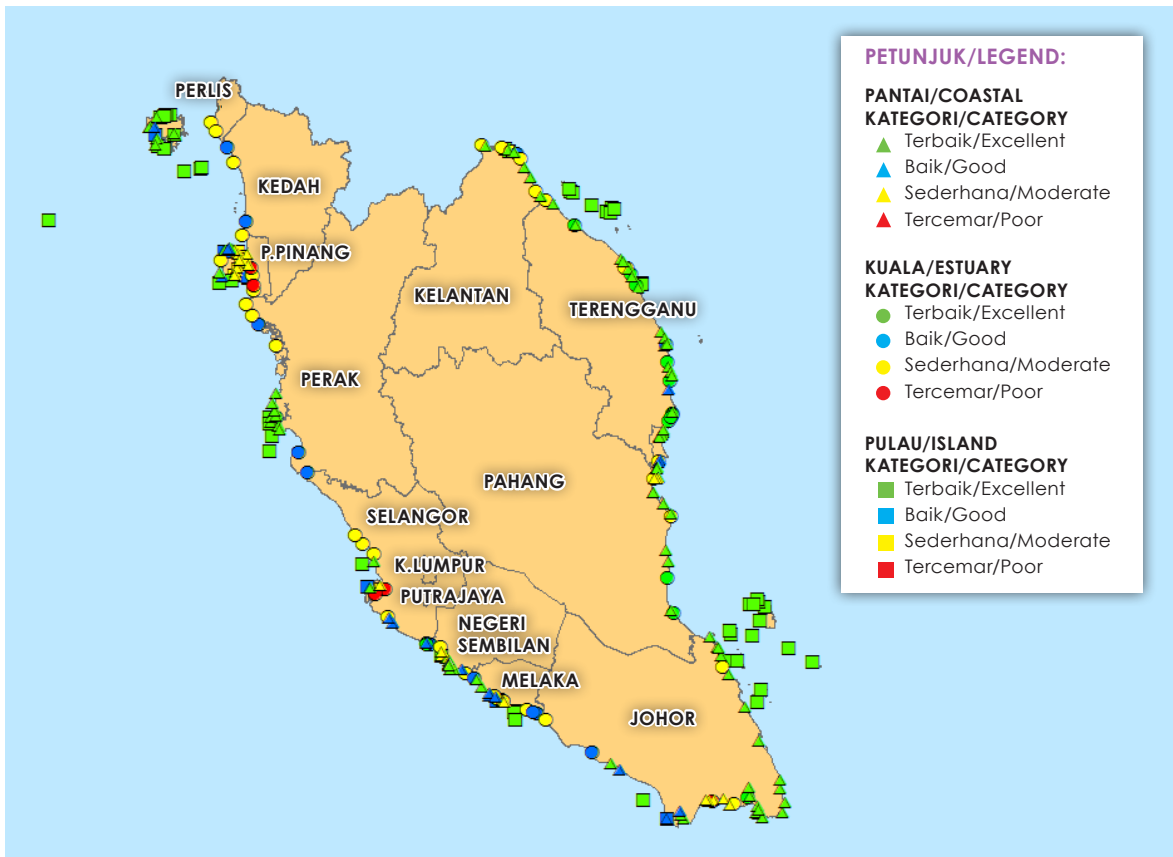
The islands that achieved the Excellent Category for Marine Water Quality Index in 2018 are listed in **Table 4.10**.

Jadual 4.10 : Senarai Pulau Terbaik, 2018
Table 4.10 : List of Excellent Islands, 2018

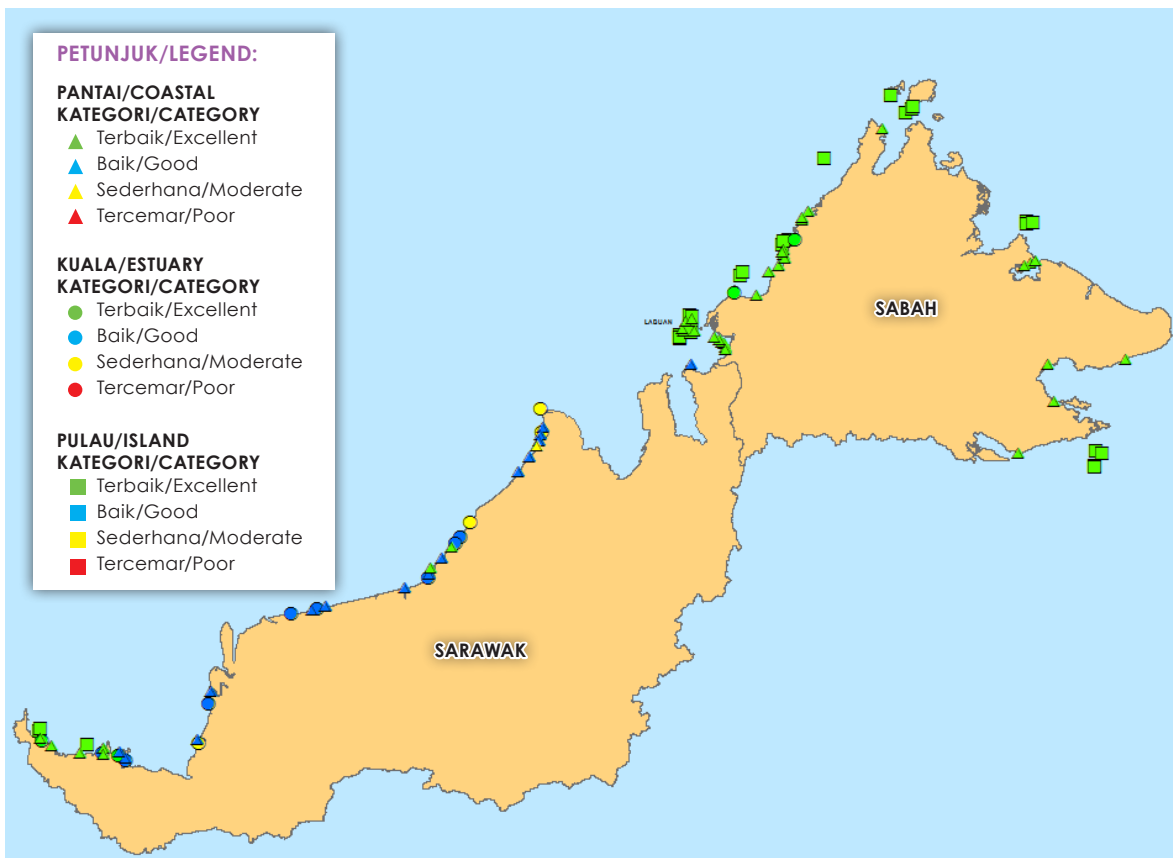
BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Gemia
2	Terengganu	Lima
3	Terengganu	Pinang
4	Terengganu	Ekor Tebu
5	Pahang	Tioman (Kg. Nipah)
6	Pahang	Tioman (Teluk Salang)
7	Pahang	Sembilang
8	Terengganu	Lang Tengah
9	Pahang	Labas
10	Pahang	Cebeh



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



PENGAWASAN KUALITI AIR MARIN BERTERUSAN

Rangkaian Pengawasan Kualiti Air Marin Berterusan (CMWQM) ditubuhkan di bawah Program Pengawasan Kualiti Alam Sekitar (EQMP) beroperasi untuk menyediakan data kualiti air marin secara berterusan bagi mengesan sebarang pencemaran marin, pelepasan daratan menggunakan partikal organik terlarut dan *chlorophyll-a* sebagai petunjuk. Kemasinan, oksigen terlarut, suhu dan pH adalah proksi yang menunjukkan tahap kebersihan dan pengaruh air masin di stesen. CMWQM memantau dua (2) kuala di Santubong dan Tanjung Piai, lima (5) stesen pada Kelas 3 diletakkan di jeti, satu (1) stesen pada Kelas 2 pada 2018. Oksigen terlarut yang dipantau melalui CMWQM pada tahun 2018 antara julat 0.34% hingga 150.89%, manakala kemasinan, suhu, kekeruhan, konduktiviti, pH, jumlah pepejal terampai, *chlorophyll-a*, fDOM, *polycyclic aromatic hydrocarbons* dan *phycoerythrin* kepekatan masing-masing antara julat 16.4 ppt to 34.3 ppt, 25.8 °C to 34.5 °C, 0 NTU – 2848 NTU, 29.6 mS/cm – 58.9 mS/cm, 6.75 – 9.37, 0 – 1278 mg/L, 0 – 108 µg/L, 0 – 230 µg/L, 0 – 702 µg/L and 0 – 189.4 µg/L.

Kepekatan bagi kebanyakan parameter adalah pada tahap semulajadi (ambien) dengan mengambilkira potensi gangguan sedia ada di stesen yang ditetapkan. Antara parameter yang dipantau di bawah rangkaian CMWQM, tiga (3) parameter yang disenaraikan di bawah Standard dan Kriteria Kualiti Air Marin Malaysia iaitu oksigen terlarut, jumlah pepejal terampai dan *polycyclic aromatic hydrocarbons*. Pada tahun 2018, semua stesen CMWQM telah memenuhi piawai pematuhan 99%. Jumlah pepejal terampai dan *polycyclic aromatic hydrocarbons* meningkat secara

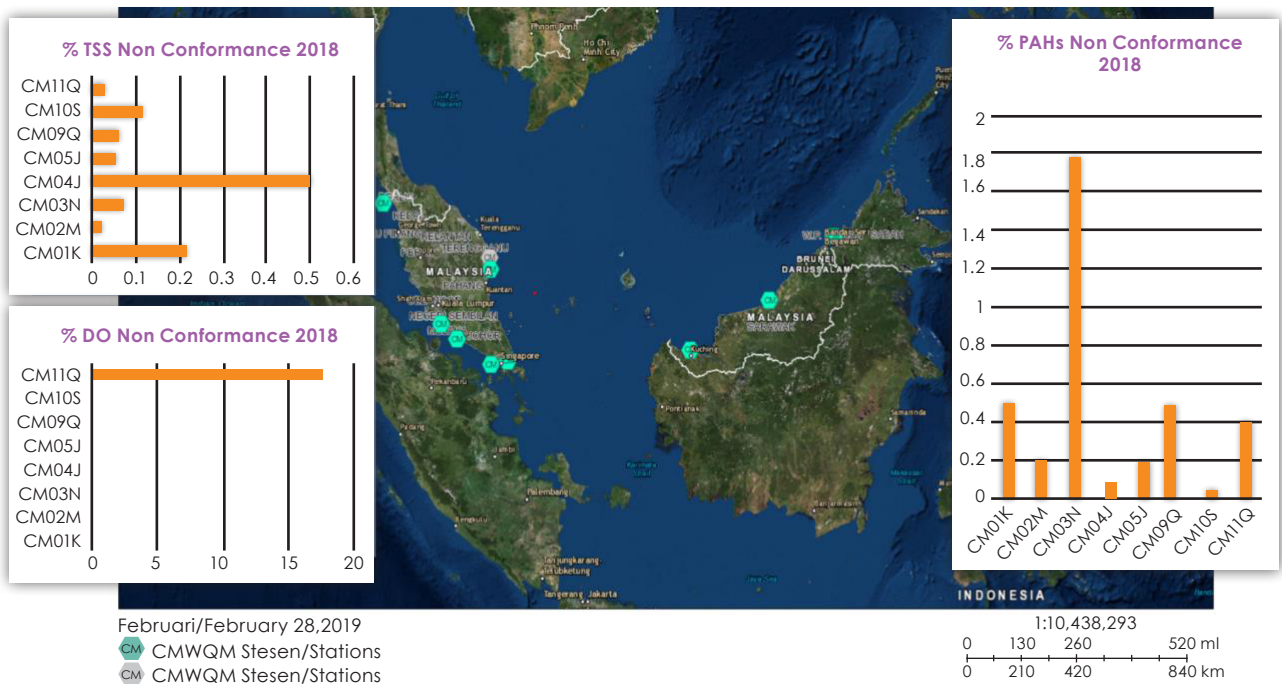
CONTINUOUS MARINE WATER QUALITY MONITORING

The Continuous Marine Water Quality Monitoring (CMWQM) network has been established under Environmental Quality Monitoring Programme (EQMP) to provide continuous marine water quality data to detect marine pollution and potential land-based discharges using dissolved organic matter and chlorophyll-a as indicator. Salinity, dissolved oxygen, temperature and pH are parameters that reflect the influences of freshwater and seawater at the station. CMWQM monitored two (2) river estuaries at Santubong and Tanjung Piai and five (5) Class 3 stations mainly at Jetties and One (1) Class 2 Station in 2018. The dissolved oxygen monitored under the CMWQM network in 2018 was ranging from 0.34% to 150.89% while salinity, temperature, turbidity, conductivity, pH, total suspended solid, chlorophyll-a, fDOM, polycyclic aromatic hydrocarbons and phycoerythrin concentration was ranging from 16.4 ppt to 34.3 ppt, 25.8 °C to 34.5 °C, 0 NTU – 2848 NTU, 29.6 mS/cm – 58.9 mS/cm, 6.75 – 9.37, 0 – 1278 mg/L, 0 – 108 µg/L, 0 – 230 µg/L, 0 – 702 µg/L and 0 – 189.4 µg/L, respectively.

Concentration for most of the parameters recorded at the stations were typical of the nature taking into account of the potential disturbance within the designated area. Among the parameters monitored under the CMWQM network, three (3) are listed under the Malaysia Marine Water Quality Standards and Criteria; i.e. dissolved oxygen, total suspended solids and polycyclic aromatic hydrocarbons. In 2018, all the parameters monitored the CMWQM stations met the stipulated standards with more than 99% compliance. Total suspended solid and polycyclic aromatic hydrocarbons spiked occasionally; most of these

berkala, kebanyakan yang meningkat disebabkan aktiviti kapal dan maritim yang berdekatan. Keadaan jangka pendek dan jarang berlaku ini tidak menyebabkan impak yang teruk kepada ekosistem marin. CM01K di Langkawi, CM05J di Tanjung Pengelih, CM09Q di Pelabuhan Bintulu, CM11Q di Santubong dan ke tahap yang lebih rendah, CM04J di Tanjung Piai menerima impak dari pelepasan di pantai manakala CM02M dan CM03N kurang dipengaruhi oleh pelepasan dari daratan. Pada tahun 2018 juga, terdapat tiga (3) amaran pencemaran yang dikesan di stesen CM02M dan CM03N. CM03N mengeluarkan amaran dua (2) kali disebabkan oleh PAHs pada tahun 2018. Status kualiti air marin yang dipantau di bawah CMWQM pada tahun 2018 dilihat sebagai baik.

spiked were due to the nearby vessel and maritime activities. These short and sparse exceedances were not causing acute impacts on the marine ecosystem. CM01K at Langkawi, CM05J at Tanjung Pengelih, CM09Q at Bintulu Port, CM11Q at Santubong river estuary and to a lesser extent, CM04J at Tanjung Piai were receiving the impacts from the coastal discharges while CM02M and CM03N were less impacted by land base discharge. In 2018, there were three (3) alerts triggered by PAHs in CM02M and CM03N. There were two (2) alert at CM03N due to PAHs in 2018. The status of the marine water quality monitored under the CMWQM network in 2018 is regarded as good.



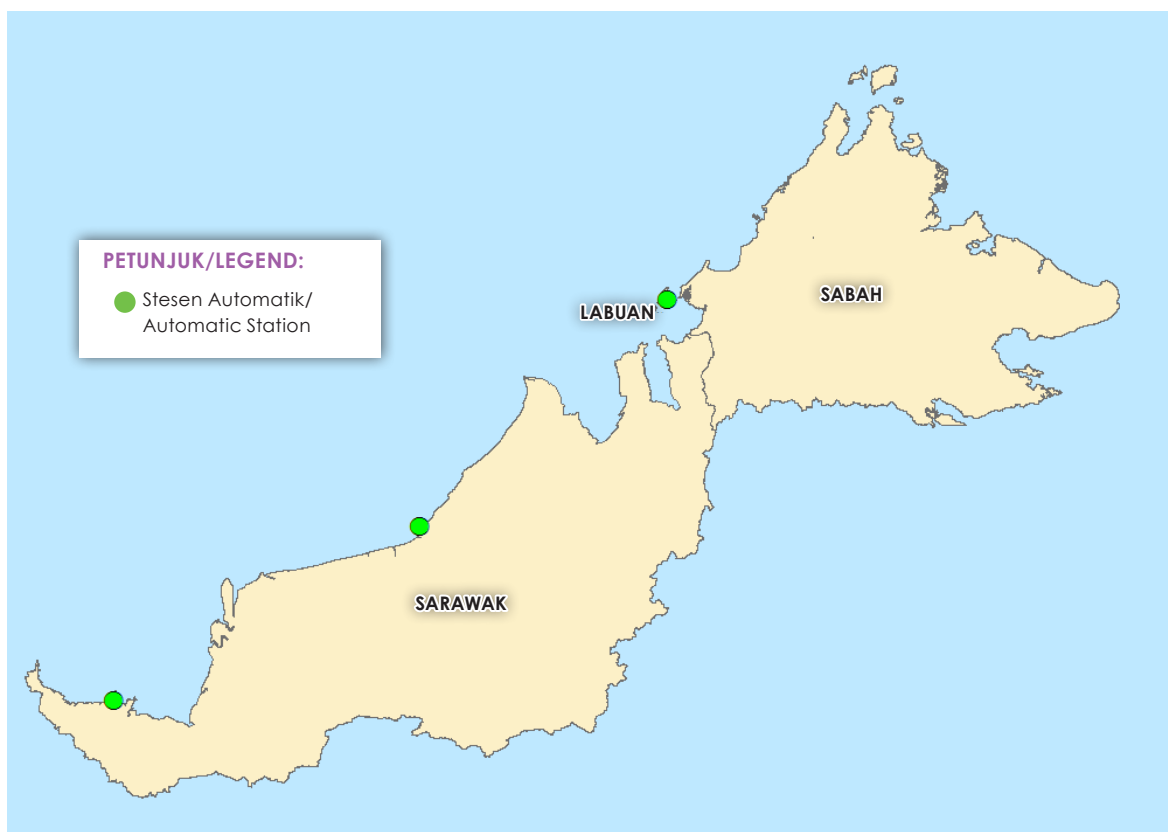
Rajah 4.4 : Peratusan Ketidapatuhan Parameter Berbanding dengan Standard Kualiti Air Marin Malaysia di setiap Stesen.

Figure 4.4 : Percentage of Non-Conformance Parameters Compared with Malaysia Marine Water Quality Standard by Station.

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



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



Inventori Punca Pencemaran

*Pollution Sources
Inventory*



BAB 5

Chapter



PENGIRAAN BEBAN PENCEMARAN

Pendahuluan

Beban pencemaran air ditakrifkan sebagai kepekatan bahan cemar yang dibawa oleh jasad air pada sesuatu masa yang diberikan. Beban pencemaran ini dipengaruhi oleh faktor kadar alir jasad air tersebut dan juga kepekatan bahan cemar yang dibawa.

Beban pencemaran air adalah kriteria 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.

BEBAN PENCEMARAN AIR

Pada tahun 2018, 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.

POLLUTION LOAD CALCULATION

Introduction

Water pollution load is define as concentration of pollutants carried by the water body at a given time. Pollution load is influenced by the water body flowrate and the pollutants' concentration carried by the water body.

The water pollution load is one of important criterion in planning and strategizing the mode of action for pollution prevention and control. The implementation of the pollution load control will enhance the river water quality in order to maintain the beneficial use of river as a source of watersupply, recreation, aquaculture, agriculture as well as to maintain the ecological system demand.

WATER POLLUTION LOAD

In the year 2018, the estimation of pollution load is focused on five (5) type of water pollution sources such as manufacturing industries, agricultural-based industries, sewage treatment plant, piggery and wet market.

The source of data for manufacturing industries and agriculture-based industries were provided by states DOE while sewage treatment plant data were obtained from Indah Water Consortium Sdn. Bhd. All data regarding piggery were provided by Department of Veterinary Services and data on wet market were acquired from Local Authority.

Pengiraan beban pencemaran ditumpukan kepada tiga (3) parameter utama yang memberikan kesan ketara kepada kualiti air sungai iaitu Keperluan Oksigen Biokimia (BOD), Pepejal Terampai (SS) dan Ammoniakal Nitrogen (NH₃N).

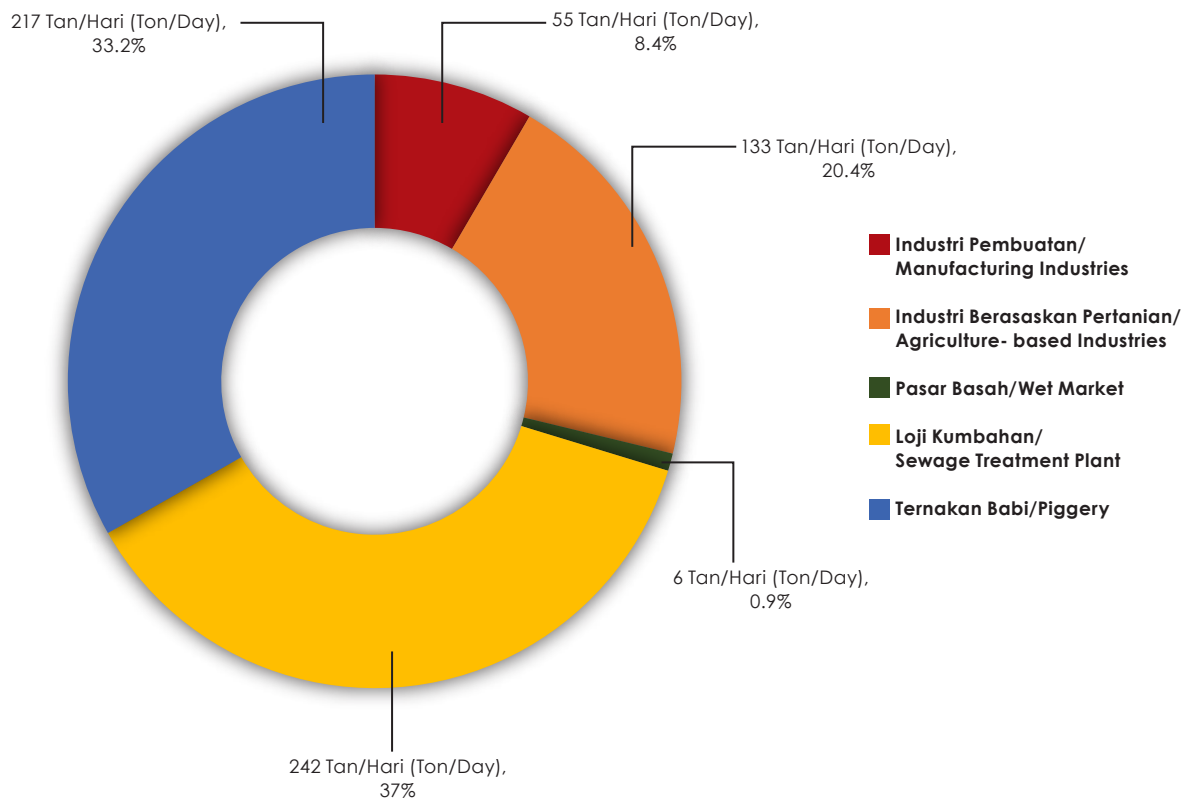
Assessment on pollution load is mainly focused on three (3) main parameters that show high impact on the water body namely Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Ammoniacal Nitrogen (NH₃N).

Keperluan Oksigen Biokimia

Biochemical Oxygen Demand

Pada tahun 2018, anggaran jumlah beban pencemaran BOD terhasil adalah sebanyak 653 tan/hari. Pelepasan daripada loji kumbahan adalah penyumbang beban pencemaran BOD tertinggi iaitu sebanyak 242 tan/hari (37%), diikuti dengan aktiviti ternakan babi menyumbang sebanyak 217 tan/hari (33.2%), industri pembuatan 55 tan/hari (8.4%), industri berasaskan pertanian 133 tan/hari (20.4%) dan pasar basah 6 tan/hari (0.9%) (**Rajah 5.1**).

In year 2018, a total estimation of 653 tonnes/day pollution load for BOD were generated. Sewage treatment plants remained as the largest BOD-load contributor with a total load of 242 tonnes/day (37%), followed by piggery activities which contributed 217 tonnes/day (33.2%), manufacturing industries 55 tonnes/day (8.4%), agriculture-based industries 133 tonnes/day (20.4%) and wet markets 6 tonnes/day (0.9%) **Figure 5.1**.



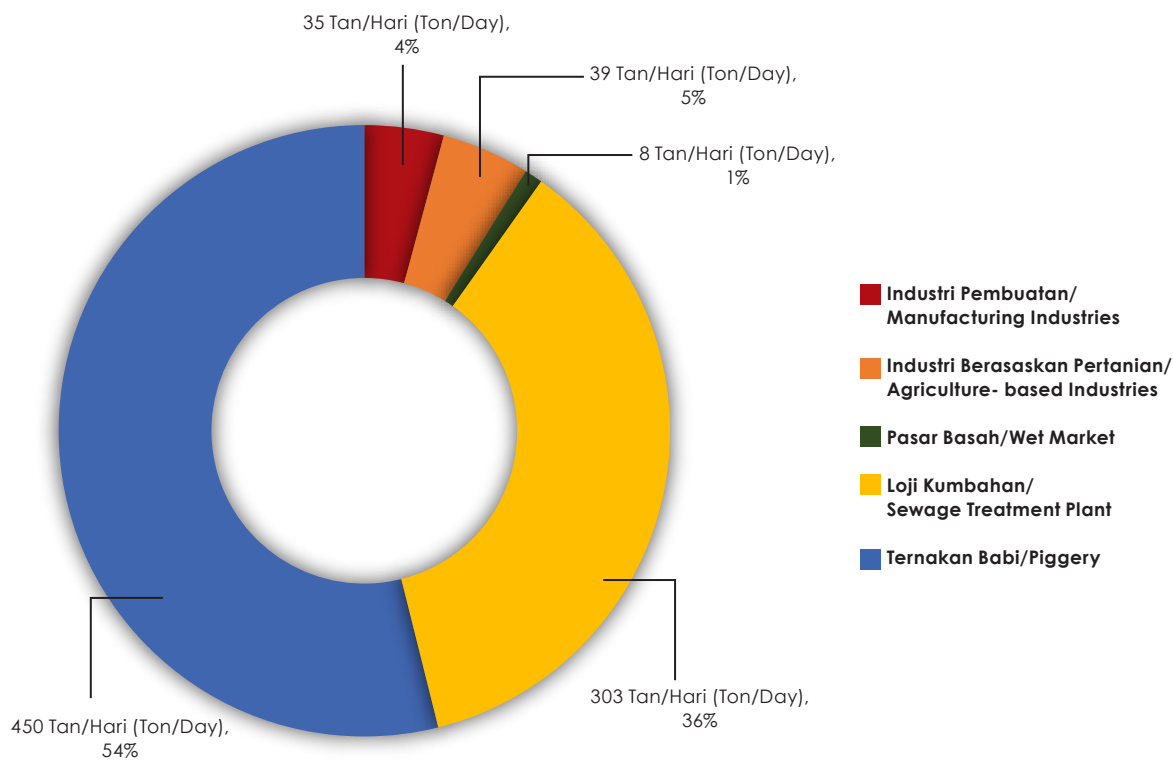
Rajah 5.1: Anggaran Beban BOD Mengikut Punca Pencemaran Air, 2018
Figure 5.1: Estimation of BOD Load Based on Sources of Water Pollution, 2018

Beban Pepejal Terampai

Pada tahun 2018, anggaran penghasilan beban pencemaran bagi SS adalah sebanyak 835 tan/hari, di mana aktiviti ternakan babi kekal sebagai penghasil beban SS utama sebanyak 450 tan/hari (54%), diikuti loji kumbahan sebanyak 303 tan/hari (36%), industri berasaskan pertanian 39 tan/hari (5%), industri pembuatan 35 tan/hari (4%), dan pasar basah 8 tan/hari (1%) (**Rajah 5.2**).

Suspended Solids Load

In year 2018, the overall estimation of SS loads gave a total figure of 835 tonnes/day where the piggery activity remained as the largest contributor with a total load of 450 tonnes/day (54%), followed by sewage treatment plant 303 tonnes/day (36%), agriculture-based industries 39 tonnes/day (5%), manufacturing industries 35 tonnes/day (4%), and wet market 8 tonnes/day (1%) (**Figure 5.2**).



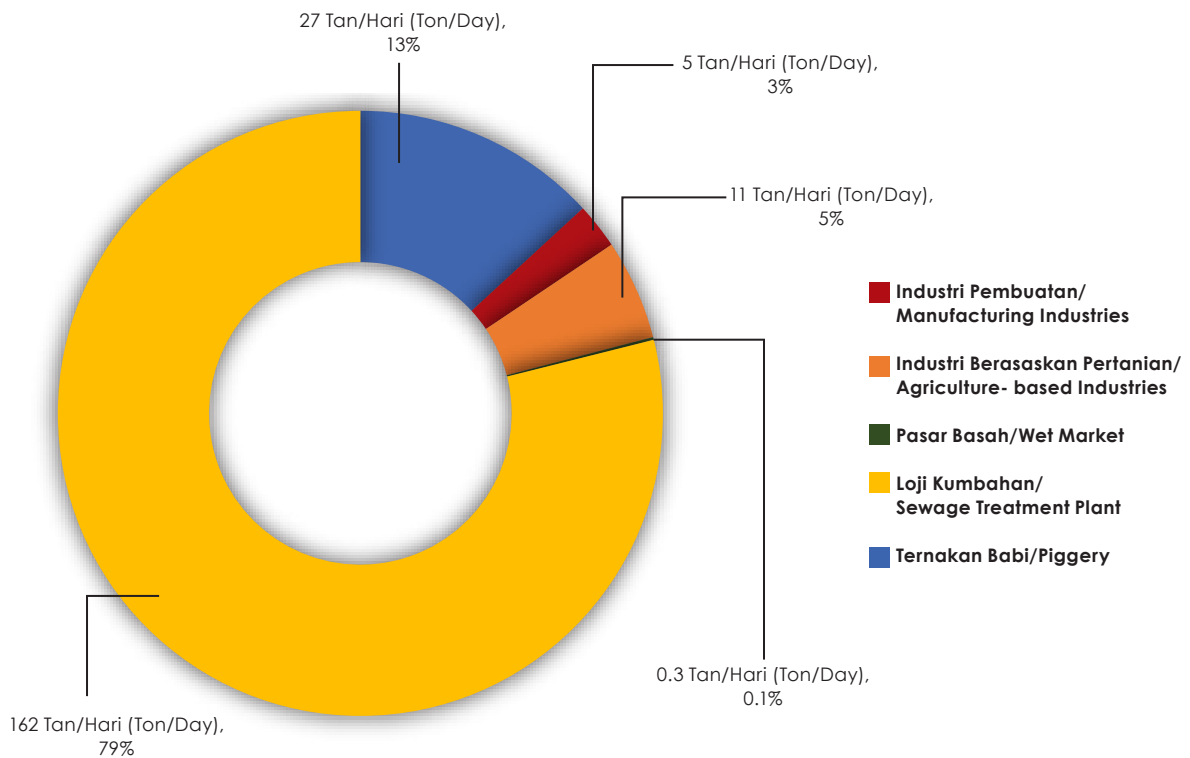
Rajah 5.2: Anggaran Beban SS Mengikut Punca Pencemaran Air, 2018
 Figure 5.2: Estimation of SS Load Based on Sources of Water Pollution, 2018

Beban Ammoniakal Nitrogen

Pada tahun 2018, anggaran beban pencemar NH₃N adalah sebanyak 205.3 tan/hari di mana pelepasan loji kumbahan adalah penyumbang terbesar beban NH₃N dengan jumlah sebanyak 162 tan/hari (79%), diikuti aktiviti ternakan babi iaitu 27 tan/hari (13%), industri berasaskan pertanian 11 tan/hari (5%), industri pembuatan 5 tan/hari (3%) dan pasar basah 0.3 tan/hari (0.1%) (Rajah 5.3).

Ammoniacal Nitrogen Load

In year 2018, the NH₃N load is estimated to be a total of 205.3 tonnes/day in which sewage treatment plant remained as the largest contributor with a total load of 162 tonnes/day (79%), followed by piggery activity 27 tonnes/day (13%), agriculture-based industries 11 tonnes/day (5%), manufacturing industries 5 tonnes/day (3%) and wet market 0.3 tonnes/day (0.1%) (Figure 5.3).



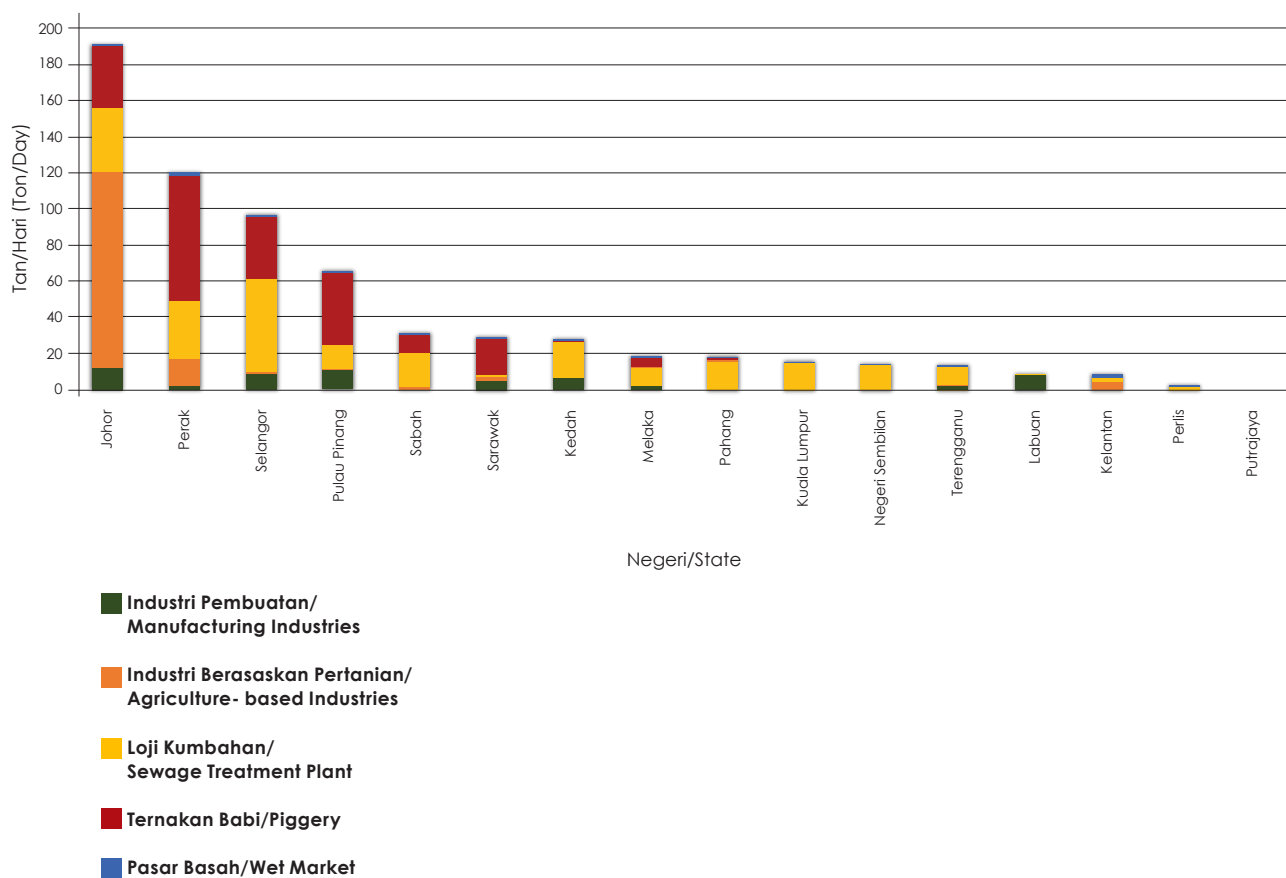
Rajah 5.3: Malaysia; Anggaran Beban NH₃N Mengikut Punca Pencemaran Air, 2018
Figure 5.3 : Malaysia; Assessment of NH₃N Load Based on Sources of Water Pollution, 2018

Beban Pencemaran Keperluan Oksigen Biokimia (BOD) Mengikut Negeri

Anggaran penghasilan beban BOD di Negeri Johor adalah tertinggi iaitu sebanyak 190 tan/hari, diikuti negeri Perak 119 tan/hari, Selangor 96 tan/hari, Pulau Pinang 65 tan/hari, Sabah 31 tan/hari dan Sarawak sebanyak 29 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 (**Rajah 5.4**).

Biochemical Oxygen Demand Load (BOD) By States

The estimation of BOD load generated in the state of Johor was recorded to be the highest with a value of 190 tonnes/day, followed by the state of Perak 119 tonnes/day, Selangor 96 tonnes/day, Penang 65 tonnes/day, Sabah 31 tonnes/day and Sarawak generated 29 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 States (**Figure 5.4**).



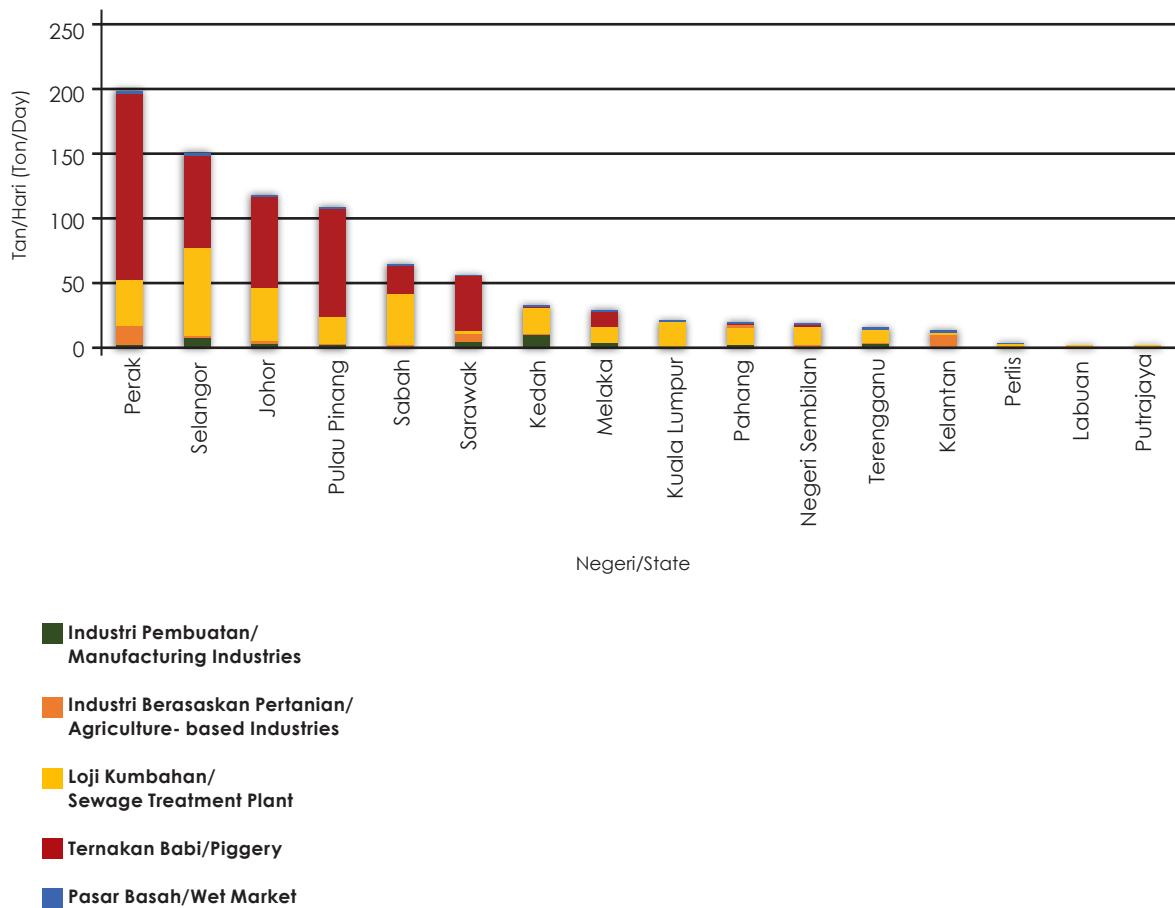
Rajah 5.4 : Taburan Anggaran Beban BOD dan Punca Pencemaran Air Mengikut Negeri, 2018
 Figure 5.4 : Dispersions of BOD Load Assessment and Sources of Water Pollution by States, 2018

Beban Pencemaran Pepejal Terampai Mengikut Negeri

Anggaran penghasilan beban SS di Negeri Perak adalah tertinggi dengan jumlah sebanyak 197 tan/hari, diikuti Selangor 149 tan/hari, Johor 117 tan/hari, Pulau Pinang 108 tan/hari dan Sabah 64 tan/hari. Lain-lain negeri didapati menghasilkan kurang daripada 55 tan/hari (**Rajah 5.5**).

Suspended Solids Load By State

The estimation of SS load was recorded highest in the State of Perak with 197 tonnes/day, followed by the State of Selangor 149 tonnes/day, State of Johor 117 tonnes/day, State of Penang 108 tonnes/day and Sabah state 64 tonnes/day. Other States generated less than 55 tonnes/day (**Figure 5.5**).



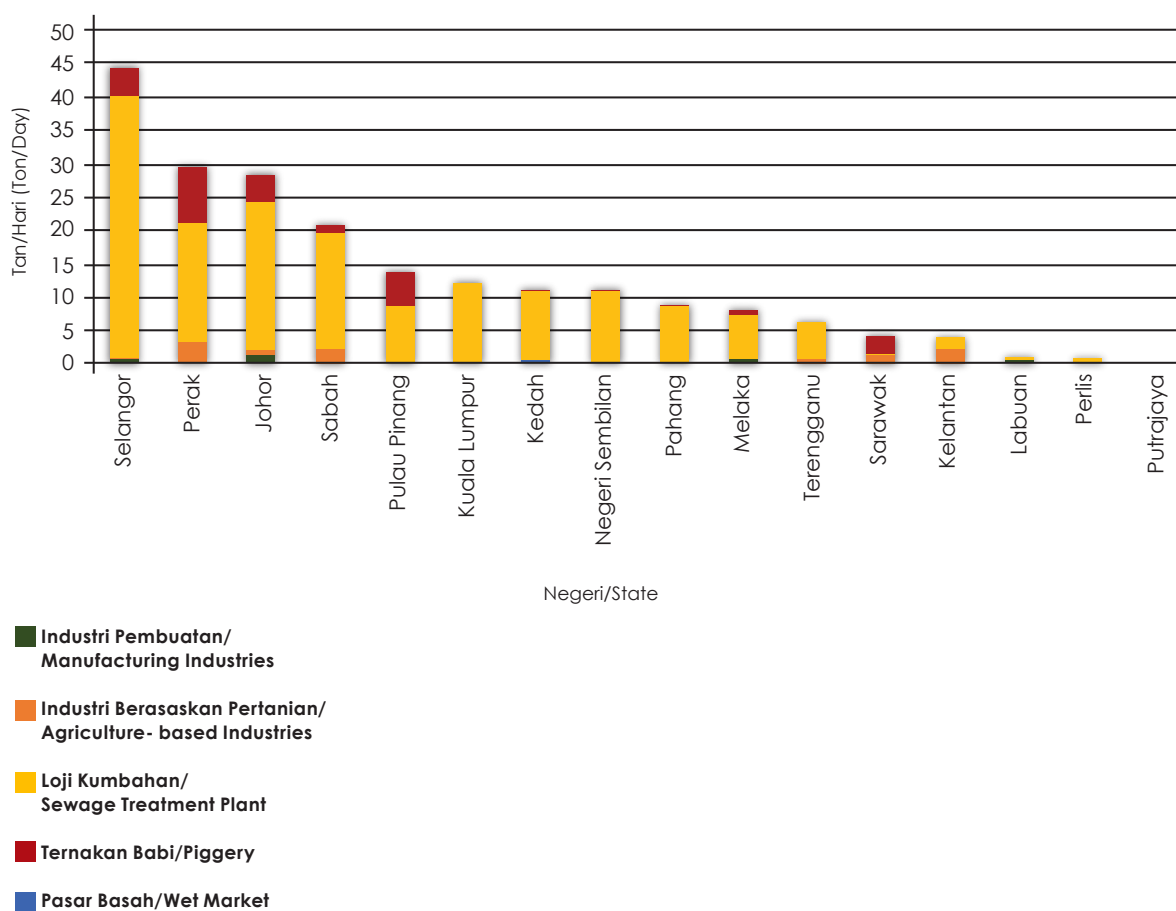
Rajah 5.5 : Taburan Anggaran Beban SS dan Punca Pencemaran Air Mengikut Negeri, 2018
 Figure 5.5 : Dispersions of SS Load Assessment and Sources of Water Pollution by States, 2018

Beban Pencemaran Ammoniakal Nitrogen Mengikut Negeri

Anggaran beban NH_3N di negeri Selangor mencatatkan nilai tertinggi berbanding dengan negeri-negeri lain, iaitu sebanyak 44 tan/hari. Diikuti negeri Perak 29 tan/hari, Johor 28 tan/hari. Lain lain negeri didapati menyumbang kurang daripada 20 tan/hari (Rajah 5.6).

Ammoniacal Nitrogen Load By State

The state of Selangor recorded the highest value of NH_3N load compared to other states with a value of 44 ton/day. This is followed by State of Perak 29 tonnes/day, Johor 28 tonnes/day. Other states generated less than 20 tonnes/day (Figure 5.6).



Rajah 5.6 : Taburan Anggaran Beban NH_3N dan Punca Pencemaran Air Mengikut Negeri, 2018

Figure 5.6 : Dispersions of NH_3N Load Assessment and Sources of Water Pollution by States, 2018

PUNCA-PUNCA PENCEMARAN UDARA

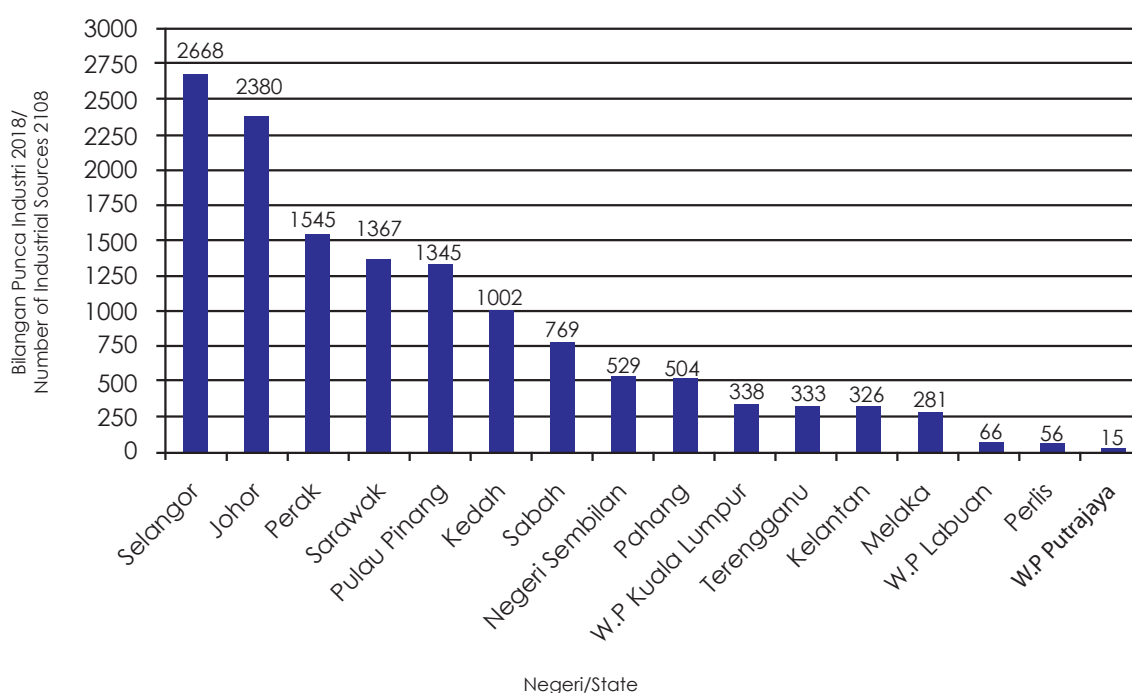
Peningkatan punca industri dan bilangan kenderaan bermotor boleh menyebabkan pencemaran udara yang teruk jika pelepasan pencemar termasuk pelepasan asap daripada kedua-dua aktiviti ini tidak dikawal dengan berkesan.

Sehingga bulan Disember 2018, jumlah punca industri yang melepaskan bahan pencemar ke udara adalah sebanyak 13,524. Bilangan punca pencemar yang tertinggi adalah di Selangor (2668:19.7%) diikuti Johor (2380:17.6%) dan Perak (1545:11.4%) (**Rajah 5.7**).

SOURCES OF AIR POLLUTION

The increasing trend of industrial sources and numbers of motor vehicles can cause severe air pollution if the emission including smoke emission from both sources were not effectively controlled.

As of December 2018, a total of 13,524 industrial sources were emitting air pollutants. The highest pollution sources were in Selangor (2,668:19.7%) followed by Johor (2,380:17.6%) and Perak (1,545:11.4%) (**Figure 5.7**).



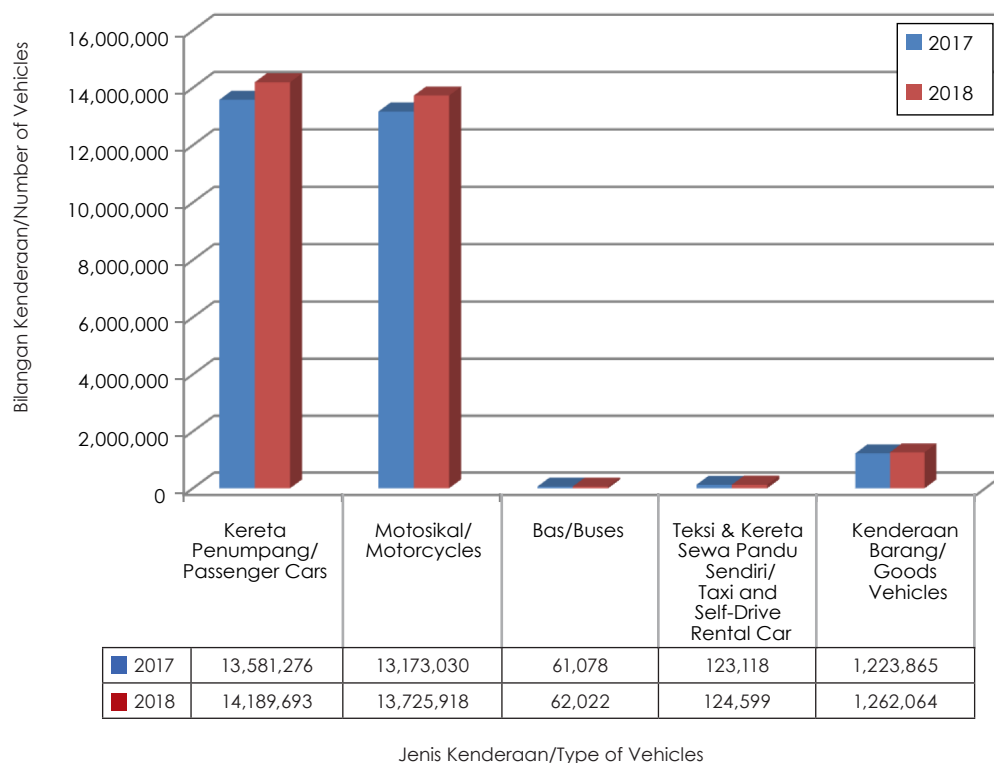
(Sumber: Sistem Inventori Pencemaran Alam Sekitar (SIMPAS), Jabatan Alam Sekitar)
(Sources: Environmental Pollution Inventory System (SIMPAS), Department of Environment)

Rajah 5.7 : Punca Pencemaran Udara Tertakluk Peraturan Udara Bersih Mengikut Negeri untuk Tahun 2018

Figure 5.7 : Industrial Air Pollution Subjected to Clean Air Regulations for Year 2018

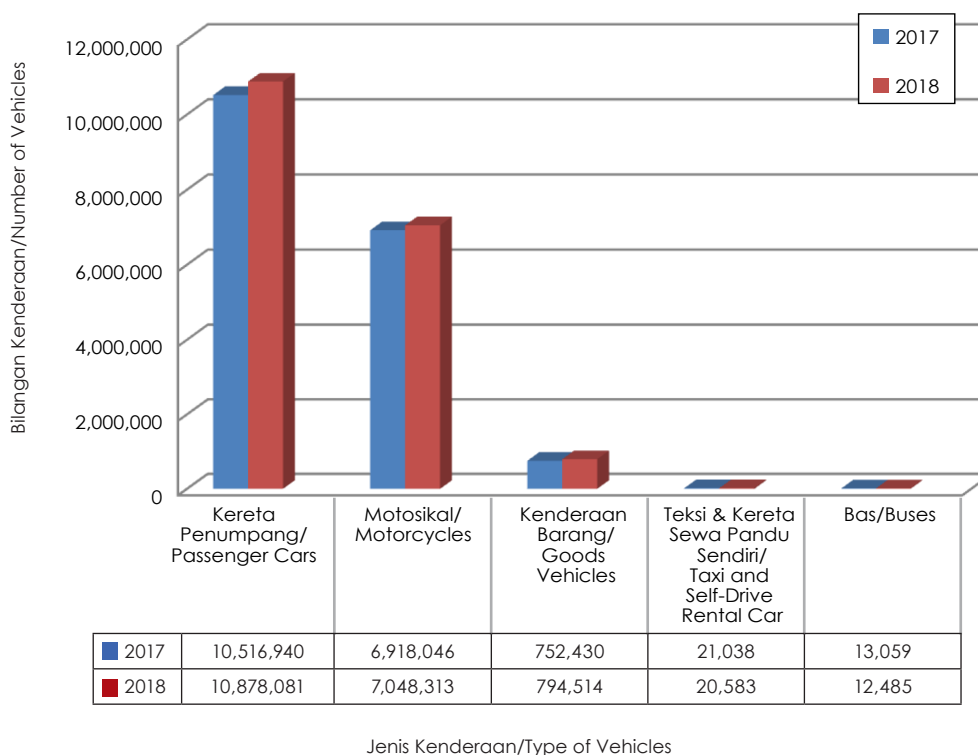
Seperti tahun-tahun yang lepas, pelepasan gas pencemar dari kenderaan bermotor merupakan punca utama yang menyumbang kepada pencemaran udara terutamanya di kawasan bandar. Pada tahun 2018, terdapat peningkatan bagi jumlah keseluruhan kenderaan bermotor yang didaftarkan. Bilangan pendaftaran yang direkodkan bagi teksi dan kenderaan sewa pandu sendiri meningkat sebanyak 1.19%, diikuti dengan peningkatan kenderaan penumpang 4.29%, motosikal 4.03%, kenderaan barangan 3.03%, dan bas 1.52% berbanding pada tahun 2017. Pendaftaran kenderaan bermotor yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2017 dan 2018 adalah seperti yang ditunjukkan dalam **Rajah 5.8**. Bilangan bagi kenderaan yang sedang digunakan dan yang masih aktif juga meningkat jumlahnya secara keseluruhan (2.84%). Bilangan bagi kenderaan penumpang, meningkat sebanyak 3.32%, kenderaan barang meningkat sebanyak 5.30% dan motosikal meningkat sebanyak 1.85%, manakala kategori lain menurun. Bilangan teksi menurun sebanyak 2.21% dan bas 4.60% jika dibandingkan dengan tahun 2017 (**Rajah 5.9**).

Similar to previous years, emission from motor vehicles remained as the major source of air pollution especially in urban areas. In 2018, there was an overall increase in the number of motor vehicles registered. The number of registered taxi and self-drive rental car increased by 1.19%, followed by increase of passenger cars 4.29%, motorcycles 4.03%, goods vehicles 3.03%, and buses 1.52% compared to 2017. The number of registered vehicles in Malaysia as reported by the Road Transport Department for 2017 and 2018 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 (2.84%). The number of passenger vehicles has increased by 3.32%, goods vehicles increased by 5.30% and motorcycles increased by 1.85%, while other categories showed decreased number of vehicles active on the road. Taxis and self-drive rental car decreased by 2.21% and buses by 4.60% compared to 2017. (**Figure 5.9**).



(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2018)
(Source: Road Transport Department, Malaysia, 2018)

Rajah 5.8 : Bilangan Kenderaan Berdaftar Tahun 2017–2018
Figure 5.8 : Number of Registered Vehicles in 2017–2018



(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2018)
(Source: Road Transport Department, Malaysia, 2018)

Rajah 5.9 : Bilangan Kenderaan Aktif Tahun 2017-2018
Figure 5.9 : Number of in Use Vehicles in 2017-2018

BEBAN PENCEMARAN PENCEMAR UDARA

Beban Pencemaran Secara Menyeluruh

Dianggarkan pada tahun 2018, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 2,210,634 metrik tan; 889,890 metrik tan bagi nitrogen dioksida (NO₂); 257,457 metrik tan bagi sulfur dioksida (SO₂) dan 26,789 metrik tan bagi jirim zarah (PM). Perbandingan keseluruhan beban pencemaran bagi tahun 2017 dan 2018 seperti ditunjukkan dalam **Rajah 5.10**.

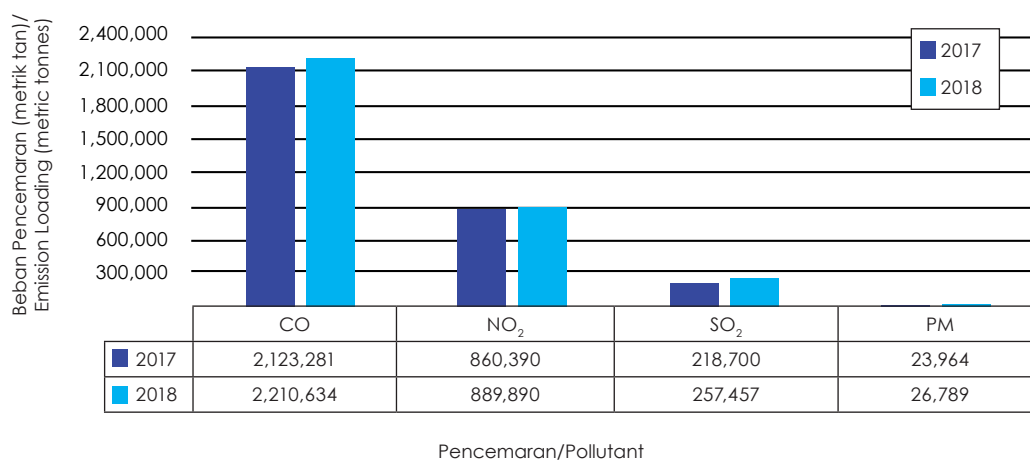
Beban pencemaran bagi CO meningkat pada tahun 2018 berbanding dengan 2017 disebabkan peningkatan penggunaan bahan api minyak dan arang batu sebagai bahan api dalam industri dan loji janakuasa (Sumber: *National Energy Balance, 2016*). Peningkatan adalah sebanyak 4.1% bagi beban pencemar CO, 3.4% bagi beban pencemar NO₂, peningkatan sebanyak 17.7% bagi pencemar SO₂ dan pencemar PM juga menunjukkan peningkatan sebanyak 11.8% berbanding dengan tahun 2017.

AIR POLLUTANT EMISSION LOAD

Overall Emission Load

It was estimated that in 2018 the overall accumulation of air pollutant emission load was 2,210,634 metric tonnes of carbon monoxide (CO); 889,890 metric tonnes of nitrogen oxides (NO₂); 257,457 metric tonnes of sulphur dioxide (SO₂) and 26,789 metric tonnes of particulate matter (PM). A comparison of the combined air pollutants emission load in 2017 and 2018 were shown in **Figure 5.10**.

Emission load for CO had increased in 2018 compared to 2017 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 2016*). The increment in CO emission load was 4.1%, 3.4% for NO₂ emission load, increment of 17.7% for SO₂ pollutant and PM, the increment was 11.8% compared to year 2017.



(Sumber: Dari National Energy Balance 2016)
(Sources: From National Energy Balance 2016)

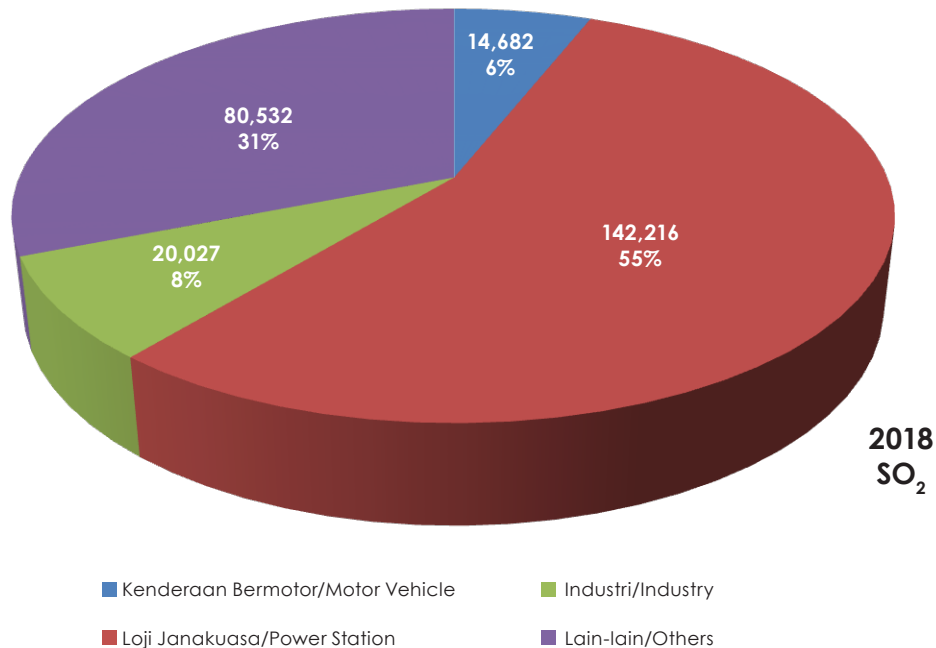
Rajah 5.10 : Beban Pencemaran Bahan Pencemar Udara dari Semua Punca, 2017-2018
Figure 5.10 : Air Pollutant Emission Load from All Sources, 2017-2018

Punca Beban Pencemaran

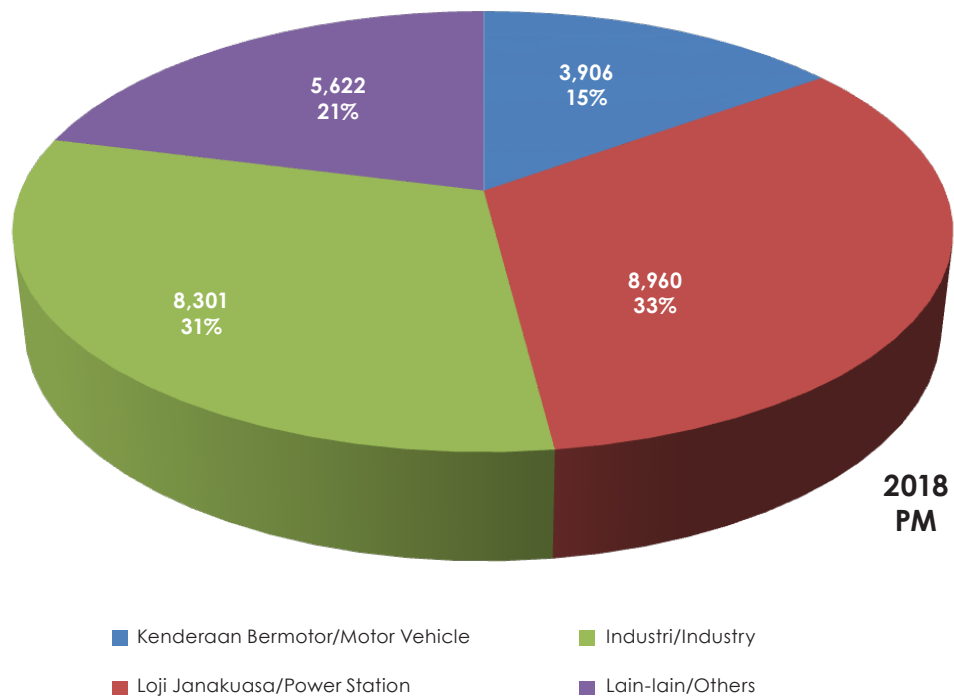
Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO₂ (55%), diikuti dengan lain-lain kategori (31%), industri (8%) dan kenderaan bermotor (6%) (**Rajah 5.11**). Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada loji janakuasa (33%), industri (31%), diikuti kenderaan bermotor (15%) dan lain-lain kategori (21%) (**Rajah 5.12**). Penyumbang terbesar bagi NO₂ adalah daripada loji janakuasa (66%) diikuti kenderaan bermotor (25%), industri (7%) dan lain-lain kategori (2%) (**Rajah 5.13**). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95.6%) (**Rajah 5.14**). Punca-punca bagi kategori 'Lain-lain' yang dinyatakan di dalam rajah-rajah adalah merupakan pelepasan bahan pencemar udara dari kawasan perumahan, komersial dan penggunaan bukan tenaga.

Emission Load by Sources

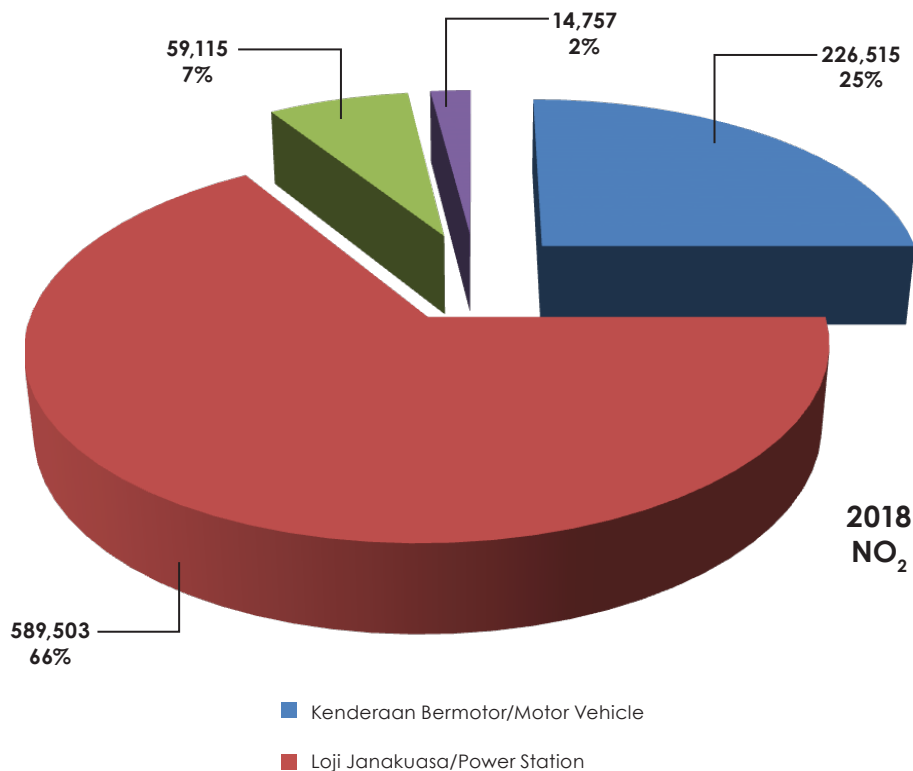
Power plants contributed the highest SO₂ emission load (55%), followed by other categories (31%), industries (8%) and motor vehicles (6%) (**Figure 5.11**). As for the PM, the highest contributors were power plants (33%) followed by industries (31%), motor vehicles (15%) and others (21%) (**Figure 5.12**). The highest contributors of NO₂ were power plants (66%) followed by motor vehicles (25%), industries (7%), and others (2%) (**Figure 5.13**). However, motor vehicles remained the highest contributor of CO (95.6%) (**Figure 5.14**). 'Others' in the figures represent air pollutant sources from residential, commercial dan non-energy use.



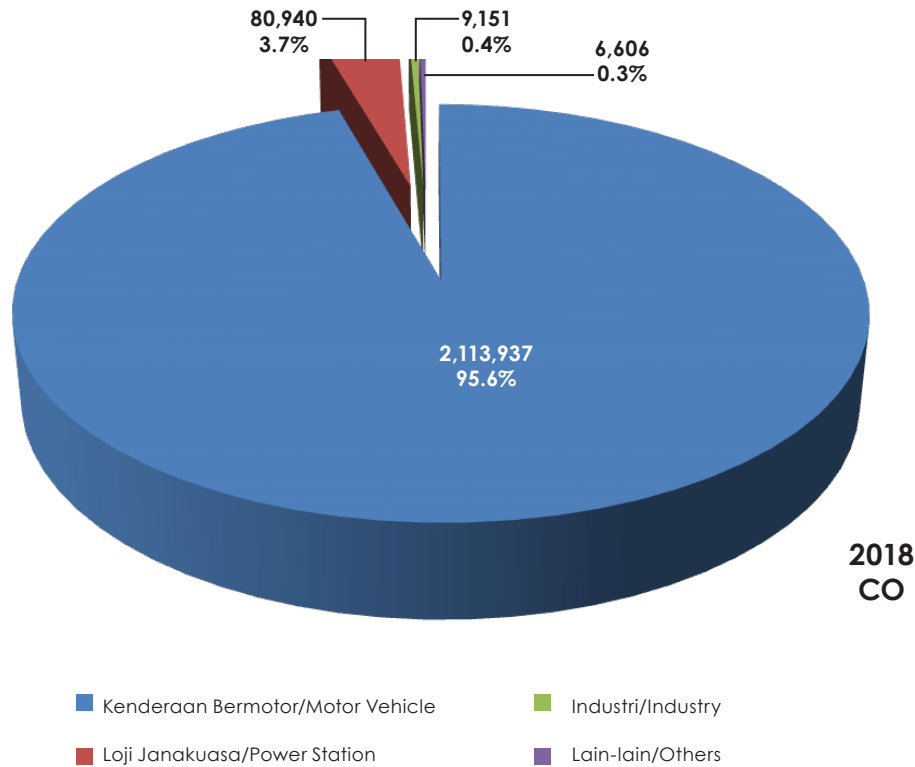
Rajah 5.11 : Punca Beban Pencemaran SO₂ (Metrik Tan), 2018
Figure 5.11 : SO₂ Emission Load by Sources (Metric Tonnes), 2018



Rajah 5.12 : Punca Beban Pencemaran Jirim Zarah (PM) (Metrik Tan), 2018
 Figure 5.12 : Particulate Matter (PM) Emission Load by Sources (Metric Tonnes), 2018



Rajah 5.13 : Punca Beban Pencemaran NO₂ (Metrik Tan), 2018
 Figure 5.13 : NO₂ Emission Load by Sources (Metric Tonnes), 2018



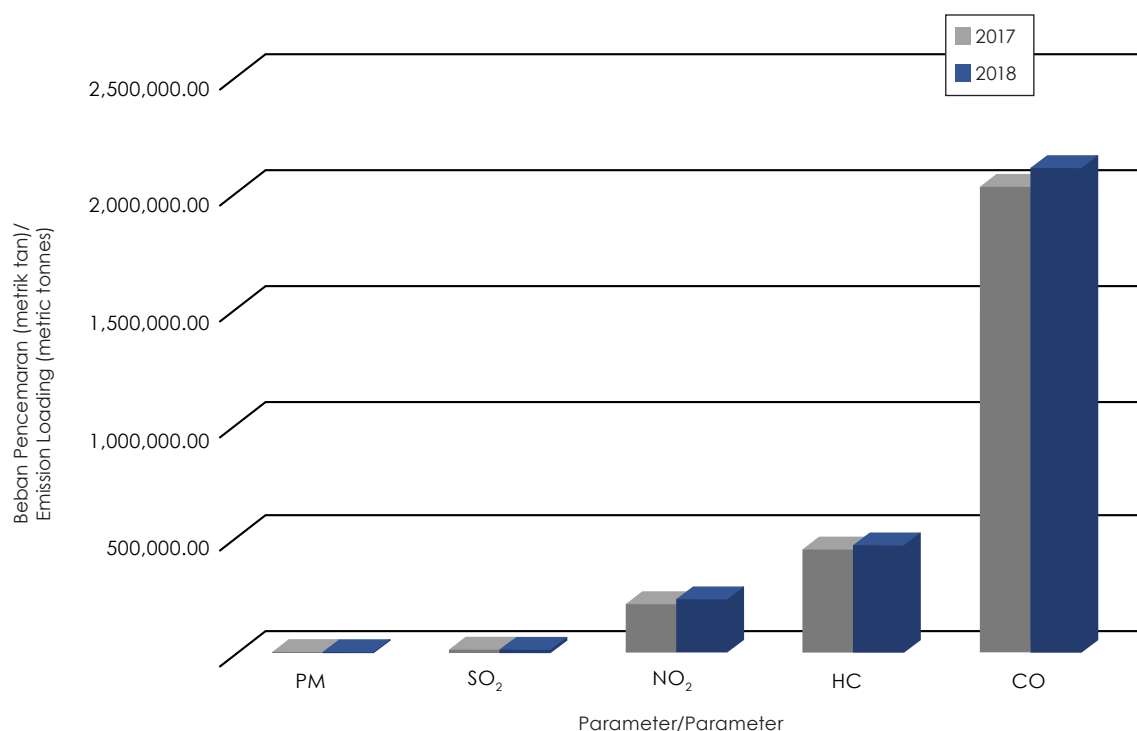
Rajah 5.14 : Punca Pencemaran CO (Metrik Tan), 2018
Figure 5.14 : CO Emission by Sources (Metric Tonnes), 2018

Anggaran pencemaran yang dihasilkan oleh beban pencemaran udara daripada kenderaan bermotor iaitu HC, CO, PM, NO₂ dan SO₂ pada tahun 2017 dan 2018 ditunjukkan dalam **Rajah 5.15**. Pada tahun 2018, beban pencemaran HC dan CO dianggarkan 465,527 metrik tan dan 2,113,937 metrik tan masing-masing. Terdapat peningkatan sebanyak 2.8% dan 4.1% bagi beban pencemaran HC dan CO jika dibandingkan dengan tahun 2017. Peningkatan beban pencemar HC dan CO dari kenderaan bermotor ini adalah berkait rapat dengan peningkatan bilangan kenderaan motor berenjin petrol yang aktif digunakan pada tahun 2018. Tren penurunan sebanyak 0.9% dapat dilihat bagi beban pencemaran PM daripada kenderaan motor pada tahun 2018 berbanding tahun 2017 berikutan bilangan kenderaan yang aktif bagi kenderaan berenjin diesel menurun. Beban pencemar SO₂ dianggarkan sebanyak 14,681.98 metrik tan pada tahun 2018

The estimated annual air pollutants emission load of HC, CO, PM, NO₂ and SO₂, from motor vehicles for year 2017 and 2018 is shown in **Figure 5.15**. In 2018, the emission load of HC and CO were estimated to be 465,527 metric tonnes and 2,113,937 metric tonnes, respectively. For year 2018, there were an increase of 2.8% and 4.1% of HC and CO emission load compared to 2017. The increment was closely related to the increase in the number of active petrol-powered motor vehicles in 2018. The downtrend for PM pollution load from motor vehicles was 0.9% in 2018 compared to 2017 due to the decreased of vehicles for diesel-powered vehicles. The SO₂ pollution load was estimated to be 14,681 metric tonnes in 2018 compared to 14,390.13 metric tonnes in 2017 (an increase of 2.0%); NO₂ emissions were estimated to be 226,515.37 metric tonnes compared with 222,036.96 metric tonnes in 2017 (an increase of 2.0%). The increase of NO₂ and SO₂ from motor vehicles in 2018 were related to the increase of

berbanding 14,390.13 metrik tan pada tahun 2017 (peningkatan sebanyak 2.0%) dan NO₂ sebanyak 226,515.37 metrik tan berbanding 222,036.96 metrik tan pada 2017 (peningkatan sebanyak 2.0%). Peningkatan NO₂ dan SO₂ dari kenderaan motor pada tahun 2018 adalah berkaitan dengan peningkatan kenderaan berdaftar dengan Jabatan Pengangkutan Jalan Malaysia (JPJ) sebanyak 4.27%. Manakala PM sebanyak 3,905.58 metrik tan berbanding 3,941.01 metrik tan pada tahun 2017.

registered vehicles with Road Transport Department Malaysia (RTD) by 4.27%. While PM emissions were estimated to be 3,905.58 metric tonnes compared to 3,941.01 metric tonnes in year 2017.



Rajah 5.15 : Beban Pencemar Udara dari Kenderaan Bermotor, 2017-2018
Figure 5.15 : Air Pollutant Emission Load from Motor Vehicles, 2017-2018

INVENTORI BUANGAN TERJADUAL

Pada tahun 2018 sebanyak 2,355,085.21 tan metrik buangan terjadual telah dihasilkan. Ini mewakili peningkatan keseluruhan sebanyak 16.75% berbanding 2,017,280.76 tan metrik yang dilaporkan pada 2017. Buangan gipsum, dross/sanga/klinker/abu dan enapcemar logam berat merupakan kategori utama dalam kategori buangan yang dihasilkan (**Jadual 5.1**). Negeri Perak telah menghasilkan jumlah terbesar buangan terjadual (20.7%), diikuti oleh Negeri Johor (17.9%), Terengganu (16.2%), Selangor (12.9%), Pahang (11.0%), manakala 10 negeri-negeri yang lain menghasilkan sebanyak 21.3 (**Rajah 5.16**).

Sebanyak 406,565.96 tan metrik (17.26%) daripada jumlah buangan yang dihasilkan diperolehi kembali di dalam dan luar negara. Ini menunjukkan penurunan sebanyak 38.54% berbanding 661,557.87 tan metrik pada tahun 2017. Daripada jumlah itu, 393,245.21 tan metrik (16.70%) daripada buangan terjadual yang diperolehkembali di kemudahan pemerolehan kembali luar tapak tempatan dan 13,320.76 tan metrik (0.57%) telah diberi kebenaran eksport untuk pemerolehan kembali di kemudahan di luar negara.

SCHEDULED WASTES INVENTORY

In 2018, a total of 2,355,085.21 metric tonnes of scheduled wastes were generated. This represents an overall increase of 16.75% as compared to 2,017,280.76 metric tonnes reported in 2017. The main categories of the total waste generated was gypsum, dross/slag/clinker/ash, and heavy metal sludge (**Table 5.1**). The state of Perak generated the largest amount of scheduled wastes (20.7%), followed by Johor (17.9%), Terengganu (16.2%), Selangor (12.9%), Pahang (11.0%), whilst the other ten states generated a total of 21.3% (**Figure 5.16**).

A total of 406,565.96 metric tonnes (17.26%) of waste were being recovered locally and abroad. This showed a decrease of 38.54% compared to 661,557.87 metric tonnes in 2017. A total of 393,245.21 metric tonnes (16.70%) of scheduled wastes were recovered at local off-site facilities and 13,320.76 metric tonnes (0.57%) were granted export approval for recovery at foreign facilities abroad.

Jadual 5.1 : Jumlah Buangan Terjadual yang Dihasilkan Mengikut Kod Buangan Terjadual, 2018
Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2018

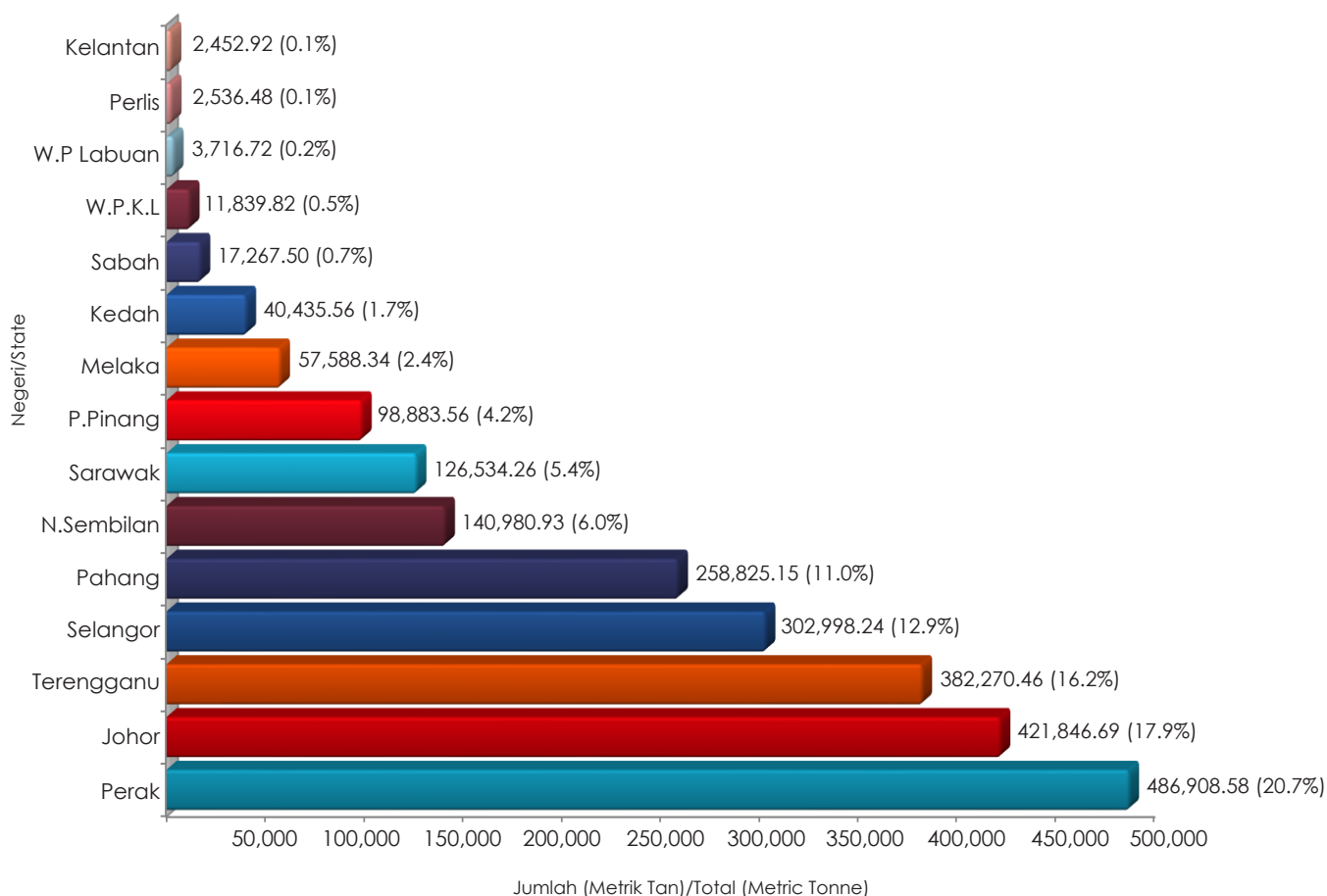
BIL/ NO	NAMA BUANGAN/ NAME OF WASTE	KOD BUANGAN/ WASTE CODE	KUANTITI BUANGAN/QUANTITY OF WASTE	
			(MT/TAHUN)/ (MT/YEAR)	PERATUSAN (%)/ PERCENTAGE (%)
1.	Gypsum/Gypsum	SW 205	823,561.73	34.97
2.	Dros/Sanga/Klinker/Abu (Dross/Slag/Clinker/Ash)	SW 104	738,316.48	31.35
3.	Enap Cemar Logam Berat/Heavy Metal Sludges	SW 204	268,521.22	11.40
4.	Minyak Pelincir Terpakai/Spent Lubricating oil	SW 305	100,335.95	4.26
5.	Emulsi Minyak Mineral-Air Terpakai/Spent Mineral Oil-Water Emulsion	SW 307	37,326.39	1.58
6.	Asid Terpakai/Spent Acids	SW 206	35,959.65	1.53
7.	Buangan Minyak atau Enap Cemar Berminyak/Waste Oil or Oily Sludges	SW 311	32,769.19	1.39
8.	Campuran Buangan Terjadual & Buangan Tidak Terjadual/Mixture of Scheduled Waste & Non-Scheduled Waste	SW 422	31,871.01	1.35
9.	Buangan Patogenik/Klinikal (Pathogenic Clinical Waste)	SW 404	30,757.04	1.31
10.	Buangan Getah atau Lateks yang Mengandungi Logam Berat/Rubber or Latex Waste Containing Heavy Metal	SW 321	29,879.59	1.27
11.	Buangan Pelarut Organic Bukan Terhalogen/Waste of Non-Halogenated Solvent	SW 322	25,512.71	1.08
12.	Bekas Tercemar/Used Container	SW 409	23,945.09	1.02
13.	Buangan Elektronik/E-Waste	SW 110	18,007.44	0.76
14.	Enap Cemar Mineral/Mineral Sludges	SW 427	16,820.10	0.71
15.	Kain Buruk, Plastik, Kertas atau Turas Tercemar/Rags, Plastics, Papers Contaminated with Scheduled Waste	SW 410	15,124.45	0.64
16.	Buangan Dakwat dan Cat/Waste of Inks and Paints	SW 417	14,711.21	0.62
17.	Tanah/Puing Tercemar/Contaminated Land/Oil	SW 408	8,784.85	0.37
18.	Campuran Minyak-Air/Oil-Water Mixture	SW 309	7,686.97	0.33
19.	Enap Cemar dari Tangki Minyak/Oil Tankers Sludges	SW 308	7,327.43	0.31
20.	Enap Cemar Dakwat dan Cat/Ink and Paints Sludges	SW 416	6,874.24	0.29
21.	Sisa dari Pengolahan atau Pemerolehan Kembali Buangan Terjadual/Residue from Recovery	SW 501	6,739.99	0.29
22.	Minyak/Enapcemar daripada Loji Penapisan Minyak/Oil/Sludges from Oil Refinery	SW 314	6,649.48	0.28
23.	Enap Cemar yang Mengandungi Fluorida/ Sludge Containing Fluoride	SW 207	6,261.81	0.27
24.	Klinker, Sanga dan Abu dari Penunu Buangan Terjadual/Clinker, Slag, Ashes from Incinerator	SW 406	5,652.50	0.24
25.	Alkali Terpakai/Spent Alkalis	SW 401	5,570.31	0.24

Jadual 5.1 : Jumlah Buangan Terjadual yang Dihasilkan Mengikut Kod Buangan Terjadual, 2018
Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2018

BIL/ NO	NAMA BUANGAN/ NAME OF WASTE	KOD BUANGAN/ WASTE CODE	KUANTITI BUANGAN/QUANTITY OF WASTE	
			(MT/TAHUN)/ (MT/YEAR)	PERATUSAN (%)/ PERCENTAGE (%)
26.	Buangan Mangkin/Waste Catalyst	SW 202	5,551.06	0.24
27.	Buangan Kimia/Lab Waste	SW 429	4,075.21	0.17
28.	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	4,034.26	0.17
29.	Campuran Buangan Terjadual/Mixture of Scheduled Waste	SW 421	3,856.07	0.16
30.	Asid Organik Terpakai/Spent Organic Acids	SW 301	3,744.84	0.16
31.	Buangan Pelarut Organik Terhalogen/Waste of Halogenated Solvents	SW 323	3,293.84	0.14
32.	Karbon Teraktif Terpakai/Contaminated Active Carbon	SW 411	2,835.94	0.12
33.	Enap Cemar dari Tangki Penyimpanan Minyak Mineral/Sludges from Mineral Oil Storage Tank	SW 310	2,453.91	0.10
34.	Minyak Hidraulik Terpakai/Spent Hydraulic Oil	SW 306	2,391.91	0.10
35.	Buangan Bateri Asid Plumbum/Waste of Acid Lead Batteries	SW 102	2,191.84	0.09
36.	Buangan Resin yang Mengandungi Pelarut Organik/Waste of Resin Containing Organic	SW 325	1,900.42	0.08
37.	Buangan Cecair Tema/Waste of Thermal Fluids	SW 327	1,789.88	0.08
38.	Sisa Berminyak dari Bengkel Automotif/Oily Residue from Workshop	SW 312	1,678.91	0.07
39.	Alkali Terpakai dengan Ph \geq 11.5/Spent Alkalis with PH > 11.5	SW 402	1,632.05	0.07
40.	Buangan Mengandungi Merkuri/Waste Containing Mercury or Compound	SW 109	1,489.20	0.06
41.	Buangan Pelekat atau Glu yang Mengandungi Pelarut Organik/Adhesive or Glue Containing Organic Solvent	SW 303	1,398.67	0.06
42.	Buangan Bateri yang Mengandungi Cadmium dan Nikel/Waste of Batteries Containing Cadmium, Hg and Lithium	SW 103	1,147.63	0.05
43.	Buangan Fotografi/Photographic Waste	SW 423	964.88	0.04
44.	Larutan Alkali Berair Terpakai yang Mengandungi Sianida/Spent Aqueous Alkaline Containing Cyanide	SW 414	783.62	0.03
45.	Buangan Asbestos/Asbestos	SW 201	570.78	0.02
46.	Tar atau Sisa Bertar dari Loji Penapisan Minyak/Tar Residue from Oil Refinery/ Petrochemical Plant	SW 315	439.39	0.02
47.	Buangan Makmal/Chemical Waste	SW 430	370.27	0.02
48.	Dadah Terbuang/Expired Drug	SW 403	267.02	0.01
49.	Tanah yang Dicemari dengan Minyak daripada Penapisan Semula Minyak Pelincir Terpakai/Contaminated Oil from Re-Refining/Used Lubricating Oil	SW 313	245.77	0.01
50.	Buangan Farmaseutikal/Discarded Drug	SW 405	224.70	0.01
51.	Buangan Mengandungi Formaldehid/Waste Containing Formaldehyde	SW 320	192.91	0.01

Jadual 5.1 : Jumlah Buangan Terjadual yang Dihasilkan Mengikut Kod Buangan Terjadual, 2018
Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2018

BIL/ NO	NAMA BUANGAN/ NAME OF WASTE	KOD BUANGAN/ WASTE CODE	KUANTITI BUANGAN/QUANTITY OF WASTE	
			(MT/TAHUN)/ (MT/YEAR)	PERATUSAN (%)/ PERCENTAGE (%)
52.	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	173.09	0.01
53.	Enap Cemar yang Distabilkan/Stabilized Sludges	SW 203	125.95	0.01
54.	Buangan Fluks/Flux Waste	SW 302	91.55	0.00
55.	Sisa dari Pemerolehan Kembali Likuor Penjerukan Asid/Residue from Recovery of Acid Pickling Liquor	SW 106	74.00	0.00
56.	Buangan Racun Perosak/Pesticide	SW 425	39.83	0.00
57.	Produk Racun Perosak yang Tidak Mengikut Spesifikasi/Used Pesticide/Herbicides/Biocides	SW 426	36.95	0.00
58.	Buangan Fenol/Waste of Phenols/Its Compound	SW 319	15.20	0.00
59.	Buangan yang Mengandungi Peroksida/Waste Containing Peroxides	SW 432	13.97	0.00
60.	Agen Pengoksidaan Terpakai/Spent Oxidizing Agent	SW 424	8.70	0.00
61.	Enap Cemar Asid/Acid Sludges	SW 316	6.32	0.00
62.	Buangan yang Mengandungi Arsenik/Waste Containing Arsenic	SW 101	2.68	0.00
63.	Diisiosianat Terpakai/Spent di-Isocyanates	SW 419	2.24	0.00
64.	Sebatian Organologam Terpakai/Spent of Organometallic Compound	SW 317	0.80	0.00
65.	Buangan yang Mengandungi BFT dan TFT/Waste Containing PCB or PCT	SW 318	0.74	0.00
66.	Garam Terpakai yang Mengandungi Sianida/Spent Salt Containing Cyanide	SW 413	0.36	0.00
67.	Sisa dari Pemprosesan Zink/Zink Residue	SW 108	0.35	0.00
68.	Sanga Kuprum/Slag of Copper	SW 107	0.29	0.00
69.	Buangan Sebatian Fosforus Organik/Waste of Organic Phosphorus Compound	SW 326	0.18	0.00
70.	Minyak Pelindapan Terpakai yang Mengandungi Sianida/Spent Quenching Oil Containing Cyanide	SW 415	0.14	0.00
71.	Buangan yang Mengandungi Dioksin atau Furan/Waste Containing Dioxins or Furans	SW 407	0.05	0.00
72.	Enap Cemar Galvani/Galvanic Sludges	SW 105	-	0.00
73.	Kek Tekan daripada Prapengolahan Lai Sabun Gliserol/ Cake from Glycerol Soap Lye	SW 304	-	0.00
74.	Enap Cemar yang Mengandungi Sianida/Sludges Containing Cyanide	SW 412	-	0.00
75.	Larutan Resap dari Tapak Pelupusan Buangan Terjadual/Leachate from Scheduled Waste Landfill	SW 420	-	0.00
76.	Buangan daripada Operasi 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			2,355,085.21	100.00



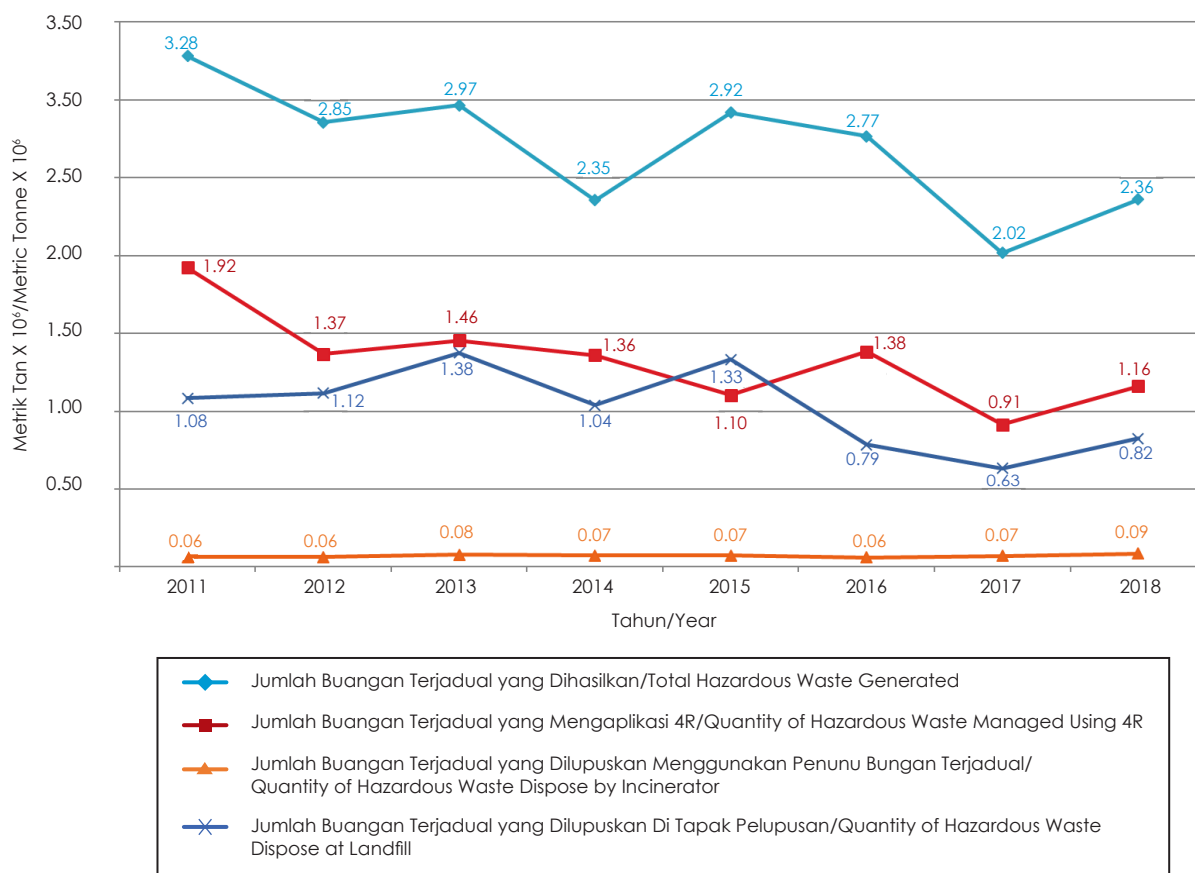
Rajah 5.16 : Penghasilan Buangan Terjadual Mengikut Negeri, 2018
Figure 5.16 : Distribution of Scheduled Waste Generated by State, 2018

Sebanyak 219,350.72 tan metrik (9.31%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan untuk pelupusan akhir, iaitu di Kualiti Alam Sdn. Bhd (175,707.17 MT), Trienekens (Sarawak) Sdn. Bhd (12,886.50 MT) dan 30,757.04 tan metrik daripada buangan klinikal telah dibakar dan dilupuskan di kemudahan luar tapak yang dilesenkan (**Jadual 5.2**). Jumlah ini menunjukkan peningkatan sebanyak 26.59% daripada sejumlah 173,276.67 tan metrik buangan berjadual dilupuskan pada tahun 2017. Sebanyak 576,861.73 tan metrik (24.49%) daripada buangan terjadual terhasil telah diolah di tapak; manakala 272,462.77 tan metrik (11.57%) telah distor di premis pengeluar buangan (**Jadual 5.3**).

A total of 219,350.72 metric tonnes (9.31%) of scheduled waste were treated for final disposal at Kualiti Alam Sdn. Bhd., 175,707.17 MT, Trienekens (Sarawak) Sdn. Bhd. (12,886.50 MT) and 30,757.04 metric tonnes of clinical wastes were managed at licensed off-site facilities (**Table 5.2**). The amount showed an increase of 26.59% from a total of 173,276.67 metric tonnes of scheduled waste disposed in 2017. A sum of 576,861.73 metric tonnes (24.29%) of scheduled waste were treated on-site; while 272,462.77 metric tonnes (11.57%) were stored on-site at waste generators' premises (**Table 5.3**).

Jadual 5.2 : Jumlah Buangan Terjadual yang Dihasilkan Mengikut Jenis Industri, 2018
Table 5.2 : Quantity of Scheduled Wastes Generated by Industry, 2018

BIL/ NO	JENIS INDUSTRI/TYPE OF INDUSTRIES	JUMLAH BUANGAN/QUANTITY OF WASTE	
		(MT/TAHUN)/ (MT/YEAR)	PERATUSAN (%)/ PERCENTAGE (%)
1.	Loji Janakuasa/Power Plant	701,868.47	29.80
2.	Premis Buangan Terjadual/Scheduled Waste Treatment and Disposal Facilities	538,152.00	22.85
3.	Industri Kimia/Chemical Industry	327,965.81	13.93
4.	Loji Rawatan Air/Water Treatment Plant	109,193.53	4.64
5.	Bengkel/Workshop	105,625.96	4.49
6.	Elektrik dan Elektronik/Electric and Electronic	99,661.39	4.23
7.	Pengilangan Logam/Metal Refinery	79,207.98	3.36
8.	Penapisan Petroleum/Petroleum Refinery	59,707.53	2.54
9.	Lain-lain/Others	50,932.77	1.23
10.	Fabrikasi Logam/Metal Fabrication	48,903.12	2.08
11.	Galian Bukan Logam/Excavation Non Metal	41,467.03	1.76
12.	Penyudahan Logam dan Sadur Elektrik/Metal Finishing and Coating	35,678.23	1.51
13.	Kenderaan/Vehicle	31,965.04	1.36
14.	Perubatan/Health Care Services	30,727.04	1.30
15.	Kertas/Paper	18,033.29	0.77
16.	Berasaskan Getah/Rubber Base	11,056.61	0.47
17.	Jentera/Machinery	10,127.49	0.43
18.	Berasaskan Kayu/Wood Base	8,009.45	0.34
19.	Kilang Kelapa Sawit/Palm Oil Mill	6,803.83	0.29
20.	Plastik/Plastic	5,660.57	0.24
21.	Percetakan/Printing	5,080.37	0.22
22.	Penapisan Minyak Makan/Edible Oil Refinery	5,000.11	0.21
23.	Pertanian/Agriculture	4,877.50	0.21
24.	Perlombongan/Mining	4,785.74	0.20
25.	Makanan & Minuman/Food & Drink	4,504.96	0.19
26.	Tekstil/Textiles	1,923.56	0.08
27.	Gudang/Warehouse	1,842.00	0.08
28.	Simen/Cement	1,475.23	0.06
29.	Kuari/Quarry	1,451.71	0.06
30.	Pembuatan Payung dan Lain-lain Industri Pembuatan/Others Manufacturing	959.12	0.04
31.	Kilang Getah/Rubber Factory	732.77	0.03
32.	Peralatan Sukan dan Permainan/Sports Equipment and Games	398.15	0.02
33.	Peralatan Pejabat dan Alat Tulis/Office Supplies and Stationery	359.66	0.02
34.	Hotel/Hotel	263.24	0.01
35.	Perkhidmatan/Services	236.10	0.01
36.	Kulit/Leather	99.28	0.00
37.	Loji Pengolahan Kumbahan (IWK, Majari, PBT)/ Sewage Treatment Plant (IWK, Majari, PBT)	94.78	0.00
38.	Rokok Dan Tembakau/Cigarettes and Tobacco	70.59	0.00
39.	Loji Pengolahan Kumbahan Persendirian/Private Sewage Treatment Plant	60.31	0.00
40.	Makanan Ternakan/Livestock Food	52.01	0.00
41.	Tapak Pelupusan Sampah/Sanitary Landfill	49.81	0.00
42.	Perikanan/Fishery	17.47	0.00
43.	Kilang Padi/Rice Mill	3.60	0.00
JUMLAH/TOTAL		2,355,085.21	100.00



Rajah 5.17 : Trend Pengurusan Buangan Terjadual, 2011-2018
Figure 5.17 : The Trend of Scheduled Waste Management, 2011-2018

Jadual 5.3 : Kemudahan yang Mengendalikan Buangan Terjadual, 2018
Table 5.3 : Facilities Handling Scheduled Wastes, 2018

BIL/NO	KEMUDAHAN/FACILITIES	(MT/TAHUN)/ (MT/YEAR)	PERATUSAN (%)/ PERCENTAGE (%)
1.	Pengurusan Khas/Special Waste Management	879,844.03	37.36
2.	Pengolahan Dalam Tapak/On-Site Treatment	576,861.73	24.49
3.	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan/ Local Off-site Recovery Facilities	393,245.21	16.70
4.	Penstoran Dalam Tapak/On-Site Storage	272,462.77	11.57
5.	Kualiti Alam Sdn Bhd	175,707.17	7.46
6.	Kemudahan Buangan Klinikal (Penunu Buangan Klinikal, Gelombang Mikro dan Tapak Pelupusan Selamat)/ Off-site Clinical Waste Facilities (Incinerator, Microwave and Secured Landfill)	30,757.04	1.31
7.	Kemudahan Luar Negara (Export)/Foreign Facilities (Export)	13,320.76	0.57
8.	Trienekens (Sarawak) Sdn Bhd	12,886.50	0.55
JUMLAH/TOTAL		2,355,085.21	100.00

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2018, 879,844.03 tan metrik (37.36%) 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 peningkatan sebanyak 72.45% berbanding 510,206.65 tan metrik pada tahun 2017. Kebanyakan buangan dihasilkan dari loji jana kuasa arang batu (70.72%), enap cemar daripada kemudahan rawatan air minuman (11.78%) dan lain-lain (17.50%) .

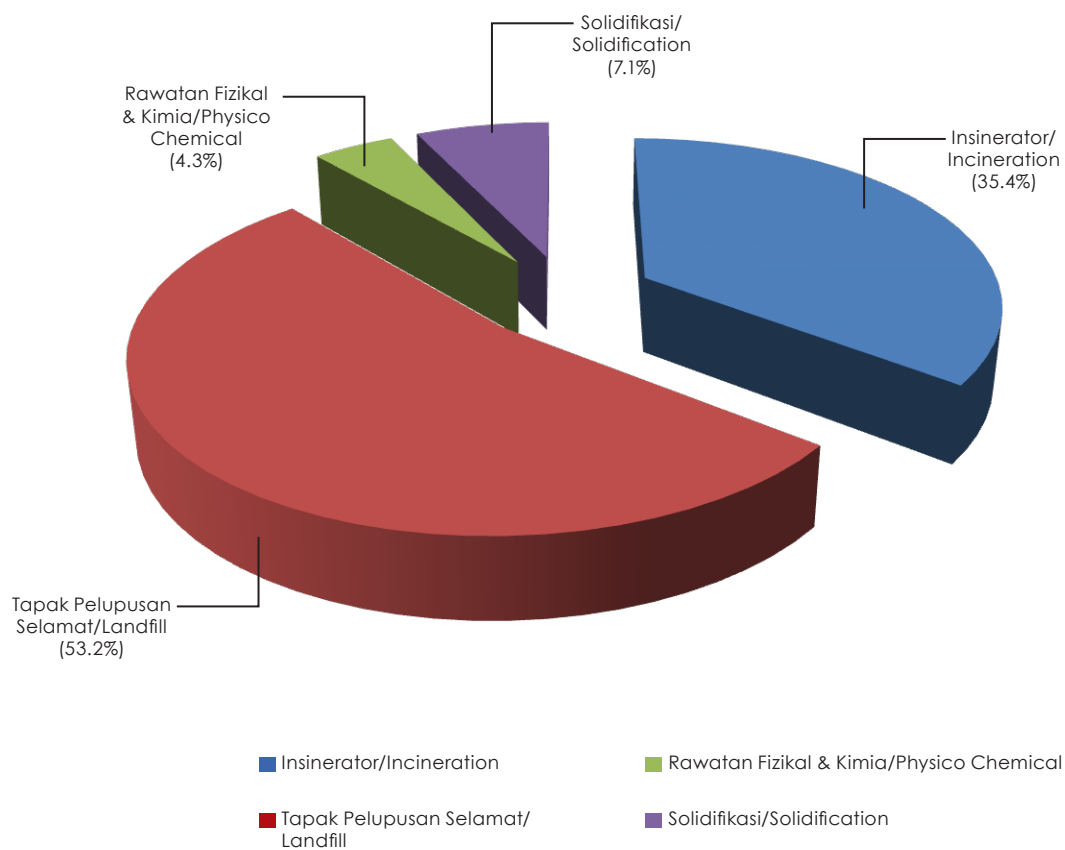
Kategori buangan terjadual yang dihantar ke premis berlesen (Kualiti Alam Sdn Bhd dan Trienekens (Sarawak) Sdn Bhd) untuk pelupusan akhir adalah seperti enapcemar yang mengandungi satu atau beberapa logam berat, campuran buangan terjadual, debu/sanga/dros atau abu yang mengandungi arsenik/merkuri dan 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. Kebanyakan sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah ke tapak pelupusan (53.2%), diikuti dibakar (35.4%), solidifikasi (7.1%) dan rawatan secara fizikal dan kimia (4.3%) (**Rajah 5.18**).

Out of the total scheduled wastes produced in 2018, 879,844.03 metric tonnes (37.36%) 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 an increase of 72.45% as compared to 510,206.65 metric tonnes in 2017. These waste streams are mostly generated from coal-fired power plant (70.72%), sludges from drinking water treatment facilities (11.78%) and others (17.50%).

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. Most wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were landfilled (53.2%), followed by incinerated (35.4%), solidified (7.1%) and treated physically and chemically (4.3%) (**Figure 5.18**)

Jadual 5.4 : Buangan Terjadual yang Diuruskan Di Bawah Pengurusan Khas, 2018
Table 5.4 : Generated Scheduled Waste Managed Under Special Management, 2018

BIL/ NO	KATEGORI BUANGAN/WASTE CATEGORY	KOD BUANGAN/ WASTE CODE	SUMBER/ SOURCES	METRIK TAN/ METRIK TONNES	PERATUSAN (%)/ PERCENTAGE (%)	KAEDAH PELUPUSAN/ METHOD OF DISPOSAL
1.	Fly Ash & Bottom Ash	SW 104	Loji Janakuasa Elektrik/Coal-Fired Power Plant	622,210.70	70.72	Guna semula sebagai bahan mentah pembuatan produk/ Reuse as raw material for product
			Industri/Industry	80,862.74	9.19	
2.	Enap Cemar Logam Berat/Heavy Metal Sludge	SW 204	Loji Rawatan Air Minuman/ Drinking Water Treatment Plant	103,663.99	11.78	Tapak Pelupusan Sanitari/ Sanitary Landfill
			Industri/Industry	16,101.22	1.83	Tapak Pelupusan Sanitari/ Sanitary Landfill
				47,244.05	5.37	Guna semula sebagai bahan mentah pembuatan produk/ Reuse as raw material for product Sanitary Landfill
3.	Abu dari Enapcemar Kertas/ Ash of Paper Sludge	SW 406	Industri/Industry	4,696.09	0.53	Guna semula sebagai bahan mentah pembuatan produk/ Reuse as raw material for product Sanitary Landfill
4.	Enap Cemar Mineral/ Mineral Sludge	SW 427	Industri/Industry	2,833.53	0.32	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	Industri/Industry	1,158.01	0.13	Tapak Pelupusan Sanitari/ Sanitary Landfill
6.	Activated Carbon Terpakai/Spent Activated Carbon	SW411	Industri/Industry	1,010.50	0.11	Guna semula sebagai bahan mentah pembuatan produk/ Reuse as raw material for product Sanitary Landfill
7.	Campuran Buangan Terjadual dan Buangan Tidak Terjadual/Mixture of Scheduled Waste and Nonscheduled Waste	SW422	Industri/Industry	49.34	0.01	Guna semula sebagai bahan mentah pembuatan produk/ Reuse as raw material for product Sanitary Landfill
8.	Buangan daripada Bahan Letupan Terpakai/Waste Use of Explosive	SW431	Industri/Industry	13.86	0.00	Kaedah <i>Slow Burning</i> / <i>Slow Burning method</i>
JUMLAH/TOTAL				879,844.03	100.00	



Rajah 5.18 : Kualiti Alam dan Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2018

Figure 5.18 : Kualiti Alam and Trienekens: Types of Treatment and Disposal of Waste, 2018



ANNEX

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS				
		I	IIA/IIIB	III#	IV	V
Al	mg/l	↑ N A T U R A L L E V E L S O R A B S E N T ↓	-	(0.06)	0.5	↑ L E V E L S A B O V E I V ↓
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	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)	-		
†-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, discoloration 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*	µS/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	°C	-	Normal + 2 °C	-	Normal + 2 °C	-	-
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
Ammoniacal Nitrogen	91 - 100	80 - 90	0 - 79
Biochemical Oxygen Demand	92 - 100	71 - 91	0 - 70
Chemical Oxygen Demand	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

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

where;

SIDO = Subindex DO (% saturation)

SIBOD = Subindex BOD

SICOD = Subindex COD

SIAN = Subindex NH₃-N

SISS = Subindex SS

SlpH = Subindex pH

0 ≤ WQI ≤ 100

BEST FIT EQUATIONS FOR THE ESTIMATION OF VARIOUS SUBINDEX VALUES

Subindex for DO (in % saturation)

$$\begin{aligned} SIDO &= 0 && \text{for } x \leq 8 \\ SIDO &= 100 && \text{for } x \geq 92 \\ SIDO &= -0.395 + 0.030x^2 - 0.00020x^3 && \text{for } 8 < x < 92 \end{aligned}$$

Subindex for BOD

$$\begin{aligned} SIBOD &= 100.4 - 4.23x && \text{for } x \leq 5 \\ SIBOD &= 108 * \exp(-0.055x) - 0.1x && \text{for } x > 5 \end{aligned}$$

Subindex for COD

$$\begin{aligned} SICOD &= -1.33x + 99.1 && \text{for } x \leq 20 \\ SICOD &= 103 * \exp(-0.0157x) - 0.04x && \text{for } x > 20 \end{aligned}$$

Subindex for NH₃-N

$$\begin{aligned} SIAN &= 100.5 - 105x && \text{for } x \leq 0.3 \\ SIAN &= 94 * \exp(-0.573x) - 5 * |x - 2| && \text{for } 0.3 < x < 4 \\ SIAN &= 0 && \text{for } x \geq 4 \end{aligned}$$

Subindex for SS

$$\begin{aligned} SISS &= 97.5 * \exp(-0.00676x) + 0.05x && \text{for } x \leq 100 \\ SISS &= 71 * \exp(-0.0061x) - 0.015x && \text{for } 100 < x < 1000 \\ SISS &= 0 && \text{for } x \geq 1000 \end{aligned}$$

Subindex for pH

$$\begin{aligned} SlpH &= 17.2 - 17.2x + 5.02x^2 && \text{for } x < 5.5 \\ SlpH &= -242 + 95.5x - 6.67x^2 && \text{for } 5.5 \leq x < 7 \\ SlpH &= -181 + 82.4x - 6.05x^2 && \text{for } 7 \leq x < 8.75 \\ SlpH &= 536 - 77.0x + 2.76x^2 && \text{for } x \geq 8.75 \end{aligned}$$

Note:

* means multiply with

MWQI FORMULA AND CALCULATION

$$MWQI = SI DO^{0.2} \times SI NH_3^{0.16} \times SI FC^{0.14} \times SI TSS^{0.14} \times SI O\&G^{0.13} \times SI NO_3^{0.12} \times SI PO_4^{0.11}$$

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*

$$SI(NH_3) = 100 \exp^{-4.6(NH_3)}$$

* If Ammoniacal Nitrogen (NH₃+N) is measured, convert the value into unionized ammonia.

Faecal Coliform (FC) in MPN/100ml

$$SI(FC) = 100 \exp^{-0.005(FC)}$$

If FC ≥ 500 MPN, SI = 8%

Total Suspended Solids (TSS) in mg/L

$$SI(TSS) = 95.8 \exp^{-0.0043(TSS)}$$

If TSS > 100 mg/L, SI = 20%

Oil & Grease (OG) in mg/L

$$SI(OG) = 98 \exp^{-0.21(OG)}$$

Nitrate (NO₃) in mg-N/L

$$SI(NO_3) = 94.83 \exp^{-0.35(NO_3)}$$

Phosphate (PO₄) in mg-P/L

$$SI(PO_4) = 95.2 \exp^{-0.002(PO_4^{*1000})}$$

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

$$PKa = (0.0901821 + \frac{2729.92}{(Temp + 273.15)}) + IS(0.1552 - 0.000314 * Temp)$$

Temperature in °C

c. Calculation of working pH

$$pH_{sw} = pH - (0.0007 \times IS) - 0.131$$

d. Calculation of mole fraction for unionized ammonia

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

Equation:

$$\text{Unionized ammonia} = \text{Total ammoniacal nitrogen} \times \text{mole fraction}$$

Total ammoniacal nitrogen should be measured in µg/l

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