



KEMENTERIAN SUMBER ASLI  
DAN KELESTARIAN ALAM

Ministry of Natural Resources  
and Environmental Sustainability

JABATAN ALAM SEKITAR

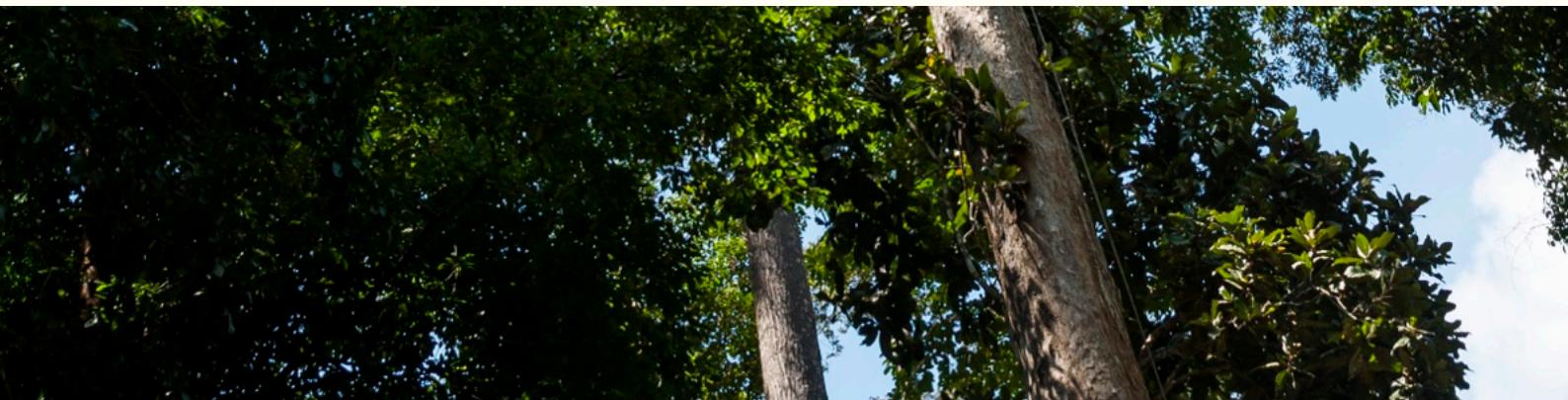
Department of Environment



# Laporan Kualiti Alam Sekeliling

*Environmental Quality Report*

# 2023





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and Environmental Sustainability

JABATAN ALAM SEKITAR  
Department of Environment

# Laporan Kualiti Alam Sekeliling

*Environmental Quality Report*

# 2023

Department of Environment, Malaysia  
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T: 03-7803-3754







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# PRAKATA / PREFACE

**"Alam Sekitar,  
Tanggungjawab Bersama"**  
**"Environment, Our Shared Responsibility"**



A handwritten signature in black ink, appearing to read "WAN A. LATIFF".

**DATO' WAN ABDUL LATIFF BIN WAN JAFFAR**  
Ketua Pengarah Kualiti Alam Sekeliling Malaysia  
*Director General of Environmental Quality Malaysia*

**S**aya amat berbesar hati untuk membentangkan Laporan Kualiti Alam Sekeliling 2023 seperti yang dikehendaki di bawah Seksyen 3(1)(i) Akta Kualiti Alam Sekeliling 1974.

Status kualiti udara di Malaysia ditunjukkan menerusi bacaan Indeks Pencemar Udara (IPU). Pada tahun 2023 bacaan IPU status baik adalah sebanyak 33.2% manakala IPU status baik pada tahun 2022 adalah 46.1%. Penurunan sebanyak 12.9% adalah kerana negara mengalami keadaan cuaca yang lebih kering dan panas berbanding tahun sebelumnya yang mana keadaan ini telah meningkatkan kes-kes pencemaran udara dan bilangan titik panas (hotspots) di dalam negara. Bacaan IPU sederhana adalah sebanyak 65.7% dan 1.1% adalah tidak sihat pada tahun 2023 untuk seluruh Malaysia.

Status kualiti air sungai yang ditentukan menerusi Indeks Kualiti Air (IKA) menunjukkan penurunan pada tahun 2023. Sebanyak 1,353 stesen pengawasan kualiti air sungai manual yang merangkumi 672 sungai telah

**I**t is my pleasure to present the Environmental Quality Report 2023 as required under Section 3(1)(i) of the Environmental Quality Act 1974.

The air quality status is reported in terms of Air Pollutant Index (API). In 2023 the API ranked good was 33.2% while in year 2022 it was 46.1%. The decrease of 12.9% is due to the country having experienced drier and hotter weather conditions than the previous year, which, in turn increased the number of cases of air pollution and hot spots in the country. The API ranked moderate and unhealthy were 65.7% and 1.1% respectively, throughout Malaysia in 2023.

The river quality in terms of Water Quality Index (WQI) showed a slight decrease in 2023. A total of 1,353 manual river water quality monitoring stations covering

dipantau dalam tahun 2023. Peratus bilangan sungai bersih adalah 72% pada tahun 2023 berbanding 74% pada tahun 2022. Status kualiti air mengikut stesen sungai juga menunjukkan penurunan kepada kualiti air sungai pada stesen-stesen yang dipantau pada tahun 2023. Bilangan stesen sungai yang dikategorikan sebagai bersih adalah 987 (73%) stesen pada tahun 2023 berbanding 1,002 (74%) stesen pada tahun 2022. Secara umumnya, penurunan kualiti air yang direkodkan pada tahun 2023 adalah disebabkan oleh peningkatan beban pencemaran pada sungai daripada punca tetap dan punca tidak tetap.

Pada tahun 2023, pengawasan kualiti air tanah yang dijalankan menunjukkan bahawa semua stesen berada dalam julat nilai pematuhan Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) kecuali bagi parameter besi (Fe), mangan (Mn), dan sebatian fenol mempunyai peratusan julat nilai pematuhan Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) yang rendah bagi guna tanah tertentu.

Dalam tahun 2023, daripada 368 stesen pengawasan kualiti air marin bagi pantai, muara sungai dan pulau di negara ini, sebanyak 173 stesen adalah terbaik, 27 stesen baik, 167 stesen sederhana dan satu (1) stesen dikategorikan tercemar. Stesen tercemar ini berada di kawasan muara.

Sebanyak 5,841,596.82 tan metrik buangan terjadual telah dihasilkan pada tahun 2023. Ini mewakili penurunan keseluruhan sebanyak 1.24% berbanding 5,915,073.84 tan metrik yang dilaporkan pada 2022.

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

672 rivers were monitored in 2023. The percentage of clean river stations is 72% in 2023 compared to 74% in 2022. There has been a decrease in river water quality status by monitored stations in 2023. The numbers of river stations categorised as clean was 987 (73%) of stations in 2023 compared to 1,002 (74%) stations in the previous year. In general, the decrease in water quality recorded in 2023 is due to an increase in the pollution load on the river from point sources and nonpoint sources.

In 2023, the results derived from the groundwater quality monitoring showed that all stations were within the Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water) values except for iron (Fe), manganese (Mn), and phenolics which had a low range of Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water) value.

In 2023, out of the 368 marine water quality monitoring stations at coastal, estuary and islands in the country, 173 stations were excellent, 27 were good, 167 were moderate while the remaining one (1) station was categorised as poor. The marine water quality station categorised as poor was located at the estuary.

A total of 5,841,596.82 metric tonnes of scheduled wastes were generated in 2023. This represents an overall decrease of 1.24% as compared to 5,915,073.84 metric tonnes reported in 2022.

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



Pulau Pangkor



The background of the entire image is a photograph of a lush green rice field in the foreground, a dense line of palm trees in the middle ground, and a vast blue sky filled with scattered white and grey clouds.

# BAB 1

*CHAPTER*

## KUALITI UDARA

---

*AIR QUALITY*

# PENGAWASAN KUALITI UDARA

## AIR QUALITY MONITORING

**Stesen pemantauan kualiti udara di seluruh negara /**  
Air quality monitoring stations in the country

**65**

STESEN PEMANTAUAN AUTOMATIK /  
AUTOMATIC MONITORING STATIONS

**14**

STESEN PEMANTAUAN MANUAL /  
MANUAL MONITORING STATIONS

**3**

STESEN PEMANTAUAN MOBIL /  
MOBILE MONITORING STATIONS



IPU adalah dikira berdasarkan kepekatan enam (**6**) bahan pencemar utama / The API is calculated based on concentration of six (6) major pollutants:

- Ozon di Permukaan Bumi ( $O_3$ )  
Ground Level Ozone ( $O_3$ )
- Karbon Monoksida (CO)  
Carbon Monoxide (CO)
- Nitrogen Dioksida ( $NO_2$ )  
Nitrogen Dioxide ( $NO_2$ )
- Sulfur Dioksida ( $SO_2$ )  
Sulphur Dioxide ( $SO_2$ )
- Habuk Halus Bersaiz Kurang dari 10 Mikron ( $PM_{10}$ )  
Particulate Matter of Less than 10 Microns in Size ( $PM_{10}$ )
- Habuk Halus Bersaiz Kurang dari 2.5 Mikron ( $PM_{2.5}$ )  
Particulate Matter of Less than 2.5 Microns in Size ( $PM_{2.5}$ )

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

Indeks Pencemar Udara (IPU) bagi keseluruhan Malaysia pada tahun 2023 telah menunjukkan sedikit penurunan bagi peratus IPU berstatus baik berbanding tahun 2022.

*The Air Pollutant Index (API) for the whole of Malaysia in 2023 has shown a slight decrease in the percentage of good API status compared to 2022.*



**4**

Jenis pengelasan  
stesen kualiti udara  
mengikut guna tanah /  
**Types of classification  
of air quality stations  
according to land use:**

- Industri / Industrial
- Bandar / Urban
- Pinggir Bandar / Suburban
- Luar Bandar / Rural

**33.2%**

IPU baik pada tahun 2023 untuk  
seluruh Malaysia / Good API  
throughout Malaysia in 2023

**65.7%**

IPU sederhana pada tahun 2023 untuk  
seluruh Malaysia / Moderate API  
throughout Malaysia in 2023

**1.1%**

IPU tidak sihat pada tahun 2023 untuk  
seluruh Malaysia / Unhealthy API  
throughout Malaysia in 2023

# KUALITI UDARA / AIR QUALITY

## PENGAWASAN KUALITI UDARA

Program Pengawasan Kualiti Alam Sekitar atau EQMP merupakan program yang merangkumi pengumpulan data bagi pemantauan kualiti udara, kualiti air sungai dan kualiti air marin di seluruh Malaysia bagi tujuan melaporkan tahap sebenar kualiti alam sekitar negara dalam usaha untuk memantau, mencegah dan mengawal pencemaran. Sistem pengawasan EQMP akan berperanan sebagai mekanisma amaran awal bagi kejadian pencemaran alam sekitar seperti jerebu, tumpahan minyak, bencana industri dan pelupusan haram buangan serta toksik berbahaya. Di bawah Program EQMP, terdapat Pusat Data Alam Sekitar yang akan memaparkan data-data alam sekitar yang dicerap melalui stesen-stesen pengawasan kualiti alam sekitar yang diselaraskan oleh JAS.

Salah satu komponen di bawah EQMP adalah pengawasan status kualiti udara. Pengawasan status kualiti udara dilaksanakan melalui 65 stesen pengawasan kualiti udara automatik, 14 stesen pengawasan secara manual dan tiga (3) stesen pengawasan kualiti udara bergerak yang ditempatkan setiap satu di Semenanjung Malaysia, Sabah dan Sarawak iaitu *Mobile Continuous Air Quality Monitoring* (MCAQM) bagi memenuhi aspirasi penempatan stesen pengawasan kualiti udara di seluruh negara. **Rajah 1.1** menunjukkan bilangan stesen pengawasan kualiti udara di Malaysia. Lokasi stesen pengawasan kualiti udara seluruh Malaysia pula seperti yang ditunjukkan di dalam **Rajah 1.2**.

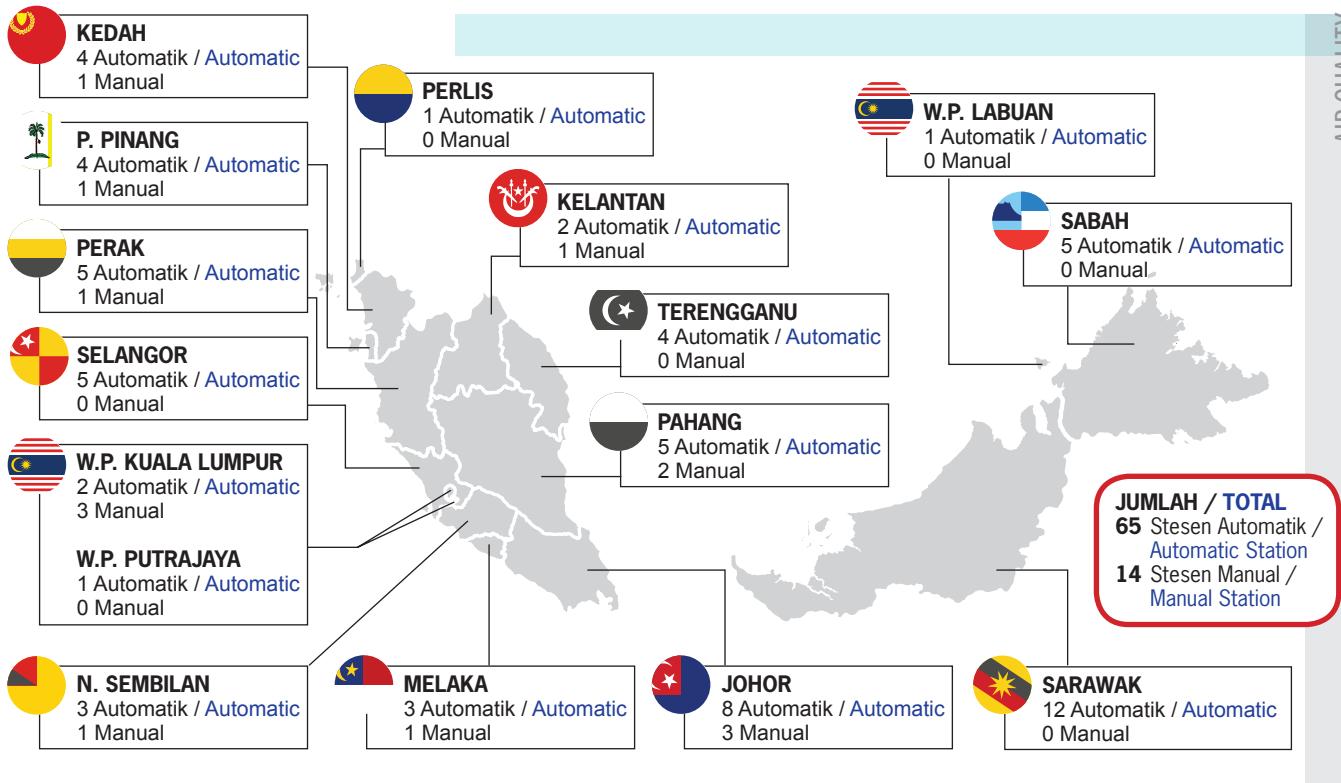
Stesen-stesen pengawasan kualiti udara ditempatkan di lokasi yang dikategorikan sebagai kawasan bandar, pinggir bandar, perindustrian dan luar bandar bertujuan untuk mengesan sebarang perubahan ketara ke atas kualiti udara yang mungkin memberi kesan berbahaya kepada kesihatan manusia dan alam sekitar. Stesen pengawasan kualiti udara di Keningau, Sabah dikategorikan sebagai latarbelakang yang menjadi penunjuk aras bacaan kualiti udara.

## AIR QUALITY MONITORING

The Environmental Quality Monitoring Programme or EQMP is a programme that involves data collection for air quality monitoring, river water quality and marine water quality throughout Malaysia for the purpose of reporting the actual level of environmental quality in the country in an effort to monitor, prevent and control pollution. The EQMP monitoring system will serve as an early warning mechanism for environmental pollution incidents such as haze, oil spills, industrial disasters and illegal disposal of hazardous wastes and toxins. Under the EQMP Program, there is an Environmental Data Center that will display environmental data observed through environmental quality monitoring stations coordinated by the DOE.

One of the components under the EQMP is the monitoring of air quality status. The monitoring of air quality status is carried out through sixty-five (65) automatic air quality monitoring stations, fourteen (14) manual monitoring stations, and three (3) mobile air quality monitoring stations namely Mobile Continuous Air Quality Monitoring ( MCAQM) that are placed each in Peninsular Malaysia, Sabah and Sarawak. With these in place, the target of having air quality monitoring stations throughout the country, is met. **Figure 1.1** shows the number of air quality monitoring stations in Malaysia. The location of air quality monitoring stations throughout Malaysia is shown in **Figure 1.2**.

Air quality monitoring stations are located in areas categorised as urban, suburban, industrial and rural areas, thereby aiming to detect any significant changes in air quality that may pose harmful to human health and the environment. The air quality monitoring station in Keningau, Sabah is categorised as the benchmark for air quality.



Rajah 1.1: Senarai Bilangan Stesen Pengawasan Kualiti Udara di Malaysia

Figure 1.1: The Number of Air Quality Monitoring Stations in Malaysia.



Rajah 1.2: Lokasi Stesen Pengawasan Udara Automatik dan Manual di Malaysia

**Figure 1.2: The Location of Air Quality Monitoring Stations Throughout Malaysia**

## STATUS KUALITI UDARA

Status kualiti udara di Malaysia ditunjukkan menerusi Indeks Pencemar Udara (IPU). Bacaan IPU seluruh negara dipaparkan di laman sesawang Jabatan Alam Sekitar, *Air Pollution Index of Malaysia (APIMS)*. IPU adalah dikira berdasarkan kepekatan enam (6) bahan pencemar utama iaitu ozon di permukaan bumi ( $O_3$ ), karbon monoksida (CO), nitrogen dioksida ( $NO_2$ ), sulfur dioksida ( $SO_2$ ), zarah halus bersaiz kurang dari 10 mikron ( $PM_{10}$ ) dan zarah halus bersaiz kurang dari 2.5 mikron ( $PM_{2.5}$ ). Pengiraan IPU adalah seperti pada **ANNEX**. IPU ini dikategorikan sebagai baik, sederhana, tidak sihat, sangat tidak sihat dan berbahaya seperti yang dinyatakan dalam **Jadual 1.1**.

## AIR QUALITY STATUS

The air quality status in Malaysia is reflected in terms of the Air Pollution Index (API). The API for the whole country is displayed on the website of the Department of Environment, *Air Pollution Index of Malaysia (APIMS)*. The API is calculated based on the concentration of six (6) main pollutants, namely ozone which exists at the ground level ( $O_3$ ), carbon monoxide (CO), nitrogen dioxide ( $NO_2$ ), sulphur dioxide ( $SO_2$ ), fine particles less than 10 microns in size ( $PM_{10}$ ) and fine particles less than 2.5 microns in size ( $PM_{2.5}$ ). The API calculation is shown in the **ANNEX**. This API is categorised as good, moderate, unhealthy, very unhealthy, and dangerous as stated in **Table 1.1**.

**Jadual 1.1: Indeks Pencemar Udara (IPU)**

**Table 1.1: Air Pollutant Index (API)**

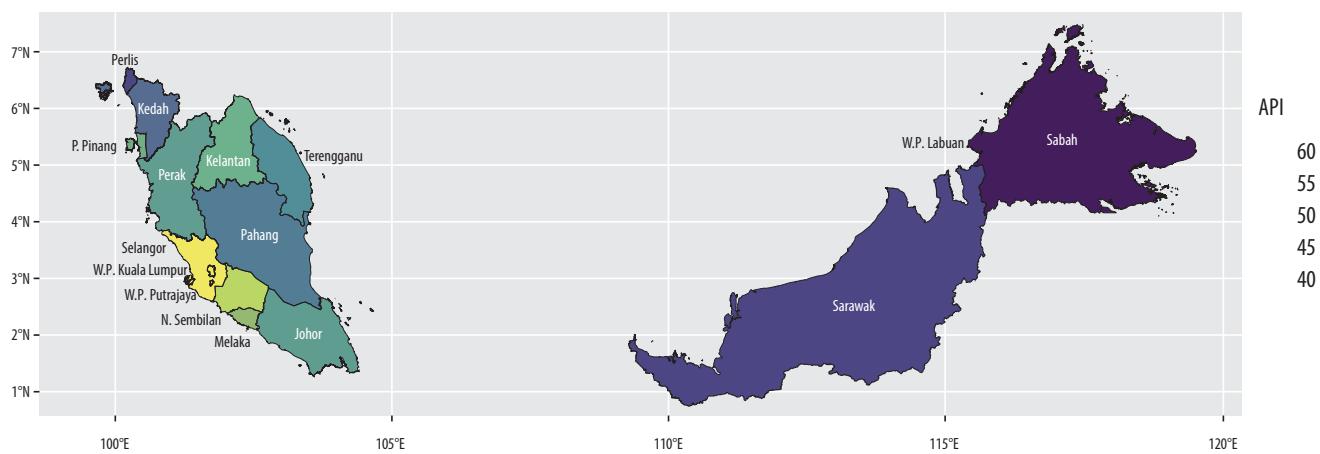
IPU / API	STATUS KUALITI UDARA / AIR QUALITY STATUS
0 – 50	Baik / Good
51 – 100	Sederhana / Moderate
101 – 200	Tidak Sihat / Unhealthy
201 – 300	Sangat Tidak Sihat / Very Unhealthy
> 300	Berbahaya / Hazardous

Pada tahun 2023 bacaan IPU status baik adalah sebanyak 33.2% manakala IPU status baik pada tahun 2022 adalah 46.1%. Penurunan sebanyak 12.9% adalah kerana negara mengalami keadaan cuaca yang lebih kering dan panas berbanding tahun sebelumnya yang mana keadaan ini telah meningkatkan kes-kes pencemaran udara dan bilangan titik panas (*hotspots*) di dalam negara. Bacaan IPU sederhana adalah sebanyak 65.7% dan 1.1% adalah tidak sihat pada tahun 2023 untuk seluruh Malaysia. **Rajah 1.3** menunjukkan purata bacaan IPU sepanjang 2023 di Malaysia.

In 2023 the API ranked good was 33.2% while in year 2022 it was 46.1%. The decrease of 12.9% is due to the country having experienced drier and hotter weather conditions than the previous year, which, in turn increased the number of cases of air pollution and hot spots in the country. The API ranked moderate and unhealthy were 65.7% and 1.1% respectively, throughout Malaysia in 2023. **Figure 1.3**, shows the average API in Malaysia for the year 2023.

Pada tahun 2023, Malaysia mengalami keadaan berjerebu yang agak teruk akibat jerebu setempat dan jerebu merentas sempadan sehingga menyebabkan kebanyakan tempat di Semenanjung Malaysia dan Sarawak mencatatkan bacaan IPU yang tidak sihat. Terdapat lapan (8) kes kebakaran yang melibatkan kebakaran tanah gambut dan tapak pelupusan sampah yang direkodkan bagi tahun 2023 iaitu tiga (3) kes di Kelantan, dua (2) kes di Pahang, dua (2) kes di Johor dan satu (1) kes di Sabah. Malaysia mengalami beberapa episod jerebu merentas sempadan iaitu bermula pada 1 September 2023 hingga 20 Oktober 2023 di mana menyebabkan kualiti udara merosot di kawasan Lembah Klang, Negeri Sembilan, Melaka, Johor dan Sarawak. Bacaan IPU tertinggi yang direkodkan sepanjang tempoh jerebu tersebut adalah 174 di Batu Pahat, Johor. Sepanjang tempoh jerebu tersebut, stesen Cheras dan stesen Nilai telah mengalami keadaan kualiti udara yang tidak sihat yang paling lama selama 2 hari berturut-turut.

In 2023, Malaysia experienced a relatively severe hazy condition due to local and transboundary haze causing most places in Peninsular Malaysia and Sarawak to record unhealthy API readings. There were eight (8) fire cases involving peat land and landfill recorded for the year 2023, with three (3) cases in Kelantan, two (2) in Pahang, two (2) in Johor, and one (1) in Sabah. Malaysia encountered several transboundary haze episodes from 1<sup>st</sup> September 2023 to 20<sup>th</sup> October 2023, which caused air quality in Klang Valley, Negeri Sembilan, Melaka, Johor, and Sarawak areas to deteriorate. The highest API reading recorded during the haze period was 174 in Batu Pahat, Johor. During the haze period, Cheras and Nilai stations encountered the longest unhealthy air quality conditions for 2 consecutive days.



Rajah 1.3: Purata Indeks Pencemaran Udara (IPU) di Malaysia

Figure 1.3: The Average API in Malaysia

## Status Kualiti Udara Lembah Klang

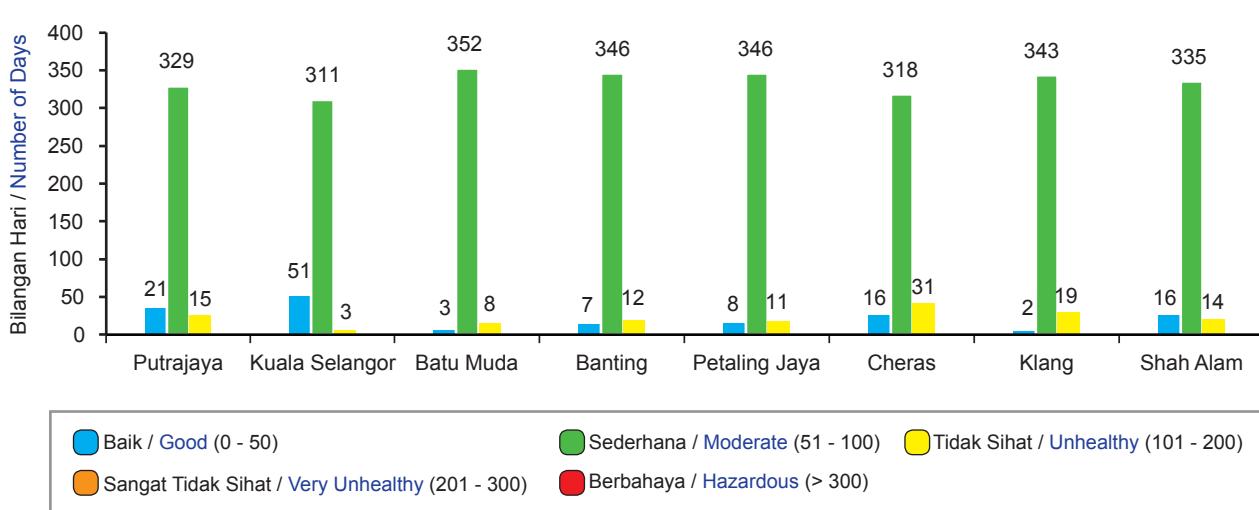
Pada tahun 2023, status kualiti udara di Lembah Klang menunjukkan semua stesen mencatatkan bacaan hari IPU sederhana yang lebih tinggi berbanding hari IPU baik. Status kualiti udara di Lembah Klang secara keseluruhannya ditunjukkan seperti di **Rajah 1.4**. Stesen Kuala Selangor mencatatkan bilangan hari IPU baik yang tertinggi di Lembah Klang iaitu 51 hari manakala Stesen Batu Muda, Kuala Lumpur mencatatkan bilangan hari IPU sederhana yang tertinggi iaitu 352 hari.

Stesen Cheras, Kuala Lumpur mencatatkan bilangan hari IPU tidak sihat yang tertinggi di Lembah Klang iaitu 31 hari diikuti oleh Stesen Klang (19 hari), Stesen Putrajaya (15 hari), Stesen Shah Alam (14 hari), Stesen Banting (12 hari), Stesen Petaling Jaya (11 hari), Stesen Batu Muda (8 hari) dan Stesen Kuala Selangor (3 hari) seperti yang ditunjukkan di dalam **Rajah 1.5**. Semua stesen di Lembah Klang merekodkan bacaan hari IPU yang tidak sihat bagi tahun 2023 disebabkan oleh keadaan berjerebu di dalam negara bagi tempoh yang tertentu. Peningkatan bahan pencemar  $PM_{2.5}$  seperti di Stesen Klang, pembentukan  $O_3$  daripada pelepasan asap kenderaan di kawasan trafik yang tinggi seperti di Stesen Cheras, Stesen Batu Muda, Kuala Lumpur,

## Klang Valley Air Quality Status

In 2023, the air quality status in the Klang Valley showed that all stations recorded higher 'moderate' daily API readings than 'good' daily API readings. The overall status of air quality in Klang Valley is shown in **Figure 1.4**. Kuala Selangor stations recorded the highest number of 'good' API readings in Klang Valley which was 51 days, while the Batu Muda Station, Kuala Lumpur recorded the highest number of 'moderate' API readings of 352 days.

The Cheras Station, Kuala Lumpur recorded the highest number of 'unhealthy' API readings in Klang Valley of 31 days, followed by Klang Station (19 days), Putrajaya Station (15 days), Shah Alam Station (14 days), Banting Station (12 days), Petaling Jaya Station (11 days), Batu Muda station (8 days) and Kuala Selangor Station (3 days) as shown in **Figure 1.5**. All stations in Klang Valley recorded 'unhealthy' daily API readings in the year 2023 due to the haze condition in the country for a certain period of time. The increase in pollutants  $PM_{2.5}$  in Klang Station, formation of  $O_3$  from vehicle emission in high traffic areas such as the Cheras Station, the Batu Muda Station, the Kuala Lumpur Shah Alam Station, and the Putrajaya Station, as well as the open burning in

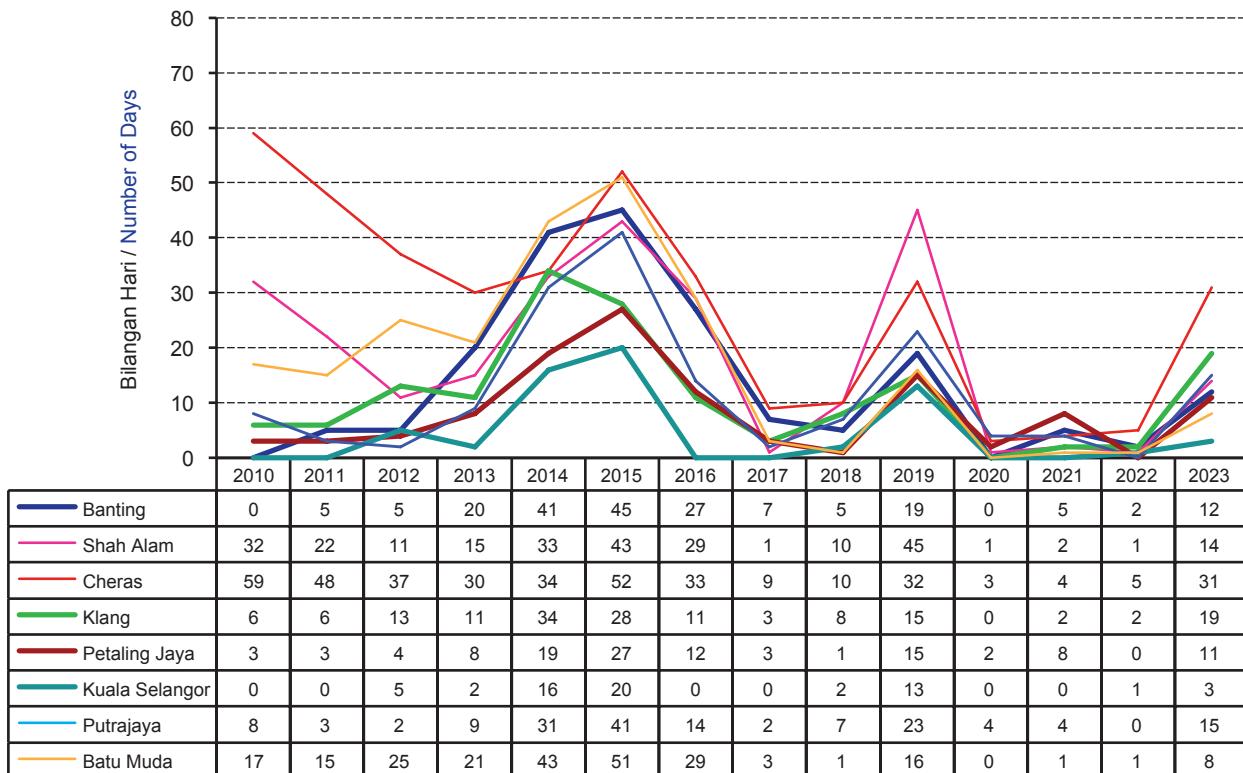


Rajah 1.4: Status Kualiti Udara, Lembah Klang 2023

Figure 1.4: Air Quality Status, Klang Valley 2023

Stesen Shah Alam dan Stesen Putrajaya dan aktiviti pembakaran terbuka di kawasan pertanian seperti di Stesen Banting dan Stesen Kuala Selangor adalah punca peningkatan bilangan hari IPU tidak sihat di Lembah Klang.

agriculture areas such as the Banting Station and Kuala Selangor may have caused the increase in the number of 'unhealthy' API days in Klang Valley.



Rajah 1.5: Bilangan Hari Tidak Sihat, Lembah Klang, 2010-2023  
Figure 1.5: Number of Unhealthy Days, Klang Valley 2010-2023

### Status Kualiti Udara Wilayah Utara

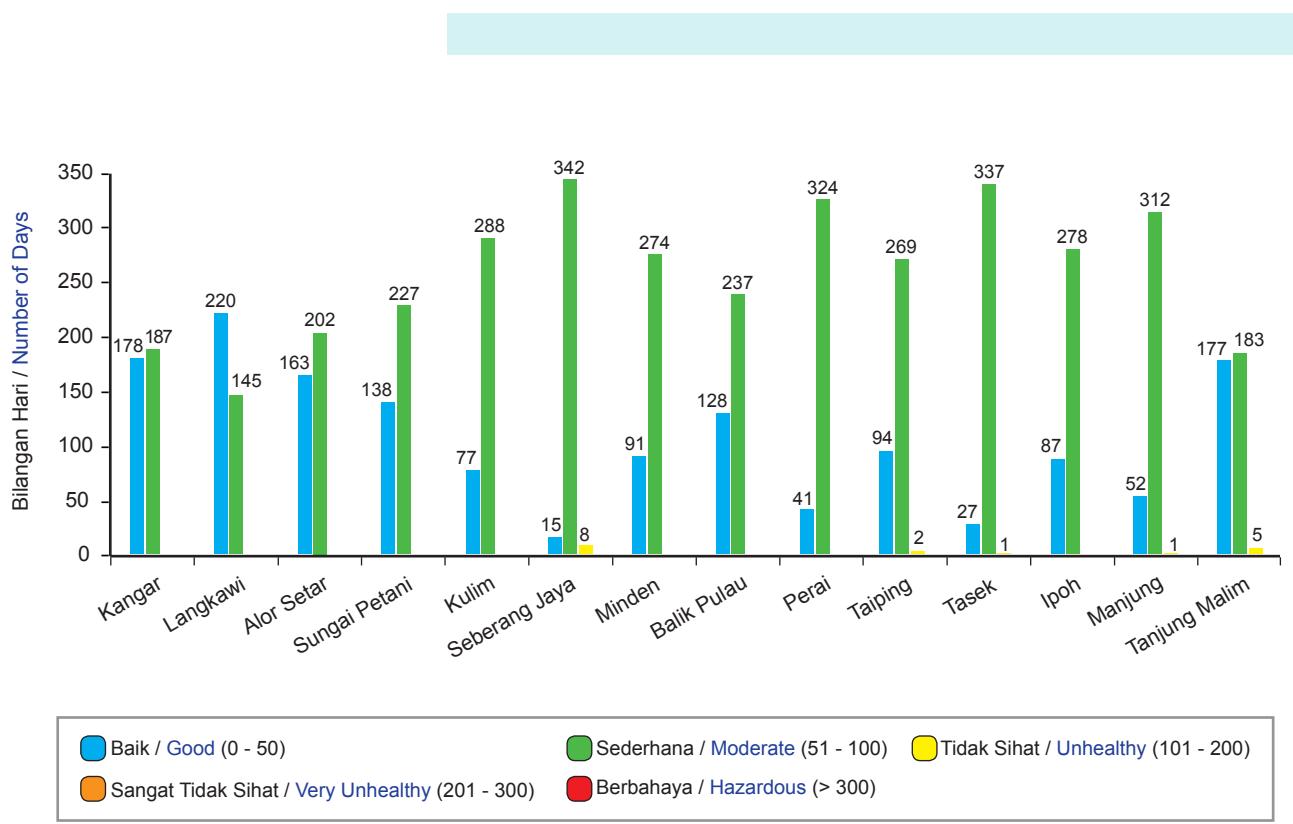
Secara keseluruhan, status kualiti udara di utara Pantai Barat Semenanjung Malaysia yang meliputi negeri Perlis, Kedah, Pulau Pinang dan Perak adalah pada tahap baik dan sederhana sepanjang masa. Stesen Langkawi, Kedah mencatatkan bacaan hari IPU baik yang lebih tinggi (220 hari) berbanding stesen-stesen yang lain manakala Stesen Seberang Jaya, Pulau Pinang mencatatkan bacaan hari IPU sederhana tertinggi iaitu 342 hari. Sebanyak lima (5) stesen mencatatkan bacaan hari IPU tidak sihat iaitu di Stesen Seberang Jaya, Pulau

### Northern Region Air Quality Status

Overall, the air quality status of the Northern region of the West Coast of Peninsular Malaysia which comprises the states of Perlis, Kedah, the State of Penang, and the State of Perak was at a 'good' to 'moderate' level at all times. The Langkawi Station, Kedah recorded a higher number of 'good' daily API readings (220 days) compared to other stations, while the Seberang Jaya Station, Penang recorded the highest number of 'moderate' daily API readings of 342 days. A total of five (5) stations recorded 'unhealthy' daily API readings,

Pinang (8 hari), Stesen Tanjung Malim, Perak (5 hari), Stesen Taiping, Perak (2 hari) dan Stesen Tasek, Perak serta di Stesen Manjung, Perak yang masing-masing merekodkan satu (1) hari bacaan IPU yang tidak sihat sepanjang tahun 2023 disebabkan oleh zarah halus daripada kejadian jerebu dan peningkatan bahan pencemar ozon daripada pelepasan asap kenderaan bermotor. Status kualiti udara keseluruhan bagi wilayah utara di Pantai Barat Semenanjung Malaysia adalah seperti yang ditunjukkan di dalam **Rajah 1.6**.

namely the Seberang Jaya Station, Penang (8 days), the Tanjung Malim Station, Perak (5 days), the Taiping Station, Perak (2 days) and the Tasek Station, Perak as well as at the Manjung Station, Perak which recorded one (1) unhealthy API day reading throughout the year 2023. This is due to fine particles from haze and an increase of ozone pollutants from motor vehicle emissions. The overall air quality status for the northern region of the West Coast of Peninsular Malaysia is shown in **Figure 1.6**.



Rajah 1.6: Status Kualiti Udara, Wilayah Utara Pantai Barat Semenanjung Malaysia, 2023

Figure 1.6: Air Quality Status, Northern Region of The West Coast of Peninsular Malaysia, 2023

### Status Kualiti Udara Wilayah Selatan

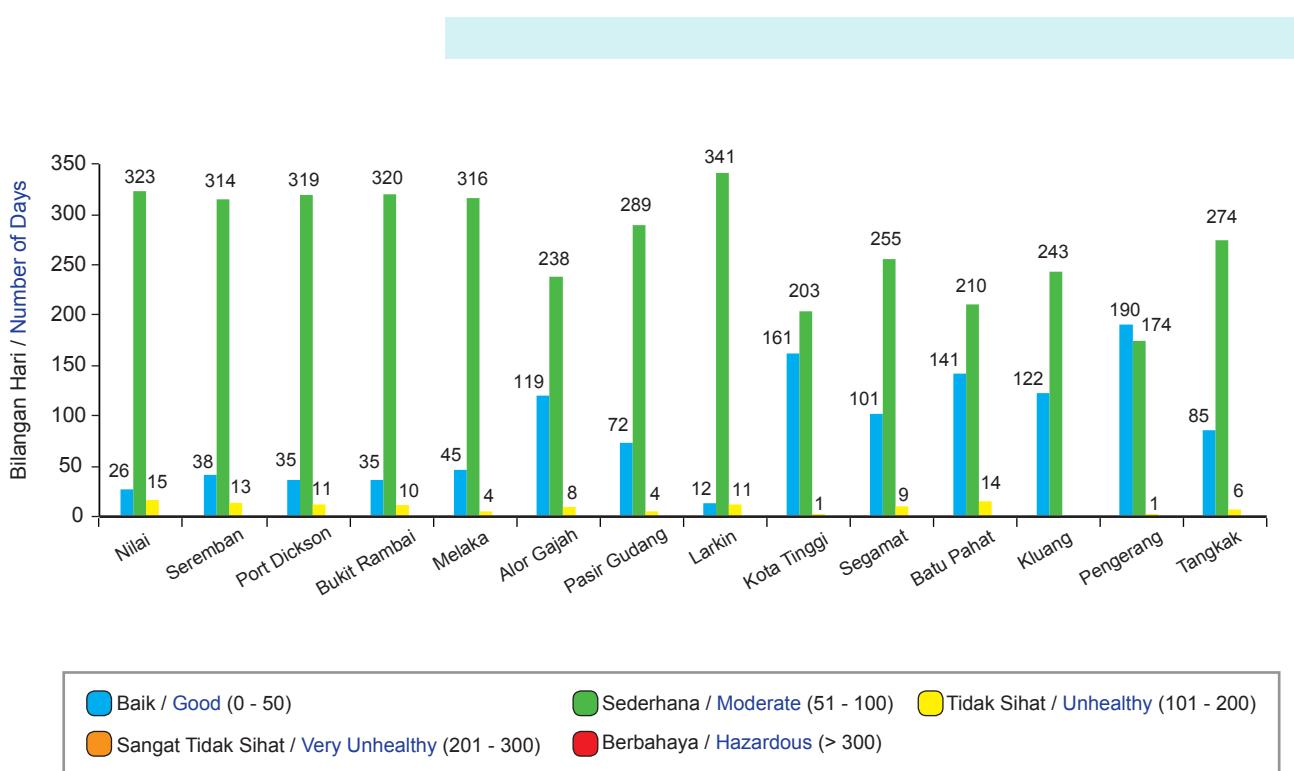
Kualiti udara di Wilayah Selatan Pantai Barat Semenanjung Malaysia meliputi Negeri Sembilan, Negeri Melaka dan Negeri Johor adalah berada pada tahap IPU baik dan sederhana sepanjang masa. Stesen Penggerang, Johor mencatatkan bilangan bacaan hari IPU baik yang tertinggi iaitu 190 hari

### Southern Region Air Quality Status

The air quality in the Southern Region of the West Coast of Peninsular Malaysia comprising Negeri Sembilan, Melaka and Johor had 'good' to 'moderate' API readings at all times. The Pengerang Station, Johor recorded the highest number of 'good' daily API readings of 190 days while the Larkin Station, Johor recorded the highest

manakala Stesyen Larkin, Johor mencatatkan bacaan hari IPU sederhana tertinggi iaitu 341 hari. Manakala Semua stesen mencatatkan bacaan hari IPU yang tidak sihat kecuali Kluang Johor. Kawasan yang merekodkan bacaan IPU tidak sihat tertinggi adalah di Nilai, Negeri Sembilan (15 hari) diikuti oleh Batu Pahat, Johor (14 hari), Seremban, Negeri Sembilan (13 hari), Port Dickson, Negeri Sembilan dan Larkin, Johor (11 hari), Bukit Rambai, Melaka (10 hari), Segamat, Johor (9 hari), Alor Gajah, Melaka (8 hari), Tangkak, Johor (6 hari), Bandaraya Melaka dan Pasir Gudang, Johor (4 hari) serta Kota Tinggi dan Pengerang, Johor (1 hari). Peningkatan bacaan hari IPU yang tidak sihat ini adalah disebabkan oleh kejadian jerebu setempat dan jerebu merentas sempadan akibat daripada aktiviti pembakaran hutan dan kawasan pertanian di samping pembentukan O<sub>3</sub> di udara daripada kepadatan trafik yang tinggi. Status kualiti udara secara keseluruhan bagi wilayah selatan di Pantai Barat Semenanjung Malaysia adalah seperti yang ditunjukkan di dalam **Rajah 1.7**.

'moderate' daily API readings of 341 days. Meanwhile, all stations recorded 'unhealthy' daily API readings except the Kluang Station, Johor. The areas that recorded the highest 'unhealthy' daily API readings were in Nilai, Negeri Sembilan (15 days) followed by Batu Pahat, Johor (14 days), Seremban, Negeri Sembilan (13 days), Port Dickson, Negeri Sembilan and Larkin, Johor (11 days), Bukit Rambai, Melaka (10 days), Segamat, Johor (9 days), Alor Gajah, Melaka (8 days), Tangkak, Johor (6 days), Malacca City and Pasir Gudang, Johor (4 days) and Kota Tinggi and Pengerang, Johor (1 day). The increase in 'unhealthy' daily API readings was due to the occurrence of local and transboundary haze caused by the burning of forest and agriculture apart from the formation of O<sub>3</sub> in the air from high traffic density. The overall air quality status for the Southern Region of the West Coast of Peninsular Malaysia is as shown in **Figure 1.7**.



Rajah 1.7: Status Kualiti Udara, Wilayah Selatan Pantai Barat Semenanjung Malaysia, 2023  
Figure 1.7: Air Quality Status, Southern Region of The West Coast of Peninsular Malaysia, 2023



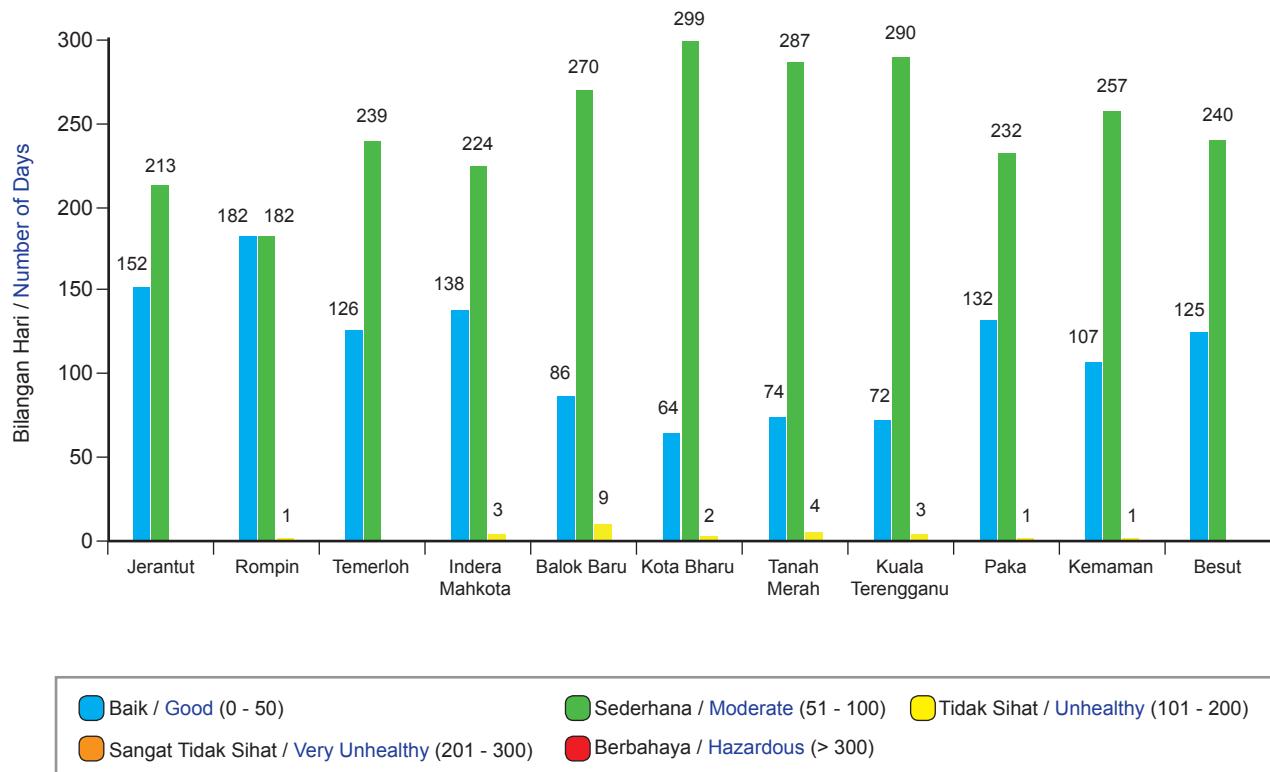
Kuala Terengganu

### Status Kualiti Udara Di Pantai Timur

Kualiti udara di Pantai Timur Semenanjung Malaysia yang merangkumi negeri Pahang, Terengganu dan Kelantan bagi tahun 2023 berstatus baik dan sederhana pada kebanyakan masa. Stesen Rompin, Pahang mencatatkan bilangan bacaan hari IPU baik tertinggi iaitu 182 hari dan Stesen Kota Bharu, Kelantan merekodkan bacaan hari IPU sederhana tertinggi iaitu 299 hari. Tujuh (7) stesen mencatatkan status kualiti udara tidak sihat yang disebabkan oleh peningkatan kepekatan  $PM_{2.5}$  akibat kebakaran hutan dan belukar di kawasan setempat iaitu Stesen Tanah Merah, Kelantan (4 hari), Stesen Indera Mahkota, Pahang dan Stesen Kuala Terengganu, Terengganu masing-masing tiga (3) hari, Stesen Kota Bharu, Kelantan (2 hari) dan Stesen Rompin, Pahang, Stesen Paka dan Stesen Kemaman, Terengganu masing-masing satu (1) hari. Manakala Stesen Balok Baru, Pahang mencatatkan sembilan (9) hari bacaan IPU yang tidak sihat akibat daripada peningkatan bacaan gas sulfur dioksida daripada kawasan perindustrian yang berhampiran. Status kualiti udara di Pantai Timur Semenanjung Malaysia secara keseluruhan adalah seperti di **Rajah 1.8**.

### East Coast Air Quality Status

The air quality on the East Coast of Peninsular Malaysia which comprises the states of Pahang, Terengganu, and Kelantan for the year 2023 was 'good' to 'moderate' at all times. The Rompin Station, Pahang recorded the highest number of 'good' daily API readings which was 182 days, and the Kota Bharu Station, Kelantan recorded the highest 'average' daily API readings of 299 days. Seven (7) stations recorded an 'unhealthy' air quality status caused by the increase of  $PM_{2.5}$  concentrations due to forest and bush fires in the local area, namely the Tanah Merah Station, Kelantan (4 days), the Indera Mahkota Station, Pahang and the Station Kuala Terengganu, Terengganu three (3) days each, the Kota Bharu Station, Kelantan (2 days) and the Rompin Station, Pahang, the Paka Station, and the Kemaman Station, Terengganu one (1) day each. Meanwhile, the Balok Baru Station, Pahang recorded nine (9) days of unhealthy API readings due to the increase of sulphur dioxide gas from nearby industrial areas. The overall air quality status on the East Coast of Peninsular Malaysia is shown in **Figure 1.8**.



Rajah 1.8: Status Kualiti Udara, Pantai Timur Semenanjung Malaysia, 2023

Figure 1.8: Air Quality Status, East Coast of Peninsular Malaysia, 2023

### Status Kualiti Udara di Sabah, Wilayah Persekutuan Labuan Dan Sarawak

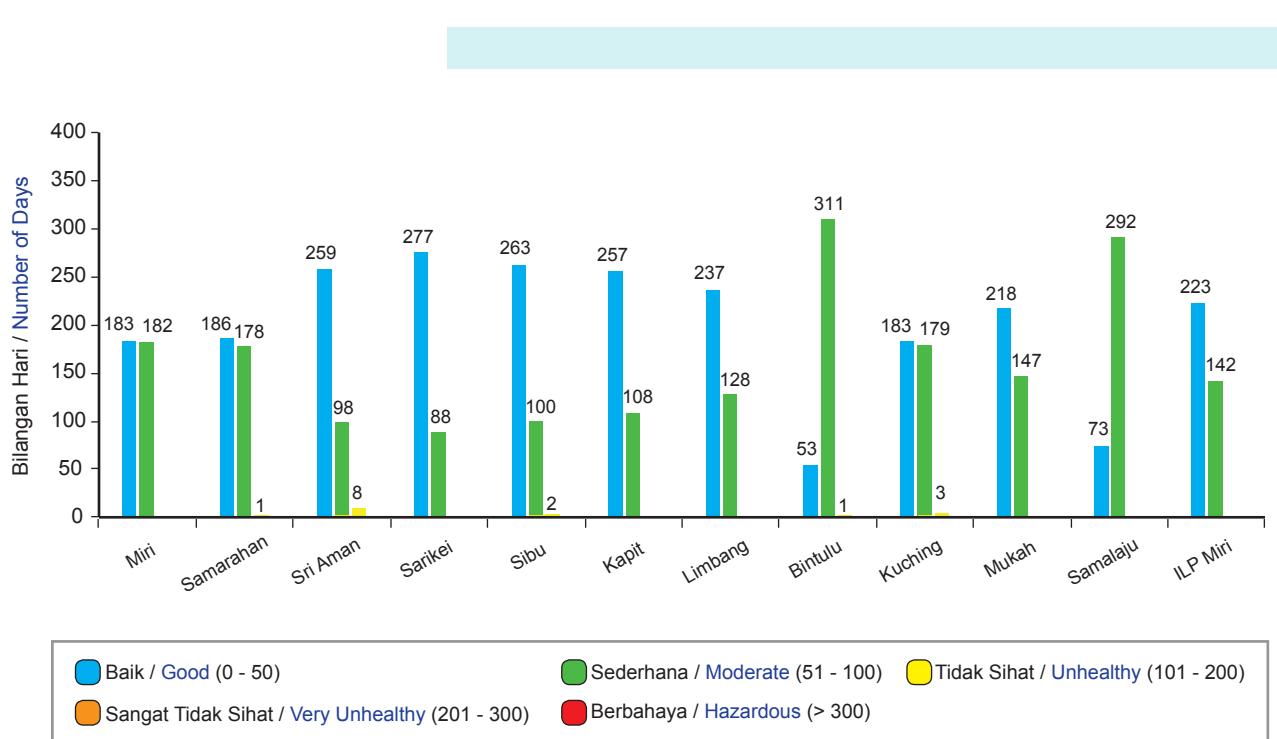
Kualiti udara di Sabah, Wilayah Persekutuan Labuan dan Sarawak adalah pada tahap baik dan sederhana sepanjang masa bagi tahun 2023. Stesen Sarikei merekodkan bacaan hari IPU baik yang paling tinggi di Sarawak iaitu 277 hari dan Stesen Kimanis merekodkan bacaan hari IPU baik yang tertinggi di Sabah iaitu 322 hari. Manakala bagi Stesen Labuan, bacaan hari IPU baik lebih tinggi dicatatkan iaitu 213 hari berbanding dengan bacaan hari IPU sederhana iaitu 152 hari. Terdapat lima (5) stesen di Sarawak yang mencatatkan bacaan tidak sihat bagi tahun 2023 iaitu Stesen Sri Aman (8 hari), Stesen Kuching (3 hari), Stesen Sibu (2 hari)

### Sabah, Federal Territory Labuan and Sarawak Air Quality Status

The air quality in Sabah, Federal Territory Labuan and Sarawak was at 'good' to 'moderate' at all times for the year 2023. The Sarikei Station recorded the highest number of 'good' daily API readings of 277 days in Sarawak and the Kimanis Station recorded the highest number of 'good' daily API readings in Sabah at 322 days. Meanwhile, for the Labuan Station, the number of good daily API readings (213 days) was higher compared to the 'moderate' daily API readings of 152 days. There were five (5) stations in Sarawak that recorded 'unhealthy' readings for 2023, namely the Sri Aman Station (8 days), the Kuching Station (3 days),

serta Stesen Bintulu dan Stesen Samarahan (1 hari) yang disebabkan oleh peningkatan kepekatan  $PM_{2.5}$  akibat kebakaran hutan dan belukar di kawasan setempat. Status kualiti udara di Sarawak secara keseluruhan ditunjukkan dalam **Rajah 1.9** dan di Sabah dan Wilayah Persekutuan Labuan ditunjukkan dalam **Rajah 1.10**.

the Sibu Station (2 days) as well as the Bintulu Station and Samarahan Station (1 day) caused by the increase of  $PM_{2.5}$  concentration due to forest and bush fires in the local area. The overall air quality status in Sarawak is shown in **Figure 1.9** and in Sabah and Federal Territory of Labuan is shown in **Figure 1.10**.



Rajah 1.9: Status Kualiti Udara, Sarawak, 2023

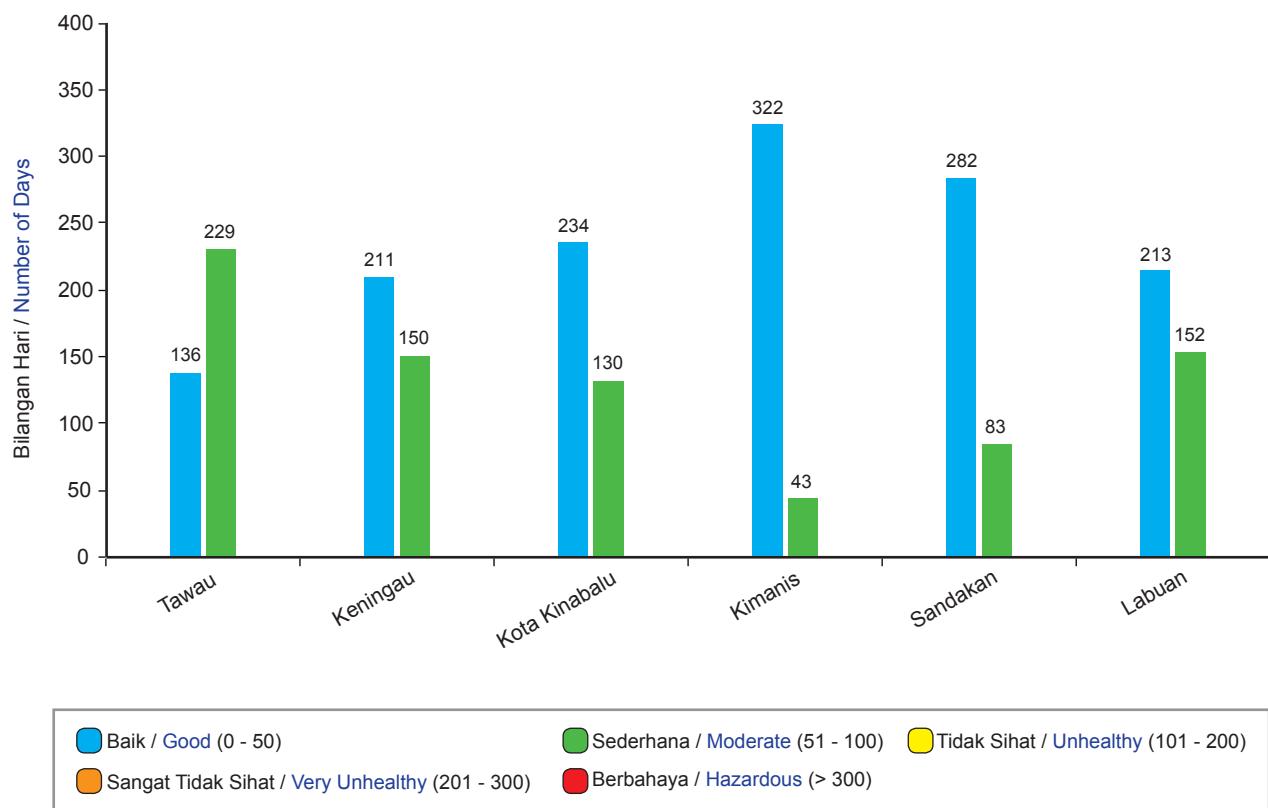
Figure 1.9: Air Quality Status, Sarawak, 2023



Stesen Sibu / Sibu Station



Stesen Bintulu / Bintulu Station



Rajah 1.10: Status Kualiti Udara, Sabah dan Wilayah Persekutuan Labuan, 2023

Figure 1.10: Air Quality Status, Sabah and Federal Territory Labuan, 2023

## TREN KUALITI UDARA

Enam (6) pencemar udara iaitu zarah halus bersaiz 10 mikron ( $PM_{10}$ ), zarah halus 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 lokasi. Parameter  $PM_{2.5}$  mula dipantau pada tahun 2018. Tren kualiti udara dari tahun 2010 hingga 2023 ditentukan dengan mengambilkira purata data kualiti udara tahunan daripada stesen-stesen pengawasan dan merujuk kepada Standard Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Jadual 1.2**. Bagi tahun 2023, Standard Kualiti Udara Ambien Malaysia IT-2 digunakan.

## AIR QUALITY TRENDS

There are six (6) air pollutants namely fine particles with a size of 10 microns ( $PM_{10}$ ), fine particles with a size of 2.5 microns ( $PM_{2.5}$ ), ground-level ozone ( $O_3$ ), sulphur dioxide ( $SO_2$ ), nitrogen dioxide ( $NO_2$ ) and carbon monoxide (CO) that are continuously monitored at 65 locations. The  $PM_{2.5}$  parameter has been monitored since the year 2018. The air quality trend from 2010 to 2023 is established by taking into consideration the average annual air quality data from monitoring stations and referring to the Malaysian Ambient Air Quality Standard as shown in **Table 1.2**. For the year 2023, Malaysian Ambient Air Quality Standard IT-2 is used.

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

PARAMETER	MASA PURATA / TIME AVERAGING	UNIT	GARIS PANDUAN SEDIA ADA / EXISTING GUIDELINES	STANDARD KUALITI UDARA AMBIEN MALAYSIA / MALAYSIAN AMBIENT AIR QUALITY		
				IT-1 (2015)	IT-2 (2018)	IT-3 (2020)
PM <sub>10</sub>	1 Tahun	µg/m <sup>3</sup>	50	50	45	40
	24 Jam	µg/m <sup>3</sup>	150	150	120	100
PM <sub>2.5</sub>	1 Tahun	µg/m <sup>3</sup>	-	35	25	15
	24 Jam	µg/m <sup>3</sup>	-	75	50	35
SO <sub>2</sub>	1 Jam	µg/m <sup>3</sup>	350	350	300	250
		ppm	0.135	0.135	0.115	0.095
	24 Jam	µg/m <sup>3</sup>	105	105	90	80
		ppm	0.040	0.040	0.035	0.030
*CO	1 Jam	mg/m <sup>3</sup>	35	35	35	30
		ppm	30.6	30.6	30.6	26.2
	8 Jam	mg/m <sup>3</sup>	10	10	10	10
		ppm	8.75	8.75	8.75	8.75
NO <sub>2</sub>	1 Jam	µg/m <sup>3</sup>	320	320	300	280
		ppm	0.170	0.170	0.160	0.150
	24 Jam	µg/m <sup>3</sup>	75	75	75	70
		ppm	0.040	0.040	0.040	0.037
O <sub>3</sub>	1 Jam	µg/m <sup>3</sup>	200	200	200	180
		ppm	0.100	0.100	0.100	0.090
	8 Jam	µg/m <sup>3</sup>	120	120	120	100
		ppm	0.060	0.060	0.060	0.050

Nota: \*mg/m<sup>3</sup> IT-Interim Tier (tahun)

Note: \*mg/m<sup>3</sup> IT-Interim Tier (year)

### Zarah Halus (PM<sub>10</sub>)

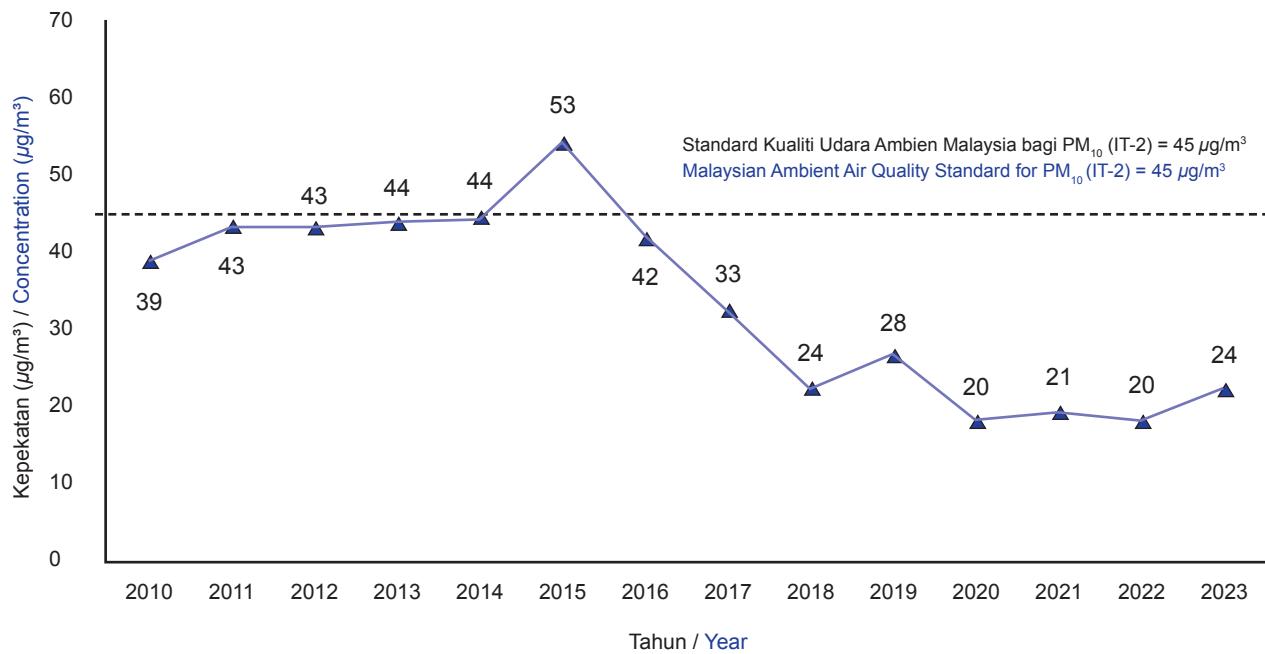
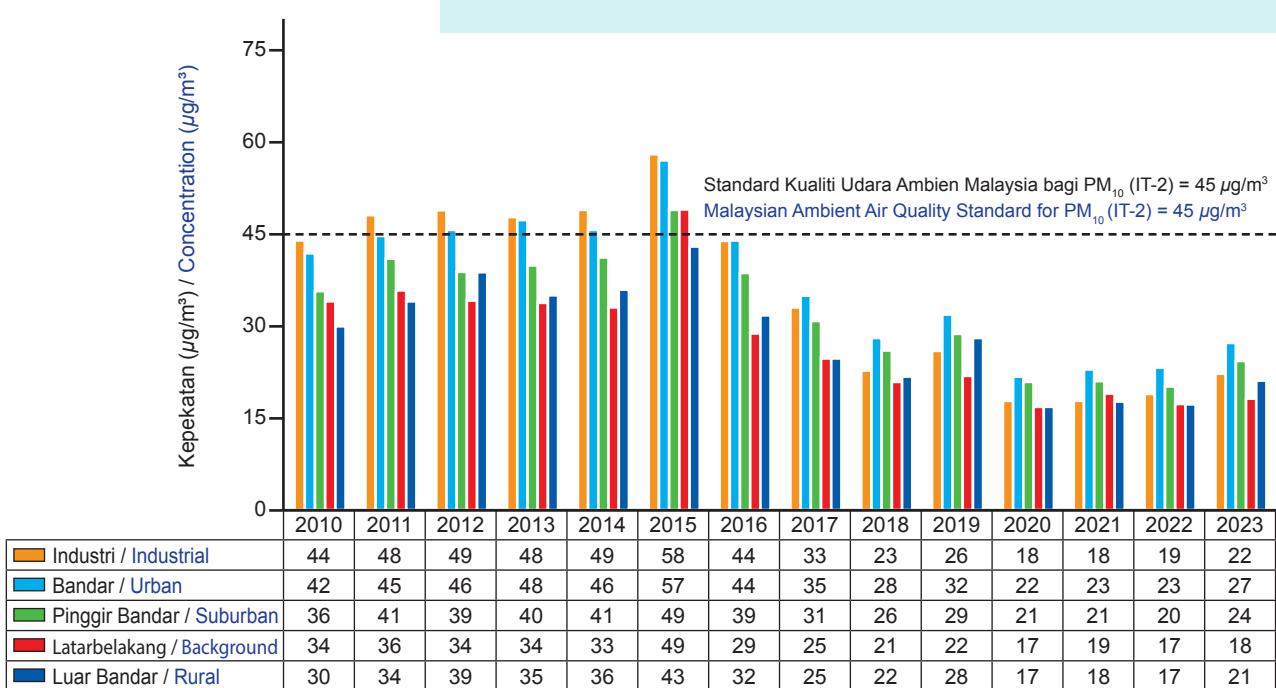
Tren purata kepekatan tahunan parameter PM<sub>10</sub> dalam udara ambien bagi tahun 2010 hingga tahun 2023 adalah seperti yang ditunjukkan dalam **Rajah 1.11**. Pada tahun 2023, nilai purata kepekatan tahunan PM<sub>10</sub> dalam udara ambien adalah 24 µg/m<sup>3</sup> iaitu lebih rendah berbanding yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu 45 µg/m<sup>3</sup>. Purata kepekatan PM<sub>10</sub> bagi tahun 2023 menunjukkan peningkatan berbanding tahun sebelumnya.

Berdasarkan kategori guna tanah, kawasan bandar merekodkan purata kepekatan PM<sub>10</sub> yang lebih tinggi berbanding kawasan yang lain seperti yang ditunjukkan dalam **Rajah 1.12**. Keadaan cuaca yang panas dan kering sepanjang tahun telah menyebabkan peningkatan aktiviti pembakaran terbuka dan bilangan titik panas dan menyebabkan peningkatan kepekatan PM<sub>10</sub> berbanding tahun 2022.

### Fine Particles (PM<sub>2.5</sub>)

The trend of the annual average concentration of PM<sub>10</sub> parameters in the ambient air for the years 2010 to 2023 is as shown in **Figure 1.11**. In the year 2023, the average annual concentration of PM<sub>10</sub> in ambient air was 24 µg/m<sup>3</sup> which is lower than the Malaysia Ambient Air Quality Standard for IT-2 which is 45 µg/m<sup>3</sup>. The average concentration of PM<sub>10</sub> for the year 2023 shows an increase compared to the previous year.

Based on the land use category, urban areas recorded a higher average concentration of PM<sub>10</sub> than other areas as shown in **Figure 1.12**. The hot and dry weather conditions throughout the year have caused an increase in open burning activities and the number of hot spots thus resulting in an increase in the concentration of PM<sub>10</sub> as compared to 2022.

Rajah 1.11: Purata Kepelbagaian Tahunan Zaraf Halus (PM<sub>10</sub>), 2010-2023Figure 1.11: Annual Average Concentration of Fine Particles (PM<sub>10</sub>), 2010-2023Rajah 1.12: Purata Kepelbagaian Tahunan Zaraf Halus (PM<sub>10</sub>) Mengikut Guna Tanah, 2010-2023Figure 1.12: Annual Average Concentration of Fine Particles (PM<sub>10</sub>) Based on Land Used, 2010-2023

## Zarah Halus ( $PM_{2.5}$ )

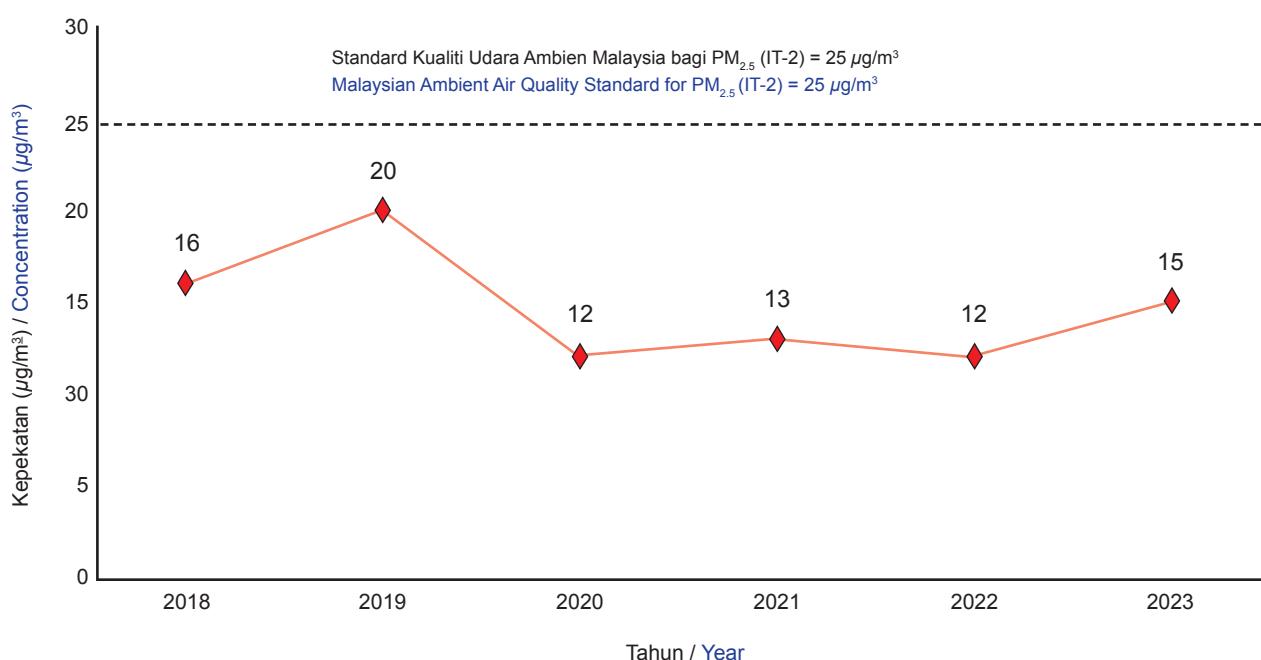
Pengukuran dan analisa parameter  $PM_{2.5}$  telah bermula pada pertengahan tahun 2017 dan mula dilaporkan di dalam Laporan Kualiti Sekeliling bermula pada tahun 2018. Nilai purata tahunan  $PM_{2.5}$  dalam udara ambien bagi tahun 2023 adalah  $15 \mu\text{g}/\text{m}^3$  iaitu lebih tinggi dari tahun 2022. Nilai purata ini tidak melebihi had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu sebanyak  $25 \mu\text{g}/\text{m}^3$  seperti yang ditunjukkan di dalam **Rajah 1.13**.

Berdasarkan kategori guna tanah, nilai purata kepekatan tahunan  $PM_{2.5}$  tertinggi adalah di kawasan bandar iaitu  $19 \mu\text{g}/\text{m}^3$  dan diikuti dengan kawasan pinggir bandar ( $15 \mu\text{g}/\text{m}^3$ ), industri dan pendalaman masing-masing  $13 \mu\text{g}/\text{m}^3$  seperti yang ditunjukkan dalam **Rajah 1.14**. Peningkatan kepekatan  $PM_{2.5}$  di udara adalah disebabkan oleh pembakaran bahan bakar daripada kenderaan, aktiviti kerja tanah dan kegiatan pembakaran terbuka perladangan dan tapak pelupusan sampah.

## Fine Particles ( $PM_{2.5}$ )

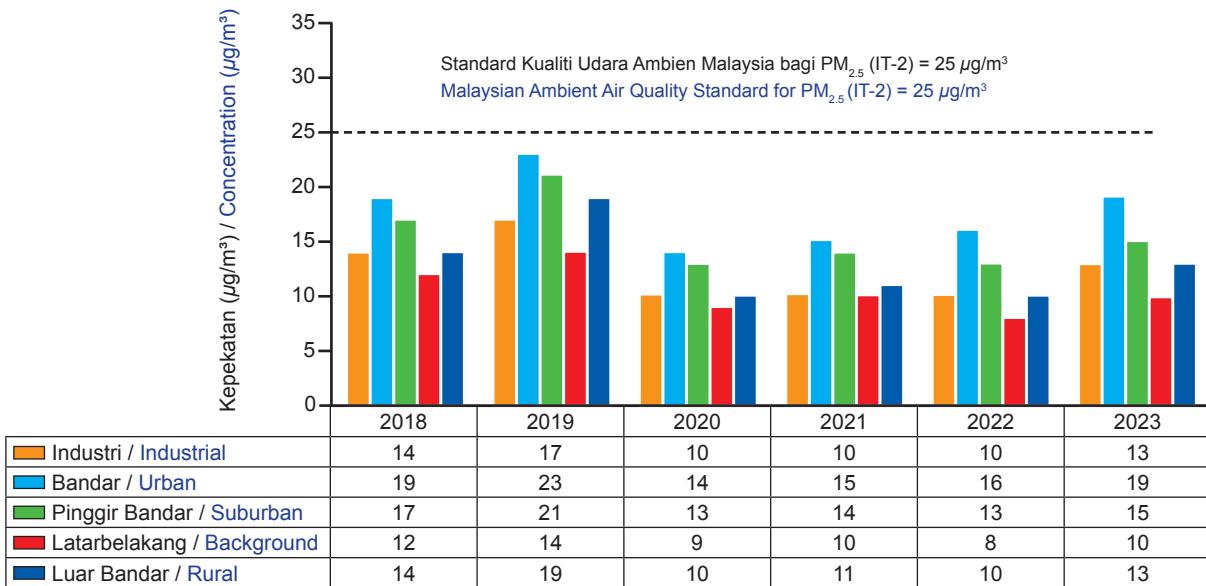
Measurement and analysis of  $PM_{2.5}$  parameters began in the middle of 2017 and began to be reported in the Environmental Quality Report in 2018. The annual average value of  $PM_{2.5}$  in the ambient air for the year 2023 was  $15 \mu\text{g}/\text{m}^3$ , higher than the year 2022. This average value does not exceed the limit set in the Malaysian Ambient Air Quality Standard for IT-2 which is  $25 \mu\text{g}/\text{m}^3$  as shown in **Figure 1.13**.

Based on the land use category, the highest annual concentration value for  $PM^{10}$  was in urban areas which was  $19 \mu\text{g}/\text{m}^3$  followed by the sub-urban areas ( $15 \mu\text{g}/\text{m}^3$ ), industrial and rural areas  $13 \mu\text{g}/\text{m}^3$  each as shown in **Figure 1.14**. The increase in the concentration of  $PM^{2.5}$  in air is caused by fuel burning from vehicles, as well as earthworks, and open burning activities in plantations and landfills.



Rajah 1.13: Purata Kepekatan Tahunan Zarah Halus ( $PM_{2.5}$ ), 2018-2023

Figure 1.13: Annual Average Concentration of Fine Particles ( $PM_{2.5}$ ), 2018-2023



Rajah 1.14: Purata Kepekatan Tahunan Zarah Halus ( $PM_{2.5}$ ) Mengikut Guna Tanah, 2018-2023

Figure 1.14: Annual Average Concentration of Fine Particles ( $PM_{2.5}$ ) Based on Land Use, 2018-2023

### Ozon ( $O_3$ ) di Permukaan Bumi

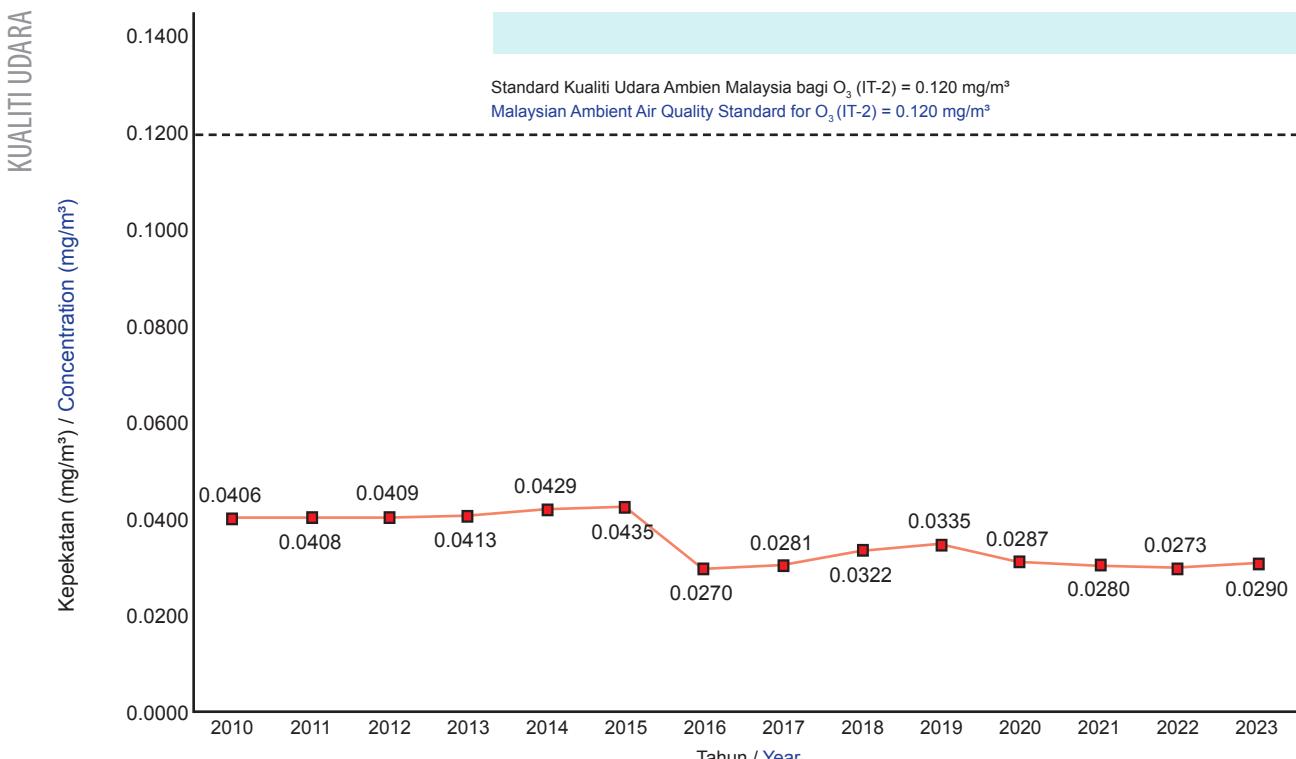
Pada tahun 2023, purata tahunan kepekatan maksimum harian  $O_3$  di permukaan bumi didapati lebih tinggi berbanding dengan tahun 2022 dengan bacaan  $0.0290 \text{ mg/m}^3$ . Secara keseluruhannya, tren purata tahunan kepekatan maksimum ozon bagi tempoh lapan (8) jam dalam udara ambien adalah mematuhi had sebanyak  $0.120 \text{ mg/m}^3$  seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2 (**Rajah 1.15**).

**Rajah 1.16** menunjukkan kepekatan  $O_3$  permukaan bumi untuk pelbagai kategori guna tanah dari tahun 2010 hingga 2023. Bermula tahun 2018, tiada pemantauan  $O_3$  dilakukan di kawasan industri kerana memberi keutamaan pemantauan  $O_3$  di kawasan bandar. Kawasan bandar mencatatkan bacaan  $O_3$  lebih tinggi disebabkan oleh jumlah trafik yang padat dan keadaan atmosfera yang sesuai bagi pembentukan  $O_3$ . Peningkatan bacaan  $O_3$  permukaan bumi juga ketara di beberapa kawasan pinggir bandar disebabkan oleh pergerakan angin yang membawa pencetus pencemar ozon iaitu nitrogen oksida ( $NO_x$ ) dan sebatian organik meruap (VOC) yang kebanyakannya dilepaskan daripada kenderaan bermotor dan industri.

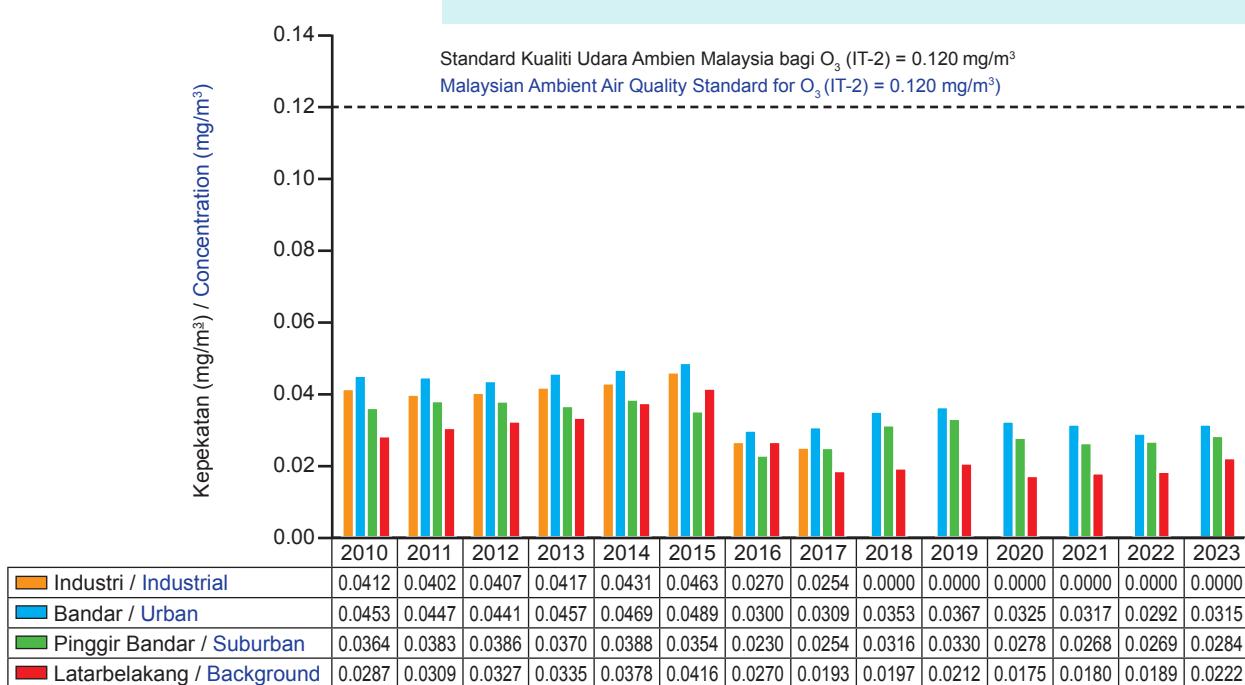
### Ground Level Ozone ( $O_3$ )

In 2023, the annual average daily maximum concentration of ground-level  $O_3$  was found to be higher compared to 2022 with a reading of  $0.0290 \text{ mg/m}^3$ . Overall, the annual average trend for the maximum concentration of ozone for a period of eight (8) hours in the ambient air is in compliance with the limit of  $0.120 \text{ mg/m}^3$  as stipulated in the Malaysian Ambient Air Quality Standard IT-2 (**Figure 1.15**).

**Figure 1.16** shows the concentration of ground-level  $O_3$  for various categories of land use from the year 2010 until 2023. Starting in 2018, no  $O_3$  monitoring has been carried out in industrial areas due to the priority for  $O_3$  monitoring being given to urban areas. Urban areas recorded higher  $O_3$  readings due to the traffic density and atmospheric conditions which are suitable for the formation of  $O_3$ . The increase in ground-level  $O_3$  readings is also significant in some suburban areas due to the movement of the wind that carries ozone pollutant pre-cursors which are nitrogen oxides ( $NO_x$ ) and volatile organic compounds (VOCs) mostly released from motor vehicles and industry.



Rajah 1.15: Purata Kepekatan Tahunan Ozon Permukaan Bumi ( $O_3$ ), 2010-2023  
Figure 1.15: Annual Average Concentration of Ground Level Ozone ( $O_3$ ), 2010-2023



Rajah 1.16: Purata Kepekatan Tahunan Permukaan Bumi Ozon ( $O_3$ ), Mengikut Guna Tanah 2010-2023  
Figure 1.16: Annual Average Concentration of Ground Level Ozone ( $O_3$ ) Based on Land Use, 2010-2023

## Sulfur Dioksida ( $\text{SO}_2$ )

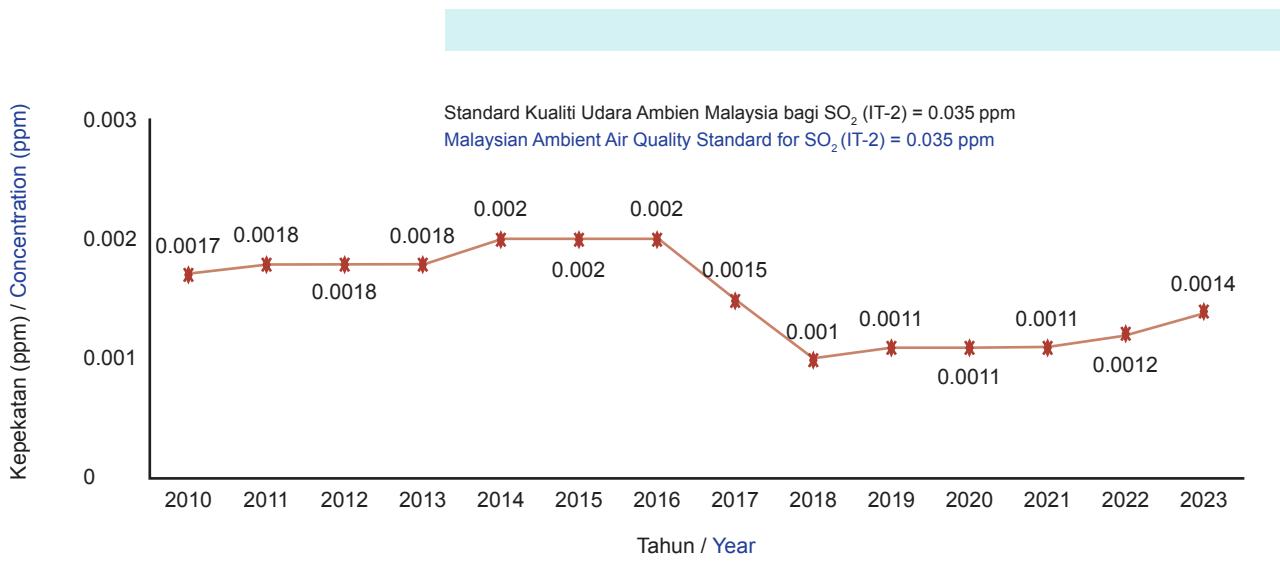
Purata kepekatan tahunan  $\text{SO}_2$  yang direkodkan pada tahun 2023 adalah 0.0014 ppm lebih tinggi dibandingkan dengan tahun 2022 iaitu 0.0013 ppm. Walaubagaimanapun, bacaan ini di bawah had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2 iaitu 0.035 ppm (**Rajah 1.17**). JAS dan beberapa agensi berkaitan telah melaksanakan beberapa strategi dalam mengawal  $\text{SO}_2$  di Malaysia. Antara strategi tersebut adalah menggalakkan penggunaan bahan api yang lebih bersih dan menggalakkan penggunaan gas asli dalam proses industri dan kenderaan. Mulai Januari 2020, bahan api petrol EURO4M RON95 yang mengandungi kandungan sulfur kurang dari 50 mg/l telah dilaksanakan dan pada 1 April 2021, EURO5 Diesel yang mengandungi kandungan sulfur kurang dari 10 mg/l pula telah diperkenalkan di pasaran.

**Rajah 1.18** menunjukkan kepekatan purata tahunan bagi  $\text{SO}_2$  mengikut kategori guna tanah. Berdasarkan kepada rajah tersebut, menunjukkan bahawa kepekatan  $\text{SO}_2$  di kawasan-kawasan industri, bandar dan pinggir bandar pada tahun 2023 adalah lebih tinggi berbanding dengan tahun 2022. Ini menunjukkan bahawa pelepasan gas daripada industri dan peningkatan bilangan kenderaan di jalan raya memberi kesan kepada peningkatan  $\text{SO}_2$  di udara.

## Sulfur Dioxide ( $\text{SO}_2$ )

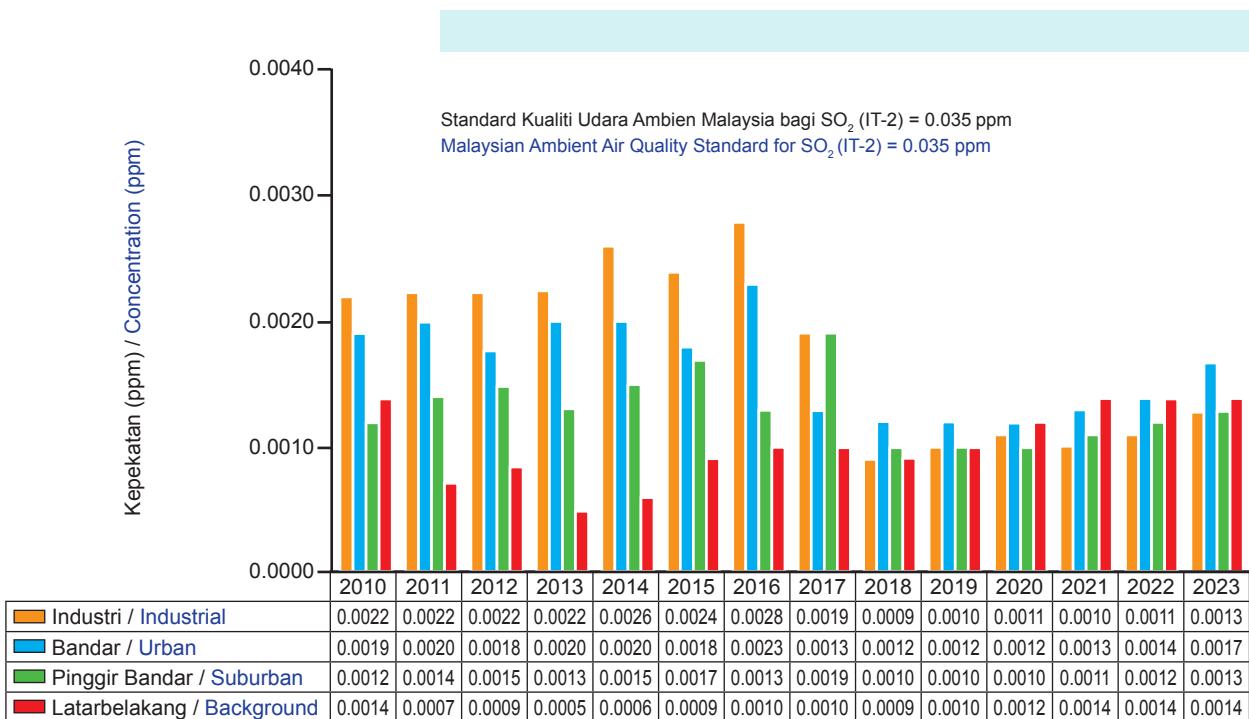
The average annual concentration of  $\text{SO}_2$  recorded in the year 2023 was 0.0014 ppm which was higher than in the year 2022 which was 0.0013 ppm. However, this reading is below the limit set in the Malaysian Ambient Air Quality Standard IT-2 which is 0.035 ppm (**Figure 1.17**). The DOE and other related agencies have implemented strategies for controlling  $\text{SO}_2$  in Malaysia. Encouraging the use of cleaner fuel and encouraging the use of natural gas in industrial processes and vehicles are among the strategies used. Since January 2020, petrol fuel EURO4M RON95 containing sulphur content less than 50 mg/l has been implemented, and on 1<sup>st</sup> April 2021, EURO5 Diesel which contains sulphur less than 10 mg/l has been introduced in the market.

**Figure 1.18** shows the annual average concentration of  $\text{SO}_2$  according to land use categories. Based on the figure, it shows that in the year 2023, the  $\text{SO}_2$  concentration in industrial estates, urban and sub-urban areas was higher than in the year 2022. This shows that the gas emissions from industries and the increase in the number of vehicles have an impact on the increase of  $\text{SO}_2$  in the air.



Rajah 1.17: Purata Kepekatan Tahunan Sulfur Dioksida ( $\text{SO}_2$ ), 2010-2023

Figure 1.17: Annual Average Concentration of Sulphur Dioxide ( $\text{SO}_2$ ), 2010-2023

Rajah 1.18: Purata Kepekatan Tahunan Sulfur Dioksida (SO<sub>2</sub>) Mengikut Guna Tanah, 2010-2023Figure 1.18: Annual Average Concentration of Sulfur Dioxide (SO<sub>2</sub>) Based on Land Use, 2010-2023

### Nitrogen Dioksida (NO<sub>2</sub>)

Pada tahun 2023, kepekatan purata tahunan NO<sub>2</sub> adalah lebih tinggi dibandingkan dengan tahun 2022 iaitu dengan bacaan 0.0065 ppm dan jauh berada di bawah had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2 seperti yang ditunjukkan di dalam **Rajah 1.19**. Kepekatan NO<sub>2</sub> tinggi di kawasan bandar seperti yang ditunjukkan di dalam **Rajah 1.20**. Ini mungkin berpunca daripada pelepasan asap kenderaan bermotor yang mempunyai bilangan kenderaan yang amat tinggi di kawasan bandar.

### Karbon Monoksida (CO)

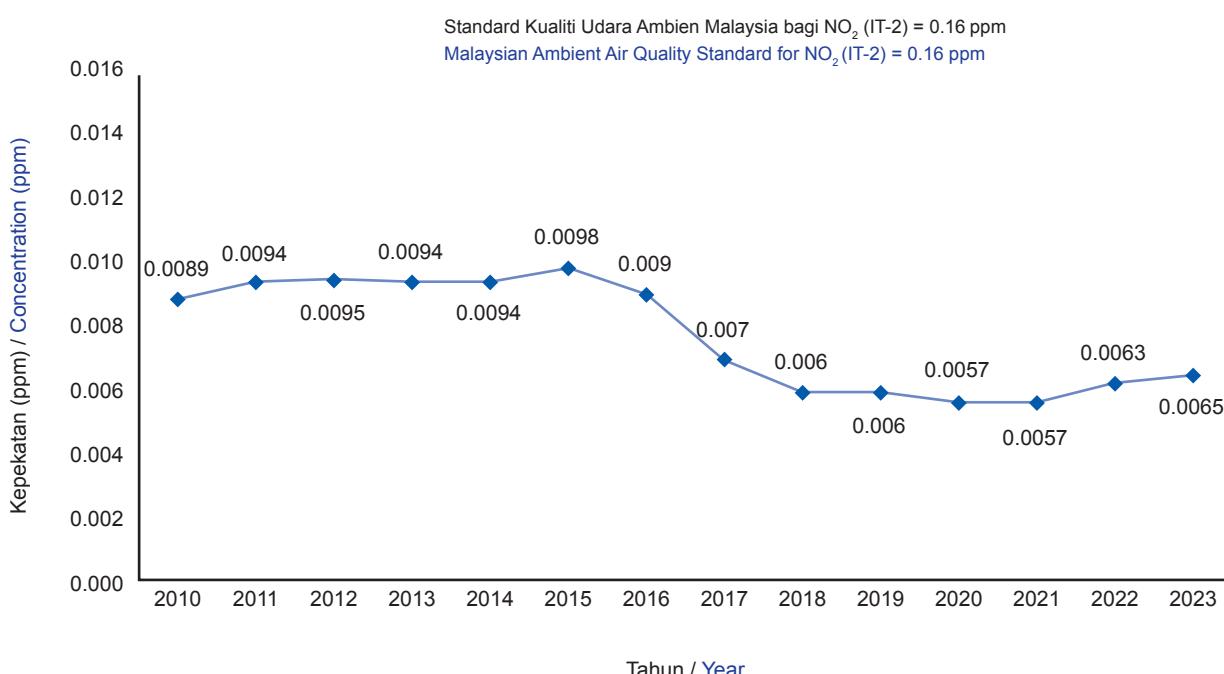
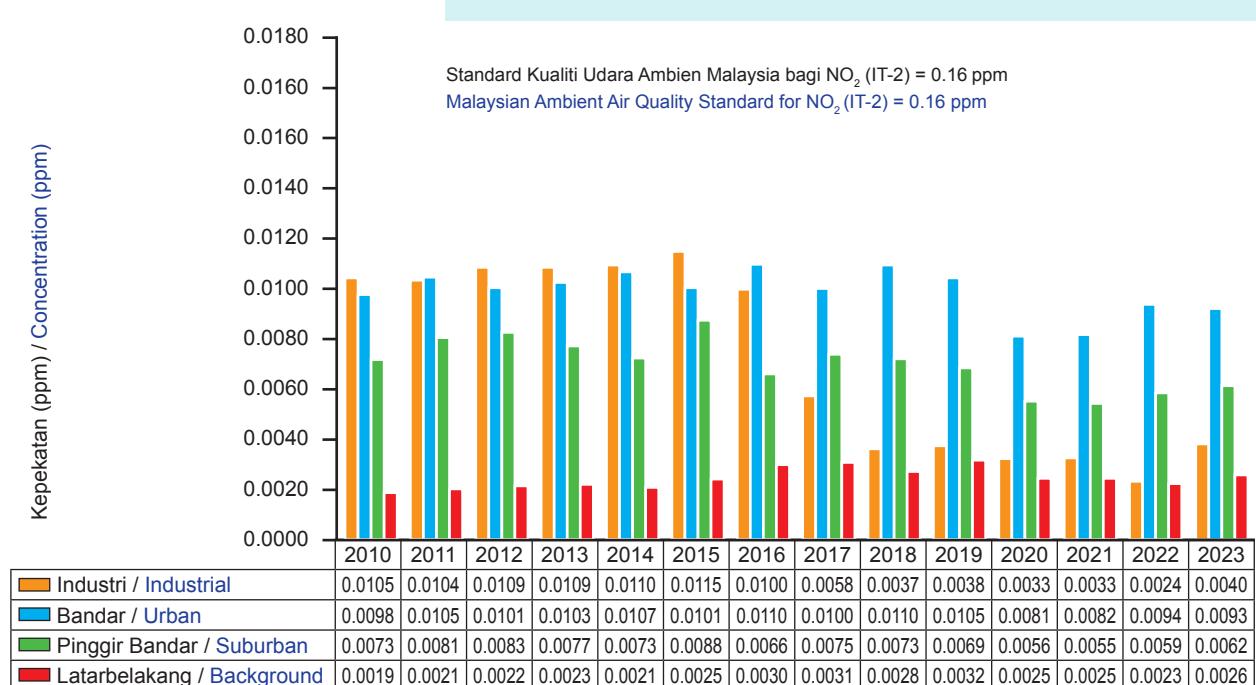
Kepekatan purata tahunan CO pada tahun 2023 menunjukkan peningkatan berbanding tahun 2022 iaitu dengan bacaan 0.5558 ppm dan mematuhi Standard Kualiti Udara Ambien Malaysia IT-2 (**Rajah 1.21**). **Rajah 1.22** menunjukkan kepekatan CO untuk pelbagai kategori guna tanah di mana kawasan bandar masih merekodkan bacaan purata tahunan CO tertinggi berbanding dengan kawasan yang lain.

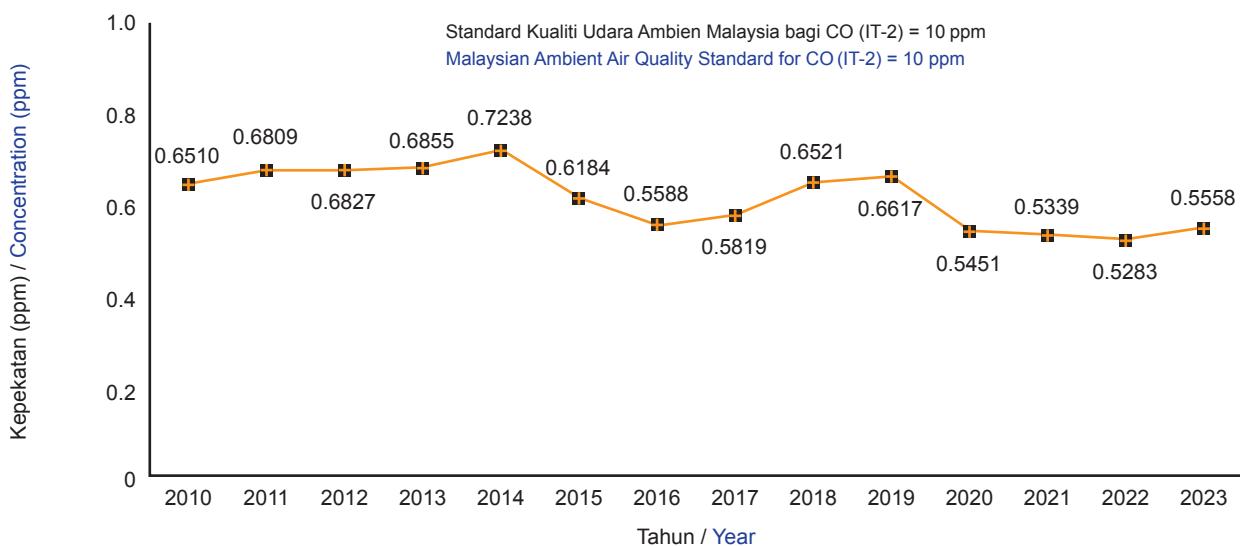
### Nitrogen Dioxide (NO<sub>2</sub>)

In the year 2023, the annual average concentration of NO<sub>2</sub> was higher than the year 2022 with the average reading at 0.0065 ppm which is much lower than the limit set in the Malaysia Ambient Air Quality Standard IT-2 as shown in **Figure 1.19**. The concentration of NO<sub>2</sub> is high in urban areas as shown in **Figure 1.20**. This may be due to smoke emissions from motor vehicles as urban areas have a very high number of vehicles.

### Carbon Monoxide (CO)

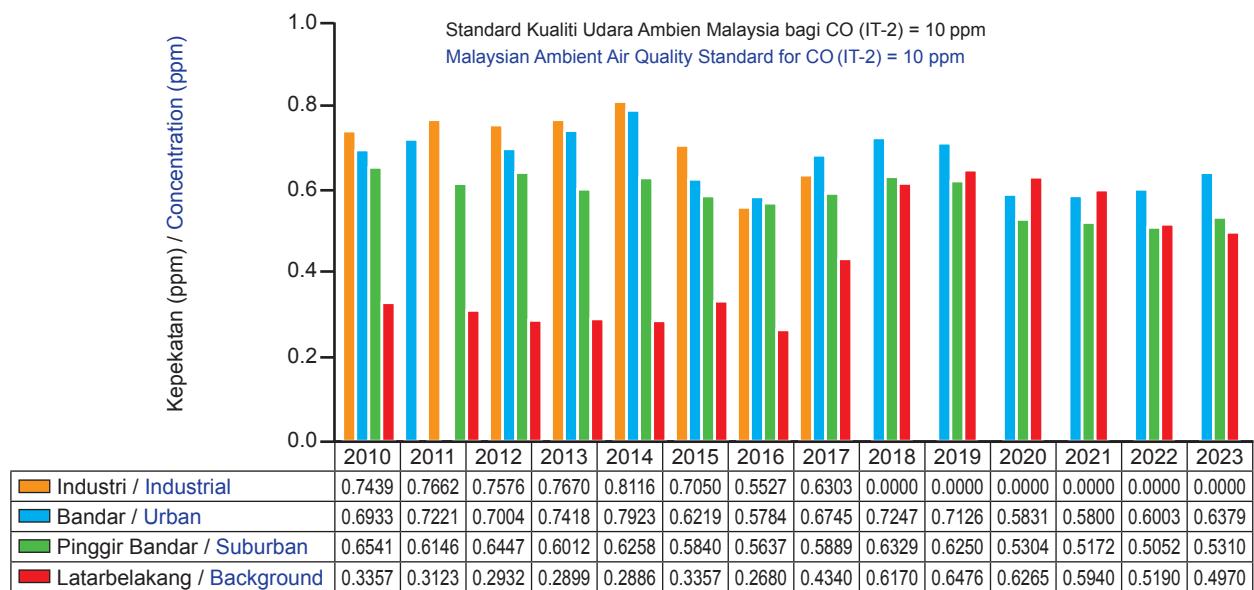
The annual average concentration of CO in 2023 showed an increase when compared to 2022 with a reading of 0.5558 ppm and complies with the Malaysian Ambient Air Quality Standard IT-2. **Figure 1.21** and **Figure 1.22** show the concentration of CO for various categories of land use where urban areas continue to record the highest average annual CO readings as compared to other areas.

Rajah 1.19: Purata Kepekatan Tahunan Nitrogen Dioksida (NO<sub>2</sub>), 2010-2023Figure 1.19: Annual Average Concentration of Nitrogen Dioxide (NO<sub>2</sub>), 2010-2023Rajah 1.20: Purata Kepekatan Tahunan Nitrogen Dioksida (NO<sub>2</sub>) Mengikut Guna Tanah, 2010-2023Figure 1.20: Annual Average Concentration of Nitrogen Dioxide (NO<sub>2</sub>) Based on Land Use, 2010-2023



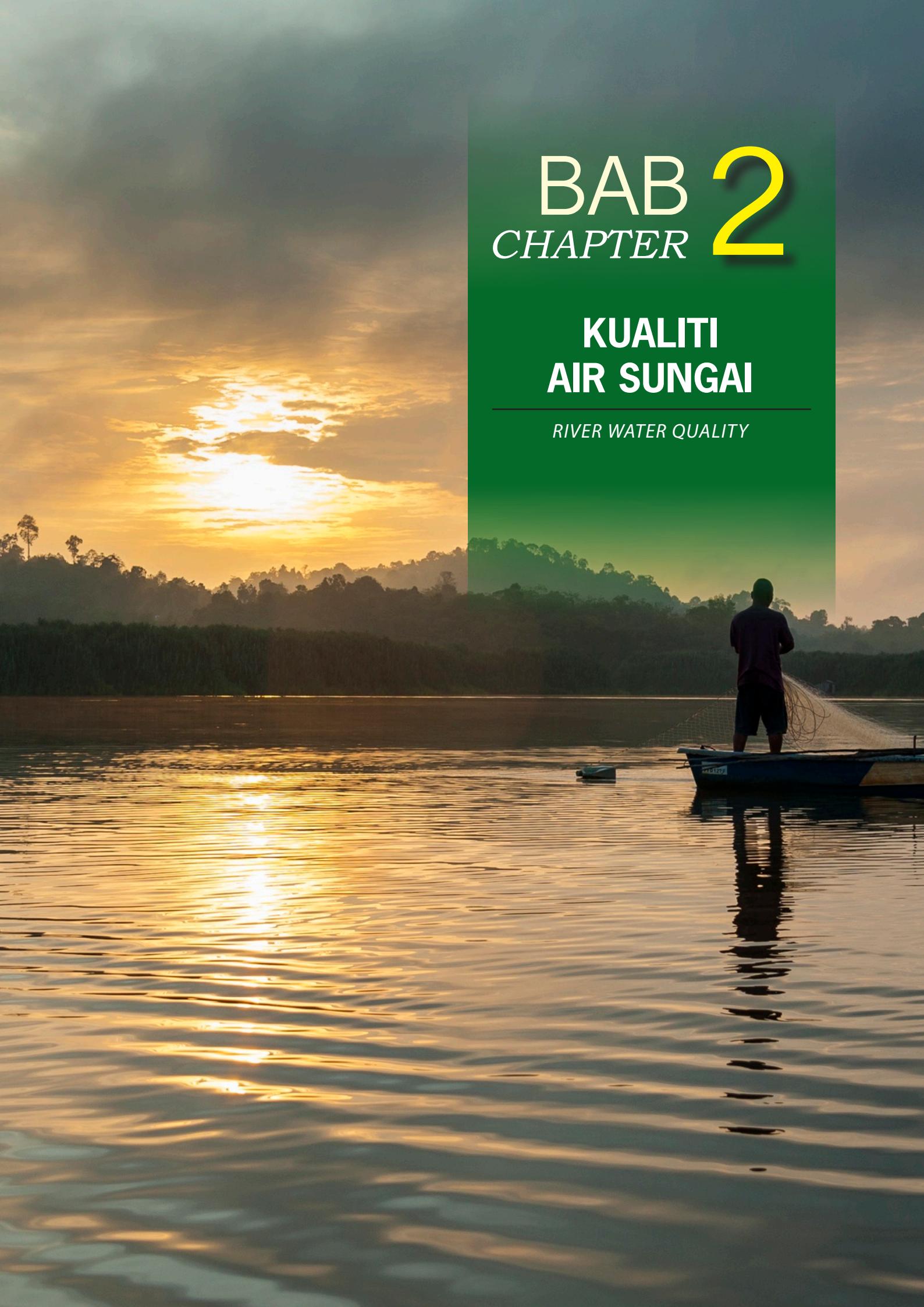
Rajah 1.21: Purata Kepekatan Tahunan Karbon Monoksida (CO), 2010-2023

Figure 1.21: Annual Average Concentration of Carbon Monoxide (CO), 2010-2023



Rajah 1.22: Purata Kepekatan Tahunan Karbon Monoksida (CO) Mengikut Guna Tanah, 2010-2023

Figure 1.22: Annual Average Concentration of Carbon Monoxide (CO) Based on Land Use, 2010-2023

The background of the image is a photograph of a river at sunset. The sky is filled with warm orange and yellow hues, with the sun partially visible behind clouds. The water reflects these colors. In the foreground, a fisherman stands in a small boat, silhouetted against the light, holding a fishing net. The opposite bank is covered in dense green trees.

# BAB CHAPTER 2

## KUALITI AIR SUNGAI

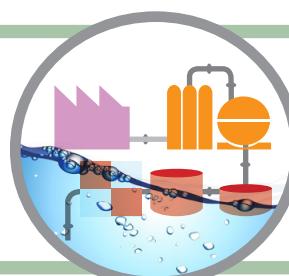
*RIVER WATER QUALITY*

# PENGAWASAN KUALITI AIR SUNGAI MANUAL

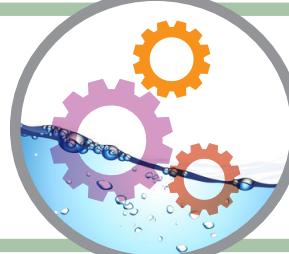
*MANUAL RIVER WATER QUALITY MONITORING*

**672****SUNGAI /  
RIVERS**

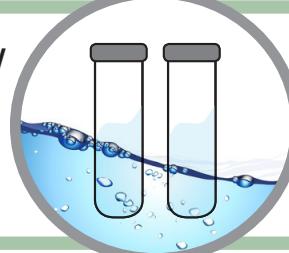
DIPANTAU OLEH  
JABATAN ALAM SEKITAR  
  
MONITORED BY THE  
DEPARTMENT OF ENVIRONMENT

**55****STESEN /  
STATIONS**

PEMANTAUAN DI  
HULU MUKA SAUK  
  
UPSTREAM WATER  
INTAKES MONITORING

**1353****STESEN /  
STATIONS**

PENGAWASAN KUALITI  
AIR SUNGAI MANUAL  
  
MANUAL RIVER WATER  
QUALITY MONITORING

**8118****PERSAMPLEN /  
SAMPLING**

PERSAMPLEN KUALITI  
AIR SUNGAI  
  
SAMPLING OF RIVER  
WATER QUALITY

# PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

## CONTINUOUS RIVER WATER QUALITY MONITORING

**26** SUNGAI RIVERS

DIPANTAU OLEH JABATAN ALAM SEKITAR  
MONITORED BY THE DEPARTMENT OF ENVIRONMENT

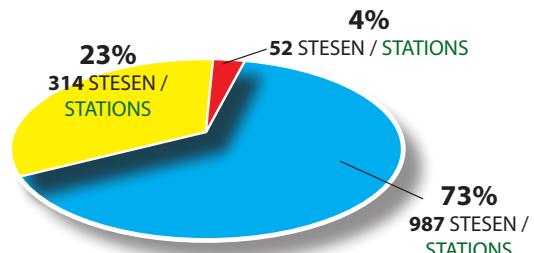
**30** STESEN STATIONS

PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK  
CONTINUOUS RIVER WATER QUALITY MONITORING

**17** PARAMETER PARAMETERS

DIPANTAU OLEH JABATAN ALAM SEKITAR  
MONITORED BY THE DEPARTMENT OF ENVIRONMENT

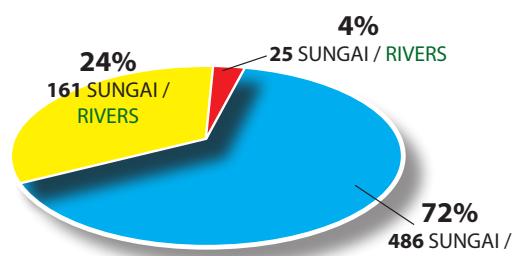
### STATUS KUALITI AIR MENGIKUT STESEN WATER QUALITY STATUS BY STATION



KELAS I CLASS I	<b>341</b> STESEN STATIONS	(25%)
KELAS II CLASS II	<b>731</b> STESEN STATIONS	(54%)
KELAS III CLASS III	<b>262</b> STESEN STATIONS	(20%)
KELAS IV CLASS IV	<b>19</b> STESEN STATIONS	(1%)
KELAS V CLASS V	<b>0</b> STESEN STATION	(0%)

INDEKS KUALITI AIR MENGIKUT STESEN  
WATER QUALITY INDEX BY STATION

### STATUS KUALITI AIR MENGIKUT SUNGAI WATER QUALITY STATUS BY RIVER



KELAS I CLASS I	<b>164</b> SUNGAI RIVERS	(25%)
KELAS II CLASS II	<b>363</b> SUNGAI RIVERS	(54%)
KELAS III CLASS III	<b>137</b> SUNGAI RIVERS	(20%)
KELAS IV CLASS IV	<b>8</b> SUNGAI RIVERS	(1%)
KELAS V CLASS V	<b>0</b> SUNGAI RIVER	(0%)

INDEKS KUALITI AIR MENGIKUT SUNGAI  
WATER QUALITY INDEX BY RIVER

# KUALITI AIR SUNGAI / RIVER WATER QUALITY



## PENGAWASAN KUALITI AIR SUNGAI MANUAL

Jabatan Alam Sekitar (JAS) meneruskan program pengawasan kualiti air sungai pada tahun 2023 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 dianalisa 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 di dalam Standard Kualiti Air Negara. Standard Kualiti Air Negara merupakan standard ambien untuk melindungi kepelbagaiaan biologi akuatik serta ianya juga digunakan sebagai penanda aras untuk penetapan jenis guna air bagi sungai tertentu.

IKA adalah julat indeks daripada 0 hingga 100 dimana julat ini dibahagi kepada tiga (3) kategori iaitu bersih, sederhana tercemar dan tercemar. Indeks ini berdasarkan kepada enam (6) parameter iaitu oksigen terlarut (DO), keperluan oksigen biokimia (BOD), keperluan oksigen kimia (COD), ammoniakal nitrogen (AN), pepejal terampai (SS) dan pH.

Pada tahun 2023, sebanyak 1,353 stesen pengawasan kualiti air sungai manual yang merangkumi 672 sungai telah dipantau di negara ini. Frekuensi persampelan bagi setiap stesen pengawasan kualiti air sungai manual dijalankan sebanyak enam (6) kali setahun dengan jumlah persampelan adalah sebanyak 8,118.

Pelaporan status kualiti air dilaporkan di dalam dua (2) pendekatan iaitu:-

- i. Status kualiti air mengikut sungai; dan
- ii. Status kualiti air mengikut stesen

## MANUAL RIVER WATER QUALITY MONITORING

The Department of Environment (DOE) continued the river water quality monitoring programme in 2023, which is done 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 measurement and sent to the laboratory as well, for analysis aimed at determining the criteria based on the sciences of physic-chemical and biological. The Water Quality Index (WQI) is used to indicate the level of pollution and the corresponding suitability in terms of water use according to the National Water Quality Standards for Malaysia (NWQS). NWQS is an ambient standard to protect aquatic biodiversity and it is also used as a benchmark for the setting of uses for certain rivers.

WQI is an index range from 0 to 100 where the range is divided into three (3) categories of clean, slightly polluted and polluted. The index is derived based on six (6) parameters, which are dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen (AN), suspended solids (SS) and pH.

In 2023, a total of 1,353 manual river water quality monitoring stations covering 672 rivers were monitored in this country. The sampling frequency for each manual river water quality monitoring station is carried out six (6) times a year with a total sampling of 8,118.

Reporting of water quality status is reported in two (2) approaches:-

- i. River water quality status by river; and
- ii. River water quality status by station

Bagi pelaporan status kualiti air mengikut sungai, penentuan IKA adalah menggunakan pengiraan secara median dimana median IKA bagi keseluruhan data yang dicerap di setiap stesen untuk mendapatkan IKA sungai tersebut. Pelaporan status kualiti air mengikut sungai adalah menggambarkan status kualiti air bagi keseluruhan sungai berdasarkan jumlah stesen yang dipantau.

Manakala bagi pelaporan status kualiti air mengikut stesen, penentuan IKA adalah berdasarkan pengiraan secara median bagi enam (6) IKA di stesen tersebut. Pelaporan status kualiti air mengikut stesen adalah menggambarkan status kualiti air di stesen tersebut sahaja (**ANNEX**).

### **STATUS KUALITI AIR MENGIKUT SUNGAI**

Status kualiti air bagi 672 sungai telah dipantau pada tahun 2023. Daripada 672 sungai yang dipantau, sebanyak 486 (72%) sungai dikategorikan sebagai bersih, 161 (24%) sungai dikategorikan sebagai sederhana tercemar dan 25 (4%) dikategorikan sebagai tercemar. Tren bagi kualiti air sungai yang dipantau adalah seperti dalam **Rajah 2.1**.

Bagi pengelasan IKA, sebanyak 164 (25%) sungai di dalam Kelas I, 363 (54%) sungai di dalam Kelas II, 137 (20%) sungai di Kelas III, dan lapan (8) (1%) sungai di Kelas IV.

Indikator utama yang diambil kira untuk menentukan kualiti air sungai berdasarkan parameter BOD, AN dan SS. Punca kemerosotan kualiti air disebabkan oleh pelepasan beban bahan pencemar sama ada daripada punca tetap atau punca tidak tetap.

Punca tetap beban pencemaran air adalah punca-punca yang mempunyai takat pelepasan yang boleh dikenalpasti dan tidak berubah dalam masa yang singkat seperti sektor industri, ternakan, sistem rawatan kumbahan dan sebagainya.

Manakala punca tidak tetap seperti aktiviti pertanian, kerja tanah, perlombongan dan kumbahan bukan najis (air cucian dapur dan bilik air selain kumbahan) tidak mempunyai takat pelepasan yang tetap dan

For water quality status reporting by river, the WQI determination is based on the median calculation where the median WQI for the entire data observed at each station to obtain the river WQI. The reporting of water quality status by river is a reflection of the quality status of the entire river based on the number of stations monitored.

While for water quality status reporting by station, the WQI determination is based on the median calculation of six (6) WQI at the station. The reporting of water quality status by station is a reflection of the quality status at the station only (**ANNEX**).

### **WATER QUALITY STATUS BY RIVER**

The water quality status of a total of 672 rivers were monitored in 2023. Out of the 672 rivers monitored, the water quality of 486 (72%) rivers were indicated as clean, 161 (24%) rivers were indicated as slightly polluted and 25 (4%) rivers were indicated as polluted. The trend of the monitored rivers water quality as shown in **Figure 2.1**.

For WQI classification, as many as 164 (25%) rivers are in Class I, 363 (54%) rivers are in Class II, 137 (20%) rivers are in Class III, and eight (8) (1%) rivers are in Class IV .

The main indicators were considered to determine the quality of river water based on the parameters of BOD, AN and SS. The cause of the deterioration of water quality is due to the discharge of the pollution load either from a point source or from a nonpoint source.

Point sources can be described as pollution sources that have specific identifiable discharge points which are unchanged over time. Sectors such as industry, livestock and sewage treatment systems fall under this category.

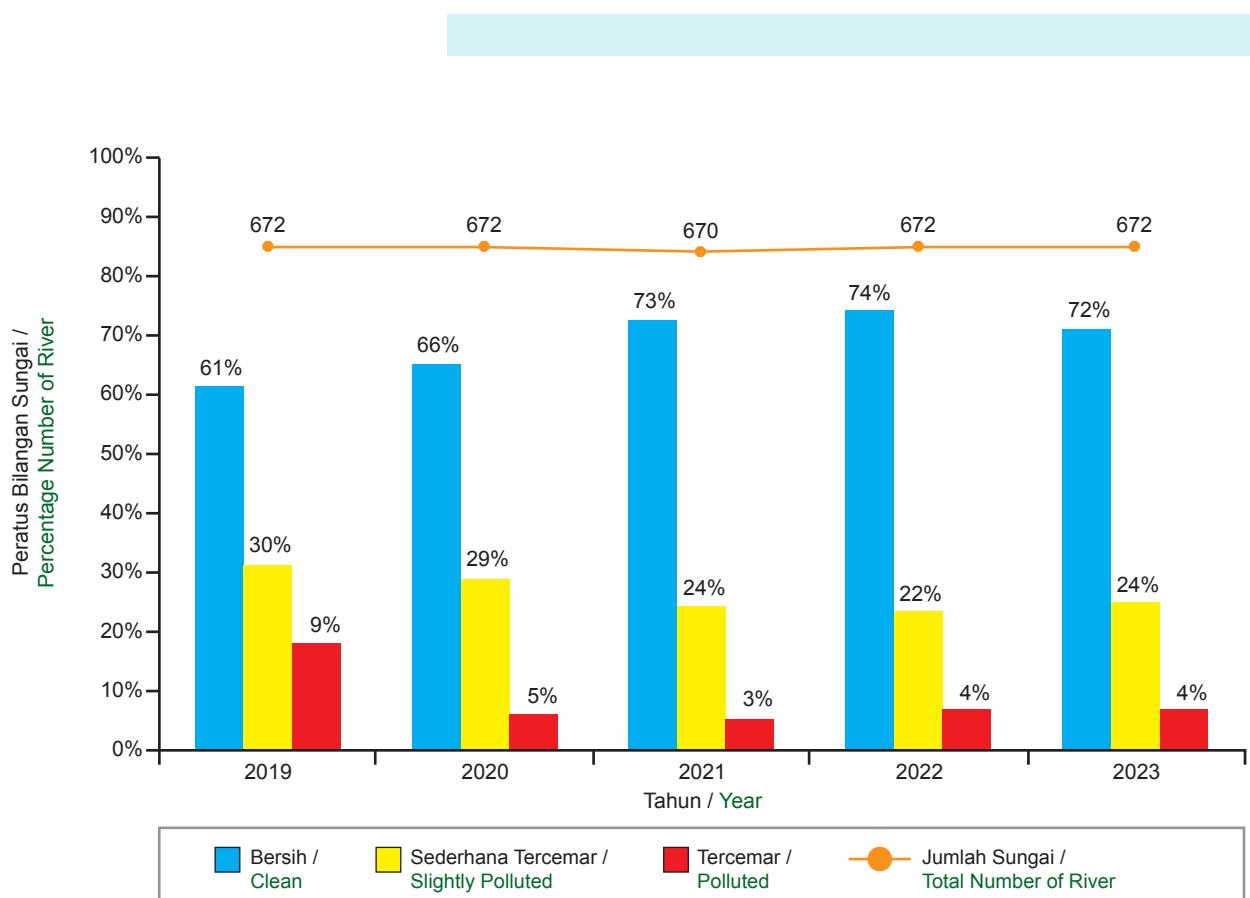
Meanwhile the nonpoint sources such agricultural activities, earthworks, mining, and sullage (domestic wastewater other than sewage such as kitchen and bathroom wastewater) do not have specific

sering berubah-ubah yang menyukarkan anggaran pelepasan beban pencemaran dibuat. Kajian berkaitan beban pencemaran di bawah kategori ini bagi Malaysia tidak banyak dibuat dan tersedia untuk rujukan buat masa ini.

BOD adalah jumlah oksigen yang diperlukan oleh bakteria atau mikroorganisma yang lain untuk menguraikan bahan organik. Kepekatan BOD yang tinggi kerap kali dikaitkan dengan pelepasan efluen yang berterusan daripada industri. AN adalah dikaitkan dengan aktiviti penternakan haiwan berkaki dan kumbahan domestik. Manakala SS dikaitkan dengan kerja-kerja tanah yang tidak teratur dan aktiviti pembukaan tanah yang tidak terkawal.

identifiable discharge points and the locations are varied over time. This makes it difficult to estimate the amount of released pollution loads.

BOD is the amount of oxygen required by bacteria or other microorganisms to decompose organic matter. High BOD concentrations are often associated with continuous discharge of effluents from industries. AN is associated with livestock farming activities and domestic sewage, while SS is caused by improper earthworks and uncontrolled land clearing activities.



Rajah 2.1: Tren Kualiti Air Sungai, 2019-2023

Figure 2.1: River Water Quality Trend, 2019-2023

**Jadual 2.2** menunjukkan kualiti air sungai yang dikategorikan sebagai tercemar berdasarkan sub-indeks BOD, AN dan SS pada tahun 2023. Daripada 25 sungai yang dikategorikan sebagai tercemar, sebanyak 17 sungai adalah berada di Kelas III manakala lapan (8) sungai adalah di Kelas IV.

Berdasarkan sub-indeks BOD, hanya satu (1) sungai berada di Kelas I, tiga (3) sungai di Kelas II, satu (1) sungai di Kelas III, tujuh (7) sungai di Kelas IV dan selebihnya 13 sungai adalah di Kelas V.

Dari segi sub-indeks AN pula, hanya satu (1) sungai berada di Kelas I, dua (2) sungai di Kelas II, tiga (3) sungai di Kelas III, dua (2) sungai di Kelas IV dan selebihnya 17 sungai adalah di Kelas V.

Dari segi sub-indeks SS, 18 sungai yang berada di Kelas I, lima (5) sungai di Kelas II dan dua (2) sungai adalah di Kelas III.

**Table 2.2** shows the quality of river water categorised as polluted based on the BOD, AN and SS sub-indexes in 2023. Out of the 25 rivers categorised as polluted, 17 rivers were in Class III while eight (8) rivers were in Class IV.

Based on the BOD sub-index, only one (1) river was in Class I, three (3) rivers in Class II, one (1) river in Class III, seven (7) rivers in Class IV and the remaining 13 rivers were in Class V.

In terms of sub-index AN, only one (1) river was in Class I, two (2) rivers in Class II, three (3) rivers in Class III, two (2) rivers in Class IV and the remaining 17 rivers were in Class V.

In terms of SS sub-index, 18 rivers were in Class I, five (5) rivers in Class II and two (2) rivers in Class III.

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Perlis	Sg. Perlis	Sg. Arau	82	83	89	88	89	B/C
		Sg. Empangan Timah Tasoh	87	93	95	96	95	B/C
		Sg. Jarum	83	88	91	89	88	B/C
		Sg. Jernih	86	91	93	95	94	B/C
		Sg. Kok Mak	86	88	87	88	86	B/C
		Sg. Korok	71	75	76	74	79	ST/SP
		Sg. Ngulang	82	90	92	93	88	B/C
		Sg. Pelarit	91	94	96	96	96	B/C
		Sg. Perlis	72	76	77	78	81	B/C
		Sg. Serai	76	82	86	90	86	B/C
		Sg. Terusan Mada	85	88	91	91	92	B/C
		Sg. Wang Kelian	94	95	97	97	97	B/C
Kedah	Sg. Kedah	Sg. Ahning	88	92	96	95	94	B/C
		Sg. Changlun	77	87	88	87	86	B/C
		Sg. Janing	91	93	97	97	97	B/C
		Sg. Kedah	64	70	77	76	73	ST/SP
		Sg. Napoh	80	82	89	90	88	B/C
		Sg. Padang Terap	87	86	93	91	92	B/C
		Sg. Pedu	90	91	95	94	95	B/C
		Sg. Pendang	77	81	82	85	85	B/C
		Sg. Sintok	81	92	96	95	92	B/C
		Sg. Tekai	80	88	94	93	91	B/C
		Sg. Temin	77	84	89	89	87	B/C
		Sg. Terusan Lengkuas	89	86	92	92	93	B/C
		Sg. Terusan Mada Selatan	88	89	92	90	91	B/C
		Sg. Terusan Tengah	89	88	93	93	94	B/C
		Sg. Kisap	90	95	97	97	96	B/C
		Sg. Kuah	74	81	79	81	69	ST/SP

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Kedah	Sg. Merbok	Sg. Bakar Arang	59	56	69	66	58	T/P
		Sg. Batu	66	70	64	59	65	ST/SP
		Sg. Bongkok	63	71	75	71	74	ST/SP
		Sg. Bukit Merah	80	92	92	89	95	B/C
		Sg. Bukit Nanas	93	95	97	97	98	B/C
		Sg. Korok	69	65	71	66	64	ST/SP
		Sg. Merbok	77	79	81	81	82	B/C
		Sg. Petani	54	63	68	64	53	T/P
		Sg. Tok Pawang	88	90	95	94	96	B/C
		Sg. Tupah	93	94	97	97	98	B/C
	Sg. Muda	Sg. Chepir	87	89	91	92	90	B/C
		Sg. Gunung Inas	92	93	93	95	96	B/C
		Sg. Jerong	67	68	78	71	74	ST/SP
		Sg. Karangan	81	85	91	83	87	B/C
		Sg. Ketil	85	87	93	91	93	B/C
		Sg. Muda	86	87	92	91	92	B/C
		Sg. Pegang	93	95	97	97	97	B/C
		Sg. Sedim	87	89	92	92	93	B/C
		Sg. Tawar	90	88	89	94	91	B/C
P. Pinang/ Kedah	Sg. Ulu Melaka	Sg. Chenang	69	78	84	77	84	B/C
		Sg. Melaka	82	90	92	93	93	B/C
		Sg. Petang	93	96	97	98	97	B/C
		Sg. Saga	76	81	92	88	85	B/C
		Sg. Tuba	88	94	96	97	96	B/C
	Sg. Perai	Sg. Air Melintas	54	58	57	60	64	ST/SP
		Sg. Jarak	72	73	73	72	73	ST/SP
		Sg. Keladi	74	78	81	82	82	B/C
		Sg. Kereh	57	55	62	57	60	ST/SP
		Sg. Kubang Semang	64	64	66	68	74	ST/SP
		Sg. Kulim	91	89	92	92	88	B/C
		Sg. Perai	63	66	70	62	66	ST/SP
		Sg. Pertama	59	65	69	52	63	ST/SP
		Sg. Seluang	64	64	67	65	64	ST/SP
		Sg. Seluang Bawah	65	61	71	67	63	ST/SP
P. Pinang	Sg. Bayan Lepas	Sg. Bayan Lepas	76	64	74	69	71	ST/SP
		Sg. Tiram	71	73	74	76	68	ST/SP
	Sg. Jawi	Sg. Chempedak	54	47	41	36	55	T/P
		Sg. Jawi	49	55	52	57	54	T/P
		Sg. Junjong	62	66	60	63	66	ST/SP
		Sg. Machang Bubok	70	76	72	68	73	ST/SP
		Sg. Tengah	61	49	58	47	63	ST/SP
	Sg. Juru	Sg. Ara	66	67	77	75	77	ST/SP
		Sg. Juru	56	68	69	68	63	ST/SP
		Sg. Kilang Ubi	68	70	71	72	65	ST/SP
		Sg. Pasir	61	65	75	66	63	ST/SP
		Sg. Permatang Rawa	64	59	75	77	74	ST/SP
		Sg. Rambai	51	57	59	56	57	T/P
	Sg. Kluang	Sg. Ara	85	82	90	88	89	B/C
		Sg. Dua Besar	57	64	68	67	63	ST/SP
		Sg. Kluang	63	65	68	52	58	T/P
		Sg. Relau	66	66	68	69	65	ST/SP
	Sg. Pinang	Sg. Air Itam	76	77	79	69	69	ST/SP
		Sg. Air Terjun	93	95	97	97	97	B/C
		Sg. Batu Feringghi	87	92	94	92	94	B/C
		Sg. Dondang	74	73	77	65	66	ST/SP
		Sg. Jelutong	64	63	65	68	63	ST/SP
		Sg. Pinang	68	69	71	64	50	T/P

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
P. Pinang	Sg. Pinang	Sg. Satu	93	96	97	97	97	B/C
		Sg. Titi Kerawang	63	68	75	63	57	T/P
P. Pinang/ Kedah/Perak	Sg. Kerian	Sg. Kechil	85	86	89	89	89	B/C
		Sg. Kerian	83	86	88	88	87	B/C
		Sg. Selama	87	88	89	89	90	B/C
		Sg. Semang	76	81	80	81	72	ST/SP
		Sg. Serdang	73	71	80	83	89	B/C
		Sg. Terusan Bagan Serai	91	93	93	93	94	B/C
Perak	Sg. Bruas	Sg. Bruas	90	90	94	95	95	B/C
		Sg. Dandang	86	91	94	95	95	B/C
		Sg. Licin	95	96	97	97	97	B/C
		Sg. Rotan	89	89	93	92	93	B/C
	Sg. Kurau	Sg. Air Hitam	92	95	98	97	96	B/C
		Sg. Ara	92	93	96	96	96	B/C
		Sg. Kurau	86	86	87	85	85	B/C
	Sg. Perak	Sg. Batang Padang	82	88	90	90	91	B/C
		Sg. Behrang	94	97	97	98	97	B/C
		Sg. Berok	92	96	97	97	96	B/C
		Sg. Bidor	84	84	87	89	88	B/C
		Sg. Chenderiang	91	93	94	94	91	B/C
		Sg. Chepor	94	96	97	96	97	B/C
		Sg. Cuar	83	87	96	95	95	B/C
		Sg. Ibol	93	94	97	96	97	B/C
		Sg. Kampar	87	92	95	95	93	B/C
		Sg. Kangsar	88	91	93	94	96	B/C
		Sg. Kepayang	70	79	84	78	84	B/C
		Sg. Kerbau	92	94	96	95	96	B/C
		Sg. Kerdah	72	80	82	81	82	B/C
		Sg. Kinjang	94	96	97	97	97	B/C
		Sg. Kinta	76	83	85	83	85	B/C
		Sg. Klah	89	91	95	90	92	B/C
		Sg. Klian Baru	76	81	84	77	79	ST/SP
		Sg. Klian Gunong	93	96	97	96	97	B/C
		Sg. Kuang	80	81	88	85	88	B/C
		Sg. Manong	95	95	97	97	98	B/C
		Sg. Nyamok	68	76	77	74	73	ST/SP
		Sg. Pari	72	80	82	86	89	B/C
		Sg. Pelus	85	88	90	88	89	B/C
		Sg. Perak	88	89	92	94	93	B/C
		Sg. Pinji	67	73	76	77	79	ST/SP
		Sg. Pulau	94	95	97	97	97	B/C
		Sg. Raia	82	86	90	90	91	B/C
		Sg. Rui	91	94	95	89	92	B/C
		Sg. Seluang	58	72	62	62	66	ST/SP
		Sg. Serokai	69	73	77	81	83	B/C
		Sg. Sintang	65	72	72	67	64	ST/SP
		Sg. Sungkai	88	91	94	92	90	B/C
		Sg. Sungkai Mati	76	81	81	84	87	B/C
		Sg. Tapah	95	96	97	96	97	B/C
		Sg. Teja	78	82	88	85	81	B/C
		Sg. Tesong	94	96	97	97	97	B/C
		Sg. Tumboh	71	73	73	76	76	ST/SP
		Sg. Woh	94	96	97	98	97	B/C
	Sg. Raja Hitam	Sg. Derhaka	68	77	79	75	74	ST/SP
		Sg. Manjong	85	86	87	86	88	B/C
		Sg. Nyior	95	96	97	97	98	B/C
		Sg. Raja Hitam	68	72	80	75	73	ST/SP

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Perak	Sg. Sepetang	Sg. Batu Tegoh	82	90	93	91	91	B/C
		Sg. Jana	86	83	84	84	88	B/C
		Sg. Lidin	75	84	86	84	86	B/C
		Sg. Limau	90	91	96	96	96	B/C
		Sg. Malai	76	76	80	76	74	ST/SP
		Sg. Nyior	88	95	97	97	97	B/C
		Sg. Sepetang	78	79	81	79	79	ST/SP
		Sg. Temerloh	86	88	95	94	94	B/C
		Sg. Trong	93	95	96	97	97	B/C
	Sg. Wangi	Sg. Deralik	73	73	74	74	75	ST/SP
		Sg. Wangi	79	81	76	69	82	B/C
Selangor/Perak	Sg. Bernam	Sg. Bernam	81	83	91	88	90	B/C
		Sg. Dusun	85	91	95	95	95	B/C
		Sg. Gelinting	87	92	96	96	97	B/C
		Sg. Inki	93	94	97	97	97	B/C
		Sg. Slim	84	88	94	92	92	B/C
		Sg. Trolak	91	92	96	95	96	B/C
Selangor	Sg. Buloh	Sg. Buloh	52	60	56	51	54	T/P
	Sg. Selangor	Sg. Air Hitam	80	75	80	77	73	ST/SP
		Sg. Batang Kali	87	90	96	93	91	B/C
		Sg. Guntong	73	80	81	83	82	B/C
		Sg. Kanching	84	90	96	93	94	B/C
		Sg. Kerling	93	94	97	96	97	B/C
		Sg. Kundang	66	70	71	77	77	ST/SP
		Sg. Rangkap	92	95	96	97	97	B/C
		Sg. Rawang	70	77	81	81	82	B/C
		Sg. Selangor	81	85	91	91	90	B/C
	Sg. Sepang	Sg. Sepang	75	78	82	84	88	B/C
	Sg. Tengi	Sg. Tengi	84	87	91	89	88	B/C
Selangor/ W.P. Kuala Lumpur	Sg. Klang	Sg. Air Busuk	59	41	40	52	42	T/P
		Sg. Ampang	60	64	66	72	70	ST/SP
		Sg. Anak Air Batu	72	81	89	80	81	B/C
		Sg. Batu	70	68	71	79	73	ST/SP
		Sg. Belongkong	67	69	73	65	78	ST/SP
		Sg. Bunos	67	70	76	71	68	ST/SP
		Sg. Damansara	62	65	76	69	66	ST/SP
		Sg. Gombak	63	73	74	83	82	B/C
		Sg. Jinjang	66	64	71	70	68	ST/SP
		Sg. Kerayong	54	58	62	59	58	T/P
		Sg. Keroh	60	64	69	68	65	ST/SP
		Sg. Klang	58	61	67	70	69	ST/SP
		Sg. Kuyoh	51	62	69	68	68	ST/SP
		Sg. Penchala	64	60	80	76	71	ST/SP
		Sg. Pusu	67	71	80	78	75	ST/SP
		Sg. Rasau	74	83	87	93	94	B/C
		Sg. Rumput	91	92	97	95	97	B/C
		Sg. Semelah	80	83	87	90	91	B/C
		Sg. Toba	59	61	69	63	53	T/P
		Sg. Untut	54	64	73	78	64	ST/SP
Selangor/ W.P. Putrajaya/ N. Sembilan	Sg. Langat	Sg. Anak Chuau	83	89	94	94	94	B/C
		Sg. Balak	56	71	70	71	74	ST/SP
		Sg. Batang Benar	67	74	74	76	84	B/C
		Sg. Batang Labu	72	79	82	84	82	B/C
		Sg. Batang Nilai	72	78	81	79	80	ST/SP

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Selangor/ W.P. Putrajaya/ N. Sembilan	Sg. Langat	Sg. Beranang	76	82	87	85	84	B/C
		Sg. Buan	76	80	83	85	82	B/C
		Sg. Chuau	87	91	94	94	94	B/C
		Sg. Jijan	78	85	82	88	88	B/C
		Sg. Langat	72	77	82	82	83	B/C
		Sg. Limau Manis	74	71	75	82	75	ST/SP
		Sg. Pajam	63	73	68	74	72	ST/SP
		Sg. Rinching	85	88	94	90	95	B/C
		Sg. Semenyih	77	83	87	86	86	B/C
		Sg. Sering	60	69	72	80	81	B/C
N. Sembilan/ Selangor	Sg. Sepang	Sg. Rambai	21	25	25	60	64	ST/SP
N. Sembilan	Sg. Lukut	Sg. Lukut	69	74	73	80	79	ST/SP
N. Sembilan/ Melaka	Sg. Linggi	Sg. Baru	68	74	70	75	79	ST/SP
		Sg. Batang Penar	82	89	93	90	90	B/C
		Sg. Batu Hampar	88	93	91	93	92	B/C
		Sg. Chembong	83	93	88	89	92	B/C
		Sg. Empangan Terip	72	80	82	85	83	B/C
		Sg. Jelai	84	89	86	88	87	B/C
		Sg. Kayu Ara	62	77	80	84	81	B/C
		Sg. Kenaboi	80	83	87	85	89	B/C
		Sg. Kepayong	83	88	89	85	93	B/C
		Sg. Kundur Besar	86	91	92	92	93	B/C
		Sg. Linggi	77	79	84	85	84	B/C
		Sg. Muar	90	88	93	91	93	B/C
		Sg. Ngori Ngori	73	76	80	83	80	ST/SP
		Sg. Paroi	76	78	80	85	80	ST/SP
		Sg. Pedas	83	90	94	93	95	B/C
		Sg. Rembau	82	91	92	91	91	B/C
		Sg. Senawang	74	73	77	81	83	B/C
		Sg. Simin	77	82	85	87	84	B/C
		Sg. Simpang Ampat	79	83	87	84	87	B/C
		Sg. Siput	85	87	90	90	89	B/C
		Sg. Temiang	68	78	71	83	78	ST/SP
		Sg. Tuang	57	57	62	70	74	ST/SP
	Sg. Tuang	Sg. Tuang	58	59	63	75	75	ST/SP
Melaka	Sg. Melaka	Sg. Batang Melaka	80	88	91	91	92	B/C
		Sg. Durian Tunggal	73	79	86	88	85	B/C
		Sg. Dusun	86	93	94	94	96	B/C
		Sg. Kemunting	87	92	92	91	96	B/C
		Sg. Malim	58	67	68	71	68	ST/SP
		Sg. Melaka	71	78	80	83	84	B/C
		Sg. Putat	58	60	72	67	67	ST/SP
		Sg. Rembia	66	73	77	77	76	ST/SP
		Sg. Tampin	86	92	94	87	93	B/C
Melaka	Sg. Duyong	Sg. Duyong	71	65	71	74	76	ST/SP
		Sg. Gapam	87	88	92	93	93	B/C
		Sg. Punggur	51	51	63	58	60	ST/SP
	Sg. Kesang	Sg. Chin-Chin	73	78	84	80	84	B/C
		Sg. Chohong	82	88	92	93	94	B/C
		Sg. Kesang	72	77	87	85	86	B/C
		Sg. Tangkak	64	67	77	74	71	ST/SP
	Sg. Merlimau	Sg. Merlimau	49	56	59	61	63	ST/SP
	Sg. Seri Melaka	Sg. Air Salak	65	62	79	78	67	ST/SP
		Sg. Seri Melaka	65	65	66	69	67	ST/SP
		Sg. Udang	81	87	86	91	94	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Johor/ N. Sembilan/ Pahang	Sg. Muar	Sg. Air Panas	92	94	97	96	97	B/C
		Sg. Belemang	90	94	95	94	96	B/C
		Sg. Gemas	67	72	83	82	83	B/C
		Sg. Gemencheh	83	82	91	85	92	B/C
		Sg. Jelai	83	88	92	91	94	B/C
		Sg. Jementah	91	93	96	95	96	B/C
		Sg. Juasseh	88	94	95	94	94	B/C
		Sg. Kelamah	79	71	88	79	84	B/C
		Sg. Labis	79	88	88	86	86	B/C
		Sg. Meda	82	82	85	80	85	B/C
		Sg. Merbudu	65	63	77	72	85	B/C
		Sg. Merlimau	59	70	66	73	72	ST/SP
		Sg. Muar	82	83	87	85	88	B/C
		Sg. P.Mengkuang	67	89	92	91	89	B/C
		Sg. Pagoh	67	66	74	76	76	ST/SP
		Sg. Palong	82	85	87	83	88	B/C
		Sg. Pendol	89	90	95	93	95	B/C
		Sg. Sarang Buaya	70	58	60	60	67	ST/SP
		Sg. Segamat	87	90	93	89	91	B/C
		Sg. Senarut	66	75	77	79	75	ST/SP
		Sg. Serom	55	63	63	63	67	ST/SP
		Sg. Simpang Loi	78	77	84	73	81	B/C
		Sg. Tenang	68	79	76	81	78	ST/SP
Johor	Sg. Air Baloi	Sg. Air Baloi	49	60	55	58	67	ST/SP
	Sg. Batu Pahat	Sg. Amran	74	75	81	80	82	B/C
		Sg. Bantang	91	96	97	97	97	B/C
		Sg. Batu Pahat	56	66	64	61	63	ST/SP
		Sg. Bekok	71	81	88	83	84	B/C
		Sg. Berlian	79	78	77	79	82	B/C
		Sg. Chaah	83	88	93	90	90	B/C
		Sg. Kahang	86	90	92	82	86	B/C
		Sg. Lenik	82	82	91	90	90	B/C
		Sg. Merek	81	88	89	88	92	B/C
		Sg. Merpo	81	91	90	91	94	B/C
		Sg. Panchor	58	59	63	59	62	ST/SP
		Sg. Semberong	55	58	71	66	77	ST/SP
		Sg. Semberong Dam	85	89	91	89	93	B/C
		Sg. Simpang Kanan	56	59	62	59	62	ST/SP
	Sg. Temehel	Sg. Simpang Kiri	61	67	71	75	69	ST/SP
		Sg. Temehel	48	57	54	59	62	ST/SP
	Sg. Benut	Sg. Benut	65	75	78	77	81	B/C
		Sg. Machap Dam	91	92	94	93	90	B/C
		Sg. Parit Hj.Yassin	77	85	81	81	83	B/C
		Sg. Pinggan	61	60	59	63	67	ST/SP
		Sg. Ulu Benut	79	89	90	86	90	B/C
Johor	Sg. Danga	Sg. Danga	46	57	61	64	57	T/P
	Sg. Endau	Sg. Anak Sg. Semberong	84	84	85	84	82	B/C
		Sg. Dengar	80	84	91	90	90	B/C
		Sg. Empangan Labong	92	89	91	91	91	B/C
		Sg. Endau	89	87	92	91	92	B/C
		Sg. Jasin	94	94	97	96	97	B/C
		Sg. Jebong	61	74	82	75	86	B/C
		Sg. Kahang	86	90	91	90	92	B/C
		Sg. Lenga	60	68	69	74	78	ST/SP
		Sg. Lenggor	86	81	89	89	89	B/C
Johor	Sg. Mamai	Sg. Mamai	86	87	88	89	86	B/C
	Sg. Melatai	Sg. Melatai	63	70	71	73	71	ST/SP

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Johor	Sg. Endau	Sg. Mengkibol	74	77	84	82	81	B/C
		Sg. Paloh	81	82	85	85	90	B/C
		Sg. Pamol	65	72	76	73	69	ST/SP
		Sg. Selai	92	92	94	94	90	B/C
		Sg. Semberong	83	84	87	83	88	B/C
		Sg. Singol	55	79	83	87	84	B/C
		Sg. Tamok	91	91	90	91	87	B/C
	Sg. Jemaluang	Sg. Jemaluang	86	81	88	86	91	B/C
	Sg. Johor	Sg. Anak Sg. Sayong	77	80	90	79	84	B/C
		Sg. Belitong	86	83	89	86	87	B/C
		Sg. Berangan	67	71	82	81	82	B/C
		Sg. Bukit Besar	76	75	82	77	68	ST/SP
		Sg. Chemangar	72	70	73	77	79	ST/SP
		Sg. Johor	83	84	89	89	88	B/C
		Sg. Layang	89	93	93	93	94	B/C
		Sg. Layau Kiri	84	87	92	89	87	B/C
		Sg. Lebam	85	79	87	88	94	B/C
		Sg. Linggiu	88	84	93	92	92	B/C
		Sg. Panti	72	79	87	86	84	B/C
		Sg. Papan	83	81	86	87	90	B/C
		Sg. Pelebah	91	88	91	91	92	B/C
		Sg. Penggeli	87	89	88	90	90	B/C
		Sg. Remis	86	86	89	89	92	B/C
		Sg. Santi	85	89	87	90	92	B/C
		Sg. Sayong	85	82	85	87	88	B/C
		Sg. Sebol	69	73	80	79	80	ST/SP
		Sg. Seluyut	77	83	87	83	85	B/C
		Sg. Semangar	82	81	92	90	89	B/C
		Sg. Semenchu	35	66	85	86	86	B/C
		Sg. Sening	83	89	93	96	94	B/C
		Sg. Serai	57	67	60	62	64	ST/SP
		Sg. Telor	84	88	89	93	92	B/C
		Sg. Temoh	64	74	84	88	79	ST/SP
		Sg. Tiram	79	76	85	82	87	B/C
	Sg. Kaw. Pasir Gudang	Sg. Buluh	41	41	43	40	46	T/P
		Sg. Latoh	58	62	68	71	69	ST/SP
		Sg. Masai	50	63	60	63	73	ST/SP
		Sg. Perembi	42	57	47	59	69	ST/SP
		Sg. Tukang Batu	37	42	35	34	35	T/P
	Sg. Kempas	Sg. Kempas	40	32	42	41	38	T/P
	Sg. Kim-Kim	Sg. Kim-Kim	67	74	79	69	84	B/C
	Sg. Mersing	Sg. Empangan Congok	84	85	88	86	92	B/C
		Sg. Mersing	87	86	92	87	92	B/C
	Sg. Paloi	Sg. Paloi	80	89	90	90	91	B/C
	Sg. Pontian Besar	Sg. Air Hitam	76	71	74	73	82	B/C
		Sg. Ayer Merah	46	43	54	54	65	ST/SP
		Sg. Pontian Besar	67	73	71	74	81	B/C
	Sg. Pontian Kecil	Sg. Pontian Kecil	79	82	79	77	79	ST/SP
	Sg. Pulai	Sg. Pulai	72	80	80	85	80	ST/SP
		Sg. Pulai Dam	93	95	95	96	96	B/C
		Sg. Ulu Choh	67	72	72	74	74	ST/SP
	Sg. Rambah	Sg. Rambah	62	68	66	71	70	ST/SP
	Sg. Sanglang	Sg. Sanglang	60	59	57	51	66	ST/SP
	Sg. Sedili Besar	Sg. Ambat	88	86	84	76	88	B/C
		Sg. Dohol	88	89	90	86	89	B/C
		Sg. Mupur	47	67	73	73	60	ST/SP
		Sg. Pasir Panjang	87	88	87	76	71	ST/SP

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Johor	Sg. Sedili Besar	Sg. Sedili Besar	82	86	87	85	89	B/C
		Sg. Temubor Kanan	90	93	95	93	95	B/C
	Sg. Sedili Kecil	Sg. Anak Sedili Kecil	56	64	63	75	80	ST/SP
		Sg. Bahan	76	74	75	69	83	B/C
		Sg. Sedili Kecil	81	82	80	82	84	B/C
	Sg. Segget	Sg. Segget	52	65	70	68	52	T/P
	Sg. Skudai	Sg. Melana	68	78	81	83	83	B/C
		Sg. Skudai	57	66	76	74	79	ST/SP
	Sg. Tebrau	Sg. Bala	42	55	47	55	60	ST/SP
		Sg. Pandan	43	46	43	58	44	T/P
		Sg. Plentong	52	56	66	67	63	ST/SP
		Sg. Sebulung	38	53	58	62	56	T/P
		Sg. Sengkuang	35	52	53	50	35	T/P
		Sg. Tampoi	44	52	60	58	54	T/P
		Sg. Tebrau	56	58	71	65	62	ST/SP
Pahang	Sg. Anak Endau	Sg. Anak Endau	92	87	90	89	90	B/C
	Sg. Balok	Sg. Balok	68	69	77	76	76	ST/SP
		Sg. Panjang	86	76	78	72	80	ST/SP
		Sg. Yior	64	62	75	74	72	ST/SP
	Sg. Bebar	Sg. Bebar	83	82	88	87	90	B/C
		Sg. Merba	86	85	91	88	88	B/C
		Sg. Serai	81	79	86	83	87	B/C
	Sg. Cherating	Sg. Cherating	79	81	86	85	86	B/C
	Sg. Kuantan	Sg. Belat	79	80	86	88	87	B/C
		Sg. Charu	92	93	96	95	96	B/C
		Sg. Galing Besar	61	64	67	76	76	ST/SP
		Sg. Kenau	90	94	97	96	97	B/C
		Sg. Kuantan	87	88	93	91	92	B/C
		Sg. Pandan	83	87	93	94	93	B/C
		Sg. Pinang	89	80	88	88	89	B/C
		Sg. Reman	86	87	91	90	91	B/C
		Sg. Riau	84	84	88	88	87	B/C
		Sg. Talam	69	72	70	76	70	ST/SP
	Sg. Merchong	Sg. Merchong	86	87	92	87	89	B/C
	Sg. Rompin	Sg. Aur	86	86	91	90	91	B/C
		Sg. Bakar	71	75	69	92	95	B/C
		Sg. Jekatih	85	87	90	91	91	B/C
		Sg. Jeram	88	88	93	90	90	B/C
		Sg. Kepasing	81	88	90	92	88	B/C
		Sg. Keratong	85	85	91	90	91	B/C
		Sg. Pontian	87	85	90	84	88	B/C
		Sg. Pukin	83	86	89	94	94	B/C
		Sg. Rompin	87	83	92	90	89	B/C
		Sg. Sepayang	84	77	84	86	85	B/C
	Sg. Tonggok	Sg. Tonggok	70	76	81	73	80	ST/SP
Pahang/ N. Sembilan	Sg. Pahang	Sg. Anak Sg. Lepar	84	85	93	89	94	B/C
		Sg. Batu	79	84	92	91	94	B/C
		Sg. Belayar	89	94	94	92	93	B/C
		Sg. Bentong	83	89	94	93	92	B/C
		Sg. Benus	83	93	95	91	95	B/C
		Sg. Bera	84	84	86	86	87	B/C
		Sg. Berkelah	92	93	97	97	97	B/C
		Sg. Bertam	89	94	95	95	93	B/C
		Sg. Bilut	84	83	88	89	88	B/C
		Sg. Burung	92	96	96	95	93	B/C
		Sg. Chini	86	82	84	85	84	B/C
		Sg. Gapoi	94	94	97	96	97	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Pahang/ N. Sembilan	Sg. Pahang	Sg. Habu	88	90	96	94	94	B/C
		Sg. Jelai	87	88	92	89	91	B/C
		Sg. Jempol	88	87	95	92	95	B/C
		Sg. Jengka	87	88	92	91	93	B/C
		Sg. Kecau	80	86	88	91	91	B/C
		Sg. Kelau	83	88	90	89	90	B/C
		Sg. Kertam	90	91	91	93	93	B/C
		Sg. Koyan	88	89	94	92	93	B/C
		Sg. Krau	90	92	94	92	94	B/C
		Sg. Kundang	86	79	82	85	86	B/C
		Sg. Lenggok	91	93	96	92	96	B/C
		Sg. Lepar	91	92	91	93	95	B/C
		Sg. Lipis	86	89	92	92	93	B/C
		Sg. Luit	89	91	93	92	89	B/C
		Sg. Maran	90	93	96	96	96	B/C
		Sg. Mentiga	85	84	86	88	91	B/C
		Sg. Pahang	85	87	91	90	90	B/C
		Sg. Penjuring	87	94	97	97	97	B/C
		Sg. Pertang	83	90	91	91	91	B/C
		Sg. Perting	91	94	96	97	97	B/C
		Sg. Raub	89	93	95	95	96	B/C
		Sg. Retang	87	92	93	94	94	B/C
		Sg. Ringlet	82	83	91	89	91	B/C
		Sg. Salak	89	87	91	91	92	B/C
		Sg. Semantan	85	88	91	88	90	B/C
		Sg. Serting	76	81	84	83	84	B/C
		Sg. T. Paya Bungor	85	91	91	92	92	B/C
		Sg. Tahan	88	91	92	94	96	B/C
		Sg. Tanglir	86	88	89	89	90	B/C
		Sg. Tasik Bera	86	91	88	89	89	B/C
		Sg. Tasik Chini	90	92	90	92	92	B/C
		Sg. Teh	90	93	94	94	96	B/C
		Sg. Tekal	81	85	89	87	90	B/C
		Sg. Telang	90	91	94	93	93	B/C
		Sg. Telemong	88	93	96	94	94	B/C
		Sg. Telom	85	86	94	92	91	B/C
		Sg. Tembeling	88	91	90	94	95	B/C
		Sg. Teranum	87	95	96	96	97	B/C
		Sg. Teras	88	92	96	96	96	B/C
		Sg. Teris	87	91	94	94	94	B/C
		Sg. Terla	91	94	97	97	97	B/C
		Sg. Triang	86	88	91	85	87	B/C
		Sg. Tringkap	82	89	94	96	97	B/C
		Sg. Ulong	94	96	97	97	97	B/C
Terengganu	Sg. Besut	Sg. Besut	90	92	94	94	94	B/C
		Sg. Jertih	84	88	92	91	87	B/C
	Sg. Chukai	Sg. Bungkus	82	80	83	81	82	B/C
		Sg. Chukai	80	80	87	88	84	B/C
		Sg. Ibok	84	85	89	89	91	B/C
		Sg. Ruang	73	67	80	80	79	ST/SP
	Sg. Dungun	Sg. Dungun	88	90	96	92	93	B/C
		Sg. Telemboh	86	86	89	89	87	B/C
	Sg. Ibai	Sg. Ibai	78	83	80	82	80	ST/SP
	Sg. Kemaman	Sg. Cherul	85	90	91	91	93	B/C
		Sg. Kemaman	84	88	92	92	92	B/C
		Sg. Neram	31	75	86	85	88	B/C
		Sg. Perasing	82	82	92	94	90	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Terengganu	Sg. Kemaman	Sg. Ransan	73	81	87	87	90	B/C
		Sg. Kertih	83	85	85	88	88	B/C
		Sg. Kluang	83	88	84	84	85	B/C
	Sg. Marang	Sg. Kerak	81	79	82	85	82	B/C
		Sg. Marang	83	88	89	94	90	B/C
		Sg. Temala	87	91	92	91	90	B/C
	Sg. Merang	Sg. Merang	77	82	77	77	80	ST/SP
	Sg. Merchang	Sg. Landas	65	71	87	87	84	B/C
		Sg. Merchang	72	71	80	73	76	ST/SP
		Sg. Paka	86	92	96	96	92	B/C
	Sg. Paka	Sg. Paka	85	87	90	90	90	B/C
		Sg. Rasau	79	82	84	83	83	B/C
		Sg. Rengat	85	84	91	91	89	B/C
		Sg. Setiu	91	92	95	95	93	B/C
	Sg. Terengganu	Sg. Chalok	87	86	92	90	91	B/C
		Sg. Setiu	86	89	93	93	93	B/C
		Sg. Tarom	88	89	94	95	92	B/C
		Sg. Berang	91	91	95	96	97	B/C
Kelantan	Sg. Golok	Sg. Nerus	88	89	92	93	92	B/C
		Sg. Pueh	69	73	87	92	91	B/C
		Sg. Telemong	89	88	93	91	93	B/C
		Sg. Terengganu	88	87	91	92	92	B/C
	Sg. Kelantan	Sg. Golok	85	88	93	90	93	B/C
		Sg. Jedok	88	90	95	95	93	B/C
		Sg. Lanas	86	84	94	90	94	B/C
		Sg. Tasik Garu	76	80	85	82	87	B/C
		Sg. Aring	76	79	80	83	82	B/C
		Sg. Belatop	83	82	89	87	89	B/C
		Sg. Ber	84	87	91	91	91	B/C
		Sg. Berok	81	82	88	89	87	B/C
		Sg. Betis	84	86	93	92	92	B/C
		Sg. Chiku	85	88	89	91	87	B/C
		Sg. Galas	84	86	88	90	91	B/C
		Sg. Isos	73	73	73	78	74	ST/SP
		Sg. Kelantan	82	82	86	87	87	B/C
		Sg. Kelesa	84	87	94	91	90	B/C
		Sg. Kenkren	88	92	93	94	94	B/C
		Sg. Kerilla	88	91	94	94	95	B/C
		Sg. Ketil	86	90	97	90	92	B/C
		Sg. Lebir	85	87	92	90	91	B/C
		Sg. Muring	84	85	92	90	93	B/C
		Sg. Nal	86	88	91	89	91	B/C
		Sg. Nenggiri	81	81	82	87	87	B/C
		Sg. Pehi	87	86	91	91	92	B/C
		Sg. Pelaur	88	90	96	95	87	B/C
		Sg. Penangau	82	78	87	89	86	B/C
		Sg. Pergau	92	92	96	96	96	B/C
		Sg. Rasau	81	80	80	85	85	B/C
		Sg. Relai	84	90	91	90	87	B/C
		Sg. Sokor	83	86	89	89	88	B/C
		Sg. Tuang	87	90	94	91	97	B/C
	Sg. Kemasin	Sg. Gali	76	79	75	83	81	B/C
		Sg. Kemasin	81	83	85	87	84	B/C
		Sg. Semerak	84	85	87	88	86	B/C
	Sg. Pengkalan Chepa	Sg. Alor B	48	65	63	59	63	ST/SP
		Sg. Alor Lintah	61	76	68	70	74	ST/SP
		Sg. Keladi	78	76	84	89	87	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Kelantan	Sg. Pengkalan Chepa	Sg. Pengkalan Chepa	59	73	73	75	69	ST/SP
		Sg. Raja Gali	73	79	87	81	87	B/C
	Sg. Pengkalan Datu	Sg. Pasir Hor	67	73	77	75	77	ST/SP
		Sg. Pengkalan Datu	76	85	86	85	87	B/C
	Sg. Balingian	Sg. Balingian	86	90	87	87	76	ST/SP
	Sg. Baram	Sg. Baram	88	84	85	86	81	B/C
		Sg. Tutuh	92	90	-	87	79	ST/SP
	Sg. Kayan	Sg. Kayan	81	82	83	82	78	ST/SP
Sarawak	Sg. Kemena	Sg. Kemena	85	82	82	84	79	ST/SP
		Sg. Sibiu	83	81	79	83	76	ST/SP
	Sg. Kerian	Sg. Kerian	82	86	84	86	83	B/C
		Sg. Seblak	82	84	88	87	79	ST/SP
		Sg. Selalang	91	92	92	90	90	B/C
	Sg. Lawas	Sg. Lawas	91	89	89	91	92	B/C
	Sg. Limbang	Sg. Limbang	91	88	89	88	85	B/C
	Sg. Lutar	Sg. Ai	92	90	91	89	91	B/C
		Sg. Lutar	88	85	84	88	79	ST/SP
		Sg. Sekerang	91	92	88	87	90	B/C
		Sg. Seterap	86	82	86	89	80	ST/SP
		Sg. Undup	88	91	85	89	89	B/C
	Sg. Miri	Sg. Adong	70	83	78	57	54	T/P
		Sg. Dalam	74	84	83	80	70	ST/SP
		Sg. Lutong	86	78	82	79	74	ST/SP
		Sg. Miri	75	87	88	58	50	T/P
		Sg. Padang Liku	90	89	88	83	81	B/C
	Sg. Mukah	Sg. Mukah	83	88	82	86	75	ST/SP
	Sg. Niah	Sg. Niah	90	86	86	86	83	B/C
		Sg. Sekaloh	81	75	81	83	75	ST/SP
	Sg. Oya	Sg. Oya	84	86	84	86	73	ST/SP
Sarawak	Sg. Rajang	Sg. Baloi	89	89	-	89	73	ST/SP
		Sg. Binatang	89	89	89	87	86	B/C
		Sg. Daro	76	80	62	66	53	T/P
		Sg. Jemoreng	78	80	63	66	55	T/P
		Sg. Julau	90	88	86	85	89	B/C
		Sg. Kanowit	88	89	87	87	88	B/C
		Sg. Meradong	86	80	82	85	78	ST/SP
		Sg. Pakan	89	88	89	88	88	B/C
		Sg. Pila Parit	81	62	77	78	81	B/C
		Sg. Rajang	85	85	85	86	83	B/C
	Sg. Sadong	Sg. Salim	80	83	81	86	76	ST/SP
		Sg. Sarikei	87	85	89	88	83	B/C
		Sg. Karangan	78	74	76	84	68	ST/SP
	Sg. Sarawak	Sg. Sadong	84	83	85	85	83	B/C
		Sg. Tarat	90	91	90	90	90	B/C
Sarawak	Sg. Sarawak	Sg. Kelantan	84	74	59	68	66	ST/SP
		Sg. Kuap	85	87	88	89	79	ST/SP
		Sg. Maong Kiri	76	72	73	82	70	ST/SP
		Sg. Samarahan	70	74	71	79	72	ST/SP
		Sg. Sarawak	85	87	86	88	87	B/C
		Sg. Sarawak Kanan	85	82	84	85	83	B/C
		Sg. Sarawak Kiri	87	88	87	87	89	B/C
		Sg. Semadang	90	89	90	90	93	B/C
		Sg. Semenggoh	77	71	78	83	75	ST/SP
	Sg. Saribas	Sg. Tabuan	73	77	76	78	64	ST/SP
		Sg. Tapah	89	89	91	90	88	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Sarawak	Sg. Semunsam	Sg. Semunsam	85	87	80	85	88	B/C
	Sg. Sibuti	Sg. Kabuloh	68	71	64	76	82	B/C
		Sg. Kejapil	90	88	89	85	86	B/C
		Sg. Satap	86	88	84	84	74	ST/SP
		Sg. Sibuti	86	85	85	81	79	ST/SP
	Sg. Similajau	Sg. Similajau	89	90	85	87	83	B/C
	Sg. Suai	Sg. Suai	89	88	87	85	80	ST/SP
	Sg. Tatau	Sg. Tatau	87	88	85	86	84	B/C
	Sg. Trusan	Sg. Trusan	92	88	88	90	86	B/C
Sabah	Sg. Apas	Sg. Apas	91	89	90	92	90	B/C
	Sg. Balung	Sg. Balung	93	87	91	92	90	B/C
	Sg. Bengkoka	Sg. Bengkoka	85	88	89	90	85	B/C
	Sg. Bingkongan	Sg. Bandau	90	91	92	92	94	B/C
		Sg. Bingkongan	92	91	94	93	94	B/C
		Sg. Menggaris	91	93	92	92	93	B/C
		Sg. Tandek	90	91	91	91	91	B/C
	Sg. Bongawan	Sg. Bongawan	88	87	87	88	87	B/C
	Sg. Brantian	Sg. Brantian	91	86	84	90	87	B/C
	Sg. Kalabakan	Sg. Kalabakan	86	84	83	86	81	B/C
	Sg. Kalumpang	Sg. Kalumpang	89	86	87	88	87	B/C
		Sg. Pang Burong 1	89	83	86	86	87	B/C
		Sg. Pang Burong 2	76	69	85	80	79	ST/SP
	Sg. Kedamaian	Sg. Kedamaian	93	90	93	92	95	B/C
		Sg. Tempasuk	92	91	92	91	92	B/C
		Sg. Wariu	91	91	93	93	94	B/C
	Sg. Kimanis	Sg. Kimanis	89	87	90	92	90	B/C
	Sg. Kinabatangan	Sg. Karamuak	92	91	92	92	91	B/C
		Sg. Kinabatangan	87	84	85	84	84	B/C
		Sg. Koyah	88	87	89	88	86	B/C
		Sg. Leepang	88	84	85	84	83	B/C
		Sg. Menanggul	87	81	86	86	82	B/C
		Sg. Pin	85	86	87	86	86	B/C
		Sg. Takala	88	85	88	87	85	B/C
	Sg. Labok	Sg. Kinipir	91	90	91	90	92	B/C
		Sg. Labok	89	87	86	88	87	B/C
		Sg. Liwagu	91	88	89	88	92	B/C
		Sg. Maliau	93	92	94	93	95	B/C
		Sg. Tungud	90	88	91	85	87	B/C
	Sg. Lakutan	Sg. Lakutan	90	89	93	88	92	B/C
	Sg. Likas	Sg. Darau	76	80	83	83	81	B/C
		Sg. Inanam	84	84	88	89	88	B/C
		Sg. Likas	78	78	76	78	71	ST/SP
		Sg. Menggatal	90	85	89	91	94	B/C
	Sg. Lingkungan	Sg. Bukau	90	88	92	87	90	B/C
		Sg. Lingkungan	89	91	93	89	93	B/C
		Sg. Membakut	87	85	87	89	89	B/C
		Sg. Menggalong	91	89	93	90	91	B/C
		Sg. Merotai	87	89	91	91	92	B/C
		Sg. Mounad	87	86	87	88	87	B/C
		Sg. Moyog	92	89	92	92	93	B/C
	Sg. Padas	Sg. Buntsit	92	91	93	92	94	B/C
		Sg. Liawan	91	91	91	92	93	B/C
		Sg. Padas	87	86	88	87	86	B/C
		Sg. Pangatan	86	87	88	87	86	B/C
		Sg. Pegalan	89	88	88	87	90	B/C
		Sg. Tandulu	90	91	92	92	93	B/C

**Jadual 2.1: Status Kualiti Air Sungai Mengikut Sungai, 2023**  
**Table 2.1: Water Quality Status by River, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
			2019	2020	2021	2022	2023	
Sabah	Sg. Paitan	Sg. Paitan	88	85	91	90	88	B/C
	Sg. Papar	Sg. Papar	92	90	91	91	92	B/C
	Sg. Sapi	Sg. Sapi	87	85	87	84	85	B/C
		Sg. Sualong	91	92	92	93	95	B/C
	Sg. Segaliud	Sg. Segaliud	87	87	85	82	84	B/C
	Sg. Segama	Sg. Segama	91	85	87	86	86	B/C
	Sg. Sembulan	Sg. Sembulan	77	79	81	74	70	ST/SP
	Sg. Silabukan	Sg. Silabukan	90	89	89	87	93	B/C
	Sg. Sugut	Sg. Bongkud	92	91	92	93	93	B/C
		Sg. Lohan	92	91	92	93	95	B/C
		Sg. Merali	92	88	91	90	95	B/C
		Sg. Sugut	91	88	91	91	94	B/C
	Sg. Tawau	Sg. Tawau	88	85	91	91	92	B/C
	Sg. Telipok	Sg. Telipok	77	86	89	89	91	B/C
	Sg. Tenghilan	Sg. Tenghilan	91	92	92	90	92	B/C
	Sg. Tingkayu	Sg. Tingkayu	89	85	85	85	80	ST/SP
	Sg. Tuaran	Sg. Damit	88	89	87	89	92	B/C
		Sg. Song Sai	91	90	92	92	94	B/C
		Sg. Tuaran	92	92	93	93	94	B/C
	Sg. Tungku	Sg. Tungku	88	89	90	89	92	B/C
	Sg. Umas-Umas	Sg. Umas Umas	90	83	84	89	85	B/C

Nota / Note:

Kategori IKA / WQI Category

<span style="background-color: #0070C0; border: 1px solid black; padding: 2px 5px;"></span>	B / C	Bersih / Clean
<span style="background-color: #FFFF00; border: 1px solid black; padding: 2px 5px;"></span>	ST / SP	Sederhana Tercemar / Slightly Polluted
<span style="background-color: #FF0000; border: 1px solid black; padding: 2px 5px;"></span>	T / P	Tercemar / Polluted

Nilai IKA / WQI Value

<span style="background-color: #0070C0; border: 1px solid black; padding: 2px 5px;"></span>	> 92.7	Kelas I / Class I	<span style="background-color: #FFA500; border: 1px solid black; padding: 2px 5px;"></span>	31.0 - 51.9	Kelas IV / Class IV
<span style="background-color: #6AA84F; border: 1px solid black; padding: 2px 5px;"></span>	76.5 - 92.7	Kelas II / Class II	<span style="background-color: #FF0000; border: 1px solid black; padding: 2px 5px;"></span>	< 31.0	Kelas V / Class V
<span style="background-color: #FFFF00; border: 1px solid black; padding: 2px 5px;"></span>	51.9 - 76.5	Kelas III / Class III	<span style="background-color: #FFFFFF; border: 1px solid black; padding: 2px 5px;"></span>	-	Tiada Data / No Data

**Jadual 2.2: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2023**

**Table 2.2: The Polluted Rivers and Classes Based on BOD, AN and SS, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	2023			KELAS BERDASARKAN / CLASS BASED ON		
			IKA / WQI	KATEGORI / CATEGORY	KELAS / CLASS	BOD	AN	SS
Kedah	Sg. Merbok	Sg. Bakar Arang	58	T/P	III	IV	IV	I
		Sg. Petani	53	T/P	III	V	V	I
P. Pinang	Sg. Jawi	Sg. Chempedak	55	T/P	III	V	III	III
		Sg. Jawi	54	T/P	III	III	V	III
	Sg. Juru	Sg. Rambai	57	T/P	III	IV	V	I
	Sg. Kluang	Sg. Kluang	58	T/P	III	IV	V	I
	Sg. Pinang	Sg. Pinang	50	T/P	IV	V	V	I
		Sg. Titi Kerawang	57	T/P	III	IV	V	I
Selangor	Sg. Buloh	Sg. Buloh	54	T/P	III	V	IV	II
Selangor/ W.P. Kuala Lumpur	Sg. Klang	Sg. Air Busuk	42	T/P	IV	V	V	I
		Sg. Kerayong	58	T/P	III	IV	V	I

**Jadual 2.2: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2023**  
**Table 2.2: The Polluted Rivers and Classes Based on BOD, AN and SS, 2023**

Selangor/ W.P. Kuala Lumpur	Sg. Klang	Sg. Toba	53	T/P	III	V	V	II
Johor	Sg. Danga	Sg. Danga	57	T/P	III	IV	V	II
	Sg. Kaw. Pasir Gudang	Sg. Buluh	46	T/P	IV	V	I	I
		Sg. Tukang Batu	35	T/P	IV	V	V	I
	Sg. Kempas	Sg. Kempas	38	T/P	IV	V	V	II
	Sg. Segget	Sg. Segget	52	T/P	III	IV	V	I
	Sg. Tebrau	Sg. Pandan	44	T/P	IV	V	V	I
		Sg. Sebulung	56	T/P	III	V	V	I
		Sg. Sengkuang	35	T/P	IV	V	V	II
Sarawak	Sg. Miri	Sg. Tampoi	54	T/P	III	V	V	I
		Sg. Adong	54	T/P	III	II	III	I
	Sg. Rajang	Sg. Miri	50	T/P	IV	II	III	I
		Sg. Daro	53	T/P	III	II	II	I
		Sg. Jemoreng	55	T/P	III	I	II	I

## TREN AIR SUNGAI

Berdasarkan kepada IKA yang telah direkodkan pada tahun 2023, didapati berlakunya penurunan kepada kualiti air sungai. Bilangan sungai yang dikategorikan sebagai bersih telah menurun kepada 486 (72%) sungai pada tahun 2023 berbanding 495 (74%) sungai pada tahun 2022. Secara umumnya, penurunan kualiti air yang direkodkan pada tahun 2023 adalah disebabkan oleh peningkatan beban pencemaran pada sungai daripada punca tetap dan punca tidak tetap.

Bilangan sungai tercemar telah menurun daripada 29 sungai pada tahun 2022 kepada 25 sungai pada tahun 2023. Ini menunjukkan terdapat peningkatan tren kualiti air dan bilangan sungai tercemar semakin berkurang. Trend kualiti air sungai adalah ditunjukkan di dalam **Rajah 2.1**.

Berdasarkan sub-indeks BOD, bilangan sungai yang dikategorikan sebagai bersih adalah 528 (78%) sungai pada tahun 2023 (**Rajah 2.2**). Bilangan sungai yang tercemar dari segi sub-indeks BOD telah menurun daripada 71 (11%) pada tahun 2022 kepada 59 (9%) sungai pada tahun 2023. Peningkatan kualiti air sungai dari segi BOD ini adalah disebabkan oleh pengurangan pelepasan bahan buangan yang bersifat organik daripada pelbagai punca seperti aktiviti industri, serta aktiviti komersial dan domestik.

## TREND IN RIVER WATER

Based on the WQI recorded in 2023, there has been a decrease in river water quality. The number of rivers categorised as clean has decreased to 486 (72%) rivers in 2023 compared to 495 (74%) rivers in 2022. In general, the decrease in water quality recorded in 2023 is due to an increase in the pollution load on the river from point sources and nonpoint sources.

The number of polluted rivers has decreased from 29 rivers in 2022 to 25 rivers in 2023. This indicates that there was an increase in water quality trends and the number of polluted rivers was decreasing. The river water quality trend is shown in **Figure 2.1**.

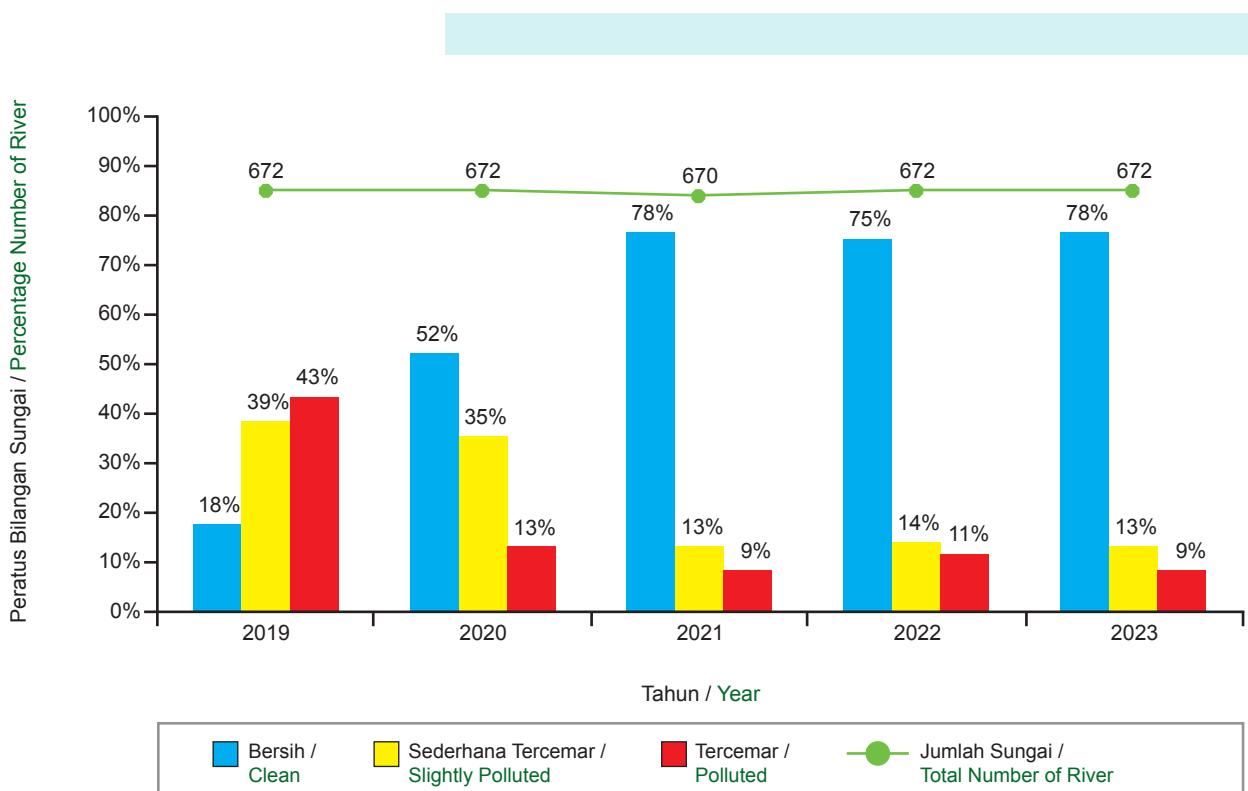
Based on the BOD sub-index, the number of rivers categorised as clean were 528 (78%) rivers in 2023 (**Figure 2.2**). The number of rivers polluted in terms of the BOD sub-index has decreased from 71 (11%) in 2022 to 59 (9%) rivers in 2023. The improvement in river water quality in terms of BOD was due to the reduction in the discharge of organic wastes from various sources such as industrial activities, as well as commercial and domestic activities.

Dari segi sub-indeks AN pula, bilangan sungai bersih telah meningkat daripada 295 (44%) sungai pada tahun 2022 kepada 311 (46%) sungai pada tahun 2023 (**Rajah 2.3**). Bilangan sungai yang tercemar dari segi sub-indeks AN telah menurun daripada 198 (29%) sungai pada tahun 2022 kepada 188 (28%) sungai pada tahun 2023. Peningkatan kualiti air sungai bagi sub-indeks AN boleh dikaitkan dengan pengurangan pelepasan air sisa kumbahan manusia dan haiwan yang tidak diolah dan diolah ke dalam air sungai.

Dari segi sub-indeks SS pula, bilangan sungai yang dikategorikan bersih telah meningkat daripada 536 (80%) sungai pada tahun 2022 kepada 551 (82%) sungai pada tahun 2023 (**Rajah 2.4**). Bilangan sungai yang dikategorikan sebagai tercemar dari segi sub-indeks SS pula telah menurun daripada 83 (12%) sungai pada 2022 kepada 76 (11%) sungai pada tahun 2023. Peningkatan kualiti air sungai dari segi pepejal terampai tersebut disebabkan oleh kecekapan kawalan ke atas aktiviti kerja tanah dan pembukaan tanah di kawasan-kawasan tertentu.

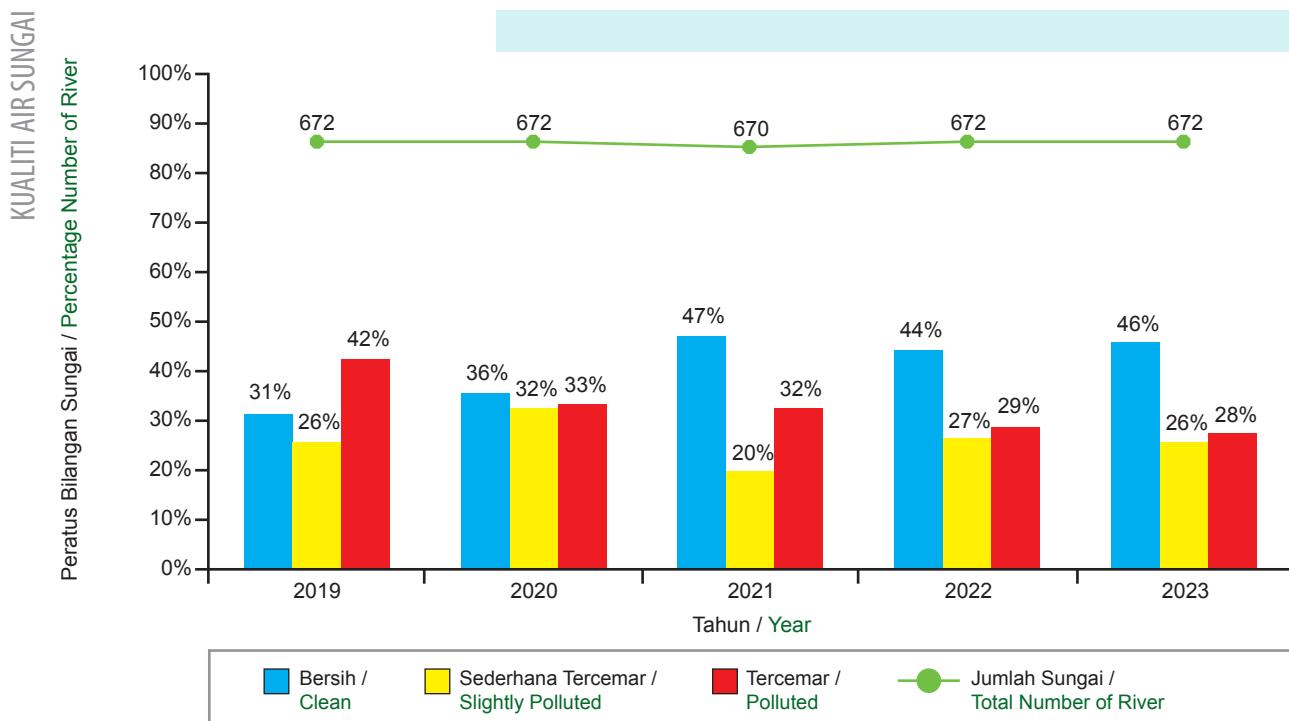
In terms of sub-index AN, the number of clean rivers has increased from 295 (44%) rivers in 2022 to 311 (46%) rivers in 2023 (**Figure 2.3**). The number of rivers polluted in terms of sub-index AN has decreased from 198 (29%) rivers in 2022 to 188 (28%) rivers in 2023. The improvement in river water quality for the AN sub-index can be attributed to a reduction in the discharge of human and animal wastewater that was untreated and treated into the river water.

In terms of SS sub-index, the number of clean rivers has increased from 536 (80%) rivers in 2022 to 551 (82%) rivers in 2023 (**Figure 2.4**). The number of rivers categorised as polluted in terms of sub-index SS has decreased from 83 (12%) rivers in 2022 to 76 (11%) rivers in 2023. The improvement in river water quality in terms of suspended solids was due to the efficiency of control over earthworks activities and land clearing in certain areas.



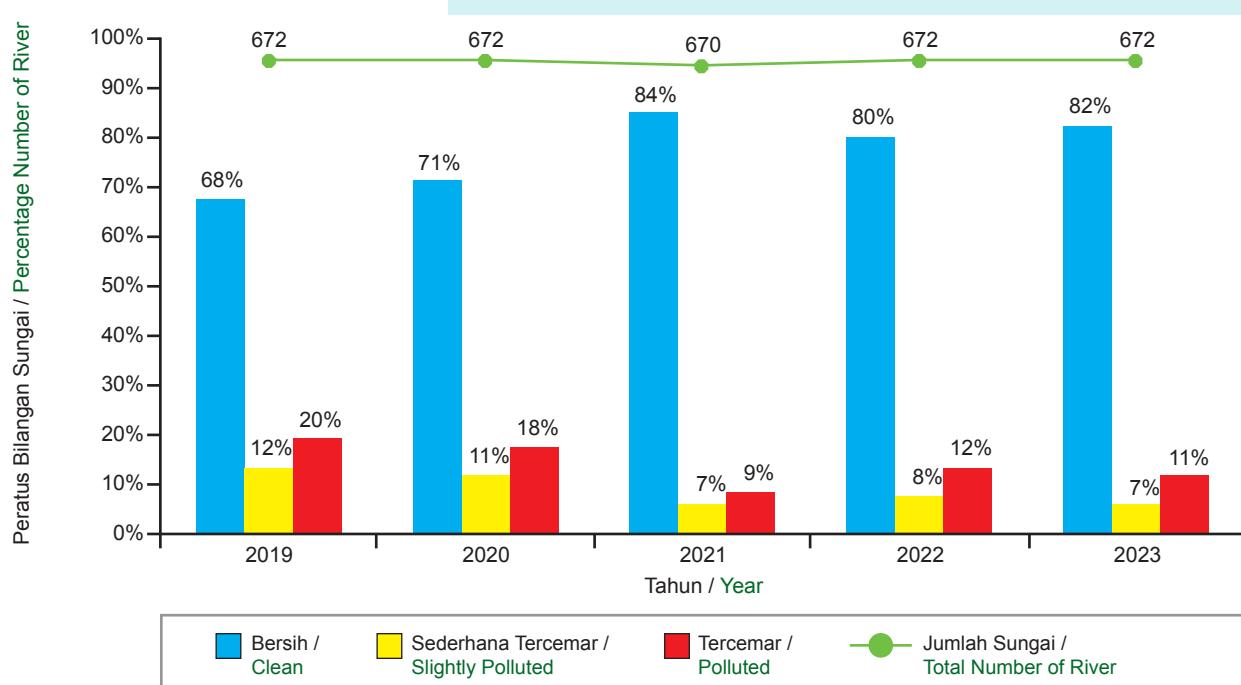
Rajah 2.2: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks BOD, 2019-2023

Figure 2.2: River Water Quality Trend on BOD Sub-Index, 2019-2023



Rajah 2.3: Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks AN, 2019-2023

Figure 2.3: River Water Quality Stations Trend on AN Sub-Index, 2019-2023



Rajah 2.4: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks SS, 2019-2023

Figure 2.4: River Water Quality Trend on AN Sub-Index, 2019-2023

## STATUS KUALITI AIR MENGIKUT STESEN

**Jadual 2.3** menunjukkan status kualiti air mengikut stesen. Daripada 1,353 stesen, 987 (73%) stesen dikategorikan sebagai bersih, 314 (23%) stesen adalah sederhana tercemar dan 52 (4%) stesen adalah tercemar (**Rajah 2.5**).

Berdasarkan kepada IKA yang telah direkodkan pada tahun 2023, didapati berlakunya penurunan kepada kualiti air sungai pada stesen-stesen yang dipantau. Ini memandangkan terdapat stesen-stesen yang sebelum ini dikategorikan sebagai bersih telah menjadi kategori sederhana tercemar.

Bilangan stesen sungai yang dikategorikan sebagai bersih adalah 987 (73%) stesen pada tahun 2023 berbanding 1,002 (74%) stesen pada tahun sebelumnya. Bilangan stesen sungai yang dikategorikan sebagai sederhana tercemar telah berlaku sedikit peningkatan daripada 295 (22%) stesen pada tahun 2022 kepada 314 (23%) stesen pada tahun 2023. Bilangan stesen yang berada di dalam kategori tercemar telah menurun daripada 56 (4%) stesen pada tahun 2022 kepada 52 (4%) stesen pada tahun 2023. Ini menunjukkan terdapat peningkatan tren kualiti air pada bilangan stesen yang berada di dalam kategori tercemar.

Secara umumnya, penurunan kualiti air yang direkodkan pada tahun 2023 adalah disebabkan oleh peningkatan pelepasan beban bahan pencemar sama ada daripada punca tetap atau punca tidak tetap ke dalam sungai.

Bagi pengelasan IKA stesen pengawasan kualiti air sungai pula, sebanyak 341 (25%) stesen di dalam Kelas I, 731 (54%) stesen di Kelas II, 262 (20%) stesen di Kelas III, dan 19 (1%) stesen di Kelas IV.

## WATER QUALITY STATUS BY STATIONS

**Table 2.3** shows the water quality status by station. Out of the 1,353 stations, 987 (73%) stations were categorised as clean, 314 (23%) stations were slightly polluted and 52 (4%) stations were polluted (**Figure 2.5**).

Based on the WQI recorded in 2023, there has been a decrease in river water quality at the monitored stations. This is because there are stations that were previously categorised as clean that have now been categorised as slightly polluted.

The number of river stations categorised as clean was 987 (73%) of stations in 2023 compared to 1,002 (74%) stations in the previous year. The number of river stations categorised as slightly polluted has increased slightly from 295 (22%) stations in 2022 to 314 (23%) stations in 2023. The number of stations in the polluted category has decreased from 56 (4%) stations in 2022 to 52 (4%) stations in 2023. This indicates that there was an increase in water quality trends in the number of stations that were in the polluted category.

Generally, the decrease in water quality recorded in 2023 is due to increased emissions of the pollutant load either from point sources or nonpoint sources into the river.

For the WQI classification of river water quality monitoring stations, 341 (25%) stations in Class I, 731 (54%) stations in Class II, 262 (20%) stations in Class III, and 19 (1%) stations in Class IV.

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perlis	Sg. Perlis	Sg. Arau	1RPLS012	80	79	88	85	90	B/C
		Sg. Arau	1RPLS014	87	91	92	93	89	B/C
		Sg. Empangan Timah Tasoh	1RPLS015	87	93	95	96	95	B/C
		Sg. Jarum	1RPLS006	83	88	91	89	88	B/C
		Sg. Jernih	1RPLS004	86	92	92	95	91	B/C
		Sg. Jernih	1RPLS005	86	90	95	94	94	B/C
		Sg. Kok Mak	1RPLS007	86	88	87	88	86	B/C
		Sg. Korok	1RPLS013	71	75	76	74	79	ST/SP
		Sg. Ngulang	1RPLS002	82	90	92	93	88	B/C
		Sg. Pelarit	1RPLS008	91	94	96	96	96	B/C
		Sg. Perlis	1RPLS001	72	76	77	78	81	B/C
		Sg. Serai	1RPLS003	76	82	86	90	86	B/C
		Sg. Terusan Mada	1RPLS010	84	88	91	92	93	B/C
		Sg. Terusan Mada	1RPLS011	87	89	92	89	91	B/C
		Sg. Wang Kelian	1RPLS009	94	95	97	97	97	B/C
Kedah	Sg. Kedah	Sg. Ahning	1KKDH011	88	92	96	95	94	B/C
		Sg. Changlun	1KKDH016	77	87	88	87	86	B/C
		Sg. Janing	1KKDH007	91	93	97	97	97	B/C
		Sg. Kedah	1KKDH001	64	70	77	76	73	ST/SP
		Sg. Napoh	1KKDH017	80	82	89	90	88	B/C
		Sg. Padang Terap	1KKDH002	87	87	91	89	93	B/C
		Sg. Padang Terap	1KKDH003	88	88	91	90	87	B/C
		Sg. Padang Terap	1KKDH004	89	85	96	95	95	B/C
		Sg. Padang Terap	1KKDH009	70	74	81	78	86	B/C
		Sg. Padang Terap	1KKDH012	91	92	97	95	96	B/C
		Sg. Pedu	1KKDH005	90	91	95	94	95	B/C
		Sg. Pendang	1KKDH008	77	81	82	85	85	B/C
		Sg. Sintok	1KKDH018	81	92	96	95	92	B/C
		Sg. Tekai	1KKDH006	80	88	94	93	91	B/C
		Sg. Temin	1KKDH010	77	84	89	89	87	B/C
		Sg. Terusan Lengkuas	1KKDH014	89	86	92	92	93	B/C
		Sg. Terusan Mada Selatan	1KKDH013	88	89	92	90	91	B/C
		Sg. Terusan Tengah	1KKDH015	89	88	93	93	94	B/C
	Sg. Merbok	Sg. Kerian	1KKER001	93	94	95	96	95	B/C
		Sg. Kisap	1KKSP001	90	95	97	97	96	B/C
		Sg. Kuah	1KKUA001	74	81	79	81	69	ST/SP
		Sg. Bakar Arang	1KMBK008	59	56	69	66	58	T/P
		Sg. Batu	1KMBK002	66	70	64	59	65	ST/SP
		Sg. Bongkok	1KMBK003	63	71	75	71	74	ST/SP
		Sg. Bukit Merah	1KMBK006	80	92	92	89	95	B/C
		Sg. Bukit Nanas	1KMBK011	93	95	97	97	98	B/C
		Sg. Korok	1KMBK009	69	65	71	66	64	ST/SP
		Sg. Merbok	1KMBK001	77	79	81	81	82	B/C
		Sg. Petani	1KMBK007	54	63	68	64	53	T/P
		Sg. Tok Pawang	1KMBK004	88	90	95	94	96	B/C
		Sg. Tok Pawang	1KMBK005	88	90	95	96	96	B/C
		Sg. Tupah	1KMBK010	93	94	97	97	98	B/C
	Sg. Muda	Sg. Chepir	1KMUD012	87	89	91	92	90	B/C
		Sg. Gunung Inas	1KMUD021	92	93	93	95	96	B/C
		Sg. Jerong	1KMUD002	61	66	75	73	77	ST/SP
		Sg. Jerong	1KMUD003	69	74	78	70	74	ST/SP
		Sg. Karangan	1KMUD009	81	85	91	83	87	B/C
		Sg. Ketil	1KMUD007	85	87	93	91	93	B/C
		Sg. Muda	1KMUD001	85	86	92	90	87	B/C
		Sg. Muda	1KMUD004	85	85	90	91	90	B/C
		Sg. Muda	1KMUD005	87	88	94	95	94	B/C
		Sg. Muda	1KMUD013	86	86	92	91	88	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kedah	Sg. Muda	Sg. Muda	1KMUD014	89	90	91	94	94	B/C
		Sg. Muda	1KMUD015	87	88	92	94	95	B/C
		Sg. Muda	1KMUD016	86	85	90	91	91	B/C
		Sg. Muda	1KMUD018	86	86	94	91	90	B/C
		Sg. Muda	1KMUD019	88	90	93	96	94	B/C
		Sg. Muda	1KMUD023	85	87	92	91	89	B/C
		Sg. Muda	1KMUD024	84	85	90	91	90	B/C
		Sg. Muda	1KMUD025	85	89	94	95	94	B/C
		Sg. Pegang	1KMUD011	93	95	97	97	97	B/C
		Sg. Sedim	1KMUD008	88	90	93	91	93	B/C
		Sg. Sedim	1KMUD017	87	89	91	93	93	B/C
		Sg. Tawar	1KMUD006	90	89	91	92	92	B/C
		Sg. Tawar	1KMUD010	88	88	89	94	91	B/C
		Sg. Tawar	1KMUD020	90	88	90	93	91	B/C
	Sg. Perai	Sg. Jarak	1KPRI018	74	74	77	69	71	ST/SP
		Sg. Jarak	1KPRI019	74	74	76	69	75	ST/SP
		Sg. Jarak	1KPRI024	73	72	70	71	69	ST/SP
		Sg. Keladi	1KPRI015	74	78	81	82	82	B/C
		Sg. Kulim	1KPRI014	75	77	82	78	81	B/C
P. Pinang	Sg. Ulu Melaka	Sg. Kulim	1KPRI016	92	90	91	92	91	B/C
		Sg. Kulim	1KPRI017	92	91	93	94	88	B/C
		Sg. Kulim	1KPRI023	91	90	92	91	91	B/C
		Sg. Kulim	1KPRI025	92	88	94	94	88	B/C
		Sg. Seluang	1KPRI021	64	64	67	65	64	ST/SP
		Sg. Seluang Bawah	1KPRI020	67	67	71	66	64	ST/SP
		Sg. Chenang	1KMLK006	69	78	84	77	84	B/C
	Sg. Bayan Lepas	Sg. Melaka	1KMLK002	77	81	90	85	83	B/C
		Sg. Melaka	1KMLK003	81	87	91	91	93	B/C
		Sg. Melaka	1KMLK007	92	96	97	97	97	B/C
		Sg. Petang	1KMLK001	93	96	97	98	97	B/C
		Sg. Saga	1KMLK004	76	81	92	88	85	B/C
		Sg. Tuba	1KMLK005	88	94	96	97	96	B/C
		Sg. Bayan Lepas	1PBLS003	76	64	74	69	71	ST/SP
		Sg. Tiram	1PBLS001	78	77	76	78	71	ST/SP
	Sg. Jawi	Sg. Tiram	1PBLS002	65	67	67	71	67	ST/SP
		Sg. Chempedak	1PJWI003	54	47	41	36	55	T/P
		Sg. Jawi	1PJWI001	49	55	52	57	54	T/P
		Sg. Junjong	1PJWI002	62	64	60	57	66	ST/SP
		Sg. Junjong	1PJWI004	47	57	52	58	53	T/P
		Sg. Junjong	1PJWI006	92	94	95	96	97	B/C
		Sg. Machang Bubok	1PJWI007	70	76	72	68	73	ST/SP
	Sg. Juru	Sg. Tengah	1PJWI005	61	49	58	47	63	ST/SP
		Sg. Ara	1PJRU006	66	67	77	75	77	ST/SP
		Sg. Juru	1PJRU001	60	68	69	66	63	ST/SP
		Sg. Juru	1PJRU012	53	64	65	70	65	ST/SP
		Sg. Kilang Ubi	1PJRU002	68	70	69	68	66	ST/SP
		Sg. Kilang Ubi	1PJRU003	71	75	70	68	67	ST/SP
		Sg. Kilang Ubi	1PJRU009	92	93	97	96	97	B/C
		Sg. Kilang Ubi	1PJRU010	58	63	60	61	54	T/P
		Sg. Kilang Ubi	1PJRU011	56	66	69	68	65	ST/SP
		Sg. Pasir	1PJRU004	61	65	75	66	63	ST/SP
		Sg. Permatang Rawa	1PJRU008	61	53	60	55	64	ST/SP
		Sg. Permatang Rawa	1PJRU013	69	66	90	87	79	ST/SP
		Sg. Rambai	1PJRU005	49	57	57	56	50	T/P
		Sg. Rambai	1PJRU007	54	56	62	55	67	ST/SP
	Sg. Kerian	Sg. Kechil	1PKER002	86	87	90	91	91	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)	
				2019	2020	2021	2022	2023		
P. Pinang	Sg. Kerian	Sg. Kechil	1PKER005	78	84	87	84	85	B/C	
		Sg. Kerian	1PKER003	83	88	89	87	88	B/C	
		Sg. Kerian	1PKER004	84	85	89	92	92	B/C	
		Sg. Kerian	1PKER006	85	86	89	89	87	B/C	
		Sg. Kerian	1PKER009	73	80	84	82	82	B/C	
		Sg. Kerian	1PKER014	77	85	86	85	84	B/C	
		Sg. Serdang	1PKER007	73	71	80	83	89	B/C	
	Sg. Kluang	Sg. Ara	1PKLU002	91	95	97	97	97	B/C	
		Sg. Ara	1PKLU003	65	68	69	72	63	ST/SP	
		Sg. Dua Besar	1PKLU005	57	64	68	67	63	ST/SP	
		Sg. Kluang	1PKLU001	63	65	68	52	58	T/P	
		Sg. Relau	1PKLU004	66	66	68	69	65	ST/SP	
	Sg. Perai	Sg. Air Melintas	1PPRI007	54	58	57	60	64	ST/SP	
		Sg. Jarak	1PPRI009	69	74	79	71	76	ST/SP	
		Sg. Jarak	1PPRI011	70	72	70	74	69	ST/SP	
		Sg. Jarak	1PPRI012	68	71	71	76	80	ST/SP	
		Sg. Kereh	1PPRI006	51	47	59	57	60	ST/SP	
		Sg. Kereh	1PPRI008	57	55	60	56	57	T/P	
		Sg. Kereh	1PPRI024	65	64	66	64	62	ST/SP	
		Sg. Kubang Semang	1PPRI005	64	64	66	68	74	ST/SP	
		Sg. Perai	1PPRI003	62	64	74	62	67	ST/SP	
		Sg. Perai	1PPRI004	63	67	70	62	65	ST/SP	
		Sg. Pertama	1PPRI022	59	65	69	52	63	ST/SP	
		Sg. Seluang Bawah	1PPRI010	62	61	68	67	62	ST/SP	
	Sg. Pinang	Sg. Air Itam	1PPNG006	72	70	74	69	65	ST/SP	
		Sg. Air Itam	1PPNG011	76	76	76	65	62	ST/SP	
		Sg. Air Itam	1PPNG018	94	96	97	96	97	B/C	
		Sg. Air Terjun	1PPNG019	93	95	97	97	97	B/C	
		Sg. Batu Feringghi	1PPNG001	79	80	82	81	77	ST/SP	
		Sg. Batu Feringghi	1PPNG002	92	95	96	96	97	B/C	
		Sg. Dondang	1PPNG012	84	83	86	54	57	T/P	
		Sg. Dondang	1PPNG013	84	84	87	58	56	T/P	
		Sg. Dondang	1PPNG014	71	71	79	75	73	ST/SP	
		Sg. Dondang	1PPNG015	72	73	75	73	76	ST/SP	
		Sg. Dondang	1PPNG016	74	71	73	68	68	ST/SP	
		Sg. Dondang	1PPNG017	72	67	63	61	66	ST/SP	
		Sg. Jelutong	1PPNG010	64	63	65	68	63	ST/SP	
		Sg. Pinang	1PPNG003	88	88	94	92	89	B/C	
		Sg. Pinang	1PPNG008	62	69	67	61	50	T/P	
		Sg. Pinang	1PPNG021	66	55	63	56	41	T/P	
	Perak	Sg. Satu	1PPNG020	93	96	97	97	97	B/C	
		Sg. Titi Kerawang	1PPNG004	63	68	75	63	57	T/P	
		Sg. Bernam	Sg. Bernam	1ABNM001	69	64	73	74	68	ST/SP
			Sg. Bernam	1ABNM002	67	72	66	63	67	ST/SP
			Sg. Bernam	1ABNM003	70	80	81	82	84	B/C
			Sg. Bernam	1ABNM004	86	86	93	93	90	B/C
			Sg. Bernam	1ABNM005	83	86	93	93	92	B/C
			Sg. Bernam	1ABNM006	87	90	97	96	96	B/C
			Sg. Gelinting	1ABNM015	87	92	96	96	97	B/C
			Sg. Inki	1ABNM012	93	94	97	97	97	B/C
			Sg. Slim	1ABNM007	86	87	94	95	94	B/C
			Sg. Slim	1ABNM008	87	88	94	95	94	B/C
			Sg. Slim	1ABNM011	79	89	94	91	92	B/C
		Sg. Bernam	Sg. Trolak	1ABNM009	90	91	96	96	96	B/C
			Sg. Trolak	1ABNM010	91	92	97	95	95	B/C
		Sg. Bernam	Sg. Trolak	1ABNM014	91	93	96	96	97	B/C
		Sg. Bruas	Sg. Bruas	1ABRU001	77	72	75	69	73	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Sg. Bruas	Sg. Bruas	1ABRU004	90	91	94	95	95	B/C
		Sg. Bruas	1ABRU005	94	96	97	97	98	B/C
		Sg. Dandang	1ABRU006	86	91	94	95	95	B/C
		Sg. Licin	1ABRU007	95	96	97	97	97	B/C
		Sg. Rotan	1ABRU002	91	92	96	94	96	B/C
		Sg. Rotan	1ABRU003	86	83	88	83	86	B/C
	Sg. Kerian	Sg. Selama	1AKER011	82	86	88	86	89	B/C
		Sg. Selama	1AKER012	85	87	88	89	89	B/C
		Sg. Selama	1AKER016	93	94	97	97	97	B/C
		Sg. Semang	1AKER013	76	81	80	81	72	ST/SP
		Sg. Terusan Bagan Serai	1AKER015	91	93	93	93	94	B/C
		Sg. Air Hitam	1AKRU007	92	95	98	97	96	B/C
		Sg. Ara	1AKRU001	92	92	96	94	96	B/C
		Sg. Ara	1AKRU006	93	95	97	97	97	B/C
		Sg. Kurau	1AKRU002	77	77	76	78	78	ST/SP
		Sg. Kurau	1AKRU003	82	77	78	79	82	B/C
		Sg. Kurau	1AKRU004	89	91	94	93	94	B/C
		Sg. Kurau	1AKRU005	89	91	91	90	92	B/C
		Sg. Perak	1APRK003	76	83	86	87	86	B/C
		Sg. Batang Padang	1APRK006	88	90	95	96	96	B/C
		Sg. Batang Padang	1APRK009	81	87	90	90	91	B/C
		Sg. Behrang	1APRK077	94	97	97	98	97	B/C
		Sg. Berok	1APRK068	92	96	97	97	96	B/C
		Sg. Bidor	1APRK002	76	71	84	87	83	B/C
		Sg. Bidor	1APRK004	81	88	89	91	88	B/C
		Sg. Bidor	1APRK005	86	91	88	87	92	B/C
		Sg. Chenderiang	1APRK012	91	94	95	94	94	B/C
		Sg. Chenderiang	1APRK013	91	92	93	94	90	B/C
		Sg. Chepor	1APRK056	94	96	97	96	97	B/C
		Sg. Cuar	1APRK046	83	87	96	95	95	B/C
		Sg. Ibol	1APRK066	93	94	97	96	97	B/C
		Sg. Kampar	1APRK031	89	93	95	96	94	B/C
		Sg. Kampar	1APRK032	82	90	94	93	92	B/C
		Sg. Kangsar	1APRK043	86	89	93	94	92	B/C
		Sg. Kangsar	1APRK044	85	90	91	93	95	B/C
		Sg. Kangsar	1APRK079	93	96	97	97	97	B/C
		Sg. Kepayang	1APRK037	71	79	86	78	84	B/C
		Sg. Kepayang	1APRK038	69	78	83	78	84	B/C
		Sg. Kerbau	1APRK064	93	94	96	95	96	B/C
		Sg. Kerbau	1APRK078	90	93	94	91	95	B/C
		Sg. Kerdah	1APRK041	67	74	73	69	79	ST/SP
		Sg. Kerdah	1APRK053	78	86	85	86	89	B/C
		Sg. Kinjang	1APRK055	94	96	97	97	97	B/C
		Sg. Kinta	1APRK019	76	78	86	83	79	ST/SP
		Sg. Kinta	1APRK022	90	90	95	96	96	B/C
		Sg. Kinta	1APRK024	75	86	85	67	92	B/C
		Sg. Kinta	1APRK025	66	75	79	78	82	B/C
		Sg. Kinta	1APRK033	70	78	84	84	83	B/C
		Sg. Kinta	1APRK034	78	81	85	83	88	B/C
		Sg. Kinta	1APRK057	70	80	83	80	83	B/C
		Sg. Kinta	1APRK058	76	82	83	85	83	B/C
		Sg. Kinta	1APRK063	91	92	95	96	97	B/C
		Sg. Klah	1APRK014	88	91	95	90	92	B/C
		Sg. Klah	1APRK015	90	91	95	91	93	B/C
		Sg. Klian Baru	1APRK016	75	82	84	80	88	B/C
		Sg. Klian Baru	1APRK017	76	78	84	77	79	ST/SP
		Sg. Klian Gunong	1APRK081	93	96	97	96	97	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Sg. Perak	Sg. Kuang	1APRK042	80	81	88	85	88	B/C
		Sg. Manong	1APRK060	95	95	97	97	98	B/C
		Sg. Nyamok	1APRK052	68	76	77	74	73	ST/SP
		Sg. Pari	1APRK023	76	79	83	87	91	B/C
		Sg. Pari	1APRK028	68	80	79	83	85	B/C
		Sg. Pelus	1APRK039	85	82	86	89	89	B/C
		Sg. Pelus	1APRK040	86	89	91	87	90	B/C
		Sg. Perak	1APRK001	82	84	86	88	81	B/C
		Sg. Perak	1APRK018	85	87	90	92	89	B/C
		Sg. Perak	1APRK020	88	90	92	94	93	B/C
		Sg. Perak	1APRK045	88	88	94	95	95	B/C
		Sg. Perak	1APRK047	82	86	88	86	86	B/C
		Sg. Perak	1APRK048	91	90	94	94	94	B/C
		Sg. Perak	1APRK049	89	86	92	92	93	B/C
		Sg. Perak	1APRK051	89	87	94	94	93	B/C
		Sg. Perak	1APRK059	92	95	97	97	97	B/C
		Sg. Perak	1APRK065	87	88	95	95	95	B/C
		Sg. Perak	1APRK069	85	88	91	86	87	B/C
		Sg. Perak	1APRK070	87	89	92	93	93	B/C
		Sg. Perak	1APRK071	87	88	92	92	93	B/C
		Sg. Perak	1APRK072	88	86	93	94	95	B/C
		Sg. Perak	1APRK074	88	87	92	92	93	B/C
		Sg. Perak	1APRK080	93	95	97	97	96	B/C
		Sg. Perak	1APRK082	94	95	96	96	96	B/C
		Sg. Perak	1APRK086	93	96	94	96	97	B/C
		Sg. Pinji	1APRK021	69	75	75	77	79	ST/SP
		Sg. Pinji	1APRK036	64	72	78	79	79	ST/SP
		Sg. Pulau	1APRK067	94	95	97	97	97	B/C
		Sg. Raia	1APRK030	82	89	90	93	93	B/C
		Sg. Raia	1APRK035	83	86	89	89	91	B/C
		Sg. Rui	1APRK084	93	95	96	93	94	B/C
		Sg. Rui	1APRK085	84	86	91	88	85	B/C
		Sg. Seluang	1APRK050	58	72	62	62	66	ST/SP
		Sg. Serokai	1APRK026	65	71	71	77	79	ST/SP
		Sg. Serokai	1APRK027	74	77	86	87	89	B/C
		Sg. Sintang	1APRK054	65	72	72	67	64	ST/SP
		Sg. Sungkai	1APRK007	92	95	95	94	94	B/C
		Sg. Sungkai	1APRK008	84	90	91	91	89	B/C
		Sg. Sungkai	1APRK073	85	92	93	92	89	B/C
		Sg. Sungkai	1APRK075	90	91	93	93	90	B/C
		Sg. Sungkai Mati	1APRK010	71	57	65	67	69	ST/SP
		Sg. Sungkai Mati	1APRK011	82	92	87	89	92	B/C
		Sg. Tapah	1APRK076	95	96	97	96	97	B/C
		Sg. Teja	1APRK083	78	82	88	85	81	B/C
		Sg. Tesong	1APRK062	94	96	97	97	97	B/C
		Sg. Tumboh	1APRK029	71	73	73	76	76	ST/SP
		Sg. Woh	1APRK061	94	96	97	98	97	B/C
	Sg. Raja Hitam	Sg. Derhaka	1ARHT004	67	79	78	74	75	ST/SP
		Sg. Derhaka	1ARHT006	69	76	79	75	74	ST/SP
		Sg. Manjong	1ARHT001	85	85	88	87	88	B/C
		Sg. Manjong	1ARHT002	82	86	86	85	88	B/C
		Sg. Nyior	1ARHT007	95	96	97	97	98	B/C
		Sg. Raja Hitam	1ARHT003	73	76	81	78	75	ST/SP
		Sg. Raja Hitam	1ARHT005	68	72	84	78	71	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Sg. Raja Hitam	Sg. Raja Hitam	1ARHT008	20	52	39	30	47	T/P
		Sg. Sepetang	1ASPT006	69	85	87	84	87	B/C
		Sg. Batu Tegoh	1ASPT007	79	87	92	91	88	B/C
		Sg. Batu Tegoh	1ASPT009	76	87	90	89	87	B/C
		Sg. Batu Tegoh	1ASPT012	94	96	97	97	97	B/C
		Sg. Batu Tegoh	1ASPT016	95	95	97	97	97	B/C
		Sg. Jana	1ASPT004	76	72	68	72	73	ST/SP
		Sg. Jana	1ASPT013	95	95	97	97	97	B/C
		Sg. Lidin	1ASPT008	75	84	86	84	86	B/C
		Sg. Limau	1ASPT014	90	91	96	96	96	B/C
		Sg. Malai	1ASPT002	76	77	82	77	75	ST/SP
		Sg. Malai	1ASPT019	73	73	77	73	73	ST/SP
		Sg. Nyior	1ASPT018	95	97	97	98	98	B/C
		Sg. Nyior	1ASPT020	87	88	94	92	96	B/C
		Sg. Sepetang	1ASPT001	72	76	75	72	76	ST/SP
		Sg. Sepetang	1ASPT003	81	83	84	83	84	B/C
		Sg. Temerloh	1ASPT010	89	90	96	95	96	B/C
		Sg. Temerloh	1ASPT011	83	86	92	92	93	B/C
		Sg. Trong	1ASPT015	90	92	96	94	96	B/C
		Sg. Trong	1ASPT017	95	96	97	97	97	B/C
	Sg. Wangi	Sg. Deralik	1AWGI001	73	71	70	77	75	ST/SP
		Sg. Deralik	1AWGI002	73	76	79	74	74	ST/SP
		Sg. Wangi	1AWGI003	70	82	82	75	84	B/C
		Sg. Wangi	1AWGI004	80	79	68	65	77	ST/SP
Selangor	Sg. Bernam	Sg. Bernam	2BBNM013	83	84	92	91	91	B/C
		Sg. Bernam	2BBNM016	83	84	91	90	91	B/C
		Sg. Dusun	2BBNM017	85	91	95	95	95	B/C
	Sg. Buloh	Sg. Buloh	2BBLH001	59	58	67	55	60	ST/SP
		Sg. Buloh	2BBLH002	49	54	61	51	48	T/P
		Sg. Buloh	2BBLH003	51	57	47	46	41	T/P
		Sg. Buloh	2BBLH004	52	59	43	45	59	T/P
		Sg. Buloh	2BBLH005	72	79	82	84	79	ST/SP
		Sg. Buloh	2BBLH006	47	57	55	50	48	T/P
	Sg. Klang	Sg. Ampang	2BKLG032	59	63	64	64	66	ST/SP
		Sg. Ampang	2BKLG042	67	70	76	81	83	B/C
		Sg. Anak Air Batu	2BKLG047	72	81	89	80	81	B/C
		Sg. Batu	2BKLG007	93	93	97	97	97	B/C
		Sg. Batu	2BKLG036	92	92	96	97	98	B/C
		Sg. Damansara	2BKLG008	60	62	71	68	66	ST/SP
		Sg. Damansara	2BKLG009	60	66	71	66	64	ST/SP
		Sg. Damansara	2BKLG017	54	64	64	65	65	ST/SP
		Sg. Damansara	2BKLG055	64	66	71	70	68	ST/SP
		Sg. Damansara	2BKLG067	89	92	95	95	95	B/C
		Sg. Gombak	2BKLG020	90	93	97	97	97	B/C
		Sg. Gombak	2BKLG027	89	93	97	95	97	B/C
		Sg. Jinjang	2BKLG044	77	81	84	86	86	B/C
		Sg. Kerayong	2BKLG013	44	51	55	50	49	T/P
		Sg. Kerayong	2BKLG051	56	66	65	63	60	ST/SP
		Sg. Keroh	2BKLG030	90	95	97	97	97	B/C
		Sg. Klang	2BKLG005	88	93	97	96	96	B/C
		Sg. Klang	2BKLG006	75	84	84	91	90	B/C
		Sg. Klang	2BKLG016	57	58	64	77	68	ST/SP
		Sg. Klang	2BKLG022	52	58	60	61	64	ST/SP
		Sg. Klang	2BKLG023	50	56	61	63	66	ST/SP
		Sg. Klang	2BKLG024	57	55	60	66	66	ST/SP
		Sg. Klang	2BKLG034	55	61	67	64	70	ST/SP
		Sg. Klang	2BKLG050	49	52	56	60	65	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Selangor	Sg. Klang	Sg. Kuyoh	2BKLG011	51	59	69	72	69	ST/SP
		Sg. Penchala	2BKLG019	56	53	72	60	66	ST/SP
		Sg. Penchala	2BKLG054	63	57	73	75	71	ST/SP
		Sg. Pusu	2BKLG021	67	71	80	78	75	ST/SP
		Sg. Rasau	2BKLG003	74	83	87	93	94	B/C
		Sg. Rumput	2BKLG033	91	92	97	95	97	B/C
		Sg. Semelah	2BKLG025	80	83	87	90	91	B/C
	Sg. Langat	Sg. Anak Chuau	2BCHU004	83	89	94	94	94	B/C
		Sg. Balak	2BLGT025	56	71	70	71	74	ST/SP
		Sg. Batang Labu	2BLGT028	72	79	75	83	82	B/C
		Sg. Batang Labu	2BLGT030	65	74	80	81	79	ST/SP
		Sg. Batang Labu	2BLGT031	61	69	71	78	77	ST/SP
		Sg. Batang Labu	2BLGT032	60	66	65	79	80	ST/SP
		Sg. Batang Labu	2BLGT033	76	86	91	88	86	B/C
		Sg. Batang Labu	2BLGT035	82	91	94	91	88	B/C
		Sg. Chuau	2BCHU001	89	91	94	94	95	B/C
		Sg. Chuau	2BCHU002	85	91	93	94	93	B/C
		Sg. Langat	2BLGT002	73	77	82	85	88	B/C
		Sg. Langat	2BLGT003	74	77	82	80	81	B/C
		Sg. Langat	2BLGT004	58	70	72	76	79	ST/SP
		Sg. Langat	2BLGT005	60	68	71	79	77	ST/SP
		Sg. Langat	2BLGT006	90	93	96	97	97	B/C
		Sg. Langat	2BLGT007	72	83	84	84	85	B/C
		Sg. Langat	2BLGT008	90	95	95	93	91	B/C
		Sg. Langat	2BLGT026	72	73	78	80	75	ST/SP
		Sg. Langat	2BLGT027	60	72	72	74	63	ST/SP
		Sg. Limau Manis	2BCHU003	74	71	75	82	75	ST/SP
		Sg. Rinching	2BLGT014	76	81	84	80	88	B/C
		Sg. Rinching	2BLGT015	92	94	97	94	97	B/C
		Sg. Semenyih	2BLGT010	77	83	88	85	86	B/C
		Sg. Semenyih	2BLGT011	74	82	86	84	86	B/C
		Sg. Semenyih	2BLGT012	79	84	86	89	86	B/C
		Sg. Sering	2BLGT034	60	69	72	80	81	B/C
	Sg. Selangor	Sg. Air Hitam	2BSEL002	78	74	80	74	73	ST/SP
		Sg. Air Hitam	2BSEL024	82	76	80	79	74	ST/SP
		Sg. Batang Kali	2BSEL003	87	90	96	93	91	B/C
		Sg. Guntong	2BSEL021	73	80	81	83	82	B/C
		Sg. Kanching	2BSEL007	84	90	96	93	94	B/C
		Sg. Kerling	2BSEL006	93	94	97	96	97	B/C
		Sg. Kundang	2BSEL012	66	70	71	77	77	ST/SP
		Sg. Rangkap	2BSEL016	92	95	96	97	97	B/C
		Sg. Rawang	2BSEL013	70	77	81	81	82	B/C
		Sg. Selangor	2BSEL001	75	77	81	80	79	ST/SP
		Sg. Selangor	2BSEL004	90	92	96	96	97	B/C
		Sg. Selangor	2BSEL005	91	95	97	96	97	B/C
		Sg. Selangor	2BSEL010	78	79	83	86	86	B/C
		Sg. Selangor	2BSEL011	80	82	91	91	90	B/C
		Sg. Selangor	2BSEL014	81	80	84	85	83	B/C
		Sg. Selangor	2BSEL015	91	93	97	96	97	B/C
		Sg. Selangor	2BSEL017	89	92	95	94	92	B/C
		Sg. Selangor	2BSEL018	79	86	88	88	84	B/C
		Sg. Selangor	2BSEL023	77	80	83	85	82	B/C
		Sg. Sembah	2BSEL009	69	74	80	80	80	ST/SP
		Sg. Sembah	2BSEL019	77	76	83	84	82	B/C
		Sg. Serendah	2BSEL008	87	90	96	95	95	B/C
	Sg. Sepang	Sg. Sepang	2BSPG001	78	85	83	88	90	B/C
		Sg. Sepang	2BSPG002	77	73	78	81	87	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Selangor	Sg. Sepang	Sg. Sepang	2BSPG003	68	76	80	83	82	B/C
	Sg. Tengi	Sg. Tengi	2BTGI001	74	76	80	72	77	ST/SP
		Sg. Tengi	2BTGI002	91	92	96	96	96	B/C
		Sg. Tengi	2BTGI003	81	79	84	82	78	ST/SP
		Sg. Tengi	2BTGI004	89	92	94	95	95	B/C
W.P. Kuala Lumpur	Sg. Klang	Sg. Air Busuk	2WKLG041	59	41	40	52	42	T/P
		Sg. Batu	2WKLG028	61	63	58	64	69	ST/SP
		Sg. Batu	2WKLG056	54	59	67	72	67	ST/SP
		Sg. Batu	2WKLG061	68	68	61	78	65	ST/SP
		Sg. Belongkong	2WKLG040	67	69	73	65	78	ST/SP
		Sg. Bunos	2WKLG006	49	71	63	44	57	T/P
		Sg. Bunos	2WKLG039	71	68	75	71	68	ST/SP
		Sg. Bunos	2WKLG043	73	73	85	83	89	B/C
		Sg. Gombak	2WKLG018	59	61	65	67	67	ST/SP
		Sg. Gombak	2WKLG026	60	73	74	80	82	B/C
		Sg. Gombak	2WKLG060	59	61	69	70	71	ST/SP
		Sg. Jinjang	2WKLG014	65	61	69	67	67	ST/SP
		Sg. Jinjang	2WKLG031	63	62	70	70	68	ST/SP
		Sg. Jinjang	2WKLG045	63	56	59	63	62	ST/SP
		Sg. Kerayong	2WKLG046	54	58	61	64	63	ST/SP
		Sg. Kerayong	2WKLG058	55	62	64	58	59	T/P
		Sg. Keroh	2WKLG015	56	62	65	61	64	ST/SP
		Sg. Keroh	2WKLG048	54	61	61	65	64	ST/SP
		Sg. Klang	2WKLG001	57	63	67	72	71	ST/SP
		Sg. Klang	2WKLG002	62	65	69	70	71	ST/SP
		Sg. Klang	2WKLG003	57	67	68	74	71	ST/SP
		Sg. Klang	2WKLG004	61	67	75	70	69	ST/SP
		Sg. Klang	2WKLG049	63	66	69	72	72	ST/SP
		Sg. Kuyoh	2WKLG052	55	64	70	66	68	ST/SP
		Sg. Penchala	2WKLG010	88	92	92	89	92	B/C
		Sg. Toba	2WKLG037	59	61	69	63	53	T/P
		Sg. Untut	2WKLG038	54	64	73	78	64	ST/SP
N. Sembilan	Sg. Langat	Sg. Batang Benar	3NLGT013	67	74	74	76	84	B/C
		Sg. Batang Labu	3NLGT009	71	81	87	85	78	ST/SP
		Sg. Batang Labu	3NLGT025	87	90	94	89	91	B/C
		Sg. Batang Nilai	3NLGT023	77	83	87	83	87	B/C
		Sg. Batang Nilai	3NLGT024	72	76	75	75	73	ST/SP
		Sg. Beranang	3NLGT019	76	82	87	85	84	B/C
		Sg. Buan	3NLGT022	76	80	83	85	82	B/C
		Sg. Jijan	3NLGT026	78	85	82	88	88	B/C
		Sg. Pajam	3NLGT020	75	82	85	86	87	B/C
		Sg. Pajam	3NLGT021	54	60	56	58	59	T/P
	Sg. Linggi	Sg. Batang Penar	3NLGI009	77	81	89	84	89	B/C
		Sg. Batang Penar	3NLGI010	84	92	95	91	92	B/C
		Sg. Batang Penar	3NLGI020	78	84	92	89	90	B/C
		Sg. Batang Penar	3NLGI021	90	95	95	93	96	B/C
		Sg. Batang Penar	3NLGI027	92	94	96	97	97	B/C
		Sg. Batang Penar	3NLGI034	75	80	78	84	84	B/C
		Sg. Batu Hampar	3NLGI024	88	93	91	93	92	B/C
		Sg. Chembong	3NLGI012	83	93	88	89	92	B/C
		Sg. Empangan Terip	3NLGI022	72	80	82	85	83	B/C
		Sg. Jelai	3NLGI025	84	89	86	88	87	B/C
		Sg. Kayu Ara	3NLGI016	62	77	80	84	81	B/C
		Sg. Kenaboi	3NLGI032	80	83	87	85	89	B/C
		Sg. Kepayong	3NLGI007	73	78	80	79	80	ST/SP
		Sg. Kepayong	3NLGI023	91	94	97	97	96	B/C
		Sg. Kundur Besar	3NLGI013	86	91	92	92	93	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)	
				2019	2020	2021	2022	2023		
N. Sembilan	Sg. Linggi	Sg. Linggi	3NLGI001	81	83	87	86	83	B/C	
		Sg. Linggi	3NLGI002	79	82	86	86	85	B/C	
		Sg. Linggi	3NLGI003	78	83	85	87	85	B/C	
		Sg. Linggi	3NLGI004	77	77	85	85	85	B/C	
		Sg. Linggi	3NLGI005	68	78	82	82	81	B/C	
		Sg. Linggi	3NLGI006	74	77	82	83	80	ST/SP	
		Sg. Muar	3NLGI026	90	88	93	91	93	B/C	
		Sg. Ngori Ngori	3NLGI040	73	76	80	83	80	ST/SP	
		Sg. Paroi	3NLGI018	76	78	80	85	80	ST/SP	
		Sg. Pedas	3NLGI014	83	90	94	93	95	B/C	
		Sg. Rembau	3NLGI011	82	91	92	91	91	B/C	
		Sg. Senawang	3NLGI017	74	73	77	81	83	B/C	
		Sg. Simin	3NLGI015	77	82	85	87	84	B/C	
		Sg. Temiang	3NLGI019	76	83	85	87	88	B/C	
		Sg. Temiang	3NLGI033	60	68	61	70	74	ST/SP	
	Sg. Lukut	Sg. Lukut	3NLKT001	69	74	73	80	79	ST/SP	
Melaka	Sg. Melaka	Sg. Dusun	3NMLK017	86	93	94	94	96	B/C	
		Sg. Kemunting	3NMLK039	87	92	92	91	96	B/C	
		Sg. Tampin	3NMLK038	92	95	96	95	97	B/C	
		Sg. Tampin	3NMLK041	84	81	83	84	84	B/C	
	Sg. Muar	Sg. Gemas	3NMUA041	68	70	71	76	78	ST/SP	
		Sg. Gemencheh	3NMUA043	86	82	91	88	94	B/C	
		Sg. Gemencheh	3NMUA045	80	82	90	85	90	B/C	
		Sg. Jelai	3NMUA054	83	88	92	91	94	B/C	
		Sg. Kelamah	3NMUA044	79	71	88	79	84	B/C	
		Sg. Muar	3NMUA042	90	91	95	96	96	B/C	
		Sg. Muar	3NMUA046	85	84	90	84	89	B/C	
		Sg. Muar	3NMUA047	85	86	90	85	89	B/C	
		Sg. Muar	3NMUA048	85	85	86	86	90	B/C	
		Sg. Muar	3NMUA049	84	88	89	89	92	B/C	
		Sg. Muar	3NMUA050	83	85	88	87	90	B/C	
		Sg. Muar	3NMUA051	85	86	90	86	91	B/C	
		Sg. Muar	3NMUA052	88	85	91	90	92	B/C	
		Sg. Muar	3NMUA053	87	85	90	90	91	B/C	
		Sg. Muar	3NMUA055	81	84	91	91	92	B/C	
Selangor	Sg. Pahang	Sg. Pertang	3NPHG002	87	89	92	91	88	B/C	
		Sg. Serting	3NPHG003	71	80	87	82	85	B/C	
		Sg. Serting	3NPHG004	71	79	86	81	84	B/C	
		Sg. Serting	3NPHG005	66	77	81	77	78	ST/SP	
		Sg. Triang	3NPHG006	86	84	93	89	91	B/C	
	Sg. Sepang	Sg. Sepang	2BSPG004	21	25	25	60	64	ST/SP	
		Sg. Baru	Sg. Baru	3MBAR001	68	74	70	75	79	ST/SP
		Sg. Duyong	Sg. Duyong	3MDYG001	71	63	69	72	68	ST/SP
			Sg. Duyong	3MDYG002	55	58	65	66	68	ST/SP
			Sg. Duyong	3MDYG003	79	77	84	87	86	B/C
			Sg. Gapam	3MDYG004	87	88	92	93	93	B/C
			Sg. Punggur	3MPGR001	47	52	67	58	66	ST/SP
			Sg. Punggur	3MPGR002	53	49	58	56	54	T/P
			Sg. Kesang	3MKSG006	59	62	53	66	64	ST/SP
Kuala Lumpur	Sg. Kesang	Sg. Chin-Chin	3MKSG008	80	79	87	84	85	B/C	
		Sg. Chin-Chin	3MKSG009	79	78	89	86	87	B/C	
		Sg. Chin-Chin	3MKSG004	80	86	91	93	92	B/C	
		Sg. Chohong	3MKSG005	89	90	94	94	95	B/C	
		Sg. Kesang	3MKSG001	63	72	82	83	84	B/C	
		Sg. Kesang	3MKSG002	76	79	88	84	87	B/C	
		Sg. Kesang	3MKSG003	72	77	88	88	88	B/C	
	Sg. Tangkak	Sg. Tangkak	3MKSG007	64	67	77	74	71	ST/SP	

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Melaka	Sg. Linggi	Sg. Simpang Ampat	3MLGI029	79	83	87	84	87	B/C
		Sg. Siput	3MLGI030	84	87	90	91	89	B/C
		Sg. Siput	3MLGI031	85	86	92	89	90	B/C
		Sg. Tuang	3MTUG002	57	57	62	70	74	ST/SP
	Sg. Melaka	Sg. Batang Melaka	3MMLK008	82	90	91	91	92	B/C
		Sg. Batang Melaka	3MMLK027	80	87	91	91	93	B/C
		Sg. Batang Melaka	3MMLK028	80	86	89	92	91	B/C
		Sg. Durian Tunggal	3MMLK011	73	79	86	88	85	B/C
		Sg. Malim	3MMLK014	55	67	71	70	66	ST/SP
		Sg. Malim	3MMLK034	63	67	68	71	70	ST/SP
		Sg. Melaka	3MMLK007	65	72	71	74	72	ST/SP
		Sg. Melaka	3MMLK009	87	91	93	92	93	B/C
		Sg. Melaka	3MMLK010	93	93	96	96	95	B/C
		Sg. Melaka	3MMLK012	59	70	72	71	69	ST/SP
		Sg. Melaka	3MMLK013	66	63	68	73	67	ST/SP
		Sg. Melaka	3MMLK015	72	81	82	84	85	B/C
		Sg. Melaka	3MMLK021	73	81	85	86	88	B/C
		Sg. Melaka	3MMLK022	79	83	86	87	88	B/C
		Sg. Melaka	3MMLK023	66	72	72	67	75	ST/SP
		Sg. Melaka	3MMLK024	61	59	69	72	66	ST/SP
		Sg. Melaka	3MMLK025	77	79	84	84	87	B/C
		Sg. Melaka	3MMLK026	71	80	81	83	86	B/C
		Sg. Melaka	3MMLK030	73	82	84	85	84	B/C
		Sg. Melaka	3MMLK032	59	70	67	68	74	ST/SP
	Sg. Merlimau	Sg. Putat	3MMLK029	62	62	74	68	68	ST/SP
		Sg. Putat	3MMLK033	53	59	63	64	65	ST/SP
		Sg. Rembia	3MMLK035	68	73	82	77	76	ST/SP
		Sg. Rembia	3MMLK036	61	68	54	82	76	ST/SP
		Sg. Tampin	3MMLK031	85	91	94	90	93	B/C
	Sg. Merlimau	Sg. Merlimau	3MMLU001	47	60	55	59	61	ST/SP
		Sg. Merlimau	3MMLU002	46	52	56	51	54	T/P
		Sg. Merlimau	3MMLU003	49	40	58	61	62	ST/SP
		Sg. Merlimau	3MMLU004	54	58	58	63	67	ST/SP
		Sg. Merlimau	3MMLU005	49	67	68	66	69	ST/SP
	Sg. Seri Melaka	Sg. Air Salak	3MSMK001	65	62	79	78	67	ST/SP
		Sg. Seri Melaka	3MSMK002	65	65	66	69	67	ST/SP
		Sg. Sg.Udang	3MSUD001	81	87	86	91	94	B/C
	Sg. Tuang	Sg. Tuang	3MTUG001	58	59	63	75	75	ST/SP
Johor	Sg. Air Baloi	Sg. Air Baloi	3JABL001	52	60	56	55	64	ST/SP
		Sg. Air Baloi	3JABL002	48	59	52	56	69	ST/SP
		Sg. Air Baloi	3JABL003	49	60	57	61	67	ST/SP
	Sg. Batu Pahat	Sg. Amran	3JBPT018	74	75	81	80	82	B/C
		Sg. Bantang	3JBPT020	91	96	97	97	97	B/C
		Sg. Batu Pahat	3JBPT001	56	66	64	61	63	ST/SP
		Sg. Bekok	3JBPT005	63	79	84	81	84	B/C
		Sg. Bekok	3JBPT008	59	57	67	58	73	ST/SP
		Sg. Bekok	3JBPT016	82	85	91	85	84	B/C
		Sg. Bekok	3JBPT017	83	87	91	90	89	B/C
		Sg. Bekok	3JBPT019	90	92	94	93	94	B/C
		Sg. Bekok	3JBPT023	58	57	63	60	66	ST/SP
		Sg. Berlian	3JBPT007	79	78	77	79	82	B/C
		Sg. Chaah	3JBPT010	83	88	93	90	90	B/C
		Sg. Kahang	3JBPT022	86	90	92	82	86	B/C
		Sg. Lenik	3JBPT011	82	82	91	90	90	B/C
		Sg. Merek	3JBPT009	81	88	89	88	92	B/C
		Sg. Merpo	3JBPT006	81	91	90	91	94	B/C
		Sg. Panchor	3JBPT025	58	59	63	59	62	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Johor	Sg. Batu Pahat	Sg. Semberong	3JBPT003	53	57	64	63	73	ST/SP
		Sg. Semberong	3JBPT004	58	64	77	72	77	ST/SP
		Sg. Semberong Dam	3JBPT021	85	89	91	89	93	B/C
	Sg. Simpang Kanan	Sg. Simpang Kanan	3JBPT002	60	58	62	59	65	ST/SP
		Sg. Simpang Kanan	3JBPT013	54	59	60	59	60	ST/SP
		Sg. Simpang Kiri	3JBPT012	73	81	82	80	87	B/C
		Sg. Simpang Kiri	3JBPT014	60	65	71	76	66	ST/SP
		Sg. Simpang Kiri	3JBPT015	55	60	64	66	65	ST/SP
		Sg. Temehel	3JBPT024	48	57	54	59	62	ST/SP
	Sg. Benut	Sg. Benut	3JBNT001	82	86	92	92	94	B/C
		Sg. Benut	3JBNT002	72	79	86	86	82	B/C
		Sg. Benut	3JBNT005	60	64	66	68	72	ST/SP
		Sg. Benut	3JBNT006	60	69	62	62	72	ST/SP
		Sg. Machap Dam	3JBNT008	91	92	94	93	90	B/C
		Sg. Parit Hj.Yassin	3JBNT004	77	85	81	81	83	B/C
		Sg. Pinggan	3JBNT007	61	60	59	63	67	ST/SP
		Sg. Ulu Benut	3JBNT003	79	89	90	86	90	B/C
	Sg. Danga	Sg. Danga	3JDGA001	47	58	62	66	57	T/P
		Sg. Danga	3JDGA002	45	55	59	62	57	T/P
	Sg. Endau	Sg. Anak Sg. Semberong	3JEND007	84	84	85	84	82	B/C
		Sg. Dengar	3JEND010	80	84	91	90	90	B/C
		Sg. Empangan Labong	3JEND027	92	89	91	91	91	B/C
		Sg. Endau	3JEND019	88	85	88	89	91	B/C
		Sg. Endau	3JEND022	87	87	90	91	91	B/C
		Sg. Endau	3JEND023	93	93	96	92	95	B/C
		Sg. Jasin	3JEND024	94	94	97	96	97	B/C
		Sg. Jebong	3JEND005	61	74	82	75	86	B/C
		Sg. Kahang	3JEND020	89	90	89	89	91	B/C
		Sg. Kahang	3JEND026	86	90	94	92	93	B/C
		Sg. Kahang	3JEND028	83	90	88	88	90	B/C
		Sg. Lenga	3JEND008	60	68	69	74	78	ST/SP
		Sg. Lenggor	3JEND009	87	82	89	89	89	B/C
		Sg. Lenggor	3JEND029	86	81	88	90	88	B/C
		Sg. Mamai	3JEND015	86	87	88	89	86	B/C
		Sg. Melatai	3JEND017	63	70	71	73	71	ST/SP
		Sg. Mengkibol	3JEND001	84	88	89	92	88	B/C
		Sg. Mengkibol	3JEND002	74	77	84	82	83	B/C
		Sg. Mengkibol	3JEND003	65	69	75	77	72	ST/SP
		Sg. Paloh	3JEND016	81	82	85	85	90	B/C
		Sg. Pamol	3JEND011	65	72	76	73	69	ST/SP
		Sg. Selai	3JEND025	92	92	94	94	90	B/C
		Sg. Semberong	3JEND004	86	89	90	87	91	B/C
		Sg. Semberong	3JEND006	83	84	84	80	90	B/C
		Sg. Semberong	3JEND012	63	76	80	77	79	ST/SP
		Sg. Semberong	3JEND018	84	85	88	88	86	B/C
		Sg. Semberong	3JEND021	83	84	88	89	88	B/C
		Sg. Singol	3JEND013	55	79	83	87	84	B/C
		Sg. Tamok	3JEND014	91	91	90	91	87	B/C
	Sg. Jemaluang	Sg. Jemaluang	3JJML001	88	81	90	90	93	B/C
		Sg. Jemaluang	3JJML002	78	81	86	80	89	B/C
	Sg. Johor	Sg. Anak Sg. Sayong	3JJHR023	79	86	92	92	92	B/C
		Sg. Anak Sg. Sayong	3JJHR032	69	75	84	72	71	ST/SP
		Sg. Belitong	3JJHR038	86	83	89	86	87	B/C
		Sg. Berangan	3JJHR013	67	71	82	81	82	B/C
		Sg. Bukit Besar	3JJHR007	57	61	60	56	46	T/P
		Sg. Bukit Besar	3JJHR009	93	90	95	95	90	B/C
		Sg. Chemangar	3JJHR019	72	70	73	77	79	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Johor	Sg. Johor	Sg. Johor	3JJHR011	83	83	89	91	88	B/C
		Sg. Johor	3JJHR014	82	85	89	91	86	B/C
		Sg. Johor	3JJHR015	84	86	91	92	90	B/C
		Sg. Johor	3JJHR040	78	84	87	88	84	B/C
		Sg. Johor	3JJHR041	85	82	89	88	90	B/C
		Sg. Johor	3JJHR042	83	85	90	88	90	B/C
		Sg. Layang	3JJHR001	89	93	93	93	94	B/C
		Sg. Layau Kiri	3JJHR017	84	87	92	89	87	B/C
		Sg. Lebam	3JJHR020	85	79	87	88	94	B/C
		Sg. Linggiu	3JJHR030	88	84	93	92	92	B/C
		Sg. Panti	3JJHR037	72	79	87	86	84	B/C
		Sg. Papan	3JJHR034	83	81	86	87	90	B/C
		Sg. Pelebah	3JJHR039	93	95	97	97	97	B/C
		Sg. Pelebah	3JJHR043	89	86	87	87	84	B/C
		Sg. Pelebah	3JJHR044	89	87	88	90	92	B/C
		Sg. Pelebah	3JJHR045	92	90	92	93	93	B/C
		Sg. Penggeli	3JJHR028	90	89	87	90	90	B/C
		Sg. Penggeli	3JJHR031	85	89	88	89	90	B/C
		Sg. Remis	3JJHR026	86	86	89	89	92	B/C
		Sg. Santi	3JJHR022	85	89	87	90	92	B/C
		Sg. Sayong	3JJHR024	81	82	85	82	84	B/C
		Sg. Sayong	3JJHR025	85	78	84	88	90	B/C
		Sg. Sayong	3JJHR027	88	82	84	88	88	B/C
		Sg. Sayong	3JJHR033	87	83	88	89	88	B/C
		Sg. Sebol	3JJHR029	69	73	80	79	80	ST/SP
		Sg. Seluyut	3JJHR035	77	83	87	83	85	B/C
		Sg. Semangar	3JJHR008	82	81	92	90	89	B/C
		Sg. Semenchu	3JJHR018	35	66	85	86	86	B/C
		Sg. Sening	3JJHR021	83	89	93	96	94	B/C
		Sg. Serai	3JJHR002	57	67	60	62	64	ST/SP
		Sg. Telor	3JJHR012	84	88	89	93	92	B/C
		Sg. Temoh	3JJHR016	64	74	84	88	79	ST/SP
		Sg. Tiram	3JJHR003	67	71	79	77	84	B/C
		Sg. Tiram	3JJHR004	87	86	91	89	90	B/C
		Sg. Tiram	3JJHR005	69	69	68	77	79	ST/SP
		Sg. Tiram	3JJHR006	90	88	93	92	91	B/C
	Sg. Kaw. Pasir Gudang	Sg. Buluh	3JPGD002	41	41	43	40	46	T/P
		Sg. Latoh	3JPGD004	58	62	68	71	69	ST/SP
		Sg. Masai	3JPGD005	50	63	60	63	73	ST/SP
		Sg. Perembi	3JPGD001	42	57	47	59	69	ST/SP
		Sg. Tukang Batu	3JPGD003	37	42	35	34	35	T/P
	Sg. Kempas	Sg. Kempas	3JKPS001	36	29	33	39	33	T/P
		Sg. Kempas	3JKPS002	44	37	42	43	45	T/P
	Sg. Kim-Kim	Sg. Kim-Kim	3JKIM001	43	51	66	57	58	T/P
		Sg. Kim-Kim	3JKIM002	83	85	90	89	89	B/C
	Sg. Mersing	Sg. Empangan Congok	3JMSG004	84	85	88	86	92	B/C
		Sg. Mersing	3JMSG001	90	87	95	93	94	B/C
		Sg. Mersing	3JMSG002	80	84	88	81	80	ST/SP
		Sg. Mersing	3JMSG003	85	83	92	87	92	B/C
	Sg. Muar	Sg. Air Panas	3JMUA035	92	94	97	96	97	B/C
		Sg. Belemang	3JMUA051	90	94	95	94	96	B/C
		Sg. Gemas	3JMUA036	65	80	85	86	89	B/C
		Sg. Jementah	3JMUA040	91	93	96	95	96	B/C
		Sg. Juasseh	3JMUA014	89	94	96	92	88	B/C
		Sg. Juasseh	3JMUA037	88	93	95	95	94	B/C
		Sg. Juasseh	3JMUA045	86	94	95	94	94	B/C
		Sg. Labis	3JMUA011	79	89	88	87	85	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Johor	Sg. Muar	Sg. Labis	3JMUA012	77	89	89	88	85	B/C
		Sg. Labis	3JMUA015	82	87	87	82	89	B/C
		Sg. Meda	3JMUA034	82	82	85	80	85	B/C
		Sg. Merbudu	3JMUA030	65	63	77	72	85	B/C
		Sg. Merlimau	3JMUA020	59	70	66	73	72	ST/SP
		Sg. Muar	3JMUA017	81	82	86	81	86	B/C
		Sg. Muar	3JMUA019	82	85	87	76	87	B/C
		Sg. Muar	3JMUA022	84	85	89	82	88	B/C
		Sg. Muar	3JMUA026	82	84	89	85	88	B/C
		Sg. Muar	3JMUA027	77	85	84	83	87	B/C
		Sg. Muar	3JMUA028	81	83	81	83	88	B/C
		Sg. Muar	3JMUA029	81	75	84	85	86	B/C
		Sg. Muar	3JMUA031	81	77	83	84	83	B/C
		Sg. Muar	3JMUA033	80	73	77	80	83	B/C
		Sg. Muar	3JMUA039	81	82	85	82	89	B/C
		Sg. Muar	3JMUA041	82	80	86	84	88	B/C
		Sg. Muar	3JMUA042	81	78	86	85	87	B/C
		Sg. Muar	3JMUA043	82	79	83	85	87	B/C
		Sg. Muar	3JMUA046	78	86	89	83	87	B/C
		Sg. Muar	3JMUA047	78	81	87	84	89	B/C
		Sg. P.Mengkuang	3JMUA018	67	89	92	91	89	B/C
		Sg. Pagoh	3JMUA049	67	66	74	76	76	ST/SP
		Sg. Palong	3JMUA024	82	88	89	87	87	B/C
		Sg. Palong	3JMUA025	81	84	85	81	88	B/C
		Sg. Pendol	3JMUA050	89	90	95	93	95	B/C
		Sg. Sarang Buaya	3JMUA038	70	58	60	60	67	ST/SP
		Sg. Segamat	3JMUA016	82	89	90	86	90	B/C
		Sg. Segamat	3JMUA044	88	91	94	89	89	B/C
		Sg. Segamat	3JMUA048	89	92	95	91	94	B/C
		Sg. Senarut	3JMUA021	66	75	77	79	75	ST/SP
		Sg. Serom	3JMUA032	55	63	63	63	67	ST/SP
		Sg. Simpang Loi	3JMUA023	78	77	84	73	81	B/C
		Sg. Tenang	3JMUA013	68	79	76	81	78	ST/SP
	Sg. Paloi	Sg. Paloi	3JPAL001	80	89	90	90	91	B/C
	Sg. Pontian Besar	Sg. Air Hitam	3JPBS001	76	71	74	73	82	B/C
		Sg. Ayer Merah	3JPBS005	46	43	54	54	65	ST/SP
		Sg. Pontian Besar	3JPBS002	63	65	65	63	78	ST/SP
		Sg. Pontian Besar	3JPBS003	77	80	85	78	81	B/C
		Sg. Pontian Besar	3JPBS004	77	86	84	85	86	B/C
		Sg. Pontian Besar	3JPBS006	60	64	63	60	79	ST/SP
		Sg. Pontian Besar	3JPBS007	70	73	73	74	80	ST/SP
	Sg. Pontian Kecil	Sg. Pontian Kecil	3JPKC001	84	86	84	85	82	B/C
		Sg. Pontian Kecil	3JPKC002	60	76	75	70	61	ST/SP
	Sg. Pulai	Sg. Pulai	3JPLI001	79	82	83	86	83	B/C
		Sg. Pulai	3JPLI002	71	72	77	82	80	ST/SP
		Sg. Pulai Dam	3JPLI004	93	95	95	96	96	B/C
		Sg. Ulu Choh	3JPLI003	67	72	72	74	74	ST/SP
	Sg. Rambah	Sg. Rambah	3JRBH001	73	75	69	78	72	ST/SP
		Sg. Rambah	3JRBH002	55	65	63	70	68	ST/SP
	Sg. Sanglang	Sg. Sanglang	3JSLG001	60	59	57	51	66	ST/SP
	Sg. Sedili Besar	Sg. Ambat	3JSBE005	88	86	84	76	88	B/C
		Sg. Dohol	3JSBE001	88	89	90	86	89	B/C
		Sg. Mupur	3JSBE009	47	67	73	73	60	ST/SP
		Sg. Pasir Panjang	3JSBE010	87	88	87	76	71	ST/SP
		Sg. Sedili Besar	3JSBE002	82	86	86	86	87	B/C
		Sg. Sedili Besar	3JSBE004	89	91	93	91	92	B/C
		Sg. Sedili Besar	3JSBE006	76	82	87	85	88	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Johor	Sg. Sedili Besar	Sg. Sedili Besar	3JSBE007	65	74	72	70	86	B/C
		Sg. Sedili Besar	3JSBE008	85	87	89	85	89	B/C
		Sg. Sedili Besar	3JSBE011	88	90	88	87	91	B/C
		Sg. Temubor Kanan	3JSBE003	90	93	95	93	95	B/C
	Sg. Sedili Kecil	Sg. Anak Sedili Kecil	3JSKE005	30	25	24	74	74	ST/SP
		Sg. Anak Sedili Kecil	3JSKE006	76	79	85	75	86	B/C
		Sg. Bahan	3JSKE002	75	78	73	64	79	ST/SP
		Sg. Bahan	3JSKE004	76	74	78	76	85	B/C
		Sg. Sedili Kecil	3JSKE001	87	89	88	83	88	B/C
		Sg. Sedili Kecil	3JSKE003	77	80	76	78	82	B/C
	Sg. Segget	Sg. Segget	3JSGT001	55	81	71	64	47	T/P
		Sg. Segget	3JSGT002	55	77	68	72	47	T/P
		Sg. Segget	3JSGT003	50	59	67	65	53	T/P
		Sg. Segget	3JSGT004	54	63	78	76	61	ST/SP
		Sg. Segget	3JSGT005	50	54	65	72	59	T/P
	Sg. Skudai	Sg. Melana	3JSKU008	85	91	95	94	94	B/C
		Sg. Melana	3JSKU009	45	61	59	66	62	ST/SP
		Sg. Skudai	3JSKU001	44	55	63	65	65	ST/SP
		Sg. Skudai	3JSKU002	49	66	71	65	78	ST/SP
		Sg. Skudai	3JSKU003	58	61	74	74	66	ST/SP
		Sg. Skudai	3JSKU004	86	89	90	93	92	B/C
		Sg. Skudai	3JSKU005	65	72	79	81	80	ST/SP
		Sg. Skudai	3JSKU006	58	66	76	77	74	ST/SP
		Sg. Skudai	3JSKU007	44	43	54	63	66	ST/SP
		Sg. Skudai	3JSKU010	52	55	62	61	67	ST/SP
		Sg. Skudai	3JSKU011	91	92	92	95	96	B/C
	Sg. Tebrau	Sg. Bala	3JTRU008	42	55	47	55	60	ST/SP
		Sg. Pandan	3JTRU007	43	46	43	58	44	T/P
		Sg. Plentong	3JTRU004	52	56	66	67	63	ST/SP
		Sg. Sebulung	3JTRU009	38	53	58	62	56	T/P
		Sg. Sengkuang	3JTRU011	35	52	53	50	35	T/P
		Sg. Tampoi	3JTRU010	44	52	60	58	54	T/P
		Sg. Tebrau	3JTRU001	40	44	65	57	56	T/P
		Sg. Tebrau	3JTRU002	61	55	72	54	71	ST/SP
		Sg. Tebrau	3JTRU003	61	65	72	68	72	ST/SP
		Sg. Tebrau	3JTRU005	49	57	65	62	56	T/P
		Sg. Tebrau	3JTRU006	58	64	69	71	54	T/P
Pahang	Sg. Anak Endau	Sg. Anak Endau	4CAED001	92	94	95	95	96	B/C
		Sg. Anak Endau	4CAED002	81	84	87	86	84	B/C
	Sg. Balok	Sg. Balok	4CBLK001	68	66	82	74	75	ST/SP
		Sg. Balok	4CBLK002	69	70	77	77	76	ST/SP
		Sg. Panjang	4CBLK004	86	76	78	72	80	ST/SP
		Sg. Yior	4CBLK003	64	62	75	74	72	ST/SP
	Sg. Bebar	Sg. Bebar	4CBBR001	79	76	86	83	84	B/C
		Sg. Bebar	4CBBR002	85	82	92	89	90	B/C
		Sg. Merba	4CBBR005	86	85	91	88	88	B/C
		Sg. Serai	4CBBR003	80	75	85	74	86	B/C
		Sg. Serai	4CBBR004	83	85	88	86	87	B/C
	Sg. Cherating	Sg. Cherating	4CCHE001	79	81	86	85	86	B/C
	Sg. Kuantan	Sg. Belat	4CKTN001	79	80	86	88	87	B/C
		Sg. Charu	4CKTN006	92	93	96	95	96	B/C
		Sg. Galing Besar	4CKTN003	64	63	70	76	75	ST/SP
		Sg. Galing Besar	4CKTN004	61	64	62	76	77	ST/SP
		Sg. Kenau	4CKTN010	90	94	97	96	97	B/C
		Sg. Kuantan	4CKTN002	85	88	93	87	92	B/C
		Sg. Kuantan	4CKTN015	84	87	93	87	93	B/C
		Sg. Kuantan	4CKTN016	88	90	93	94	91	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Sg. Kuantan	Sg. Kuantan	4CKTN017	91	93	96	96	97	B/C
		Sg. Kuantan	4CKTN018	92	94	96	97	97	B/C
		Sg. Kuantan	4CKTN019	81	80	85	87	85	B/C
		Sg. Kuantan	4CKTN020	87	86	93	87	92	B/C
		Sg. Kuantan	4CKTN021	83	85	88	89	91	B/C
		Sg. Pandan	4CKTN012	83	87	93	94	93	B/C
		Sg. Pinang	4CKTN005	89	80	88	88	89	B/C
		Sg. Reman	4CKTN014	86	87	91	90	91	B/C
		Sg. Riau	4CKTN007	84	84	88	88	87	B/C
		Sg. Talam	4CKTN013	69	72	70	76	70	ST/SP
	Sg. Merchong	Sg. Merchong	4CMCO002	85	82	92	86	87	B/C
		Sg. Merchong	4CMCO003	87	89	93	89	89	B/C
	Sg. Pahang	Sg. Anak Sg. Lepar	4CPHG136	84	85	93	89	94	B/C
		Sg. Batu	4CPHG056	79	84	92	91	94	B/C
		Sg. Belayar	4CPHG135	89	94	94	92	93	B/C
		Sg. Bentong	4CPHG040	92	92	95	95	94	B/C
		Sg. Bentong	4CPHG045	82	87	91	89	90	B/C
		Sg. Bentong	4CPHG092	84	92	95	90	89	B/C
		Sg. Bentong	4CPHG133	79	86	93	94	93	B/C
		Sg. Bentong	4CPHG134	86	92	96	96	95	B/C
		Sg. Bentong	4CPHG144	82	86	89	88	86	B/C
		Sg. Benus	4CPHG047	82	91	91	91	90	B/C
		Sg. Benus	4CPHG118	85	94	94	92	96	B/C
		Sg. Benus	4CPHG152	87	93	96	91	97	B/C
		Sg. Bera	4CPHG019	82	83	86	85	87	B/C
		Sg. Bera	4CPHG020	82	84	86	89	87	B/C
		Sg. Bera	4CPHG058	85	85	86	88	87	B/C
		Sg. Bera	4CPHG059	88	85	91	85	88	B/C
		Sg. Bera	4CPHG063	85	85	86	85	88	B/C
		Sg. Berkelah	4CPHG098	92	93	97	97	97	B/C
		Sg. Bertam	4CBTM002	88	91	94	89	90	B/C
		Sg. Bertam	4CBTM010	81	74	79	78	79	ST/SP
		Sg. Bertam	4CBTM011	94	96	96	97	97	B/C
		Sg. Bertam	4CBTM013	94	97	97	97	96	B/C
		Sg. Bilut	4CPHG119	82	83	88	85	87	B/C
		Sg. Bilut	4CPHG129	87	85	92	92	88	B/C
		Sg. Burung	4CBTM005	92	96	96	95	93	B/C
		Sg. Chini	4CPHG004	86	82	84	85	84	B/C
		Sg. Gapoi	4CPHG086	94	94	97	96	97	B/C
		Sg. Habu	4CBTM004	88	90	96	94	94	B/C
		Sg. Jelai	4CPHG0130	88	90	93	93	93	B/C
		Sg. Jelai	4CPHG096	86	86	91	88	86	B/C
		Sg. Jelai	4CPHG125	87	88	90	90	90	B/C
		Sg. Jempol	4CPHG049	86	83	91	90	91	B/C
		Sg. Jempol	4CPHG050	90	93	97	94	96	B/C
		Sg. Jempol	4CPHG087	89	93	95	93	96	B/C
		Sg. Jempol	4CPHG088	89	90	95	91	91	B/C
		Sg. Jempol	4CPHG121	79	85	95	94	95	B/C
		Sg. Jengka	4CPHG041	88	92	95	93	94	B/C
		Sg. Jengka	4CPHG051	85	86	89	90	91	B/C
		Sg. Kecau	4CPHG091	74	83	87	91	91	B/C
		Sg. Kecau	4CPHG116	80	84	87	84	85	B/C
		Sg. Kecau	4CPHG151	84	89	89	95	94	B/C
		Sg. Kelau	4CPHG117	86	88	91	94	93	B/C
		Sg. Kelau	4CPHG145	82	82	86	86	87	B/C
		Sg. Kelau	4CPHG146	85	91	93	94	91	B/C
		Sg. Kelau	4CPHG153	83	84	89	84	88	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Sg. Pahang	Sg. Kertam	4CPHG014	90	91	91	93	93	B/C
		Sg. Koyan	4CPHG033	88	89	94	92	93	B/C
		Sg. Krau	4CPHG003	90	92	94	92	94	B/C
		Sg. Kundang	4CPHG018	86	79	82	85	86	B/C
		Sg. Lenggok	4CBTM003	91	93	96	92	96	B/C
		Sg. Lepar	4CPHG006	91	92	91	93	95	B/C
		Sg. Lipis	4CPHG029	85	85	90	89	92	B/C
		Sg. Lipis	4CPHG030	86	88	91	91	91	B/C
		Sg. Lipis	4CPHG035	91	93	96	94	97	B/C
		Sg. Luit	4CPHG015	89	91	93	92	89	B/C
		Sg. Maran	4CPHG016	90	93	96	96	96	B/C
		Sg. Mentiga	4CPHG005	85	80	77	83	91	B/C
		Sg. Mentiga	4CPHG042	87	85	86	88	89	B/C
		Sg. Mentiga	4CPHG089	82	85	87	89	90	B/C
		Sg. Pahang	4CPHG007	83	82	90	88	88	B/C
		Sg. Pahang	4CPHG008	86	93	93	91	94	B/C
		Sg. Pahang	4CPHG010	86	87	90	92	91	B/C
		Sg. Pahang	4CPHG011	85	88	93	89	90	B/C
		Sg. Pahang	4CPHG012	90	89	93	90	92	B/C
		Sg. Pahang	4CPHG013	86	89	91	90	88	B/C
		Sg. Pahang	4CPHG021	83	87	92	90	93	B/C
		Sg. Pahang	4CPHG022	88	87	91	91	93	B/C
		Sg. Pahang	4CPHG023	91	91	94	92	91	B/C
		Sg. Pahang	4CPHG027	83	88	94	92	96	B/C
		Sg. Pahang	4CPHG054	87	87	90	88	90	B/C
		Sg. Pahang	4CPHG055	83	86	91	90	91	B/C
		Sg. Pahang	4CPHG097	84	88	93	89	89	B/C
		Sg. Pahang	4CPHG100	83	84	89	88	88	B/C
		Sg. Pahang	4CPHG104	87	87	91	90	91	B/C
		Sg. Pahang	4CPHG111	83	89	92	93	92	B/C
		Sg. Pahang	4CPHG113	84	87	92	88	90	B/C
		Sg. Pahang	4CPHG124	87	89	91	91	90	B/C
		Sg. Pahang	4CPHG126	89	88	92	91	91	B/C
		Sg. Pahang	4CPHG127	84	89	88	96	95	B/C
		Sg. Pahang	4CPHG131	84	88	88	89	93	B/C
		Sg. Pahang	4CPHG137	85	86	93	90	90	B/C
		Sg. Pahang	4CPHG138	84	85	90	89	89	B/C
		Sg. Pahang	4CPHG139	82	83	90	89	89	B/C
		Sg. Pahang	4CPHG141	83	87	91	93	93	B/C
		Sg. Pahang	4CPHG148	85	88	92	88	90	B/C
		Sg. Pahang	4CPHG150	86	87	89	89	88	B/C
		Sg. Penjuring	4CPHG044	87	94	97	97	97	B/C
		Sg. Pertang	4CPHG132	79	91	90	91	92	B/C
		Sg. Perting	4CPHG120	91	94	96	97	97	B/C
		Sg. Raub	4CPHG123	89	93	95	95	96	B/C
		Sg. Retang	4CPHG105	87	92	93	94	94	B/C
		Sg. Ringlet	4CBTM001	82	83	91	89	91	B/C
		Sg. Salak	4CPHG122	89	87	91	91	92	B/C
		Sg. Semantan	4CPHG025	83	87	92	88	89	B/C
		Sg. Semantan	4CPHG036	90	91	92	93	96	B/C
		Sg. Semantan	4CPHG061	84	87	90	85	88	B/C
		Sg. Semantan	4CPHG084	86	88	93	88	90	B/C
		Sg. Serting	4CPHG101	80	84	85	86	87	B/C
		Sg. Serting	4CPHG102	83	85	84	86	88	B/C
		Sg. T. Paya Bungor	4CPHG002	85	91	91	92	92	B/C
		Sg. Tahan	4CPHG109	88	91	92	94	96	B/C
		Sg. Tanglir	4CPHG048	87	88	94	90	92	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Sg. Pahang	Sg. Tanglir	4CPHG053	87	89	87	89	89	B/C
		Sg. Tanglir	4CPHG057	84	87	84	89	90	B/C
		Sg. Tanglir	4CPHG106	86	88	86	87	90	B/C
		Sg. Tanglir	4CPHG107	86	88	88	90	90	B/C
		Sg. Tasik Bera	4CPHG140	86	91	88	89	89	B/C
		Sg. Tasik Chini	4CPHG043	89	92	88	93	91	B/C
		Sg. Tasik Chini	4CPHG060	90	93	90	92	92	B/C
		Sg. Tasik Chini	4CPHG071	90	91	92	93	93	B/C
		Sg. Tasik Chini	4CPHG108	90	92	93	93	93	B/C
		Sg. Tasik Chini	4CPHG110	90	91	87	93	92	B/C
		Sg. Tasik Chini	4CPHG112	90	93	89	92	93	B/C
		Sg. Tasik Chini	4CPHG114	89	92	92	93	94	B/C
		Sg. Tasik Chini	4CPHG115	91	92	90	92	92	B/C
		Sg. Tasik Chini	4CPHG130	89	92	90	92	91	B/C
		Sg. Tasik Chini	4CPHG143	89	92	87	90	90	B/C
		Sg. Teh	4CPHG090	90	93	94	94	96	B/C
		Sg. Tekal	4CPHG062	81	85	89	87	90	B/C
		Sg. Telang	4CPHG032	90	91	94	93	93	B/C
		Sg. Telemong	4CPHG046	86	94	96	95	95	B/C
		Sg. Telemong	4CPHG093	91	93	93	93	93	B/C
		Sg. Telemong	4CPHG094	89	91	97	94	94	B/C
		Sg. Telom	4CBTM008	86	86	95	94	93	B/C
		Sg. Telom	4CBTM009	83	86	93	92	90	B/C
		Sg. Tembeling	4CPHG142	88	91	90	94	95	B/C
		Sg. Teranum	4CPHG038	87	95	96	96	97	B/C
		Sg. Teras	4CPHG037	87	93	96	95	96	B/C
		Sg. Teras	4CPHG147	88	91	96	96	94	B/C
		Sg. Teris	4CPHG081	87	91	94	95	94	B/C
		Sg. Teris	4CPHG082	87	92	95	94	95	B/C
		Sg. Teris	4CPHG083	88	92	94	94	95	B/C
		Sg. Terla	4CBTM007	91	92	95	97	97	B/C
		Sg. Terla	4CBTM012	88	95	97	97	97	B/C
		Sg. Triang	4CPHG024	85	88	91	85	87	B/C
		Sg. Triang	4CPHG074	86	88	91	84	86	B/C
		Sg. Tringkap	4CBTM006	82	89	94	96	97	B/C
		Sg. Ulong	4CBTM014	94	96	97	97	97	B/C
	Sg. Rompin	Sg. Aur	4CRPN005	86	86	91	90	91	B/C
		Sg. Bakar	4CRPN016	71	75	69	92	95	B/C
		Sg. Jekatih	4CRPN012	86	87	91	92	91	B/C
		Sg. Jekatih	4CRPN013	84	87	90	91	91	B/C
		Sg. Jeram	4CRPN006	88	88	93	90	90	B/C
		Sg. Kepasing	4CRPN010	81	88	90	92	88	B/C
		Sg. Keratong	4CRPN011	82	84	87	91	89	B/C
		Sg. Keratong	4CRPN018	86	84	91	91	90	B/C
		Sg. Keratong	4CRPN021	85	86	93	90	93	B/C
		Sg. Keratong	4CRPN022	83	88	93	90	93	B/C
		Sg. Pontian	4CRPN003	87	85	90	84	88	B/C
		Sg. Pukin	4CRPN014	83	87	90	92	94	B/C
		Sg. Pukin	4CRPN015	83	84	90	94	94	B/C
		Sg. Pukin	4CRPN017	83	87	89	94	94	B/C
		Sg. Rompin	4CRPN004	86	78	88	87	86	B/C
		Sg. Rompin	4CRPN007	88	79	92	88	88	B/C
		Sg. Rompin	4CRPN008	86	85	93	91	91	B/C
		Sg. Rompin	4CRPN020	87	83	93	91	89	B/C
		Sg. Rompin	4CRPN030	86	86	90	91	90	B/C
		Sg. Sepayang	4CRPN002	84	77	84	86	85	B/C
	Sg. Tonggok	Sg. Tonggok	4CTGK001	73	80	82	67	80	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Sg. Tonggok	Sg. Tonggok	4CTGK002	63	65	80	75	81	B/C
	Sg. Besut	Sg. Besut	4TBST002	89	91	93	94	93	B/C
		Sg. Besut	4TBST003	91	92	94	93	94	B/C
		Sg. Besut	4TBST004	91	93	96	93	94	B/C
		Sg. Besut	4TBST005	91	92	93	95	94	B/C
		Sg. Besut	4TBST006	89	92	94	95	93	B/C
		Sg. Jertih	4TBST001	84	88	92	91	87	B/C
	Sg. Chukai	Sg. Bungkus	4TCKI006	82	80	83	81	82	B/C
		Sg. Chukai	4TCKI003	80	80	87	88	84	B/C
		Sg. Ibok	4TCKI001	79	81	87	89	89	B/C
		Sg. Ibok	4TCKI002	86	91	91	87	94	B/C
		Sg. Ruang	4TCKI004	74	74	80	80	80	ST/SP
		Sg. Ruang	4TCKI005	73	65	80	79	78	ST/SP
	Sg. Dungun	Sg. Dungun	4TDGN002	90	92	96	95	96	B/C
		Sg. Dungun	4TDGN003	88	91	95	93	93	B/C
		Sg. Dungun	4TDGN004	88	90	94	91	93	B/C
		Sg. Dungun	4TDGN005	90	90	94	92	92	B/C
		Sg. Dungun	4TDGN006	85	91	94	91	92	B/C
		Sg. Telemboh	4TDGN001	86	86	89	89	87	B/C
	Sg. Ibai	Sg. Ibai	4TIBI001	77	81	75	73	81	B/C
		Sg. Ibai	4TIBI002	81	79	84	83	79	ST/SP
		Sg. Ibai	4TIBI003	79	85	82	87	83	B/C
	Sg. Kemaman	Sg. Cherul	4TKMM003	84	90	92	92	94	B/C
		Sg. Cherul	4TKMM004	85	91	91	90	94	B/C
		Sg. Cherul	4TKMM010	81	89	90	91	93	B/C
		Sg. Kemaman	4TKMM007	90	92	95	95	96	B/C
		Sg. Kemaman	4TKMM008	85	87	94	89	91	B/C
		Sg. Kemaman	4TKMM009	82	86	90	92	91	B/C
		Sg. Neram	4TKMM005	31	75	86	85	88	B/C
		Sg. Perasing	4TKMM006	82	82	92	94	90	B/C
		Sg. Ransan	4TKMM001	64	65	78	79	87	B/C
		Sg. Ransan	4TKMM002	87	91	95	95	95	B/C
	Sg. Kertih	Sg. Kertih	4TKTH001	84	82	88	91	89	B/C
		Sg. Kertih	4TKTH002	83	87	83	86	87	B/C
	Sg. Kluang	Sg. Kluang	4TKLU005	83	88	84	84	85	B/C
	Sg. Marang	Sg. Kerak	4TMRG001	81	79	82	85	82	B/C
		Sg. Marang	4TMRG002	83	88	89	94	90	B/C
		Sg. Temala	4TMRG003	87	91	92	91	90	B/C
	Sg. Merang	Sg. Merang	4TMRER001	77	82	77	77	80	ST/SP
	Sg. Merchang	Sg. Landas	4TMCA001	65	71	87	87	84	B/C
		Sg. Merchang	4TMCA002	72	71	80	73	76	ST/SP
	Sg. Paka	Sg. Besul	4TPKA001	86	92	96	96	92	B/C
		Sg. Paka	4TPKA005	84	87	88	89	90	B/C
		Sg. Paka	4TPKA006	84	88	92	91	89	B/C
		Sg. Paka	4TPKA007	87	88	90	91	89	B/C
		Sg. Rasau	4TPKA003	79	83	85	86	87	B/C
		Sg. Rasau	4TPKA004	79	77	83	79	80	ST/SP
		Sg. Rengat	4TPKA002	85	84	91	91	89	B/C
	Sg. Setiu	Sg. Bari	4TSTU002	91	92	95	95	93	B/C
		Sg. Chalok	4TSTU001	86	85	94	91	93	B/C
		Sg. Chalok	4TSTU005	89	90	92	93	92	B/C
		Sg. Chalok	4TSTU006	84	83	83	85	87	B/C
		Sg. Setiu	4TSTU004	84	87	93	93	93	B/C
		Sg. Setiu	4TSTU007	86	90	94	93	94	B/C
		Sg. Tarom	4TSTU003	88	89	94	95	92	B/C
	Sg. Terengganu	Sg. Berang	4TTGG002	91	89	92	96	95	B/C
		Sg. Berang	4TTGG011	90	92	97	96	97	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Terengganu	Sg. Terengganu	Sg. Nerus	4TTGG004	84	85	91	87	90	B/C
		Sg. Nerus	4TTGG005	91	92	95	96	94	B/C
		Sg. Nerus	4TTGG006	91	89	93	95	94	B/C
		Sg. Nerus	4TTGG010	60	66	68	72	71	ST/SP
		Sg. Nerus	4TTGG014	87	90	94	94	92	B/C
		Sg. Nerus	4TTGG015	90	91	94	95	92	B/C
		Sg. Pueh	4TTGG007	65	70	82	86	89	B/C
		Sg. Pueh	4TTGG008	72	77	89	93	93	B/C
		Sg. Telemong	4TTGG012	89	88	93	91	93	B/C
		Sg. Terengganu	4TTGG001	86	87	91	90	89	B/C
		Sg. Terengganu	4TTGG003	91	90	95	96	94	B/C
		Sg. Terengganu	4TTGG009	87	87	88	89	91	B/C
		Sg. Terengganu	4TTGG013	89	89	92	93	93	B/C
		Sg. Golok	4DGLK002	87	86	93	91	92	B/C
		Sg. Golok	4DGLK003	90	94	97	94	97	B/C
Kelantan	Sg. Golok	Sg. Golok	4DGLK004	82	87	93	89	94	B/C
		Sg. Golok	4DGLK005	86	89	93	90	92	B/C
		Sg. Golok	4DGLK006	84	86	91	88	87	B/C
		Sg. Jedok	4DGLK008	88	90	95	95	93	B/C
		Sg. Lanas	4DGLK007	86	84	94	90	94	B/C
		Sg. Tasik Garu	4DGLK001	76	80	85	82	87	B/C
		Sg. Kelantan	4DKLT013	76	79	80	83	82	B/C
		Sg. Belatop	4DKLT020	80	83	89	87	87	B/C
	Sg. Kelantan	Sg. Belatop	4DKLT021	86	87	96	93	92	B/C
		Sg. Belatop	4DKLT046	74	78	82	82	80	ST/SP
		Sg. Ber	4DKLT018	84	87	91	91	91	B/C
		Sg. Berok	4DKLT016	79	81	83	85	85	B/C
		Sg. Berok	4DKLT019	82	88	90	90	90	B/C
		Sg. Berok	4DKLT022	81	81	84	81	83	B/C
		Sg. Betis	4DKLT017	84	86	93	92	92	B/C
		Sg. Chiku	4DKLT037	83	88	88	90	84	B/C
		Sg. Chiku	4DKLT043	87	89	90	92	90	B/C
		Sg. Galas	4DKLT014	83	89	89	81	85	B/C
		Sg. Galas	4DKLT031	86	89	90	92	97	B/C
		Sg. Galas	4DKLT032	87	87	92	87	91	B/C
	Sg. Kelantan	Sg. Galas	4DKLT033	79	84	81	91	88	B/C
		Sg. Galas	4DKLT034	81	82	79	92	88	B/C
		Sg. Isos	4DKLT049	73	73	73	78	74	ST/SP
		Sg. Kelantan	4DKLT001	82	82	83	87	86	B/C
		Sg. Kelantan	4DKLT006	78	78	87	89	87	B/C
		Sg. Kelantan	4DKLT010	81	84	83	82	88	B/C
		Sg. Kelantan	4DKLT045	78	80	84	87	88	B/C
		Sg. Kelantan	4DKLT054	87	88	89	91	87	B/C
	Sg. Kelantan	Sg. Kelantan	4DKLT055	85	85	93	90	94	B/C
		Sg. Kelantan	4DKLT056	78	81	83	87	87	B/C
		Sg. Kelesa	4DKLT015	84	87	94	91	90	B/C
		Sg. Kenkren	4DKLT047	88	92	93	94	94	B/C
		Sg. Kerilla	4DKLT002	87	92	94	94	95	B/C
		Sg. Kerilla	4DKLT003	90	91	94	93	95	B/C
		Sg. Ketil	4DKLT036	86	90	97	90	93	B/C
		Sg. Ketil	4DKLT053	84	90	96	90	92	B/C
		Sg. Lebir	4DKLT026	89	92	94	91	91	B/C
		Sg. Lebir	4DKLT027	78	85	87	79	87	B/C
		Sg. Lebir	4DKLT028	85	88	94	94	93	B/C
		Sg. Lebir	4DKLT029	82	84	87	81	88	B/C
		Sg. Lebir	4DKLT058	85	88	95	91	95	B/C
		Sg. Muring	4DKLT059	84	85	92	90	93	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kelantan	Sg. Kelantan	Sg. Nal	4DKLT007	89	89	93	90	91	B/C
		Sg. Nal	4DKLT008	85	88	91	89	91	B/C
		Sg. Nal	4DKLT009	85	87	91	88	90	B/C
		Sg. Nenggiri	4DKLT023	82	82	83	86	88	B/C
		Sg. Nenggiri	4DKLT024	80	83	86	87	86	B/C
		Sg. Nenggiri	4DKLT025	80	80	78	91	85	B/C
		Sg. Pehi	4DKLT011	87	88	92	91	92	B/C
		Sg. Pehi	4DKLT044	88	86	90	91	92	B/C
		Sg. Pelaur	4DKLT048	88	90	96	95	87	B/C
		Sg. Penangau	4DKLT050	82	78	87	89	86	B/C
		Sg. Pergau	4DKLT004	93	91	96	97	97	B/C
		Sg. Pergau	4DKLT005	89	90	95	94	95	B/C
		Sg. Pergau	4DKLT038	92	94	96	97	97	B/C
		Sg. Pergau	4DKLT039	92	94	97	97	97	B/C
		Sg. Pergau	4DKLT040	93	94	97	97	96	B/C
		Sg. Pergau	4DKLT041	87	90	94	93	93	B/C
		Sg. Pergau	4DKLT051	92	91	96	97	97	B/C
		Sg. Pergau	4DKLT052	88	92	94	94	95	B/C
		Sg. Rasau	4DKLT061	81	80	80	85	85	B/C
		Sg. Relai	4DKLT012	83	90	91	88	88	B/C
		Sg. Relai	4DKLT030	86	88	91	94	85	B/C
		Sg. Sokor	4DKLT042	83	86	89	89	88	B/C
		Sg. Tuang	4DKLT035	87	90	94	91	97	B/C
	Sg. Kemasin	Sg. Gali	4DKMS006	76	79	75	83	81	B/C
		Sg. Kemasin	4DKMS001	83	84	90	90	87	B/C
		Sg. Kemasin	4DKMS003	73	75	76	76	78	ST/SP
		Sg. Semerak	4DKMS002	84	85	91	88	88	B/C
		Sg. Semerak	4DKMS004	83	86	89	89	88	B/C
		Sg. Semerak	4DKMS005	88	80	77	80	76	ST/SP
	Sg. Pengkalan Chepa	Sg. Alor B	4DPCH003	48	65	63	59	63	ST/SP
		Sg. Alor Lintah	4DPCH004	61	76	68	70	74	ST/SP
		Sg. Keladi	4DPCH002	78	76	84	89	87	B/C
		Sg. Pengkalan Chepa	4DPCH005	50	68	70	70	61	ST/SP
		Sg. Pengkalan Chepa	4DPCH006	69	75	82	76	76	ST/SP
		Sg. Raja Gali	4DPCH001	73	79	87	81	87	B/C
	Sg. Pengkalan Datu	Sg. Pasir Hor	4DPDT004	67	73	77	75	77	ST/SP
		Sg. Pengkalan Datu	4DPDT001	76	83	86	88	86	B/C
		Sg. Pengkalan Datu	4DPDT002	73	83	87	85	87	B/C
		Sg. Pengkalan Datu	4DPDT003	77	86	86	87	89	B/C
Sarawak	Sg. Balingian	Sg. Balingian	6QBLG001	83	90	87	84	69	ST/SP
		Sg. Balingian	6QBLG002	88	88	86	89	88	B/C
	Sg. Baram	Sg. Baram	6QBRM001	86	79	81	83	79	ST/SP
		Sg. Baram	6QBRM002	85	81	83	83	84	B/C
		Sg. Baram	6QBRM003	90	89	89	88	80	ST/SP
		Sg. Baram	6QBRM004	92	90	88	87	80	ST/SP
		Sg. Tutuh	6QBRM005	92	90	-	87	79	ST/SP
	Sg. Kayan	Sg. Kayan	6QKYN001	77	77	76	76	76	ST/SP
		Sg. Kayan	6QKYN002	79	82	83	84	82	B/C
		Sg. Kayan	6QKYN003	85	87	88	87	84	B/C
	Sg. Kemenia	Sg. Kemenia	6QKMN001	82	82	82	82	78	ST/SP
		Sg. Kemenia	6QKMN002	84	89	83	84	76	ST/SP
		Sg. Kemenia	6QKMN003	86	81	80	85	80	ST/SP
		Sg. Kemenia	6QKMN004	89	91	83	84	82	B/C
		Sg. Sibiu	6QKMN005	83	81	79	83	76	ST/SP
	Sg. Kerian	Sg. Kerian	6QKRN014	80	82	81	86	77	ST/SP
		Sg. Kerian	6QKRN015	86	89	84	88	86	B/C
		Sg. Seblak	6QKRN016	82	84	88	87	79	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sarawak	Sg. Kerian	Sg. Selalang	6QKRN017	91	92	92	90	90	B/C
		Sg. Lawas	6QLWS001	91	89	87	90	90	B/C
		Sg. Lawas	6QLWS002	90	87	88	91	93	B/C
		Sg. Lawas	6QLWS003	91	89	90	92	92	B/C
	Sg. Limbang	Sg. Limbang	6QLBG001	90	88	86	88	83	B/C
		Sg. Limbang	6QLBG002	91	87	86	88	85	B/C
		Sg. Limbang	6QLBG003	91	88	90	89	86	B/C
		Sg. Limbang	6QLBG004	92	90	91	88	87	B/C
		Sg. Limbang	6QLBG005	92	92	88	90	87	B/C
	Sg. Lumar	Sg. Ai	6QLPR001	92	89	91	88	87	B/C
		Sg. Ai	6QLPR002	92	91	91	89	94	B/C
		Sg. Lumar	6QLPR003	81	77	83	88	76	ST/SP
		Sg. Lumar	6QLPR004	81	82	85	87	75	ST/SP
		Sg. Lumar	6QLPR005	91	89	85	90	90	B/C
		Sg. Sekerang	6QLPR006	91	92	88	87	90	B/C
		Sg. Seterap	6QLPR007	86	82	86	89	80	ST/SP
		Sg. Undup	6QLPR008	88	91	85	89	89	B/C
	Sg. Miri	Sg. Adong	6QMRI001	70	83	78	57	54	T/P
		Sg. Dalam	6QMRI002	74	84	83	80	70	ST/SP
		Sg. Lutong	6QMRI003	86	80	82	83	79	ST/SP
		Sg. Lutong	6QMRI004	86	77	80	74	72	ST/SP
		Sg. Miri	6QMRI005	75	87	88	56	48	T/P
		Sg. Miri	6QMRI006	76	88	88	60	52	T/P
		Sg. Padang Liku	6QMRI007	90	89	88	83	81	B/C
	Sg. Mukah	Sg. Mukah	6QMKH001	81	85	80	81	72	ST/SP
		Sg. Mukah	6QMKH002	83	89	82	86	61	ST/SP
		Sg. Mukah	6QMKH003	85	89	81	86	73	ST/SP
		Sg. Mukah	6QMKH004	88	89	87	88	86	B/C
		Sg. Mukah	6QMKH005	83	89	84	87	80	ST/SP
	Sg. Niah	Sg. Niah	6QNIA001	90	86	87	85	82	B/C
		Sg. Niah	6QNIA002	90	86	86	86	84	B/C
		Sg. Sekaloh	6QNIA003	69	68	64	79	59	T/P
		Sg. Sekaloh	6QNIA004	83	87	86	84	79	ST/SP
	Sg. Oya	Sg. Oya	6QOYA001	82	79	76	83	67	ST/SP
		Sg. Oya	6QOYA002	84	89	81	87	68	ST/SP
		Sg. Oya	6QOYA003	91	89	89	86	84	B/C
	Sg. Rajang	Sg. Baloi	6QRJG019	89	89	-	89	73	ST/SP
		Sg. Binatang	6QRJG004	89	89	89	87	86	B/C
		Sg. Daro	6QRJG021	76	80	62	66	53	T/P
		Sg. Jemoreng	6QRJG022	78	80	63	66	55	T/P
		Sg. Julau	6QRJG005	90	88	86	85	89	B/C
		Sg. Kanowit	6QRJG006	88	89	87	87	88	B/C
		Sg. Meradong	6QRJG003	86	80	82	85	78	ST/SP
		Sg. Pakan	6QRJG020	89	88	89	88	88	B/C
		Sg. Pila Parit	6QRJG023	81	62	77	78	81	B/C
		Sg. Rajang	6QRJG008	82	83	86	86	81	B/C
		Sg. Rajang	6QRJG009	80	84	86	87	81	B/C
		Sg. Rajang	6QRJG010	85	82	86	85	81	B/C
		Sg. Rajang	6QRJG011	86	80	85	87	81	B/C
		Sg. Rajang	6QRJG012	78	85	84	89	64	ST/SP
		Sg. Rajang	6QRJG013	85	87	86	87	83	B/C
		Sg. Rajang	6QRJG014	85	85	84	86	82	B/C
		Sg. Rajang	6QRJG015	88	85	83	84	83	B/C
		Sg. Rajang	6QRJG016	88	85	86	87	84	B/C
		Sg. Rajang	6QRJG017	88	90	86	86	88	B/C
		Sg. Rajang	6QRJG018	87	90	84	87	85	B/C
		Sg. Salim	6QRJG007	80	83	81	86	76	ST/SP

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sarawak	Sg. Rajang	Sg. Sarikei	6QRJG001	83	80	86	87	82	B/C
		Sg. Sarikei	6QRJG002	90	89	90	88	88	B/C
	Sg. Sadong	Sg. Karangan	6QSDG001	71	68	69	76	62	ST/SP
		Sg. Karangan	6QSDG002	83	87	87	88	72	ST/SP
		Sg. Sadong	6QSDG003	75	73	81	84	77	ST/SP
		Sg. Sadong	6QSDG004	71	72	66	78	63	ST/SP
		Sg. Sadong	6QSDG005	87	88	90	87	88	B/C
		Sg. Sadong	6QSDG006	89	90	91	88	92	B/C
		Sg. Tarat	6QSDG007	90	91	90	90	90	B/C
	Sg. Sarawak	Sg. Kelantan	6QSWK017	84	74	59	68	66	ST/SP
		Sg. Kuap	6OSWK009	83	79	88	86	72	ST/SP
		Sg. Kuap	6QSWK010	87	87	88	89	87	B/C
		Sg. Maong Kiri	6QSWK011	76	72	73	82	70	ST/SP
		Sg. Samarahan	6QSWK013	68	65	63	66	62	ST/SP
		Sg. Samarahan	6QSWK014	79	80	85	87	80	ST/SP
		Sg. Sarawak	6QSWK001	83	81	84	84	78	ST/SP
		Sg. Sarawak	6QSWK003	85	83	85	87	83	B/C
		Sg. Sarawak	6QSWK004	86	88	87	88	88	B/C
		Sg. Sarawak	6QSWK006	82	84	80	84	81	B/C
		Sg. Sarawak	6QSWK007	89	90	88	91	91	B/C
		Sg. Sarawak	6QSWK008	90	91	89	90	92	B/C
		Sg. Sarawak Kanan	6QSWK002	85	82	84	85	83	B/C
		Sg. Sarawak Kiri	6QSWK005	87	88	87	87	89	B/C
		Sg. Semadang	6OSWK016	90	89	90	90	93	B/C
		Sg. Semenggoh	6QSWK012	77	71	78	83	75	ST/SP
		Sg. Tabuan	6QSWK015	73	77	76	78	64	ST/SP
		Sg. Tapah	6QSWK018	89	89	91	90	88	B/C
	Sg. Saribas	Sg. Layar	6QSRB002	86	85	88	87	83	B/C
		Sg. Layar	6QSRB003	90	87	90	88	90	B/C
		Sg. Saribas	6QSRB001	80	74	79	87	75	ST/SP
	Sg. Semunsam	Sg. Semunsam	6QSMS001	85	87	80	85	88	B/C
Sabah	Sg. Sibuti	Sg. Kabuloh	6QSBT001	64	76	61	70	69	ST/SP
		Sg. Kabuloh	6QSBT002	72	69	64	87	92	B/C
		Sg. Kejapil	6QSBT003	90	88	89	85	86	B/C
		Sg. Satap	6QSBT004	86	88	84	84	74	ST/SP
		Sg. Sibuti	6QSBT005	88	82	84	77	78	ST/SP
		Sg. Sibuti	6QSBT006	86	87	88	84	81	B/C
	Sg. Similajau	Sg. Similajau	6QSML001	89	90	86	86	83	B/C
		Sg. Similajau	6QSML002	88	89	84	88	85	B/C
	Sg. Suai	Sg. Suai	6QSUAI001	89	88	87	85	80	ST/SP
	Sg. Tatau	Sg. Tatau	6QTTU001	87	88	85	86	84	B/C
	Sg. Trusan	Sg. Trusan	6QTSN001	92	88	88	90	86	B/C
	Sg. Apas	Sg. Apas	5SAPS001	91	89	90	92	90	B/C
	Sg. Balung	Sg. Balung	5SBLU001	93	87	91	92	90	B/C
	Sg. Bengkoka	Sg. Bengkoka	5SBKK001	88	90	91	90	88	B/C
		Sg. Bengkoka	5SBKK002	85	86	86	88	85	B/C
	Sg. Bingkongan	Sg. Bandau	5SBKG001	90	91	92	92	94	B/C
		Sg. Bingkongan	5SBKG005	92	92	94	93	94	B/C
		Sg. Bingkongan	5SBKG006	93	91	94	94	94	B/C
		Sg. Menggaris	5SBKG002	91	93	93	90	93	B/C
		Sg. Menggaris	5SBKG003	92	92	92	93	93	B/C
		Sg. Tandek	5SBKG004	90	91	91	91	91	B/C
		Sg. Bongawan	5SBGW001	88	87	87	88	87	B/C
	Sg. Brantian	Sg. Brantian	5SBTN001	91	86	84	90	87	B/C
	Sg. Kalabakan	Sg. Kalabakan	5SKBK001	89	85	85	90	82	B/C
		Sg. Kalabakan	5SKBK002	85	84	84	86	81	B/C
		Sg. Kalabakan	5SKBK003	85	82	83	86	83	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sabah	Sg. Kalumpang	Sg. Kalumpang	5SKLP001	90	86	86	91	91	B/C
		Sg. Kalumpang	5SKLP002	92	86	90	88	89	B/C
		Sg. Kalumpang	5SKLP003	87	84	85	86	83	B/C
		Sg. Pang Burong 1	5SKLP004	89	83	86	86	87	B/C
		Sg. Pang Burong 2	5SKLP005	76	69	85	80	79	ST/SP
	Sg. Kedamaian	Sg. Kedamaian	5SKDI004	93	90	93	92	95	B/C
		Sg. Tempasuk	5SKDI001	91	87	93	91	92	B/C
		Sg. Tempasuk	5SKDI002	93	91	92	92	93	B/C
		Sg. Wariu	5SKDI003	91	91	93	93	94	B/C
	Sg. Kimanis	Sg. Kimanis	5SKMA001	89	87	90	92	90	B/C
	Sg. Kinabatangan	Sg. Karamuak	5SKBT006	92	91	92	92	91	B/C
		Sg. Kinabatangan	5SKBT001	87	85	86	83	84	B/C
		Sg. Kinabatangan	5SKBT002	88	82	84	85	83	B/C
		Sg. Kinabatangan	5SKBT004	88	84	87	84	83	B/C
		Sg. Kinabatangan	5SKBT005	90	86	85	83	83	B/C
		Sg. Koyah	5SKBT003	88	87	89	88	86	B/C
		Sg. Leepang	5SKBT009	88	84	85	84	83	B/C
		Sg. Menanggul	5SKBT008	87	81	86	86	82	B/C
		Sg. Pin	5SKBT010	85	86	87	86	86	B/C
		Sg. Takala	5SKBT007	88	85	88	87	85	B/C
	Sg. Labok	Sg. Kinipir	5SLBK001	91	90	91	90	92	B/C
		Sg. Kinipir	5SLBK002	91	86	91	91	93	B/C
		Sg. Labok	5SLBK006	89	87	86	88	87	B/C
		Sg. Liwagu	5SLBK003	91	88	89	86	89	B/C
		Sg. Liwagu	5SLBK004	91	88	88	91	93	B/C
		Sg. Maliau	5SLBK005	93	92	94	93	95	B/C
		Sg. Tungud	5SLBK007	90	88	91	85	87	B/C
	Sg. Lakutan	Sg. Lakutan	5SLKT001	90	89	93	88	92	B/C
	Sg. Likas	Sg. Darau	5SLKS008	76	80	83	83	81	B/C
		Sg. Inanam	5SLKS001	77	79	81	80	75	ST/SP
		Sg. Inanam	5SLKS002	82	84	87	90	88	B/C
		Sg. Inanam	5SLKS003	93	92	93	93	95	B/C
		Sg. Likas	5SLKS004	70	77	73	78	71	ST/SP
		Sg. Likas	5SLKS005	85	78	77	80	73	ST/SP
		Sg. Menggatal	5SLKS006	85	81	87	89	95	B/C
		Sg. Menggatal	5SLKS007	91	87	91	92	91	B/C
	Sg. Lingkungan	Sg. Bukau	5SLKG002	90	88	92	87	90	B/C
		Sg. Lingkungan	5SLKG001	89	91	93	89	93	B/C
	Sg. Membakut	Sg. Membakut	5SMBT001	87	85	87	89	89	B/C
	Sg. Menggalong	Sg. Menggalong	5SMGL001	86	86	91	85	87	B/C
		Sg. Menggalong	5SMGL002	93	92	93	92	92	B/C
	Sg. Merotai	Sg. Merotai	5SMRT001	87	88	90	91	91	B/C
		Sg. Merotai	5SMRT002	89	92	94	92	94	B/C
		Sg. Merotai	5SMRT003	84	87	90	87	90	B/C
	Sg. Mounad	Sg. Mounad	5SMND001	86	85	89	88	88	B/C
		Sg. Mounad	5SMND002	88	86	86	89	85	B/C
	Sg. Moyog	Sg. Moyog	5SMYG001	90	86	88	91	90	B/C
		Sg. Moyog	5SMYG002	92	89	92	91	92	B/C
		Sg. Moyog	5SMYG003	92	92	94	93	94	B/C
		Sg. Moyog	5SMYG004	93	92	94	92	95	B/C
	Sg. Padas	Sg. Bunsit	5SPDS001	92	91	93	92	94	B/C
		Sg. Liawan	5SPDS002	91	91	91	92	93	B/C
		Sg. Padas	5SPDS003	86	86	87	88	85	B/C
		Sg. Padas	5SPDS004	88	88	90	88	90	B/C
		Sg. Padas	5SPDS005	89	86	88	82	86	B/C
		Sg. Padas	5SPDS011	86	85	88	87	85	B/C
		Sg. Pangatan	5SPDS006	86	87	88	87	86	B/C

**Jadual 2.3: Status Kualiti Air Sungai Mengikut Stesen, 2023**  
**Table 2.3: Water Quality Status by Stations, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2023) / WQI CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sabah	Sg. Padas	Sg. Pegalan	5SPDS008	90	89	91	90	93	B/C
		Sg. Pegalan	5SPDS009	88	87	86	86	89	B/C
		Sg. Pegalan	5SPDS010	86	86	87	84	89	B/C
		Sg. Tandulu	5SPDS007	90	91	92	92	93	B/C
	Sg. Paitan	Sg. Paitan	5SPTN001	88	85	91	90	88	B/C
		Sg. Papar	5SPPR001	91	89	91	90	92	B/C
		Sg. Papar	5SPPR002	91	90	91	90	91	B/C
		Sg. Papar	5SPPR003	91	89	90	88	92	B/C
		Sg. Papar	5SPPR004	92	90	91	93	92	B/C
		Sg. Papar	5SPPR005	93	92	91	93	91	B/C
	Sg. Sapi	Sg. Sapi	5SSAP002	87	85	85	83	86	B/C
		Sg. Sapi	5SSAP003	86	86	86	84	88	B/C
		Sg. Sapi	5SSAP004	89	87	88	87	82	B/C
		Sg. Sualong	5SSAP001	91	92	92	93	95	B/C
	Sg. Segaliud	Sg. Segaliud	5SSLD001	87	86	85	81	83	B/C
		Sg. Segaliud	5SSLD002	87	87	86	84	85	B/C
	Sg. Segama	Sg. Segama	5SSGM001	91	86	87	86	86	B/C
		Sg. Segama	5SSGM002	91	85	88	87	87	B/C
		Sg. Segama	5SSGM003	91	85	88	87	85	B/C
	Sg. Sembulan	Sg. Sembulan	5SSBL001	81	84	81	74	75	ST/SP
		Sg. Sembulan	5SSBL002	73	74	80	69	70	ST/SP
	Sg. Silabukan	Sg. Silabukan	5SSBK001	89	86	87	83	89	B/C
		Sg. Silabukan	5SSBK002	90	89	91	91	95	B/C
	Sg. Sugut	Sg. Bongkud	5SSUG001	92	91	92	93	93	B/C
		Sg. Lohan	5SSUG002	92	91	92	93	95	B/C
		Sg. Merali	5SSUG003	92	88	91	90	95	B/C
		Sg. Sugut	5SSUG004	91	91	91	91	94	B/C
		Sg. Sugut	5SSUG005	91	88	92	91	95	B/C
		Sg. Sugut	5SSUG006	90	85	89	87	89	B/C
	Sg. Tawau	Sg. Tawau	5STWU001	83	77	83	78	80	ST/SP
		Sg. Tawau	5STWU002	85	83	88	88	88	B/C
		Sg. Tawau	5STWU003	92	91	93	92	94	B/C
		Sg. Tawau	5STWU004	92	91	93	93	94	B/C
	Sg. Telipok	Sg. Telipok	5STLP001	66	70	70	82	86	B/C
		Sg. Telipok	5STLP002	88	90	90	91	93	B/C
	Sg. Tenghilan	Sg. Tenghilan	5STHL001	91	92	92	90	92	B/C
	Sg. Tingkayu	Sg. Tingkayu	5STKY001	89	84	85	85	80	ST/SP
		Sg. Tingkayu	5STKY002	89	86	86	84	80	ST/SP
	Sg. Tuaran	Sg. Damit	5STUA001	88	89	87	88	93	B/C
		Sg. Damit	5STUA002	89	87	87	90	92	B/C
		Sg. Song Sai	5STUA003	91	90	92	92	94	B/C
		Sg. Tuaran	5STUA004	92	92	93	93	95	B/C
		Sg. Tuaran	5STUA005	93	92	93	93	94	B/C
	Sg. Tungku	Sg. Tungku	5STKU001	87	89	90	88	90	B/C
		Sg. Tungku	5STKU002	90	90	89	90	94	B/C
	Sg. Umas-Umas	Sg. Umas Umas	5SUSM001	90	83	84	89	85	B/C

Nota / Note:

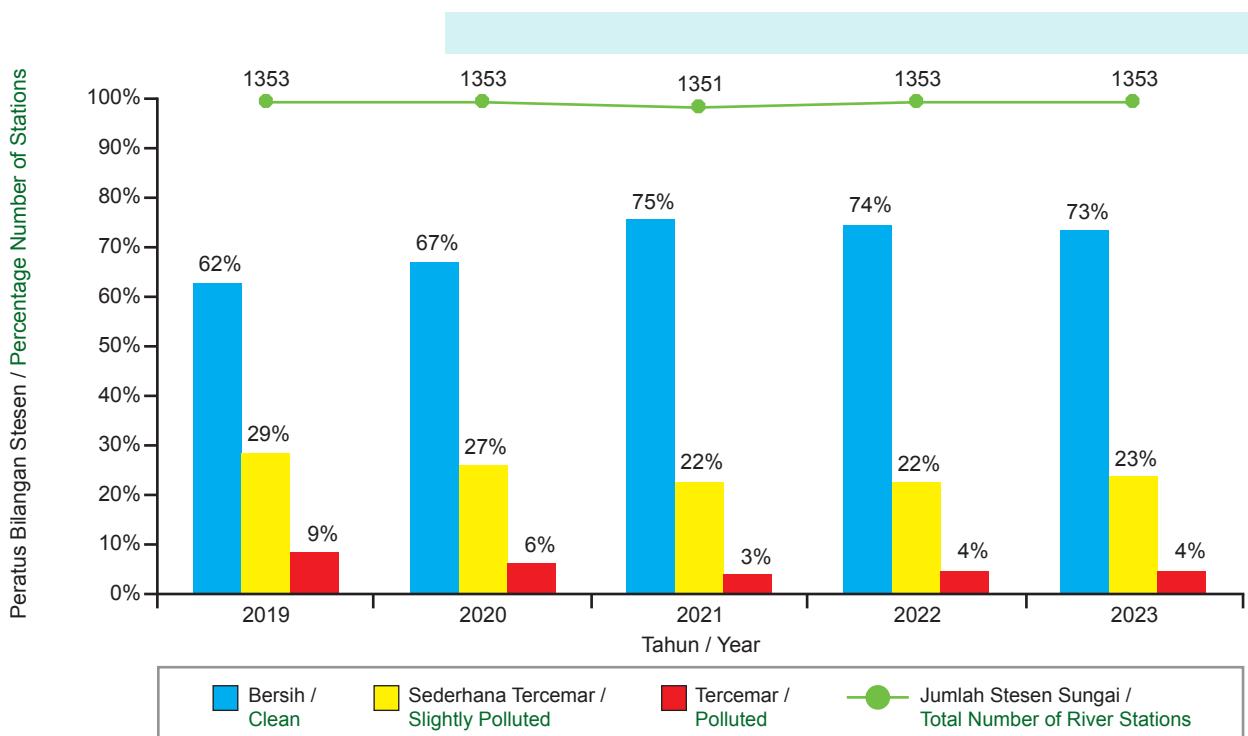
Kategori IKA / WQI Category

Nilai IKA / WQI Value

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

> 92.7	Kelas I / Class I
76.5 - 92.7	Kelas II / Class II
51.9 - 76.5	Kelas III / Class III

31.0 - 51.9	Kelas IV / Class IV
< 31.0	Kelas V / Class V
—	Tiada Data / No Data



Rajah 2.5: Tren Stesen Kualiti Air Sungai, 2019-2023

Figure 2.5: River Water Quality Stations Trend, 2019-2023

#### STESEN PENGAWASAN KUALITI AIR SUNGAI KATEGORI TERCEMAR

**Jadual 2.4** menunjukkan sebanyak 52 stesen pengawasan kualiti air sungai dikategorikan tercemar pada tahun 2023. Sebanyak 33 stesen berada di dalam Kelas III dan 19 stesen berada di Kelas IV.

Berdasarkan sub-indeks BOD, tujuh (7) stesen sungai dikategorikan sebagai Kelas II, lima (5) stesen di Kelas III, 14 stesen di Kelas IV dan 26 stesen di Kelas V.

Dari segi sub-indeks AN pula, satu (1) stesen sungai dikategorikan sebagai Kelas I, dua (2) stesen di Kelas II, lima (5) stesen di Kelas III, 10 stesen di Kelas IV dan 34 stesen di Kelas V.

Dari segi sub-indeks SS, sebanyak 33 stesen sungai dikategorikan sebagai Kelas I, 15 stesen di Kelas II dan empat (4) stesen di Kelas III.

Daripada 52 stesen sungai yang berada di dalam kategori tercemar, penyumbang terbesar kemerosotan stesen pengawasan kualiti air sungai kepada Kelas V adalah berpunca daripada parameter AN iaitu sebanyak 65% dan diikuti parameter BOD iaitu sebanyak 50%.

#### WATER QUALITY MONITORING STATIONS CATEGORISED AS POLLUTED

**Table 2.4** indicates a total of 52 river water quality monitoring stations categorised as polluted in 2023. 33 stations were in Class III and 19 stations in Class IV.

Based on the BOD sub-index, seven (7) river stations were classified as Class II, five (5) stations in Class III, 14 stations in Class IV, and 26 stations in Class V.

In terms of the AN sub-index, one (1) river station classified as Class I, two (2) stations in Class II, five (5) stations in Class III, 10 stations in Class IV, and 34 stations in Class V.

In terms of the SS sub-index, 33 river stations were classified as Class I, 15 stations in Class II, and four (4) stations in Class III.

Of the 52 river stations in the polluted category, the largest contributor to the deterioration of river water quality monitoring stations to Class V was due to the AN parameter of 65%, followed by the BOD parameter of 50%.

**Jadual 2.4: Stesen Sungai Tercemar dan Kelas Kualiti Air Berdasarkan Sub-Indeks BOD, AN dan SS, 2023****Table 2.4: Polluted River Stations and Classes Based on BOD, AN and SS Sub-Index, 2023**

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	2023			KELAS BERDASARKAN / CLASS BASED ON		
				IKA / WQI	KATEGORI / CATEGORY	KELAS / CLASS	BOD	AN	SS
Kedah	Sg. Merbok	Sg. Petani	1KMBK007	53	T/P	III	V	V	I
		Sg. Bakar Arang	1KMBK008	58	T/P	III	IV	IV	I
P. Pinang	Sg. Juru	Sg. Rambai	1PJRU005	50	T/P	IV	V	V	II
		Sg. Kilang Ubi	1PJRU010	54	T/P	III	IV	V	I
	Sg. Jawi	Sg. Jawi	1PJWI001	54	T/P	III	III	V	III
		Sg. Chempedak	1PJWI003	55	T/P	III	V	III	III
		Sg. Junjong	1PJWI004	53	T/P	III	III	IV	II
	Sg. Kluang	Sg. Kluang	1PKLU001	58	T/P	III	IV	V	I
	Sg. Pinang	Sg. Titi Kerawang	1PPNG004	57	T/P	III	IV	V	I
		Sg. Pinang	1PPNG008	50	T/P	IV	V	V	I
		Sg. Dondang	1PPNG012	57	T/P	III	IV	V	I
		Sg. Dondang	1PPNG013	56	T/P	III	IV	V	I
		Sg. Pinang	1PPNG021	41	T/P	IV	V	V	I
Perak	Sg. Perai	Sg. Kereh	1PPRI008	57	T/P	III	III	V	II
	Sg. Raja Hitam	Sg. Raja Hitam	1ARHT008	47	T/P	IV	IV	V	III
Selangor	Sg. Buloh	Sg. Buloh	2BBLH002	48	T/P	IV	V	IV	II
		Sg. Buloh	2BBLH003	41	T/P	IV	V	IV	II
		Sg. Buloh	2BBLH004	59	T/P	III	IV	IV	II
		Sg. Buloh	2BBLH006	48	T/P	IV	V	IV	II
	Sg. Klang	Sg. Kerayong	2BKLG013	49	T/P	IV	V	V	I
W.P. Kuala Lumpur	Sg. Klang	Sg. Bunos	2WKLG006	57	T/P	III	V	IV	I
		Sg. Toba	2WKLG037	53	T/P	III	V	V	II
		Sg. Air Busuk	2WKLG041	42	T/P	IV	V	V	I
		Sg. Kerayong	2WKLG058	59	T/P	III	V	V	I
N. Sembilan	Sg. Langat	Sg. Pajam	3NLGT021	59	T/P	III	V	V	I
Melaka	Sg. Merlimau	Sg. Merlimau	3MMLU002	54	T/P	III	IV	IV	I
	Sg. Duyong	Sg. Punggur	3MPGR002	54	T/P	III	II	IV	II
Johor	Sg. Danga	Sg. Danga	3JDGA001	57	T/P	III	IV	V	III
		Sg. Danga	3JDGA002	57	T/P	III	IV	V	II
	Sg. Johor	Sg. Bukit Besar	3JJHR007	46	T/P	IV	V	V	II
	Sg. Kim-Kim	Sg. Kim-Kim	3JKIM001	58	T/P	III	III	IV	I
	Sg. Kempas	Sg. Kempas	3JKPS001	33	T/P	IV	V	V	II
		Sg. Kempas	3JKPS002	45	T/P	IV	V	V	II
	Sg. Kaw. Pasir Gudang	Sg. Buluh	3JPGD002	46	T/P	IV	V	I	I
		Sg. Tukang Batu	3JPGD003	35	T/P	IV	V	V	I
	Sg. Segget	Sg. Segget	3JSGT001	47	T/P	IV	V	V	I
		Sg. Segget	3JSGT002	47	T/P	IV	V	V	I
		Sg. Segget	3JSGT003	53	T/P	III	IV	V	I
		Sg. Segget	3JSGT005	59	T/P	III	IV	V	I
	Sg. Tebrau	Sg. Tebrau	3JTRU001	56	T/P	III	V	V	I
		Sg. Tebrau	3JTRU005	56	T/P	III	III	V	I
		Sg. Tebrau	3JTRU006	54	T/P	III	IV	V	I
		Sg. Pandan	3JTRU007	44	T/P	IV	V	V	I
		Sg. Sebulung	3JTRU009	56	T/P	III	V	V	I
		Sg. Tampoi	3JTRU010	54	T/P	III	V	V	I
		Sg. Sengkuang	3JTRU011	35	T/P	IV	V	V	II
Sarawak	Sg. Miri	Sg. Adong	6QMRI001	54	T/P	III	II	III	I
		Sg. Miri	6QMRI005	48	T/P	IV	II	III	I
		Sg. Miri	6QMRI006	52	T/P	III	II	III	I
	Sg. Niah	Sg. Sekaloh	6QNIA003	59	T/P	III	II	III	II
	Sg. Rajang	Sg. Daro	6QRJG021	53	T/P	III	II	II	I
		Sg. Jemoreng	6QRJG022	55	T/P	III	II	II	I

## TREN STESEN PENGAWASAN KUALITI AIR SUNGAI

Berdasarkan sub-indeks BOD, 1,057 (78%) stesen sungai dikategorikan sebagai bersih adalah sedikit menurun pada tahun 2023 berbanding 1,021 (75%) stesen pada tahun 2022 (**Rajah 2.6**). Bilangan stesen sungai yang sederhana tercemar dari segi sub-indeks BOD telah meningkat daripada 185 (14%) stesen pada tahun 2022 kepada 162 (12%) stesen pada tahun 2023, manakala bilangan stesen yang berada di dalam kategori tercemar telah menurun daripada 147 (11%) stesen pada tahun 2022 kepada 134 (10%) stesen pada tahun 2023.

Dari segi sub-indeks AN, bilangan stesen sungai berada di dalam kategori bersih telah meningkat daripada 655 (49%) stesen pada tahun 2022 kepada 686 (51%) stesen pada tahun 2023 (**Rajah 2.7**). Bilangan sungai yang sederhana tercemar telah menurun daripada 329 (24%) stesen pada tahun 2022 kepada 310 (23%) stesen pada tahun 2023, manakala bilangan stesen yang berada di dalam kategori tercemar telah menurun daripada 369 (27%) stesen pada tahun 2022 kepada 357 (26%) stesen pada tahun 2023.

Dari segi sub-indeks SS pula, bilangan stesen sungai yang dikategorikan bersih telah meningkat daripada 994 (74%) stesen pada tahun 2022 kepada 1,006 (74%) stesen pada tahun 2023 (**Rajah 2.8**). Bilangan stesen sungai yang dikategorikan sebagai sederhana tercemar telah menurun daripada 114 (8%) stesen pada 2022 kepada 110 (8%) stesen pada tahun 2023, manakala bilangan stesen yang tercemar telah menurun daripada 245 (18%) stesen pada tahun 2022 kepada 237 (18%) stesen pada tahun 2023.

Kesimpulannya, didapati stesen pengawasan kualiti air sungai mengalami sedikit kemerosotan kualiti air bagi tahun 2023 berbanding 2022. Secara umumnya, kemerosotan tersebut adalah disebabkan peningkatan jumlah beban pencemaran kepada stesen pengawasan berkenaan yang berpuncak daripada aktiviti yang berkaitan dengan punca tetap serta punca tidak tetap.

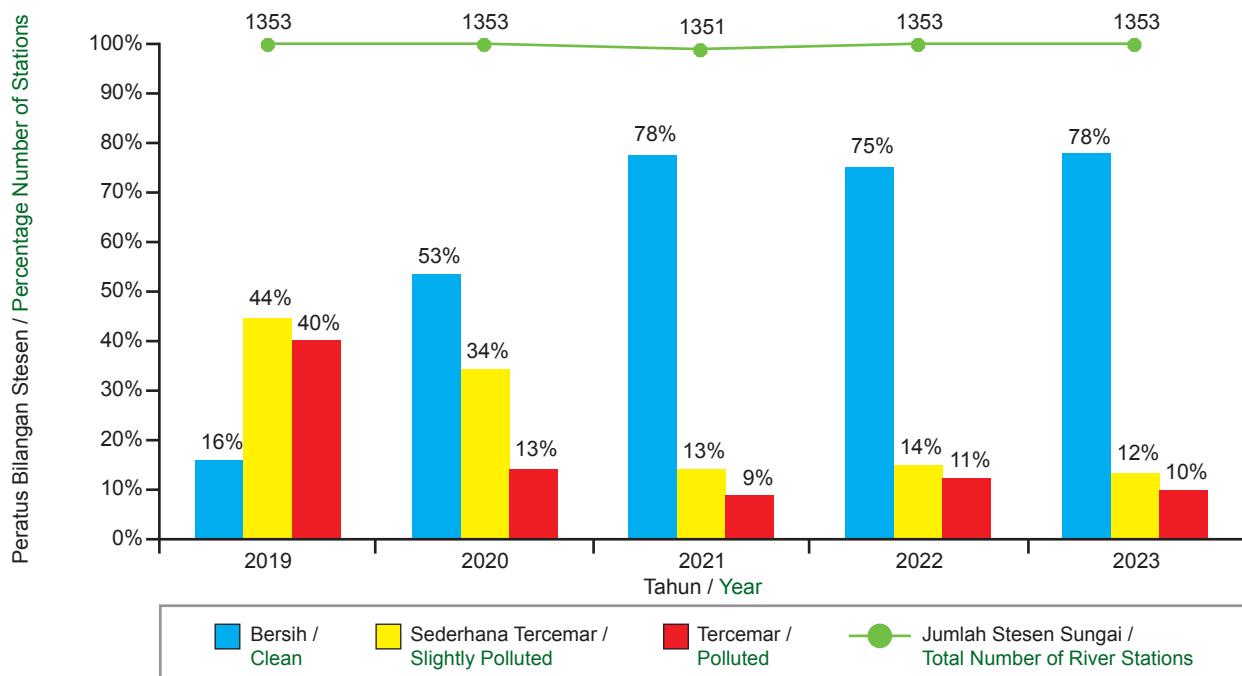
## TRENDS OF RIVER WATER QUALITY MONITORING STATIONS

In terms of the BOD sub-index, 1,057 (78%) river stations were categorised as clean in 2023; this is a slight decrease compared to 1,021 (75%) stations in the year before (**Figure 2.6**). The number of river stations in the slightly polluted category in terms of BOD sub-index increased from 185 (14%) stations in 2022 to 162 (12%) stations in 2023 while the number of stations in the polluted category decreased from 147 (11%) stations in 2022 to 134 (10%) stations in 2023.

In terms of the AN sub-index, the number of river stations in the clean category significantly increased from 655 (49%) stations in 2022 to 686 (51%) stations in 2023 (**Figure 2.7**). The number of river stations in the slightly polluted category has decreased from 329 (24%) stations in 2022 to 310 (23%) stations in 2023 while the number of stations in the clean category decreased from 369 (27%) stations in 2022 to 357 (26%) stations in 2023.

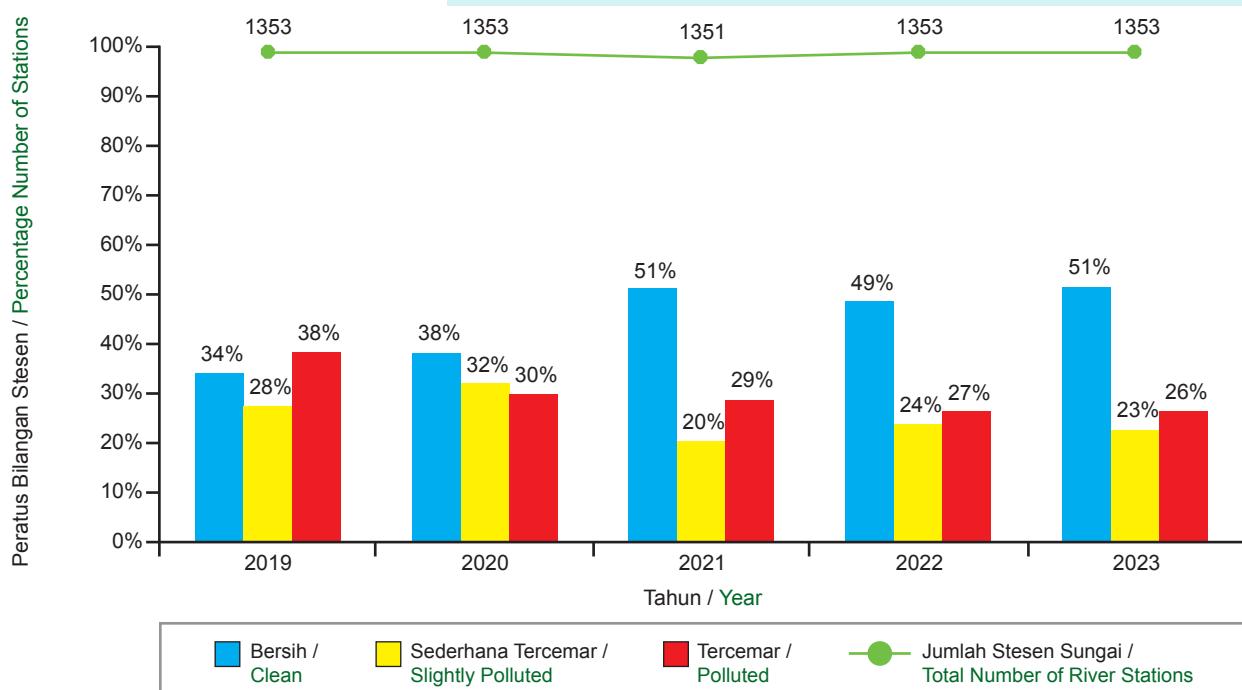
In terms of SS sub-index, the number of river stations in the clean category has increased from 994 (74%) stations in 2022 to 1,006 (74%) stations in 2023 (**Figure 2.8**). The number of river stations categorised as slightly polluted has decreased from 114 (8%) stations in 2022 to 110 (8%) stations in 2023, while the number of polluted stations has decreased from 245 (18%) stations in 2022 to 237 (18%) stations in 2023.

In conclusion, it was found that the river water quality monitoring station experienced a slight deterioration in water quality for 2023 compared to 2022. In general, the decrease is due to the increase in the amount of pollution load to the monitoring station due to activities related to point sources and nonpoint sources.



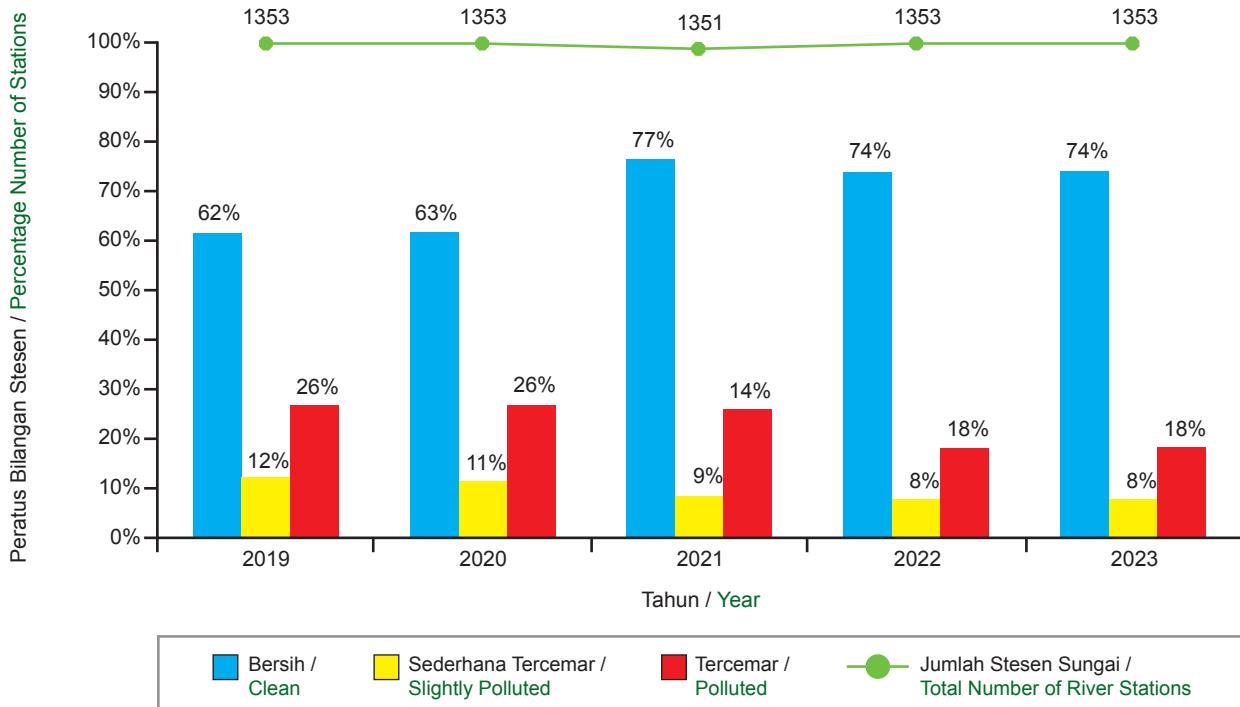
Rajah 2.6: Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks BOD, 2019-2023

Figure 2.6: River Water Quality Stations Trend on BOD Sub-Index, 2019-2023



Rajah 2.7: Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks AN, 2019-2023

Figure 2.7: River Water Quality Stations Trend on AN Sub-Index, 2019-2023



Rajah 2.8: Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks SS, 2019-2023

Figure 2.8: River Water Quality Stations Trend on SS Sub-Index, 2019-2023

### ANALISIS LOGAM BERAT DI STESEN PENGAWASAN KUALITI AIR SUNGAI

Pada tahun 2023, sebanyak 8,118 sampel kualiti air mewakili 1,353 stesen pengawasan sungai manual setiap negeri diambil bagi memantau kandungan beberapa jenis logam berat seperti raksa (Hg), arsenik (As), kadmium (Cd), kromium (Cr), plumbum (Pb) dan zink (Zn). Pematuhan dipantau dengan merujuk Standard Kualiti Air Kebangsaan (NWQS) (**Jadual 2.5**).

Bagi parameter Hg, Cd dan Zn, semua stesen sungai di seluruh negara telah menunjukkan pematuhan penuh kepada Kelas II. Parameter As, Cr dan Pb menunjukkan julat pematuhan Kelas II antara 90.7% hingga 100%.

### ANALYSIS OF HEAVY METALS AT RIVER WATER QUALITY MONITORING STATIONS

In 2023, a total of 8,118 water quality samples of 1,353 manual river water quality stations for each state were taken to monitor a few heavy metal concentrations such as mercury (Hg), arsenic (As), cadmium (Cd), chromium (Cr), plumbum (Pb) and zinc (Zn). Compliance was monitored by referring to the National Water Quality Standards (NWQS) (**Table 2.5**).

For Hg, Cd, and Zn parameters, all river stations in the country showed full compliance with Class II. Parameters of As, Cr, and Pb showed compliance with Class II in the range of 90.7% to 100%.

**Jadual 2.5: Peratusan Pematuhan Parameter Logam Berat mengikut Negeri**  
**Table 2.5: Percentage of Heavy Metal Parameter Compliance by State**

NEGERI / STATE	BIL. STESEN / NO. OF STATION	BIL. PERSAMPELAN / NO. OF SAMPLING	PEMATUHAN KELAS II (%) / COMPLIANCE OF CLASS II (%)					
			RAKSA / MERCURY (Hg)	ARSENIK / ARSENIC (As)	KADMUM / CADMIUM (Cd)	KROMIUM / CHROMIUM (Cr)	PLUMBUM / PLUMBUM (Pb)	ZINK / ZINC (Zn)
Perlis	15	90	100%	100%	100%	100%	100%	100%
Kedah	74	444	100%	100%	100%	100%	100%	100%
P. Pinang	66	396	100%	100%	100%	99.7%	100%	100%
Perak	150	900	100%	97.9%	100%	100%	100%	100%
Selangor	95	570	100%	96.5%	100%	100%	100%	100%
W.P. Kuala Lumpur	27	162	100%	90.7%	100%	100%	100%	100%
N. Sembilan	66	396	100%	99.7%	100%	100%	99.2%	100%
Melaka	54	324	100%	100%	100%	98.5%	99.1%	100%
Johor	227	1362	100%	100%	100%	99.9%	99.8%	100%
Pahang	192	1152	100%	100%	100%	100%	99.8%	100%
Terengganu	69	414	100%	100%	100%	100%	100%	100%
Kelantan	83	498	100%	100%	100%	100%	100%	100%
Sarawak	117	702	100%	100%	100%	100%	100%	100%
Sabah	118	708	100%	100%	100%	100%	99.9%	100%

#### KUALITI AIR SUNGAI BAGI STESEN DI HULU MUKA SAUK

Pada tahun 2023, 52 (94%) daripada 55 stesen pengawasan kualiti air di hulu muka sauk telah menunjukkan indeks kualiti air bersih, satu (1) (2%) stesen kategori sederhana tercemar, manakala dua (2) (4%) stesen berada dalam kategori tercemar.

Berdasarkan pengelasan kualiti air, sebanyak 30 (54%) stesen berada di dalam Kelas I dan 23 (42%) stesen di Kelas II, manakala dua (2) (4%) stesen di Kelas III. **Jadual 2.6** menunjukkan status kualiti air di stesen hulu muka sauk.

Bagi sub-indeks BOD, 54 (98%) stesen sungai telah menunjukkan kualiti air di dalam Kelas II dan satu (1) (2%) stesen sungai adalah di Kelas III.

Berdasarkan sub-indeks AN, sebanyak 46 (84%) stesen menunjukkan kualiti air berada di dalam Kelas I, lapan (8) (14%) stesen di Kelas II dan satu (1) (2%) stesen di Kelas III.

Dari segi sub-indeks SS, 36 (66%) stesen sungai telah berada di dalam Kelas I, lapan (8) (14%) stesen di Kelas II, sembilan (9) (16%) stesen di Kelas III dan dua (2) (4%) stesen di Kelas IV (**Rajah 2.9**).

#### RIVER WATER QUALITY FOR STATIONS LOCATED AT UPSTREAM INTAKES

In 2023, 52 (94%) of the 55 water quality monitoring stations upstream showed a clean water quality index, one (1) (2%) of the slightly polluted category, while two (2) (4%) stations were in the polluted category.

Based on the water quality classification, 30 (54%) stations were in Class I and 23 (42%) stations in Class II, while two (2) (4%) stations were in Class III. **Table 2.6** shows the status of water quality at the upstream station.

For the BOD sub-index, 54 (98%) river stations have shown water quality in Class II and one (1) (2%) river stations are in Class III.

Based on sub-index AN, 46 (84%) stations showed water quality in Class I, eight (8) (14%) stations in Class II and one (1) (2%) station in Class III.

In terms of SS sub-index, 36 (66%) river stations were in Class I, eight (8) (14%) stations in Class II, nine (9) (16%) stations in Class III and two (2) (4%) stations in Class IV (**Figure 2.9**).

**Jadual 2.6: Status Kualiti Air di Hulu Muka Sauk, 2023**  
**Table 2.6: Water Quality Status of Upstream Water Intake, 2023**

NEGERI / STATE	LEMBANGAN SUNGAI / RIVER BASIN	SUNGAI / RIVER	STesen ID / ID STATION	MUKA SAUK / WATER INTAKE	NILAI IKA/ WQI VALUE	2023		
						SUB-INDEKS BOD / BOD SUB-INDEX	SUB-INDEKS AN / AN SUB-INDEX	SUB-INDEKS SS / SS SUB-INDEX
Perlis	Sg. Perlis	Sg. Terusan Mada	1RPLS010	Loji Rawatan Air Arau Fasa IV	93	96	99	91
		Sg. Terusan Mada	1RPLS011	Loji Rawatan Air TTPC, Sg. Baru	91	96	99	90
Kedah	Sg. Kedah	Sg. Ahning	1KKDH011	Padang Sanai	94	96	87	86
		Sg. Padang Terap	1KKDH012	Kuala Nerang	96	96	95	96
		Sg. Temin	1KKDH010	Changloon	87	96	87	79
	Sg. Muda	Sg. Muda	1KMUD014	Jeneri	94	96	99	78
		Sg. Muda	1KMUD015	Jeniang	95	96	99	86
		Sg. Muda	1KMUD016	Bukit Selambau	91	96	99	72
		Sg. Muda	1KMUD018	Pinang Tunggal	90	96	94	75
		Sg. Muda	1KMUD019	Nami	94	96	99	84
		Sg. Sedim	1KMUD017	Bikan	93	96	99	82
	Sg. Ulu Melaka	Sg. Melaka	1KMLK003	Ulu Melaka	93	96	98	89
		Sg. Saga	1KMLK004	Padang Saga	85	88	96	93
P. Pinang	Sg. Pinang	Sg. Satu	1PPNG020	Batu Feringgi	97	96	99	96
Perak	Sg. Kurau	Sg. Air Hitam	1AKRU007	Loji Rawatan Air Jelai	96	96	99	96
	Sg. Perak	Sg. Manong	1APRK060	Loji Rawatan Air Manong	98	96	99	96
Perak	Sg. Perak	Sg. Perak	1APRK059	Loji Rawatan Air Sauk	97	96	99	96
		Sg. Tesong	1APRK062	Loji Rawatan Air Sg. Klah	97	96	99	96
		Sg. Woh	1APRK061	Loji Rawatan Air Kuala Woh	97	96	99	97
	Sg. Sepetang	Sg. Batu Tegoh	1ASPT016	Loji Rawatan Air Bukit Larut	97	96	99	97
	Sg. Bernam	Sg. Gelinting	1ABNM015	Loji Rawatan Air Ulu Slim	97	96	99	94
		Sg. Trolak	1ABNM014	Loji Rawatan Air Trolak Timur	97	96	99	97
Selangor	Sg. Langat	Sg. Batang Labu	2BLGT028	Loji Rawatan Air Salak Tinggi	82	86	66	62
		Sg. Semenyih	2BLGT010	Loji Rawatan Air Semenyih	86	92	91	62
	Sg. Klang	Sg. Gombak	2BKLG020	Loji Rawatan Air Gombak	97	96	99	96
N. Sembilan	Sg. Muar	Sg. Jelai	3NMUA054	Loji Rawatan Air Dangi	94	96	99	87
Melaka	Sg. Kesang	Sg. Chin-Chin	3MKSG008	Muka sauk Loji Rawatan Air Chin-chin	85	96	90	58
Johor	Sg. Batu Pahat	Sg. Semberong Dam	3JBPT021	Semberong Dam	93	94	99	93
	Sg. Benut	Sg. Machap Dam	3JBNT008	Machap Dam	90	92	99	92
	Sg. Endau	Sg. Kahang	3JEND026	Jalan Felda Kahang Timur, Kluang	93	96	91	91
	Sg. Pulai	Sg. Pulai Dam	3JPLI004	Pulai Dam	96	96	99	96
	Sg. Muar	Sg. Jementah	3JMUA040	Loji Rawatan Air Jementah	96	96	99	94
		Sg. Muar	3JMUA039	Loji Rawatan Air Gombang	89	96	98	89
Pahang	Sg. Pahang	Sg. Bertam	4CBTM013	Loji Rawatan Air Habu	96	96	99	97
		Sg. Gapoi	4CPHG086	Muka sauk Loji Rawatan Air Gapoi	97	96	99	96
		Sg. Jempol	4CPHG087	Loji Air Sg Jerik	96	96	99	88
		Sg. Jempol	4CPHG088	Loji Air Jengka 3	91	96	99	83
		Sg. Mentiga	4CPHG089	Loji Air Chini	90	96	94	75
		Sg. Terla	4CBTM012	Loji Rawatan Air Kuala Terla	97	96	99	97
		Sg. Triang	4CPHG074	Loji Rawatan Air Sg. Triang	86	96	93	58
		Sg. Ulong	4CBTM014	Brinchang Dam	97	96	99	97
Terengganu	Sg. Terengganu	Sg. Terengganu	4TTGG013	Loji Air Serada	93	96	92	95

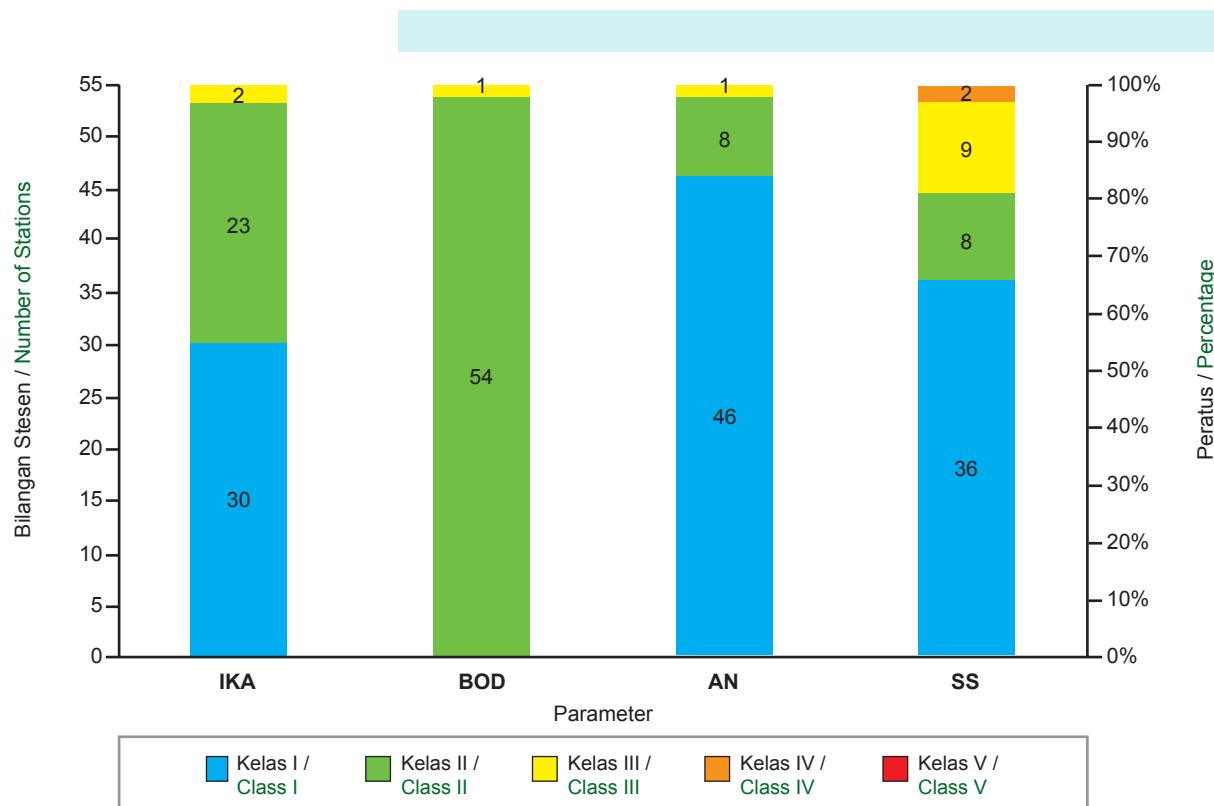
Jadual 2.6: Status Kualiti Air di Hulu Muka Sauk, 2023  
Table 2.6: Water Quality Status of Upstream Water Intake, 2023

NEGERI/STATE	LEMBANGAN SUNGAI / RIVER BASIN	SUNGAI / RIVER	STESEN ID / ID STATION	MUKA SAUK / WATER INTAKE	NILAI IKA / WQI VALUE	2023		
						SUB-INDEKS BOD / BOD SUB-INDEX	SUB-INDEKS AN / AN SUB-INDEX	SUB-INDEKS SS / SS SUB-INDEX
Kelantan	Sg. Golok	Sg. Golok	4DGLK003	Syarikat Air Kelantan	97	96	98	96
	Sg. Kelantan	Sg. Chiku	4DKLT043	Felda Ciku 2	90	96	92	67
		Sg. Kelantan	4DKLT045	Loji Air Kelar, Pasir Mas	88	96	96	50
		Sg. Pehi	4DKLT044	Loji Air Pahi	92	96	97	70
Sarawak	Sg. Kerian	Sg. Selalang	6QKRN017	Selalang Water Intake	90	96	88	92
	Sg. Mukah	Sg. Mukah	6QMKH005	Mukah Water Intake	80	96	90	64
		Sg. Daro	6QRJG021	Daro Water Intake	53	96	72	94
	Sg. Rajang	Sg. Jemoreng	6QRJG022	Jemoreng Water Intake	55	96	84	95
		Sg. Pakan	6QRJG020	Pakan Water Intake	88	96	92	77
		Sg. Pila Parit	6QRJG023	Igan Water Intake	81	96	85	63
Sabah	Sg. Padas	Sg. Padas	5SPDS011	Water Intake Jabatan Air Beaufort	85	96	91	50
	Sg. Papar	Sg. Papar	5SPPR004	Sekolah Kebangsaan Mandalipau	92	96	92	88
		Sg. Papar	5SPPR005	Water Intake Kogopon	91	96	96	92

Nota / Note:

Kelas IKA / WQI Classes

<span style="background-color: #0070C0; width: 15px; height: 15px; display: inline-block;"></span> Kelas I / Class I	<span style="background-color: #54A24B; width: 15px; height: 15px; display: inline-block;"></span> Kelas II / Class II	<span style="background-color: #FFD700; width: 15px; height: 15px; display: inline-block;"></span> Kelas III / Class III	<span style="background-color: #E69138; width: 15px; height: 15px; display: inline-block;"></span> Kelas IV / Class IV	<span style="background-color: #C00000; width: 15px; height: 15px; display: inline-block;"></span> Kelas V / Class V
--	--	--	--	--



Rajah 2.9 : Kualiti Air Sungai di Stesen Hulu Muka Sauk, 2023

Figure 2.9 : River Water Quality at Upstream Water Intake Stations, 2023

## STATUS PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

**Rajah 2.10(a)** dan **Rajah 2.10(b)** menunjukkan lokasi 30 stesen pengawasan sungai automatik serta takat pengambilan air yang disenaraikan seperti dalam **Jadual 2.7**.

Pada tahun 2023, status kualiti air sungai bagi 30 stesen pengawasan sungai automatik telah dinilai berdasarkan peratusan pematuhan kepada Kelas II. Parameter yang diukur adalah pH, DO, BOD, COD, AN dan pepejal terampai (SS). Pematuhan ini ditunjukkan seperti pada **Jadual 2.8**.

Dari segi pematuhan Kelas II, stesen yang menunjukkan pematuhan 90% atau lebih kepada kualiti air Kelas II pada tahun 2023 adalah di dapati di 12 (40%) stesen iaitu CR06A, CR14N, CR15N, CR18J, CR22C, CR23C, CR25T, CR26D, CR27S, CR29Q, CR30Q dan CR31S.

DO adalah salah satu penunjuk kepada kehadiran BOD yang disebabkan oleh bahan pencemar organik. Julat pematuhan DO yang rendah didapati di 20 (67%) stesen iaitu CR01K, CR02K, CR03K, CR04P, CR05A, CR07B, CR08B, CR09B, CR10B, CR12W, CR13N, CR16M, CR17M, CR18J, CR19J, CR21J, CR23C, CR24T, CR29Q dan CR30Q

Ammonium ( $\text{NH}_4$ ) adalah satu bentuk ammonia ( $\text{NH}_3$ ) yang telah terion. Pengukuran  $\text{NH}_4$  memberi petunjuk kepada potensi kehadiran pencemar  $\text{NH}_3$  atau AN dalam air sungai apabila pH dan suhu air berubah. Pematuhan yang kurang daripada 90% bagi Kelas II AN didapati di 15 (50%) stesen iaitu CR02K, CR03K, CR04P, CR05A, CR07B, CR08B, CR09B, CR10B, CR11B, CR12W, CR13N, CR16M, CR17M, CR18J dan CR21J.

pH adalah ukuran bagi keasidan dan kealkalian mengikut skala pH. Julat pematuhan yang rendah bagi pH diperhatikan di 10 (33%) stesen sungai iaitu CR01K, CR02K, CR04P, CR05A, CR18J, CR19J, CR20J, CR23C, CR24T dan CR25T.

Kekeruhan digunakan sebagai penunjuk kehadiran SS di dalam sungai. Bagi julat pematuhan SS yang direkodkan adalah rendah bagi semua stesen.

**Rajah 2.11** hingga **Rajah 2.16** menunjukkan peratus pematuhan Kelas II mengikut zon.

## CONTINUOUS RIVER WATER QUALITY MONITORING (CRWQM) STATUS

**Figure 2.10(a)** and **Figure 2.10(b)** show the location of the 30 continuous river monitoring stations and subsequent water intakes as listed in **Table 2.7**.

In 2023, the river water quality status of the 30 continuous river water quality monitoring stations were assessed based on percentage of compliance to Class II. The measured parameters are pH, DO, BOD, COD, AN and suspended solid (SS). The compliance is shown in **Table 2.8**.

In terms of Class II compliance, 90% compliance or more to Class II water quality in 2023 at 12 (40%) stations which were CR06A, CR14N, CR15N, CR18J, CR22C, CR23C, CR25T, CR26D, CR27S, CR29Q, CR30Q and CR31S stations.

DO is one of the indicators of the presence of BOD which is caused by organic pollutants. Low range compliance of DO was observed at 20 (67%) stations CR01K, CR02K, CR03K, CR04P, CR05A, CR07B, CR08B, CR09B, CR10B, CR12W, CR13N, CR16M, CR17M, CR18J, CR19J, CR21J, CR23C, CR24T, CR29Q and CR30Q

Ammonium ( $\text{NH}_4$ ) is an ionized form of ammonia ( $\text{NH}_3$ ). The measurement of  $\text{NH}_4$  indicates the potential presence of  $\text{NH}_3$  or AN pollutants in rivers when the pH and temperature changes. Low range compliance of AN was observed at 15 (50%) stations CR02K, CR03K, CR04P, CR05A, CR07B, CR08B, CR09B, CR10B, CR11B, CR12W, CR13N, CR16M, CR17M, CR18J and CR21J.

pH is a measurement of acidity and alkalinity based on the pH scale. Relatively low compliance of pH ranges was observed at 10 (33%) river stations CR01K, CR02K, CR04P, CR05A, CR18J, CR19J, CR20J, CR23C, CR24T and CR25T.

Turbidity is used as an indicator of SS presence in a river. Low-range compliance of SS was recorded at all stations.

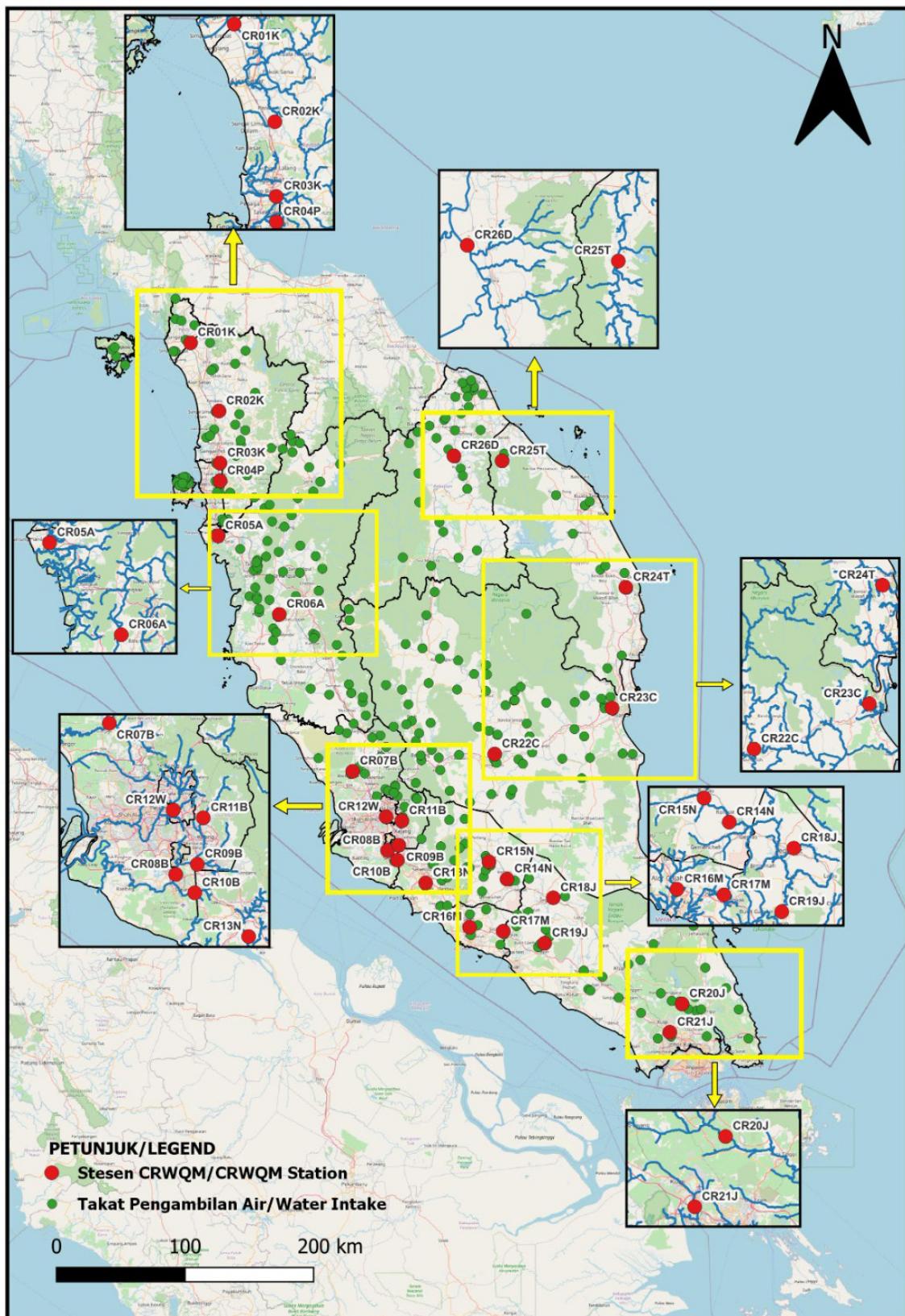
**Figure 2.11** to **Figure 2.16** shows the percentage of Class II compliance by zones.

**Jadual 2.7: Lokasi CRWQM: ID Stesen, Sungai bagi Stesen dan Takat Pengambilan Air**  
**Table 2.7: CRWQM Location: Station ID, River Monitored and Water Intake**

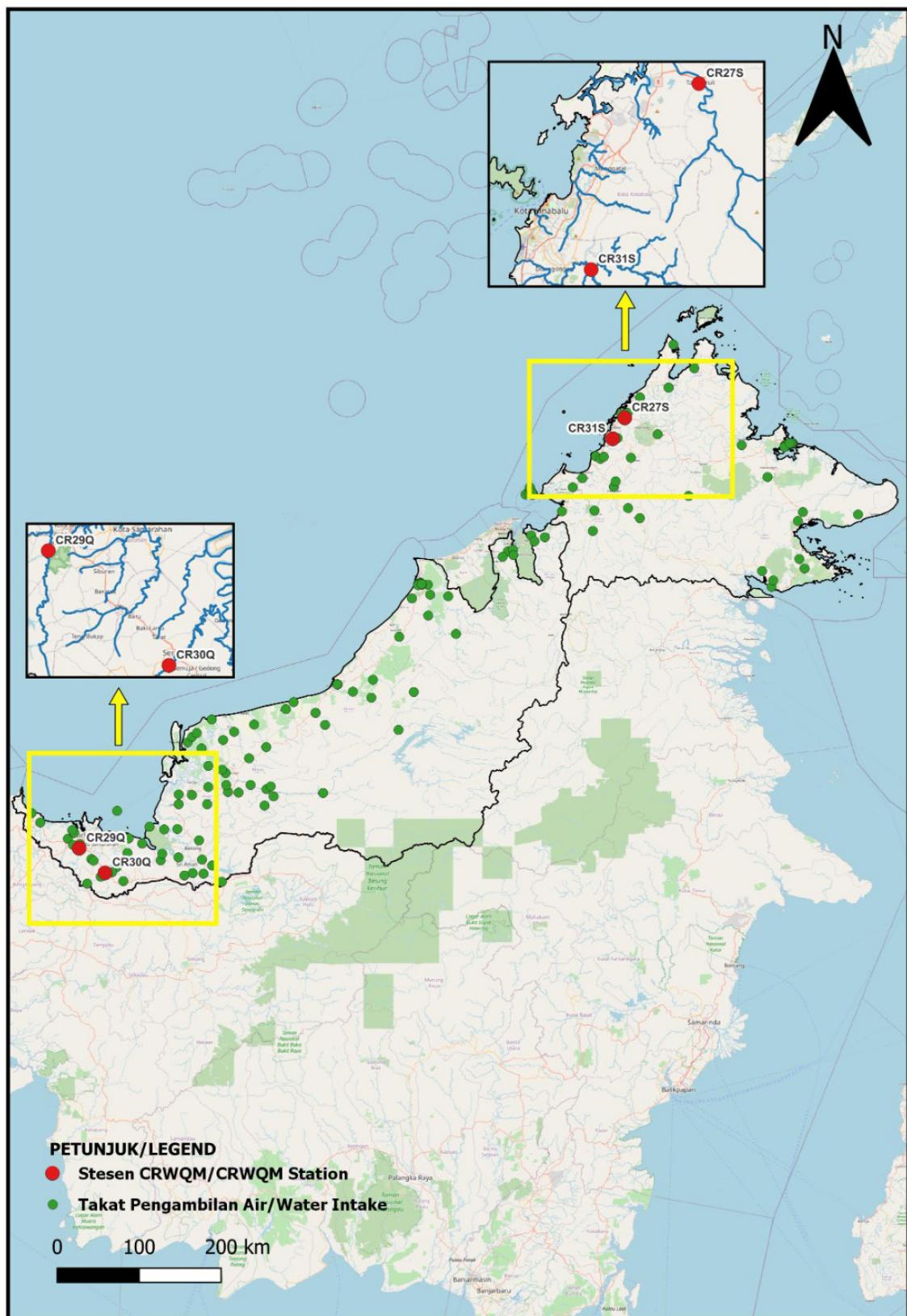
NEGERI / STATE	ID STESEN / ID STATION	SUNGAI / RIVER	TAKAT PENGAMBILAN AIR / WATER INTAKE
Kedah	CR01K	Terusan MADA	Arau Fasa IV
	CR02K	Terusan MADA	Bukit Jenun
	CR03K	Sungai Muda	Kulim Hi-Tech
Penang	CR04P	Sungai Kulim	Toh Along
Perak	CR05A	Sungai Bogak	Parit Buntar
	CR 06A	Sungai Perak	Sultan Idris
Selangor	CR07B	Sungai Selangor	Sg. Selangor Fasa 1,2,3
	CR08B	Sungai Langat	Bukit Tampoi
	CR09B	Sungai Semenyih	Jenderam
	CR10B	Sungai Labu	Labu Lanjut
	CR11B	Sungai Langat	Cheras Batu 11
W.P. Kuala Lumpur	CR12W	Sungai Klang	Tiada Berkenaan / Not Applicable
N. Sembilan	CR13N	Sungai Linggi	Lingga
	CR14N	Sungai Muar	Pasir Besar
	CR15N	Sungai Muar	Jelai Jempol
Melaka	CR16M	Sungai Melaka	Durian Tunggal
	CR17M	Sungai Kesang	Chin Chin
Johor	CR18J	Sungai Segamat	Segamat
	CR19J	Sungai Muar	Panchor
	CR20J	Sungai Johor	Semanggar
	CR21J	Sungai Skudai	Skudai
Pahang	CR22C	Sungai Pahang	Lubuk Kawah
	CR23C	Sungai Kuantan	Semambu
Terengganu	CR24T	Sungai Paka	Bulit Bauk
	CR25T	Sungai Besut	Bukit Bunga
Kelantan	CR26D	Sungai Kelantan	Sokor
Sabah	CR27S	Sungai Tuaran	Telibong
	CR31S	Sungai Moyog	Kasigui
Sarawak	CR29Q	Sungai Sarawak	Sarawak Kiri
	CR30Q	Sungai Batang Sadong	Tebekang

**Jadual 2.8: Peratus Pematuhan Kelas II mengikut Stesen dan Negeri**  
**Table 2.8: Percentage of Compliance to Class II by Station and State**

NEGERI / STATE	ID STESEN / STATION ID	PEMATUHAN KELAS II (%) / COMPLIANCE TO CLASS II (%)					
		DO	BOD	COD	TSS	AN	pH
Kedah	CR01K	48.86	100	84.50	56.94	98.97	84.94
	CR02K	86.32	75.07	100	34.92	82.88	86.37
	CR03K	71.32	100	100	9.59	85.46	93.53
P. Pinang	CR04P	40.57	35.02	99.83	2.23	22.08	60.08
Perak	CR05A	87.68	96.66	97.69	84.21	80.82	41.79
	CR06A	100	100	100	52.57	100	100
Selangor	CR07B	89.21	0	100	12.91	71.35	99.98
	CR08B	40.87	0	100	25.35	38.05	99.92
	CR09B	64.18	100	100	2.44	79.20	98.98
	CR10B	18.75	97.94	100	22.08	24.73	99.67
	CR11B	94.67	0.01	100	2.70	72.95	99.98
W.P. Kuala Lumpur	CR12W	0.73	0	100	38.03	6.09	100
N. Sembilan	CR13N	50.79	0	100	34.51	65.48	99.81
	CR14N	99.94	100	100	10.98	98.03	99.54
	CR15N	96.50	100	100	9.84	91.08	98.66
Melaka	CR16M	68.97	100	100	6.48	71.44	96.64
	CR17M	89.87	100	100	32.04	79.66	95.33
Johor	CR18J	89.28	79.79	100	41.62	89.71	88.59
	CR19J	2.67	99.38	100	35.28	99.75	67.17
	CR20J	95.77	100	100	26.57	97.81	19.81
	CR21J	42.16	2.00	89.05	65.94	7.85	98.61
Pahang	CR22C	92.26	100	100	31.40	99.87	100
	CR23C	67.11	100	100	88.62	95.82	76.54
Terengganu	CR24T	80.02	100	100	66.19	99.41	7.12
	CR25T	93.45	100	99.50	58.09	97.88	74.11
Kelantan	CR26D	97.55	100	100	4.92	93.52	99.38
Sabah	CR27S	100	100	100	67.19	100	99.98
	CR31S	99.93	0.02	100	77.35	100	99.75
Sarawak	CR29Q	72.44	97.69	99.98	81.66	97.61	98.57
	CR30Q	89.20	95.04	99.83	69.10	93.15	95.59

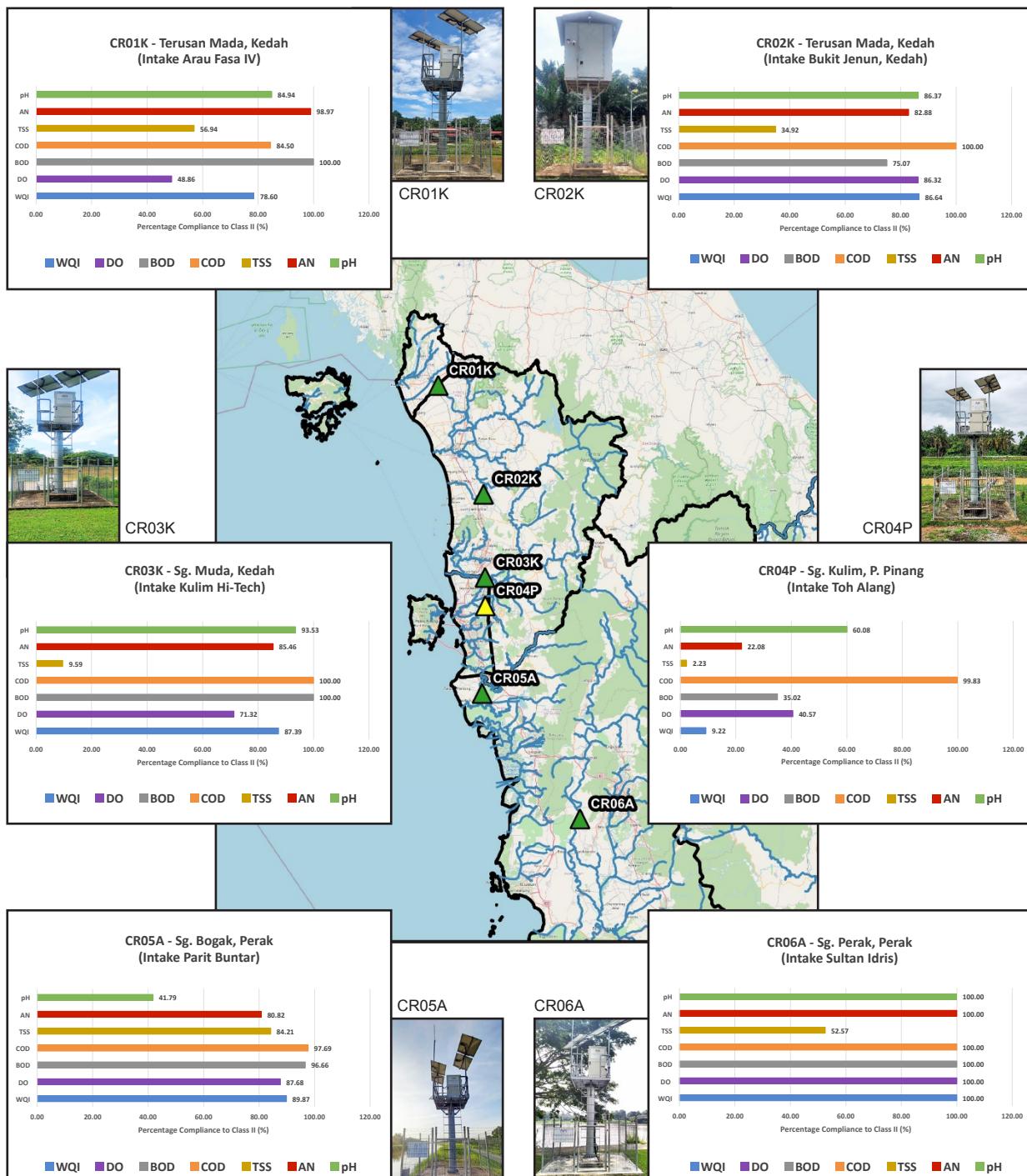


Rajah 2.10(a): Stesen Pengawasan Kualiti Air Sungai Automatik dan Takat Pengambilan Air  
Figure 2.10(a): Continuous River Water Quality Monitoring Stations and Water Intakes



Rajah 2.10(b): Stesen Pengawasan Kualiti Air Sungai Automatik dan Takat Pengambilan Air  
 Figure 2.10(b): Continuous River Water Quality Monitoring Stations and Water Intakes

## CRWQM 2023 (WILAYAH UTARA)



## Kelas IKA / WQI Class

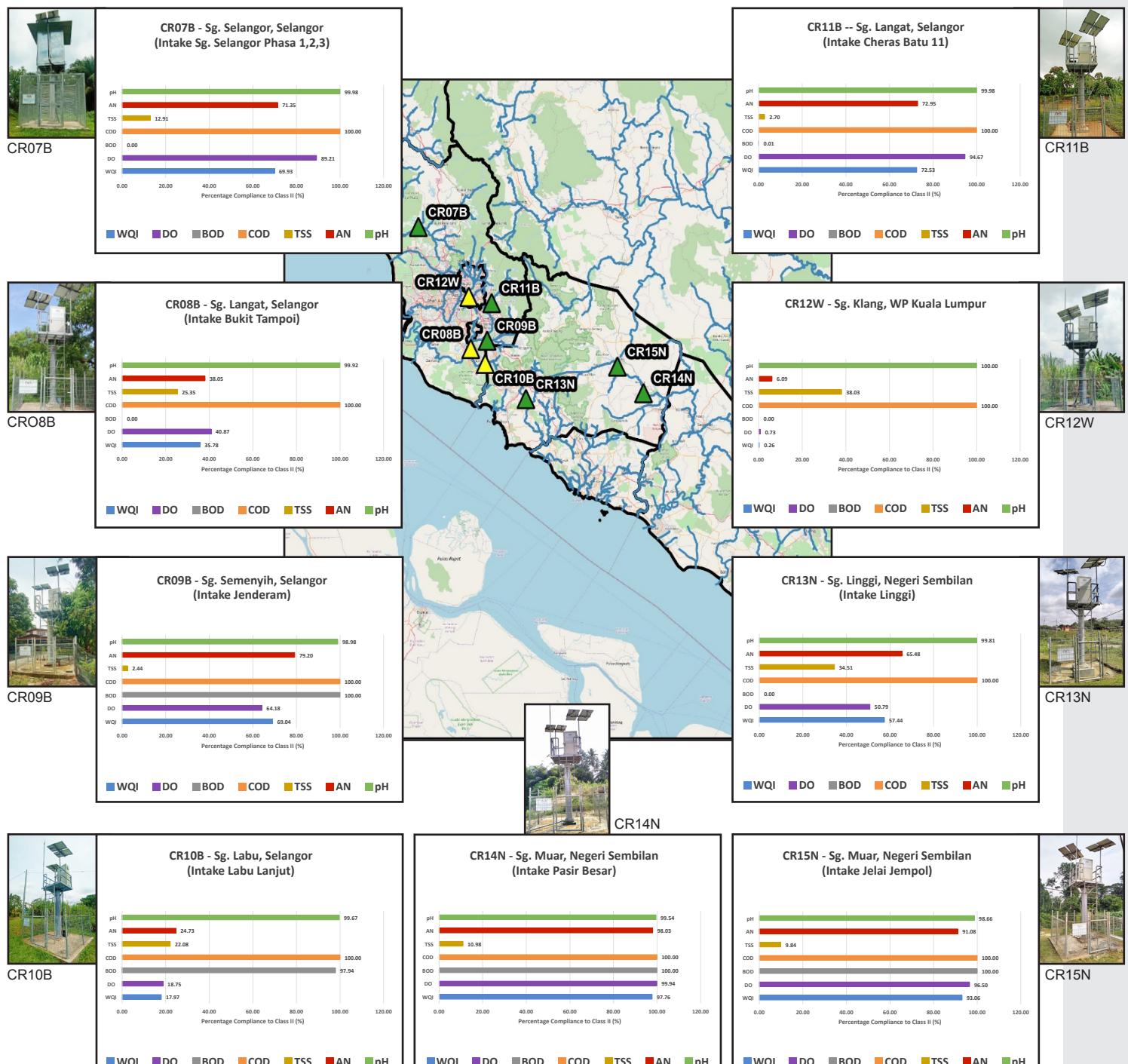
## Petunjuk / Legend

- ▲ Kelas I / Class I
- ▲ Kelas IV / Class IV
- ▲ Kelas II / Class II
- ▲ Kelas V / Class V
- ▲ Kelas III / Class III
- Sempadan Negeri / State Boundary

0 50 100 km

Rajah 2.11: Peratus Pematuhan Kelas II (Wilayah Utara)  
Figure 2.11: Percentage of Compliance with Class II (Northern Region)

## CRWQM 2023 (WILAYAH TENGAH)



### Kelas IKA / WQI Class

#### Petunjuk / Legend

- |                       |                     |
|-----------------------|---------------------|
| Kelas I / Class I     | Kelas IV / Class IV |
| Kelas II / Class II   | Kelas V / Class V   |
| Kelas III / Class III |                     |

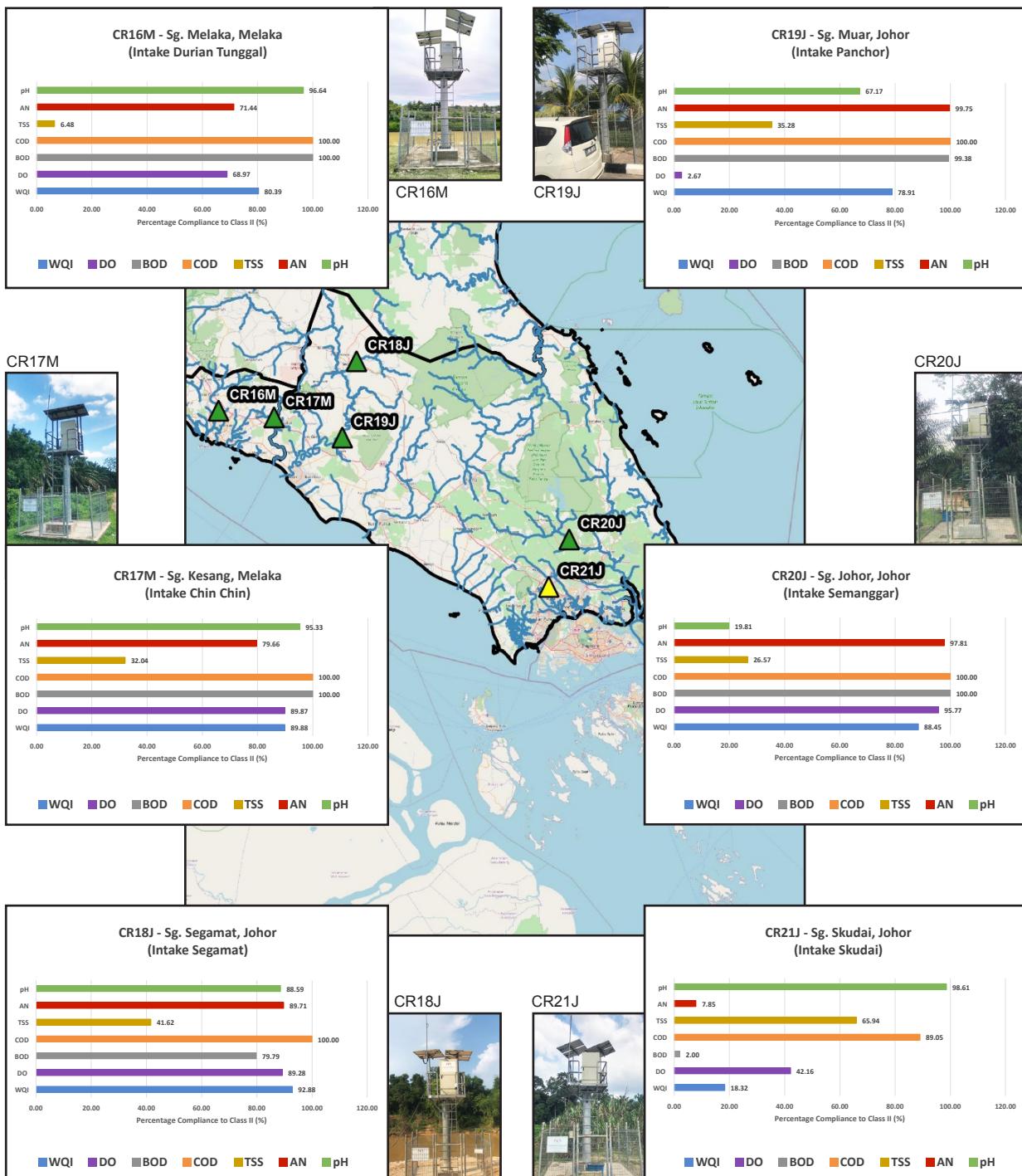
— Sempadan Negeri / State Boundary

0      50      100 km

Rajah 2.12: Peratus Pematuhan Kelas II (Wilayah Tengah)

Figure 2.12: Percentage of Compliance with Class II (Central Region)

## CRWQM 2023 (WILAYAH SELATAN)



## Kelas IKA / WQI Class

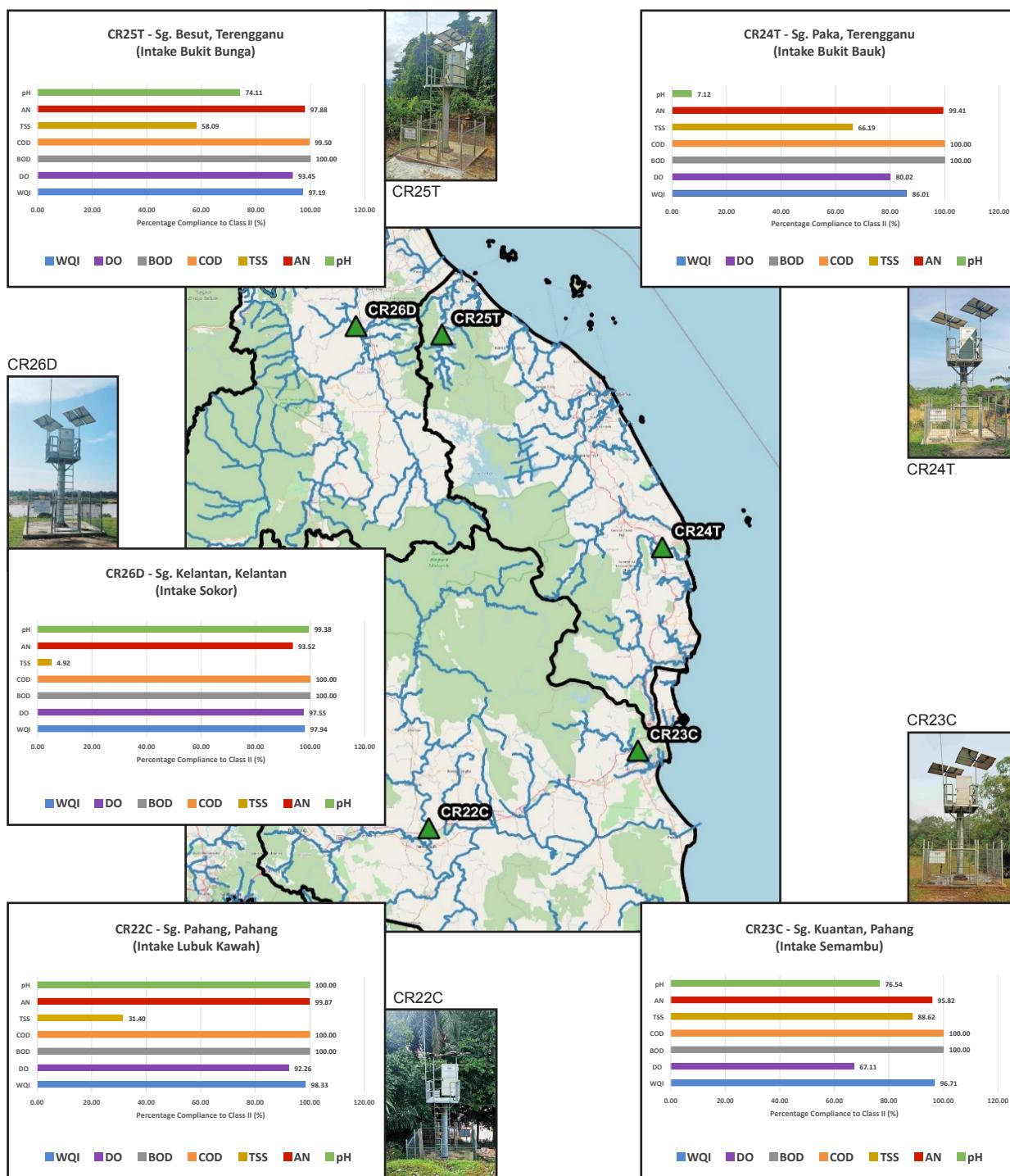
## Petunjuk / Legend

- ▲ Kelas I / Class I
- ▲ Kelas IV / Class IV
- ▲ Kelas II / Class II
- ▲ Kelas V / Class V
- ▲ Kelas III / Class III
- Sempadan Negeri / State Boundary

0 50 100 km

Rajah 2.13: Peratus Pematuhan Kelas II (Wilayah Selatan)  
Figure 2.13: Percentage of Compliance with Class II (Southern Region)

## CRWQM 2023 (WILAYAH TIMUR)



## Kelas IKA / WQI Class

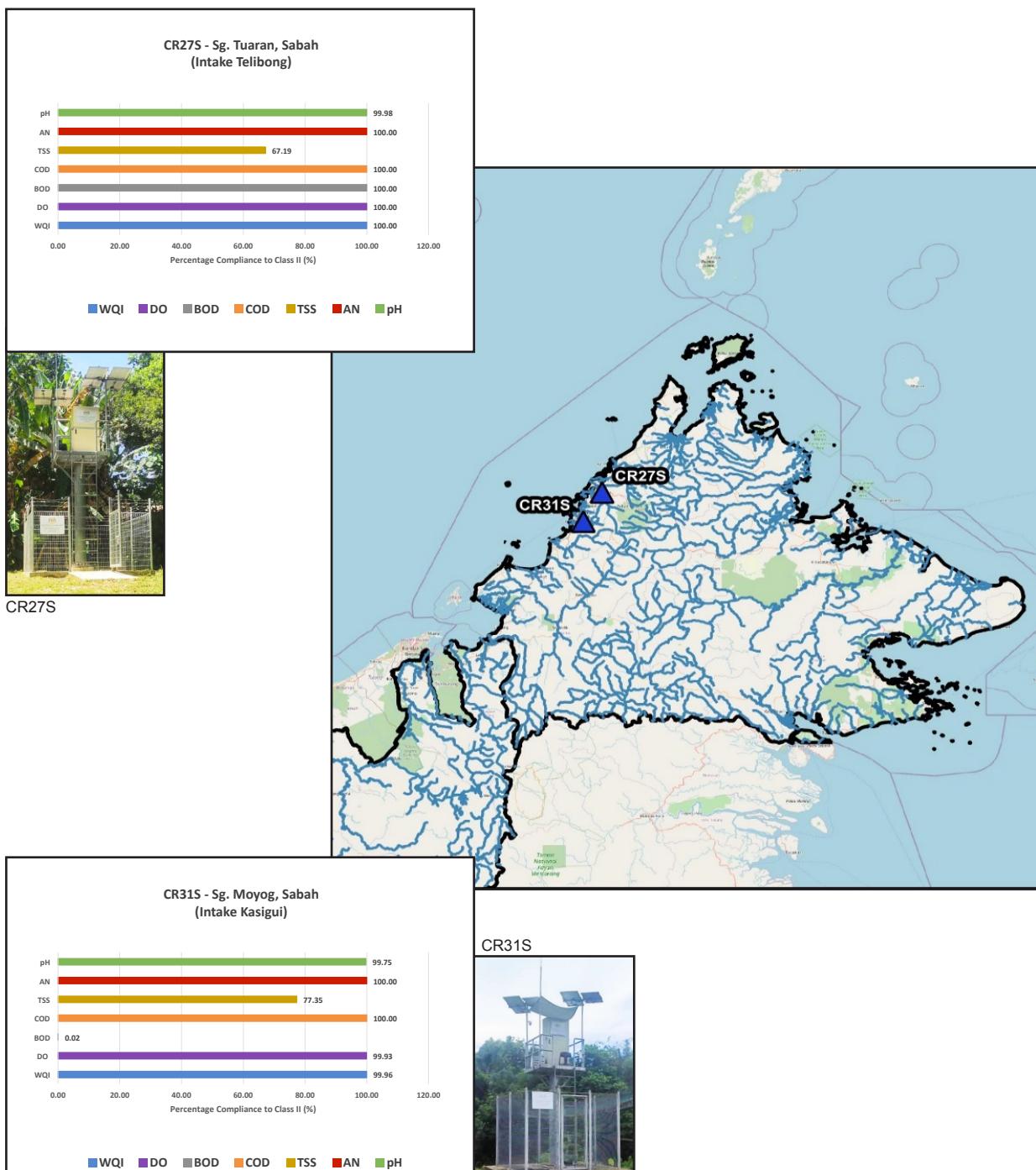
## Petunjuk / Legend

- ▲ Kelas I / Class I
- ▲ Kelas IV / Class IV
- ▲ Kelas II / Class II
- ▲ Kelas V / Class V
- ▲ Kelas III / Class III

— Sempadan Negeri / State Boundary

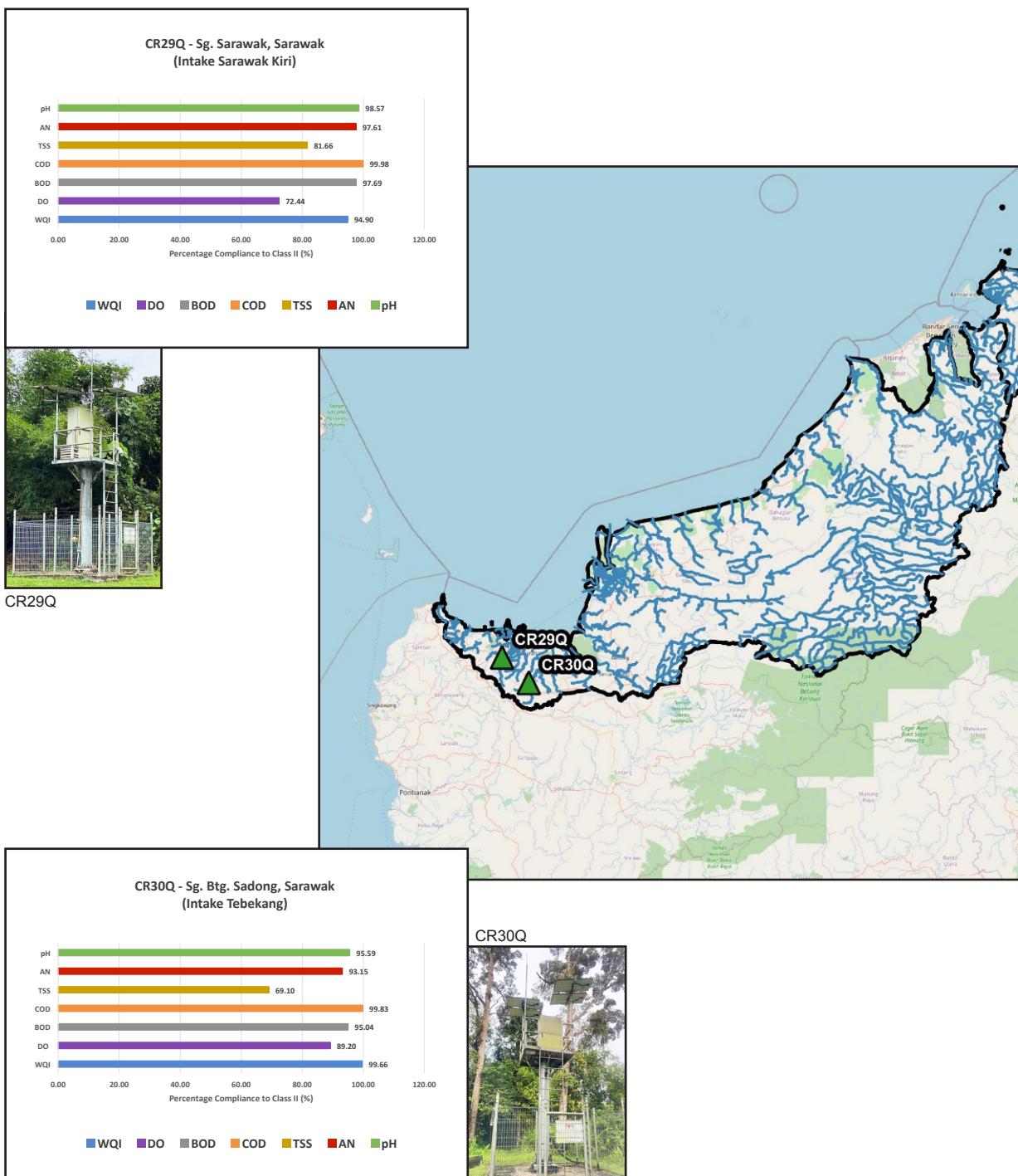
0      50      100 km

Rajah 2.14: Peratus Pematuhan Kelas II (Wilayah Timur)  
Figure 2.14: Percentage of Compliance with Class II (Eastern Region)


**Petunjuk /  
Legend**

- |  |   |
|--|---|
| <span style="color: blue;">▲</span> Kelas I / Class I<br><span style="color: green;">▲</span> Kelas II / Class II<br><span style="color: yellow;">▲</span> Kelas III / Class III | <span style="color: orange;">▲</span> Kelas IV / Class IV<br><span style="color: red;">▲</span> Kelas V / Class V |
| <span style="color: black;">—</span> Sempadan Negeri / State Boundary  |   |
| <span style="color: black;">0</span> <span style="color: black;">50</span> <span style="color: black;">100 km</span>   |   |

Rajah 2.15: Peratus Pematuhan Kelas II (Wilayah Sabah)  
 Figure 2.15: Percentage of Compliance with Class II (Sabah Region)

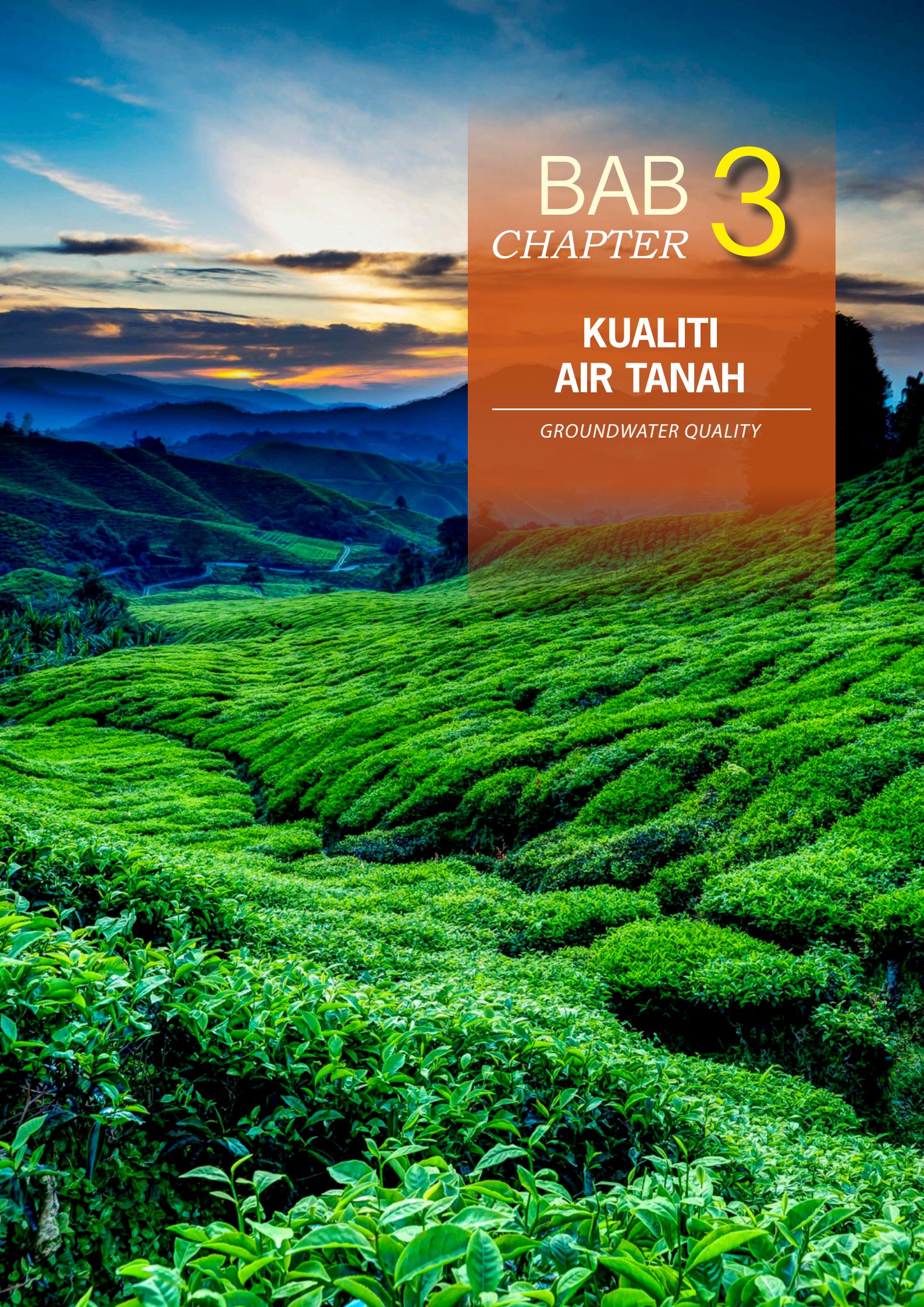
**Kelas IKA / WQI Class****Petunjuk / Legend**

- ▲ Kelas I / Class I
- ▲ Kelas IV / Class IV
- ▲ Kelas II / Class II
- ▲ Kelas V / Class V
- ▲ Kelas III / Class III

**Sempadan Negeri / State Boundary**

0 50 100 km

**Rajah 2.16: Peratus Pematuhan Kelas II (Wilayah Sarawak)****Figure 2.16: Percentage of Compliance with Class II (Sarawak Region)**



# BAB CHAPTER

# 3

## KUALITI AIR TANAH

GROUNDWATER QUALITY

# PENGAWASAN KUALITI AIR TANAH

GROUNDWATER QUALITY MONITORING

**120**

Stesen di Seluruh  
Negara  
Stations (Wells)  
Nationwide

**12**

Jenis Guna Tanah  
Land Use Category

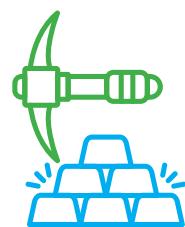
**441**

Bilangan Sampel Air  
Tanah dianalisa  
Number of Groundwater  
Samples Analysed

## BEKAS LOMBONG EMAS USED GOLD MINES

**0**  
**3**  
**0**

Sangat Baik /  
Excellent  
Baik /  
Good  
Sederhana /  
Moderate



## KAWASAN PERTANIAN AGRICULTURAL AREA



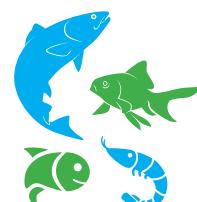
**4**  
**8**  
**3**

Sangat Baik /  
Excellent  
Baik /  
Good  
Sederhana /  
Moderate

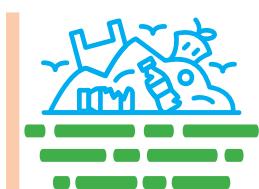
## AKUAKULTUR AQUACULTURE

**0**  
**5**  
**2**

Sangat Baik /  
Excellent  
Baik /  
Good  
Sederhana /  
Moderate



## BEKAS TAPAK PELUPUSAN SAMPAH USED SOLID WASTE LANDFILL



**1**  
**15**  
**10**

Sangat Baik /  
Excellent  
Baik /  
Good  
Sederhana /  
Moderate

## BANDAR & PINGGIR BANDAR URBAN & SUBURBAN AREA

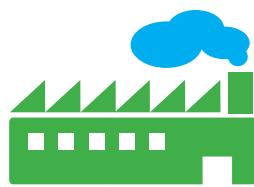


**2**  
**8**  
**2**

Sangat Baik /  
Excellent  
Baik /  
Good  
Sederhana /  
Moderate

**PADANG GOLF  
GOLF COURSES**

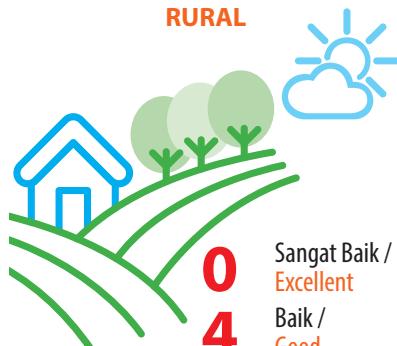
**0** Sangat Baik /  
Excellent  
**6** Baik /  
Good  
**0** Sederhana /  
Moderate

**TAPAK PERINDUSTRIAN  
INDUSTRIAL SITES**

**0** Sangat Baik /  
Excellent  
**15** Baik /  
Good  
**6** Sederhana /  
Moderate

**BEKALAN AIR  
WATER SUPPLY**

**0** Sangat Baik /  
Excellent  
**5** Baik /  
Good  
**0** Sederhana /  
Moderate

**LUAR BANDAR  
RURAL**

**0** Sangat Baik /  
Excellent  
**4** Baik /  
Good  
**1** Sederhana /  
Moderate

**KAWASAN PERANGINAN  
RESORTS**

**0** Sangat Baik /  
Excellent  
**1** Baik /  
Good  
**1** Sederhana /  
Moderate

**BEKAS TAPAK PELUPUSAN  
BANGKAI HAIWAN  
USED ANIMAL BURIAL SITES**

**0** Sangat Baik /  
Excellent  
**10** Baik /  
Good  
**3** Sederhana /  
Moderate



# KUALITI AIR TANAH / GROUNDWATER QUALITY

## PENGAWASAN KUALITI AIR TANAH

Program Pengawasan Kualiti Air Tanah Kebangsaan telah dimulakan semenjak tahun 1997. Tapak stesen pengawasan yang telah dipilih adalah mewakili jenis guna tanah spesifik di mana terdapat 120 buah stesen pengawasan kualiti air tanah (telaga) di seluruh negara.

Pada tahun 2023 hanya 115 stesen telah dijalankan persampelan kualiti air tanah. Ini memandangkan terdapat lima (5) stesen pengawasan kualiti air tanah yang tiada luahan air akibat faktor pembangunan berhampiran, keadaan stesen yang memerlukan penyelenggaraan dalaman dan tiada akses masuk ke stesen. **Jadual 3.1** menunjukkan taburan stesen pengawasan kualiti air tanah di Malaysia mengikut jenis kategori guna tanah.

Pada tahun 2023, sebanyak 441 sampel telah dianalisa untuk bahan kimia 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 (IKAT) digunakan sebagai satu kaedah menentukan kategori dan status kualiti air tanah. IKAT dibangunkan berdasarkan tujuh (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 baik hingga sangat tercemar (**Jadual 3.2**).

## GROUNDWATER QUALITY MONITORING

Groundwater Water Quality Monitoring was established in 1997. The monitoring station sites that have been selected are representative of specific land use, where there are 120 groundwater quality monitoring stations (wells) across the country.

In 2023, only 115 stations were conducted for groundwater quality sampling. This is considering that there are five (5) ground water quality monitoring stations that have no water discharge due to nearby development factors, the condition of the station that requires internal maintenance and no access to the station. **Table 3.1** shows the distribution of groundwater quality monitoring stations in Malaysia based on land use.

In 2023, 441 samples were analysed 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 Groundwater Quality Index (GWQI) is used as a benchmark to determine the groundwater quality status and its category. GWQI was developed based on seven (7) parameters which are pH, Iron, Total Dissolved Solids, Nitrate, E. coli, Phenol and Sulphate. The GWQI with a scale ranging from 0 to 100 will identify the quality of the groundwater from excellent to very poor (**Table 3.2**).



**Jumlah / Total = 120**  
(Bagi 12 jenis guna tanah /  
For 12 types of land use)

Jumlah Telaga Pengawasan bagi Setiap Negeri Seluruh Malaysia, 2023  
Total Number of Monitoring Wells for Each State of Malaysia, 2023

**Jadual 3.1: Taburan Stesen Pengawasan**  
**Kualiti Air Tanah di Seluruh Negeri di Malaysia mengikut Jenis Kategori Guna Tanah, 2023**  
**Table 3.1: Distribution of Groundwater Quality Monitoring Stations (Wells) Throughout**  
**the States in Malaysia based on Land Use, 2023**

KATEGORI / CATEGORY	BILANGAN TELAGA / NUMBER OF WELLS	NEGERI / STATE	BILANGAN TELAGA / NUMBER OF WELLS
Kawasan Pertanian / Agricultural Area	15	Sabah	2
		Terengganu	5
		Pahang	1
		Kedah	3
		Perlis	1
		Kelantan	2
		Selangor	1
Bandar & Pinggir Bandar / Urban & Suburban Area	13	Sabah	1
		Terengganu	2
		Pahang	1
		Kedah	1
		Perlis	2
		Kelantan	3
		Selangor	2
Tapak Perindustrian / Industrial Sites	22	W.P. Putrajaya	1
		W.P. Labuan	1
		Terengganu	5
		Johor	2
		Kedah	1
		Kelantan	2
		Melaka	1
		Selangor	3
		P. Pinang	3
		N. Sembilan	1
		Perak	1
		Pahang	1
Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfill	26	Perlis	1
		Sabah	7
		Sarawak	2
		Terengganu	2
		Johor	2
		Kelantan	3
		Perak	1
		W.P. Kuala Lumpur	5
		N. Sembilan	3
Padang Golf / Golf Courses	7	Melaka	1
		Sabah	2
		Kelantan	4
		W.P. Kuala Lumpur	1
Luar Bandar / Rural	5	Terengganu	1
		Kelantan	2
		Melaka	1
		Selangor	1
Bekas Lombong Emas / Used Gold Mine	3	Sarawak	3
Bekalan Air / Water Supply	5	Sabah	1
		Sarawak	4
		Sarawak	2
Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	14	Johor	3
		Perak	3
		Selangor	3
		P. Pinang	3
		Pahang	6
Akuakultur / Aquaculture	7	Terengganu	1

**Jadual 3.1: Taburan Stesen Pengawasan Kualiti Air Tanah di Seluruh Negeri di Malaysia mengikut Jenis Kategori Guna Tanah, 2023**  
**Table 3.1: Distribution of Groundwater Quality Monitoring Stations (Wells) Throughout the States in Malaysia based on Land Use, 2023**

KATEGORI / CATEGORY	BILANGAN TELAGA / NUMBER OF WELLS	NEGERI / STATE	BILANGAN TELAGA / NUMBER OF WELLS
Tapak Pelupusan Radioaktif / Radioactive Landfills	1	Perak	1
Kawasan Peranginan / Resorts	2	Sabah	1
		Kedah	1
<b>JUMLAH / TOTAL</b>			<b>120</b>

**Jadual 3.2: Klasifikasi Indeks Kualiti Air Tanah**  
**Table 3.2: Groundwater Quality Index Classification**

KATEGORI / CATEGORY	IKAT / GWQI	POTENSI KEGUNAAN / POTENTIAL USE
Sangat Tercemar / Very Poor	0-15	Kajian air terperinci sebelum digunakan / Investigation needed before use
Tercemar / Poor	16-39	Pengairan atau pertanian / Irrigation or agriculture
Sederhana / Moderate	40-69	Penggunaan Industri / Industrial Use
Baik / Good	70-89	Berpontensi sebagai air minuman / Potential use as drinking water
Sangat Baik / Excellent	>90	Air berkualiti untuk semua kegunaan / High quality water for all purpose

#### STATUS KUALITI AIR TANAH BAGI KAWASAN PERTANIAN

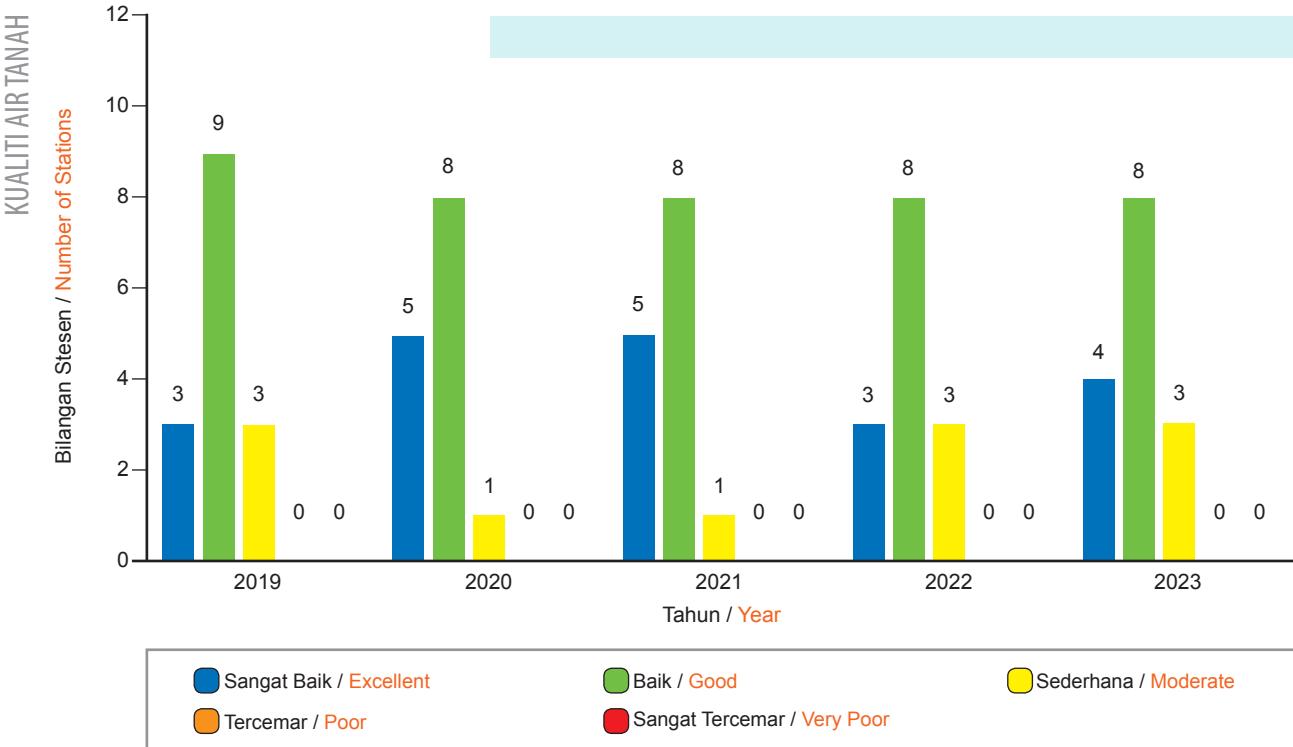
Tren IKAT mulai tahun 2019 hingga 2023 bagi kawasan pertanian adalah seperti yang ditunjukkan dalam **Rajah 3.1**. Berdasarkan **Rajah 3.1**, didapati bilangan stesen sangat baik telah meningkat pada tahun 2023 berbanding dengan tahun sebelumnya, baik dan sederhana adalah sama seperti tahun sebelumnya. Tiada stesen tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak 15 stesen kawasan pertanian telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan empat (4) stesen (27%) dikategorikan sebagai sangat baik, lapan (8) stesen (53%) dikategorikan sebagai baik dan tiga (3) stesen (20%) dikategorikan sebagai sederhana (**Jadual 3.3**).

#### STATUS OF GROUNDWATER QUALITY INDEX FOR AGRICULTURE

The GWQI trend for agriculture from the year 2019 until 2023 is shown in **Figure 3.1**. Based on **Figure 3.1**, the number of stations ranked excellent in 2023 has increased compared to the previous year, while the number of stations ranked good and moderate were the same as the previous year. There were no stations ranked poor and very poor in the year 2023.

In 2023, a total of 15 stations under agriculture were monitored. The monitoring results indicated that four (4) stations were categorised as excellent (27%), eight (8) stations as good (53%) and three (3) stations as moderate (20%) (**Table 3.3**).



Rajah 3.1: Tren Indeks Kualiti Air Tanah Kawasan Pertanian, 2019-2023

Figure 3.1: Trends of Groundwater Quality Index for Agriculture, 2019-2023

Jadual 3.3: Status Indeks Kualiti Air Tanah bagi Kawasan Pertanian

Table 3.3: Status of Groundwater Quality Index for Agriculture

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perlis	Pertanian / Agriculture	Rimba Mas, Padang Besar	MW(7)-R610006-1-15.72	92	96	86	90	90	Sangat Baik / Excellent
Kedah	Pertanian / Agriculture	Padang Mat Sirat, Langkawi	MW(7)-K69911-1-5.80	89	97	97	91	91	Sangat Baik / Excellent
		Padang Mat Sirat, Langkawi	MW(7)-K69911-2-12.09	79	95	95	78	85	Baik / Good
		Sek. Keb. Kepala Batas	MW(7)-R610014-2-9.34	81	73	91	81	77	Baik / Good
Selangor	Pertanian / Agriculture	Masjid Jamei Huda, Parit 7, Sekinchan	MW(7)-B310105-1-13.70	60	60	63	65	64	Sederhana / Moderate
Pahang	Pertanian / Agriculture	Sek. Keb. Lepar	MW(7)-C310302-1-6.64	88	88	90	91	91	Sangat Baik / Excellent
Kelantan	Pertanian / Agriculture	Kampong Jembal Kota Bharu.	MW(7)-D610214-7-7.58	97	82	79	79	85	Baik / Good
		Sek. Keb. Beris Lalang Bachok	MW(7)-D510202-1-4.05	80	–	–	–	74	Baik / Good
Terengganu	Pertanian / Agriculture	Kg. Merang, Setiu	MW(7)-T510208-1-8.56	79	79	78	82	80	Baik / Good
		Sek. Keb. Alor Peroi Kg. Gajah Mati	MW(7)-T510203-3-45.82	60	78	77	61	66	Sederhana / Moderate
		Sek. Keb. Alor Peroi Kg. Gajah Mati	MW(7)-T510203-4-22.13	63	72	80	63	65	Sederhana / Moderate
		Sek. Keb. Alor Peroi Kg. Gajah Mati	MW(7)-T510203-5-6.16	80	91	97	80	82	Baik / Good
		Sek. Keb. Telaga Hulu Terengganu	MW(7)-T510216-1-9.06	78	82	72	79	78	Baik / Good
Sabah	Pertanian / Agriculture	Limbawang Agriculture Stesen, Beaufort	MW(7)-H511511-1-7.50	82	76	81	70	76	Baik / Good
		Yongs Farm, Tawau	MW(7)-H411712-1-16.2	97	97	79	83	90	Sangat Baik / Excellent

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

## STATUS KUALITI AIR TANAH BAGI BANDAR DAN PINGGIR BANDAR

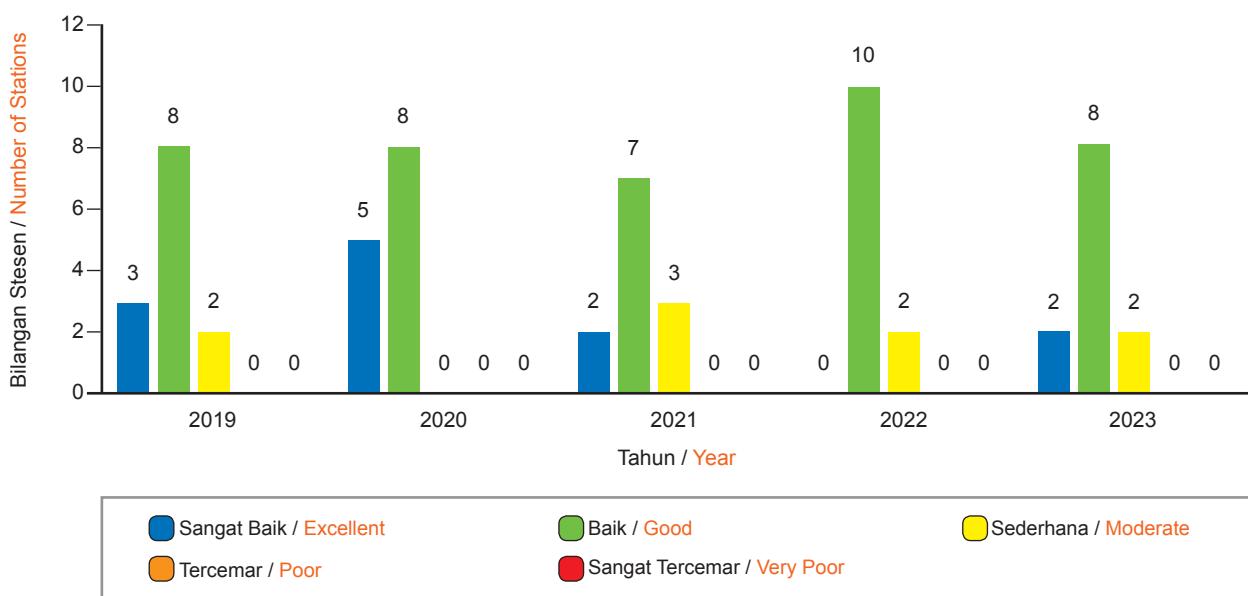
Tren IKT mulai tahun 2019 hingga 2023 bagi bandar dan pinggir bandar adalah seperti yang ditunjukkan dalam **Rajah 3.2**. Berdasarkan **Rajah 3.2** didapati bilangan stesen sangat baik telah meningkat manakala bilangan stesen baik telah menurun dibandingkan tahun sebelumnya. Tiada stesen dalam kategori tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak 12 stesen guna tanah bandar dan pinggir bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan dua (2) stesen (17%) dikategorikan sebagai sangat baik, lapan (8) stesen (66%) dikategorikan sebagai baik dan dua (2) stesen (17%) dikategorikan sebagai sederhana. Satu (1) stesen tiada luahan air (**Jadual 3.4**).

## STATUS OF GROUNDWATER QUALITY INDEX FOR URBAN AND SUBURBAN

The GWQI trend for urban and suburban from year 2019 until 2023 is shown in **Figure 3.2**. Based on **Figure 3.2** the number of stations ranked excellent has increased, while the number of stations ranked good has decreased compared to the previous year. There were no stations ranked poor or very poor in 2023.

In 2023, a total of 12 stations under urban and suburban were monitored. The monitoring results indicated that two (2) stations (17%) were categorised as excellent, eight (8) stations (66%) were ranked good and two (2) stations (17%) were categorised as moderate (17%). There was no groundwater discharge from one (1) station (**Table 3.4**).



Rajah 3.2: Tren Indeks Kualiti Air Tanah bagi Bandar dan Pinggir Bandar, 2019-2023

Figure 3.2: Trends of Groundwater Quality Index for Urban and Suburban, 2019-2023

**Jadual 3.4: Status Indeks Kualiti Air Tanah bagi Bandar dan Pinggir Bandar**  
**Table 3.4: Status of Groundwater Quality Index for Urban and Suburban**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2022) / CATEGORY (2022)
				2019	2020	2021	2022	2023	
Perlis	Bandar & Pinggir Bandar / Urban & Suburban	Arau , Perlis	MW(7)-R4-1-5.41	76	75	68	68	83	Baik / Good
		Arau , Perlis	MW(7)-R4-1-19.80	87	93	88	87	89	Baik / Good
Kedah	Bandar & Pinggir Bandar / Urban & Suburban	Sek. Keb. Darul Uloom Kepala Batas	MW(7)-K2-1-6.22	75	74	82	77	67	Sederhana / Moderate
Selangor	Bandar & Pinggir Bandar / Urban & Suburban	Saujana Golf Resort, Subang	MW(7)-S13-1-5.45	79	78	80	78	82	Baik / Good
		Saujana Golf Resort, Subang	MW(7)-S13-1-12.67	97	97	89	83	85	Baik / Good
W.P. Putrajaya	Bandar & Pinggir Bandar / Urban & Suburban	Taman Wetland	MW(7)-W210103-1-10.0	72	80	-	-	91	Sangat Baik / Excellent
Pahang	Bandar & Pinggir Bandar / Urban & Suburban	Nenasi	MW(7)-C13-1-45.97	88	93	85	88	87	Baik / Good
Kelantan	Bandar & Pinggir Bandar / Urban & Suburban	Sek. Men. Keb. Rantau Panjang	MW(7)-D7-1-5.50	96	97	80	85	86	Baik / Good
		Sek. Men. Keb. Rantau Panjang	MW(7)-D7-1-20.23	86	82	79	80	77	Baik / Good
		Sek. Men. Keb. Cherang Ruku, Pasir Puteh	MW(7)-D510202-1-7.98	67	88	68	76	-	Tiada Data / No Data
Terengganu	Bandar & Pinggir Bandar / Urban & Suburban	Kg. Raja, Besut	MW(7)-T1-1-7.25	79	88	96	76	82	Baik / Good
		Kg. Raja, Besut	MW(7)-T1-1-31.79	64	73	64	64	67	Sederhana / Moderate
Sabah	Bandar & Pinggir Bandar / Urban & Suburban	Sek. Keb. Inanam	MW(7)-H511601-9-7.50	93	91	92	84	90	Sangat Baik / Excellent

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

#### STATUS KUALITI AIR TANAH BAGI TAPAK PERINDUSTRIAN

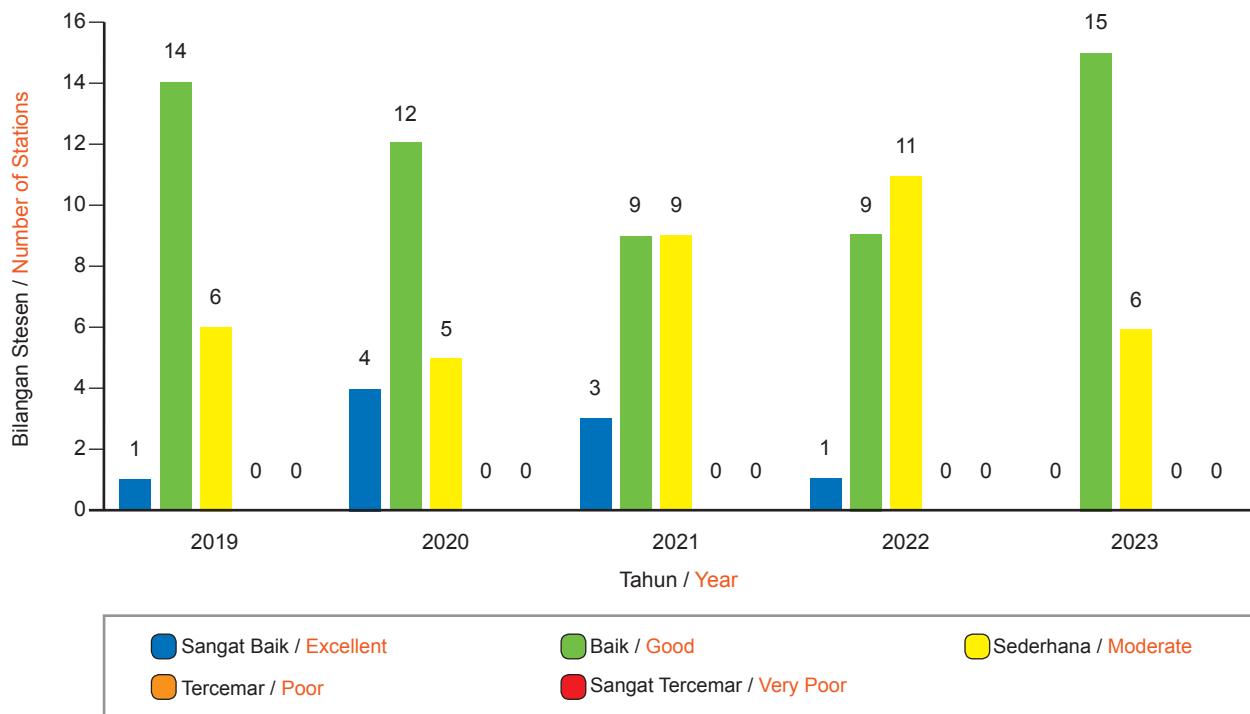
Tren IKAT mulai tahun 2019 hingga 2023 bagi tapak perindustrian adalah seperti yang ditunjukkan dalam **Rajah 3.3**. Berdasarkan **Rajah 3.3** didapati bilangan stesen sangat baik telah menurun dan bilangan stesen baik meningkat. Tiada stesen dalam kategori tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak 21 stesen tapak perindustrian telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan 15 stesen (71%) dikategorikan sebagai baik dan enam (6) stesen (29%) dikategorikan sebagai sederhana. Satu (1) stesen tiada luahan air (**Jadual 3.5**).

#### STATUS OF GROUNDWATER QUALITY INDEX FOR INDUSTRIAL SITES

The GWQI trend for industrial sites from year 2019 until 2023 is shown in **Figure 3.3**. Based on **Figure 3.3**, the number of stations ranked excellent has decreased, while the good category has increased compared to the previous year. No station was categorised under poor or very poor in the year 2023.

In 2023, a total of 21 stations for industrial sites were monitored. The monitoring result indicates that 15 stations (71%) were categorised as good and six (6) stations (29%) were categorised as moderate. There was no groundwater discharge from one (1) station (**Table 3.5**).



Rajah 3.3: Tren Indeks Kualiti Air Tanah bagi Tapak Perindustrian, 2019–2023

Figure 3.3: Trends of Groundwater Quality Index for Industrial Sites, 2019–2023

**Jadual 3.5: Status Indeks Kualiti Air Tanah bagi Tapak Perindustrian**  
**Table 3.5: Status of Groundwater Quality Index for Industrial Sites**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perlis	Tapak Perindustrian / Industrial Sites	Felda Chuping	MW(7)-R610006-2-7.32	71	90	76	84	84	Baik / Good
Kedah	Tapak Perindustrian / Industrial Sites	Kulim Hi-Tech	MW(7)-K3-1-8.45	82	72	82	76	73	Baik / Good
P. Pinang	Tapak Perindustrian / Industrial Sites	Mak Mandin (MAGRI)	MW(7)-P1-2-4.50	69	78	78	65	70	Baik / Good
		Mak Mandin (KASTAM)	MW(7)-P1-1-6.50	74	79	84	74	75	Baik / Good
		Bayan Lepas	MW(7)-P2-1-4.34	78	98	95	77	78	Baik / Good
Selangor	Tapak Perindustrian / Industrial Sites	Sek. Keb. Seksyen 20, Shah Alam	MW(7)-S9A-1-8.20	82	73	62	75	65	Sederhana / Moderate
		CIAST, Seksyen 19, Shah Alam	MW(7)-S9-1-20.21	81	81	66	78	70	Baik / Good
		CIAST, Seksyen 19, Shah Alam	MW(7)-S9-1-5.97	54	78	53	68	67	Sederhana / Moderate
N. Sembilan	Tapak Perindustrian / Industrial Sites	Senawang Edible Oil	MW(7)-N4-1-6.44	81	65	72	66	71	Baik / Good

**Jadual 3.5: Status Indeks Kualiti Air Tanah bagi Tapak Perindustrian**  
**Table 3.5: Status of Groundwater Quality Index for Industrial Sites**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Melaka	Tapak Perindustrian / Industrial Sites	Petronas Oil Refinery, Melaka	MW(7)-M1-1-8.10	64	64	82	64	64	Sederhana / Moderate
Johor	Tapak Perindustrian / Industrial Sites	Tg. Puteri, Pasir Gudang	MW(7)-J5-1-7.34	73	85	90	91	80	Baik / Good
		Tg. Puteri, Pasir Gudang	MW(7)-J5-2-7.49	70	60	48	64	63	Sederhana / Moderate
Pahang	Tapak Perindustrian / Industrial Sites	LYNAS, Gebeng	MW(7)-C310302-1-6.50	66	62	77	68	65	Sederhana / Moderate
Kelantan	Tapak Perindustrian / Industrial Sites	Eastern Garment Manufacturing Pengkalan Chepa	MW(7)-D6-2-51.38	87	71	57	67	84	Baik / Good
		Eastern Garment Manufacturing Pengkalan Chepa	MW(7)-D6-24.24	79	71	68	81	82	Baik / Good
Terengganu	Tapak Perindustrian / Industrial Sites	TCOT Kerteh, Kemaman	MW(7)-T15-1-5.68	88	97	80	84	86	Baik / Good
		TCOT Kerteh, Kemaman	MW(7)-T15-1-24.89	82	82	65	68	70	Baik / Good
		KSB Telok Kalong, Kemaman	MW(7)-T16-1-5.57	64	82	64	69	70	Baik / Good
		KSB Telok Kalong, Kemaman	MW(7)-T16-1-18.76	61	69	60	66	67	Sederhana / Moderate
		Sek. Keb. Bari Pantai, Setiu	MW(7)-T510208-1-7.86	74	78	78	78	84	Baik / Good
Perak	Tapak Perindustrian / Industrial Sites	Pusat Kecemerlangan Gopeng, Perak	MW(7)-A4101009-2-11.95	-	-	-	-	-	Tiada Data / No Data
W.P Labuan	Tapak Perindustrian / Industrial Sites	Asian Supply Base W.P. Labuan	MW(7)-H511509-1-6.80	91	94	91	69	80	Baik / Good

Nota / Note:

– Stesen Baru / New Station

– Tiada Data / No Data:

i. Tiada Air / No Water

ii. Stesen Rosak / Destroyed Station

#### STATUS KUALITI AIR TANAH BAGI BEKAS TAPAK PELUPUSAN SAMPAH

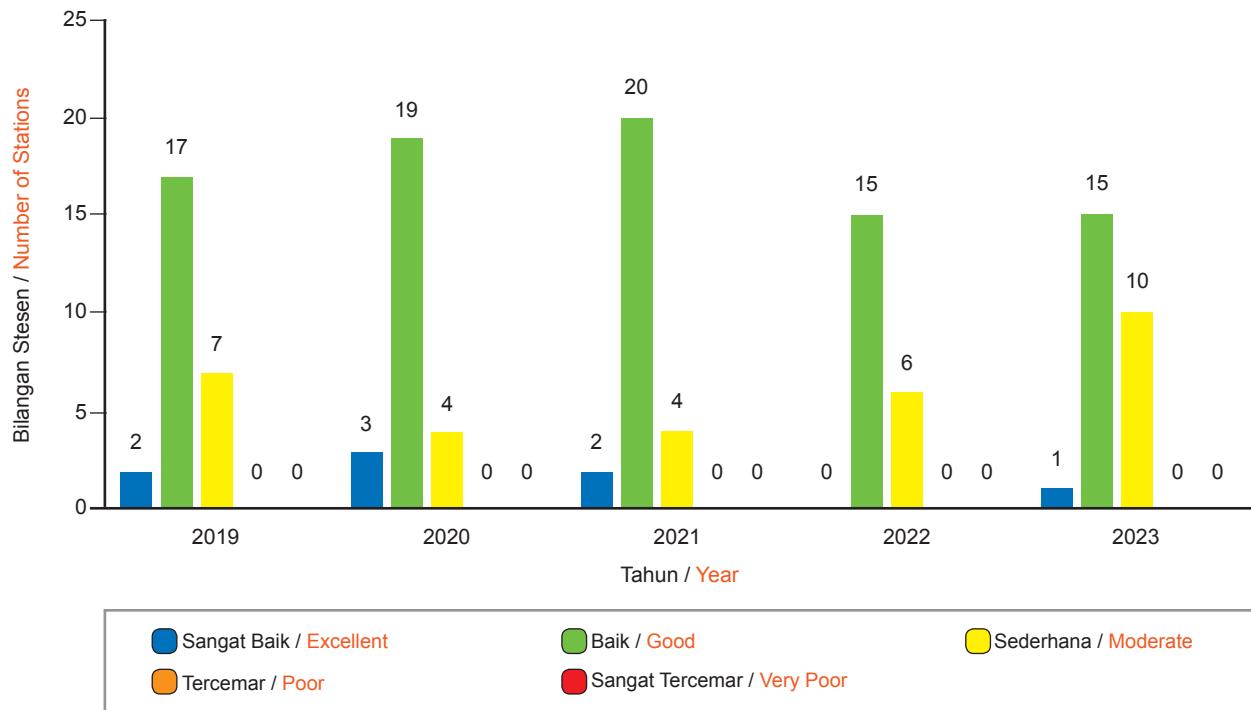
Tren IKAT mulai tahun 2019 hingga 2023 bagi bekas tapak pelupusan sampah adalah seperti yang ditunjukkan dalam **Rajah 3.4**. Berdasarkan **Rajah 3.4** didapati bilangan stesen sangat baik dan sederhana meningkat, manakala bilangan stesen baik sama seperti tahun sebelumnya. Tiada stesen tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak 26 stesen bekas tapak pelupusan sampah telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan satu (1) stesen (4%) dikategorikan sebagai sangat baik, 15 stesen (57%) dikategorikan sebagai baik dan 10 stesen (39%) dikategorikan sebagai sederhana (**Jadual 3.6**).

#### STATUS OF GROUNDWATER QUALITY INDEX FOR USED SOLID WASTE LANDFILLS

The GWQI trend from 2019 to 2023 for used solid waste landfills is shown in **Figure 3.4**. Based on **Figure 3.4**, the number of stations ranked excellent and moderate increased, while the number of stations ranked good was the same as the previous year. There were no stations ranked poor or very poor in 2023.

In 2023, a total of 26 stations for used solid waste landfills were monitored. The results of the monitoring programme conducted showed one (1) station (4%) was in the excellent category, 15 stations (57%) were categorised as good and 10 stations (39%) were categorised as moderate (**Table 3.6**).



Rajah 3.4: Tren Indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Sampah, 2019-2023

Figure 3.4: Trends of Groundwater Quality Index for Used Solid Waste Landfills, 2019-2023

Jadual 3.6: Status Indeks Kualiti Air Tanah bagi Guna Tanah Bekas Tapak Pelupusan Sampah

Table 3.6: Status of Groundwater Quality Index of Used Solid Waste Landfills

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Pusing, Batu Gajah	MW(7)-A11-1-6.05	59	73	79	67	68	Sederhana / Moderate
W.P. Kuala Lumpur	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Jln Sg. Besi	MW(7)-S11-1-5.50	86	79	64	–	61	Sederhana / Moderate
		Jln Sg. Besi	MW(7)-S11-1-5.54	82	74	73	–	69	Sederhana / Moderate
		Jln Sg. Besi	MW(7)-S11-1-5.57	93	74	82	–	70	Baik / Good
		Tmn Beringin, Kepong	MW(7)-S13-1-7.26	95	84	73	–	89	Baik / Good
		Tmn Beringin, Kepong	MW(7)-S13-2-6.10	87	75	77	–	69	Sederhana / Moderate
N. Sembilan	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kualiti Alam	MW(7)-N5-1-8.00	84	79	83	81	91	Sangat Baik / Excellent
		Kualiti Alam	MW(7)-N5-1-7.55	64	64	82	70	75	Baik / Good
		TPS Tanah Merah (CYPARK), Port Dickson	MW(7)-N210108-2-10.03	69	70	71	66	73	Baik / Good

**Jadual 3.6: Status Indeks Kualiti Air Tanah bagi Guna Tanah Bekas Tapak Pelupusan Sampah**  
**Table 3.6: Status of Groundwater Quality Index of Used Solid Waste Landfills**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Melaka	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Tapak Pelupusan Sampah, Sungai Udang	MW(7)-M210209-1-7.68	62	75	56	64	64	Sederhana / Moderate
Johor	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kg. Batu 4, Kota Tinggi	MW(7)-J4-1-6.94	65	89	61	73	76	Baik / Good
		Tapak Pelupusan Sisa Pepejal, Ladang CEP, Simpang Renggam	MW(7)-J110302-1-7.02	64	63	64	72	69	Sederhana / Moderate
Kelantan	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-13.43	89	82	73	86	85	Baik / Good
		Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-5.34	89	82	73	74	83	Baik / Good
		Pasir Mas Landfill, Kg.Pusu 40, Pasir Mas	MW(7)-D8-1-5.22	89	94	72	76	82	Baik / Good
Terengganu	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-5.45	78	98	75	74	85	Baik / Good
		Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-22.89	78	97	76	73	77	Baik / Good
Sabah	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	IATC, Kg. Duvanson, Penampang	MW(7)-H511601-1-8.80	82	82	82	77	64	Sederhana / Moderate
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-2-14.0	82	82	82	70	72	Baik / Good
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-3-8.00	86	85	85	75	71	Baik / Good
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-4-17.3	85	85	84	72	74	Baik / Good
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-5-19.0	73	80	80	69	69	Sederhana / Moderate
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-6-10.2	80	80	96	69	64	Sederhana / Moderate
		IATC, Kg. Duvanson, Penampang	MW(7)-H511601-7-10.3	82	82	97	84	82	Baik / Good
Sarawak	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kemuyang, No.1	MW(7)-QS-K1-11.10	53	53	84	61	63	Sederhana / Moderate
		Kemuyang, No.2	MW(7)-QS-K2-10.78	72	69	83	70	70	Baik / Good

#### STATUS KUALITI AIR TANAH BAGI PADANG GOLF

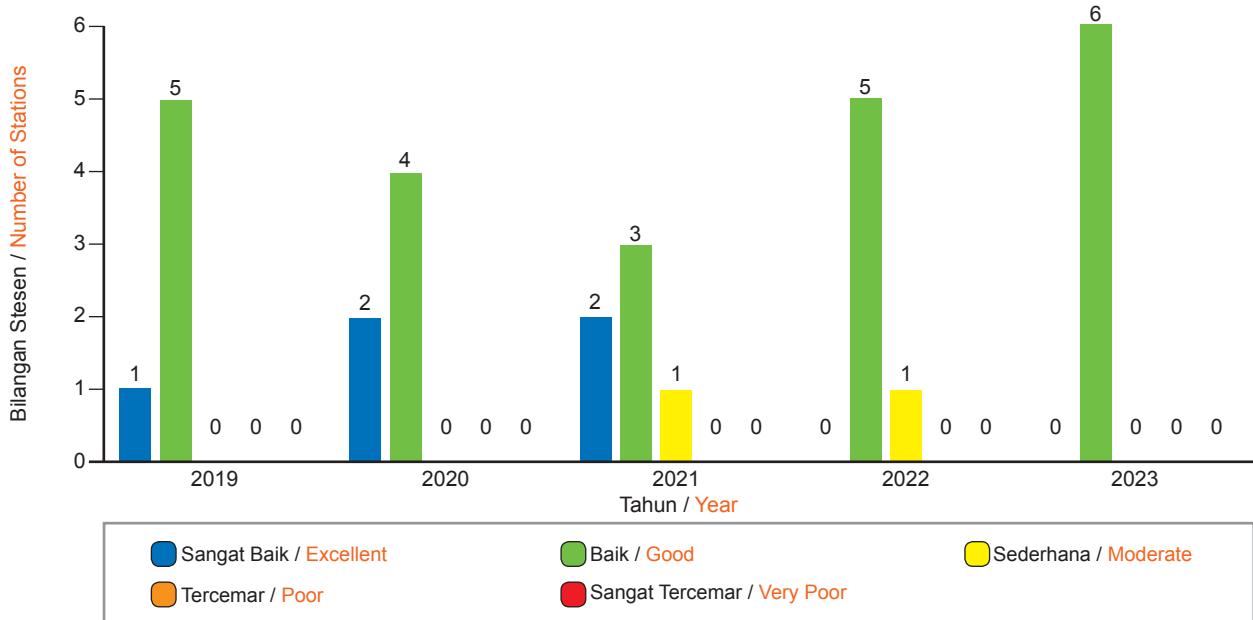
Tren IKAT mulai tahun 2019 hingga 2023 bagi padang golf adalah seperti yang ditunjukkan dalam **Rajah 3.5**. Berdasarkan **Rajah 3.5**, didapati bilangan stesen dalam kategori baik adalah meningkat berbanding tahun sebelumnya. Tiada stesen dalam kategori sangat baik, sederhana, tercemar dan sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak enam (6) stesen yang dipantau. Hasil program pengawasan yang telah dijalankan menunjukan enam (6) stesen (100%) dikategorikan sebagai baik. Satu (1) stesen tiada luahan air (**Jadual 3.7**).

#### STATUS OF GROUNDWATER QUALITY INDEX OF GOLF COURSES

The GWQI trend from 2019 to 2023 for golf courses is as shown in **Figure 3.5**. Based on **Figure 3.5**, the number of stations under the good category in 2023 increased compared to the year before. No station was categorised as excellent, moderate, poor and very poor category in the year 2023.

In the year 2023, six (6) stations were monitored. The monitoring results indicate that all six (6) stations (100%) were categorised as good. There was no groundwater discharge from one (1) station (**Table 3.7**).



Rajah 3.5: Tren Indeks Kualiti Air Tanah bagi Padang Golf, 2019-2023

Figure 3.5: Trends of Groundwater Quality Index for Golf Courses, 2019-2023

**Jadual 3.7: Status Indeks Kualiti Air Tanah bagi Padang Golf**  
**Table 3.7: Status of Groundwater Quality Index for Golf Courses**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
W.P. Kuala Lumpur	Padang Golf / Golf Courses	Royal Selangor Golf Club	MW(7)-S12-1-5.37	-	-	-	-	-	Tiada Data / No Data
Kelantan	Padang Golf / Golf Courses	Kelab Golf & Desa Pengkalan Chepa	MW(7)-D3-1-6.90	89	82	79	86	86	Baik / Good
		Kelab Golf & Desa Pengkalan Chepa	MW(7)-D3-1-6.37	84	71	62	82	86	Baik / Good
		Kelab Golf D'Raja Kubang Kerian	MW(7)-D6-4-31.29	82	82	75	64	83	Baik / Good
		Kelab Golf D'Raja Kubang Kerian	MW(7)-D6-4-9.05	85	81	90	76	83	Baik / Good
Sabah	Padang Golf / Golf Courses	Sandakan Golf Club, Sandakan	MW(7)-H511801-1-8.82	81	96	81	76	71	Baik / Good
		Sandakan Golf Club, Sandakan	MW(7)-H511801-2-8.60	96	95	95	78	89	Baik / Good

Nota / Note:

– Stesen Baru / New Station

– Tiada Data / No Data:

i. Tiada Air / No Water

ii. Stesen Rosak / Destroyed Station

**STATUS KUALITI AIR TANAH BAGI LUAR BANDAR**

Tren IKAT mulai tahun 2019 hingga 2023 bagi kawasan luar bandar adalah seperti yang ditunjukkan dalam **Rajah 3.6**. Berdasarkan **Rajah 3.6**, didapati bilangan stesen baik dan sederhana adalah sama seperti tahun sebelumnya. Tiada stesen dalam kategori sangat baik, tercemar atau sangat tercemar pada tahun 2023.

**STATUS OF GROUNDWATER QUALITY INDEX FOR RURAL**

GWQI trend for rural area from the year 2019 until 2023 is shown in **Figure 3.6**. Based on **Figure 3.6**, the number of stations under the good and moderate were the same as the previous year. No station fell under the excellent, poor or very poor categories in the year 2023.

Pada tahun 2023, sebanyak lima (5) stesen kawasan luar bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan empat (4) stesen (80%) dikategorikan sebagai baik dan satu (1) stesen (20%) dikategorikan sebagai sederhana (**Jadual 3.8**).

In 2023, a total of five (5) stations under rural areas were monitored. The monitoring results indicate that four (4) stations (80%) were categorised as good and one (1) station (20%) was categorised as moderate (**Table 3.8**).



Rajah 3.6: Tren Indeks Kualiti Air Tanah bagi Luar Bandar, 2019-2023

Figure 3.6: Trends of Groundwater Quality Index for Rural, 2019-2023

**Jadual 3.8: Status Indeks Kualiti Air Tanah bagi Luar Bandar**  
**Table 3.8: Status of Groundwater Quality Index for Rural**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kelantan	Luar Bandar / Rural Areas	Sek. Keb. Jelawat Bachok	MW(7)-D610214-10-6.10	80	79	73	84	78	Baik / Good
		Sek. Men. Keb. Jelawat Bachok	MW(7)-D610213-1-5.09	65	81	58	79	81	Baik / Good
Selangor	Luar Bandar / Rural Areas	Institut Alam Sekitar Malaysia, EIMAS, UKM Bangi	MW(7)-B210104-1-20.40	72	85	76	73	88	Baik / Good
Melaka	Luar Bandar / Rural Areas	Pusat Kecemerlangan Buangan Terjadual, JAS Taboh Naning	MW(7)-M210209-2-21.10	49	42	63	45	50	Sederhana / Moderate
Terengganu	Luar Bandar / Rural Areas	Kg. Padang Pak Wan, Bkt. Payung, Marang	MW(7)-T510313-1-6.99	80	88	79	85	84	Baik / Good

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

## STATUS KUALITI AIR TANAH BAGI BEKAS LOMBONG EMAS

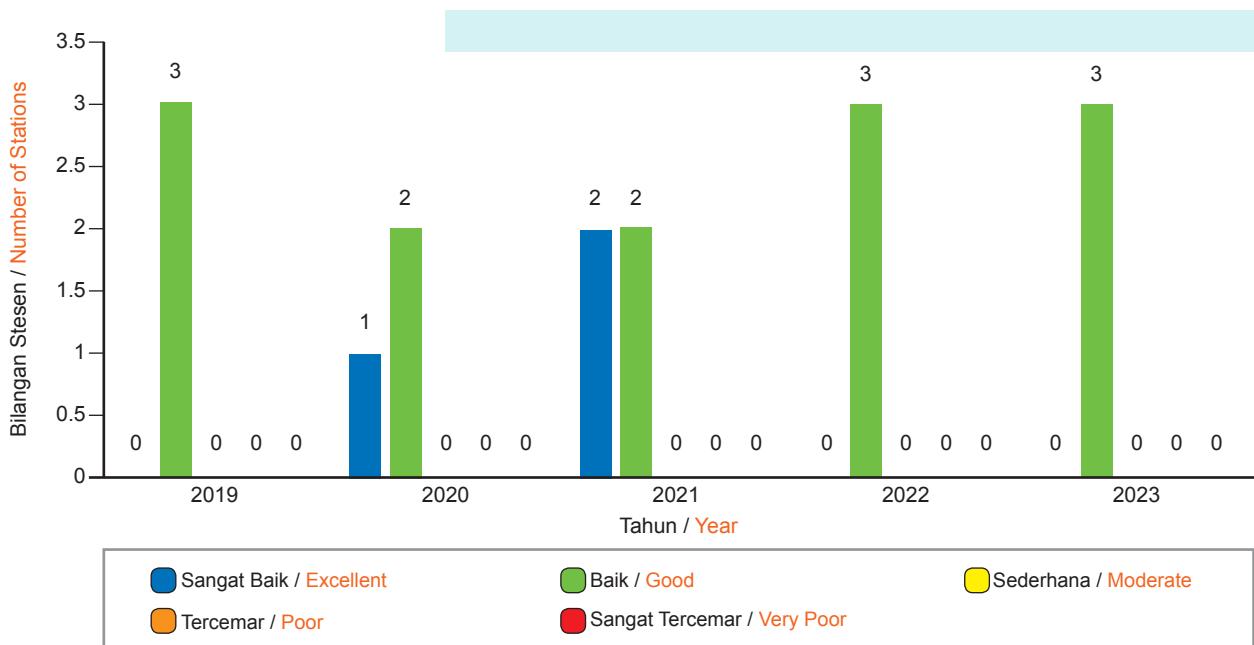
Tren IKAT mulai tahun 2019 hingga 2023 bagi bekas lombong emas adalah seperti yang ditunjukkan dalam **Rajah 3.7**. Berdasarkan **Rajah 3.7**, didapati bilangan stesen baik adalah sama seperti tahun sebelumnya. Tiada stesen dalam kategori sangat baik, sederhana, tercemar atau sangat tercemar pada tahun 2023 bagi kategori ini.

Pada tahun 2023, sebanyak tiga (3) stesen bekas lombong emas telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan ketiga-tiga stesen dikategorikan sebagai baik (**Jadual 3.9**).

## STATUS OF GROUNDWATER QUALITY INDEX FOR USED GOLD MINE

GWQI trend for used gold mine from the year 2019 until 2023 is shown in **Figure 3.7**. Based on **Figure 3.7**, the number of stations ranked good were the same as the previous year. No station was categorised as excellent, moderate, poor or very poor in the year 2023.

In 2023, a total of three (3) stations for used gold mines were monitored. The monitoring results indicate that all stations were categorised as good (**Table 3.9**).



Rajah 3.7: Tren Indeks Kualiti Air Tanah bagi Bekas Lombong Emas, 2019-2023

Figure 3.7: Trends of Groundwater Quality Index for Used Gold Mine, 2019-2023

**Jadual 3.9: Status Indeks Kualiti Air Tanah bagi Bekas Lombong Emas**  
**Jadual 3.9: Status of Groundwater Quality Index for Used Gold Mine**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sarawak	Bekas Lombong Emas / Used Gold Mine	Bau, No. 1	MW(7)-QK-B1-27.27	85	88	92	87	71	Baik / Good
		Bau, No. 2	MW(7)-QK-B2-29.50	84	93	87	84	70	Baik / Good
		Bau	MW(7)-QK-B3-29.00	82	82	82	87	70	Baik / Good

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

## STATUS KUALITI AIR TANAH BAGI BEKALAN AIR

Tren IKAT mulai tahun 2019 hingga 2023 bagi bekalan air adalah seperti yang ditunjukkan dalam **Rajah 3.8**. Berdasarkan **Rajah 3.8**, didapati bilangan stesen bagi kategori baik meningkat berbanding tahun sebelumnya. Tiada stesen dalam kategori sangat baik, sederhana, tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak lima (5) stesen bekalan air telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan lima (5) stesen (100%) dikategorikan sebagai baik (**Jadual 3.10**).

## STATUS OF GROUNDWATER QUALITY INDEX FOR WATER SUPPLY

GWQI trend for water supply from the year 2019 until 2023 is shown in **Figure 3.8**. Based on **Figure 3.8**, the number of stations categorised as good have increased compared to the previous year. No stations were categorised under excellent, moderate, poor or very poor in the year 2023.

In 2023, a total of five (5) stations for water supply were monitored. The monitoring results indicate that all five (5) stations (100%) were categorised as good (**Table 3.10**).



Rajah 3.8: Tren Indeks Kualiti Air Tanah bagi Bekalan Air, 2019-2023

Figure 3.8: Trends of Groundwater Quality Index for Water Supply, 2019-2023

**Jadual 3.10: Status Indeks Kualiti Air Tanah bagi Bekalan Air**  
**Table 3.10: Status of Groundwater Quality Index for Water Supply**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sabah	Bekalan Air Tempatan / Municipal Water Supply	Kg. Tajau Laut, Kudat	MW(7)-H511604-1-4.5	87	88	97	77	88	Baik / Good
Sarawak	Bekalan Air Tempatan / Municipal Water Supply	Kabong, No. 1	MW(7)-QB-K1-6.70	84	70	79	70	70	Baik / Good
		Pusat Rawatan Air.JKR, No. 1, Miri	MW(7)-QL-L1-7.53	92	99	-	-	71	Baik / Good
		LAKU (Lambir), No. 1, Miri	MW(7)-QM-L1-30.50	75	83	93	80	81	Baik / Good
		Kg. Lusut Kiri, No. 3, Miri	MW(7)-QM-L3-28.30	77	87	76	70	70	Baik / Good

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

#### STATUS KUALITI AIR TANAH BAGI BEKAS TAPAK PELUPUSAN BANGKAI HAIWAN

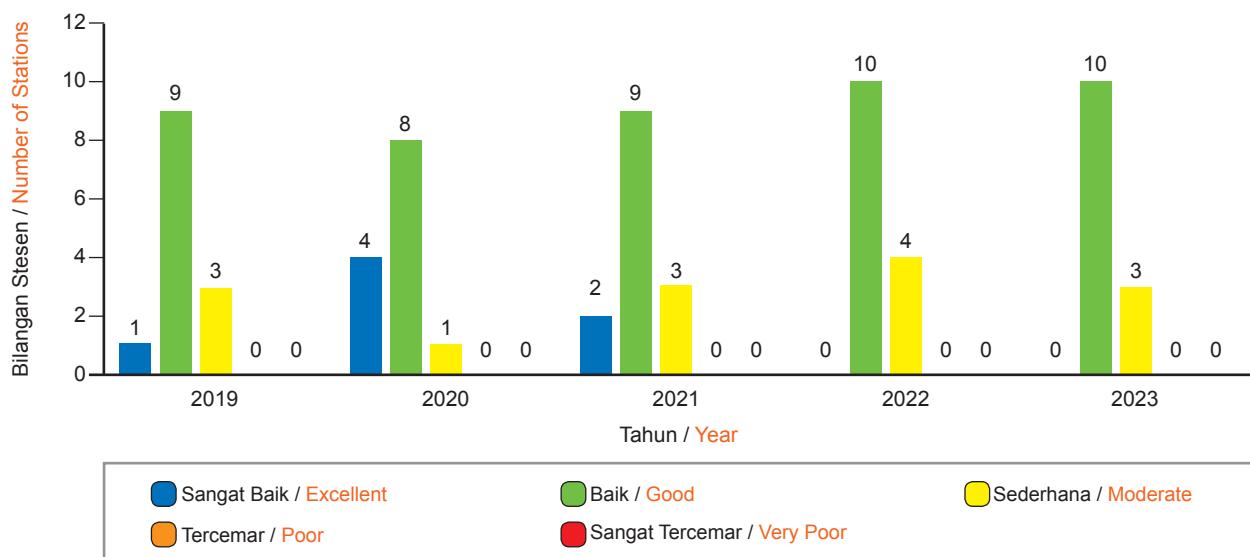
Tren IKAT mulai tahun 2019 hingga 2023 bagi bekas tapak pelupusan bangkai haiwan adalah seperti yang ditunjukkan dalam **Rajah 3.9**. Berdasarkan **Rajah 3.9** didapati bilangan stesen dalam kategori baik adalah sama seperti tahun sebelumnya manakala bilangan stesen sederhana berkurang daripada tahun sebelumnya. Tiada stesen dalam kategori sangat baik, tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023 sebanyak 13 stesen yang dipantau. Berdasarkan **Jadual 3.11**, yang telah dijalankan menunjukkan 10 stesen (77%) dikategorikan sebagai baik dan tiga (3) stesen (23%) sebagai sederhana. Satu (1) stesen tiada luahan air (**Jadual 3.11**).

#### STATUS OF GROUNDWATER QUALITY INDEX FOR USED ANIMAL BURIAL SITES

GWQI trend for used animal burial sites from the year 2019 until 2023 is shown in **Figure 3.9**. Based on **Figure 3.9**, the number of stations categorised as good category were the same as the previous year while stations in the moderate category decreased compared to 2022. No stations were in the excellent, poor or very poor categories in the year 2023

In the year 2023, 13 stations were monitored. Based on **Table 3.11**, 10 stations (77%) were categorised as good and three (3) stations (23%) were categorised as moderate. There was no groundwater discharge from one (1) station (**Table 3.11**).



Rajah 3.9: Tren Indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Bangkai Haiwan, 2019-2023

Figure 3.9: Trends of Groundwater Quality Index for Used Animal Burial Sites, 2019-2023

**Jadual 3.11: Status indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Bangkai Haiwan**  
**Table 3.11: Status of Groundwater Quality Index for Used Animal Burial Sites**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Tapak Bazar Seramik Tambun	MW(7)-A(IP)-1-5.92	69	78	73	67	69	Sederhana / Moderate
		Tapak Bekas Wabak JE Jalong	MW(7)-A(SS)-2-3.14	-	-	88	73	85	Baik / Good
		Tapak Bekas Wabak JE Jalong	MW(7)-A(SS)-1-7.65	83	87	84	74	75	Baik / Good
P. Pinang	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Perkampungan Ldg Valdor (Kelapa)	MW(7)-P(LV)-1-7.45	96	96	93	72	72	Baik / Good
		Perkampungan Ldg Valdor (Tengah)	MW(7)-P(LV)-2-6.78	74	90	92	75	74	Baik / Good
		Perkampungan Ldg Valdor (Jalan)	MW(7)-P(LV)-3-7.30	72	90	81	74	64	Sederhana / Moderate
Johor	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Ulu Choh (Pintu)	MW(7)-JPN-1-6.90	62	73	81	63	68	Sederhana / Moderate
		Ulu Choh (Kolam)	MW(7)-JPN-2-6.10	70	70	62	71	74	Baik / Good
		Ulu Choh (Sungai)	MW(7)-JPN-3-6.71	78	83	82	69	85	Baik / Good
Selangor	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Stesen Kg. Sg. Keroh, Sepang	MW(7)-S(SE)-1-5.67	59	52	62	62	-	Tiada Data / No Data
		TNB Sepang	MW(7)-S(SE)-2-6.95	79	96	68	76	80	Baik / Good
		Ladang Sepang	MW(7)-S(SE)-3-5.60	78	87	72	77	81	Baik / Good
Sarawak	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Oya Road, No. 1, Sibu	MW(7)-QS-Y1-10.00	79	79	89	71	70	Baik / Good
		Oya Road, No. 2, Sibu	MW(7)-QS-Y2-9.17	78	83	82	72	76	Baik / Good

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

## STATUS KUALITI AIR TANAH BAGI AKUAKULTUR

Tren IKAT mulai tahun 2019 hingga 2023 bagi akuakultur adalah seperti yang ditunjukkan dalam **Rajah 3.10**. Berdasarkan **Rajah 3.10** didapati bilangan stesen dikategorikan sebagai baik dan sederhana adalah sama seperti tahun sebelumnya. Tiada stesen dalam keadaan sangat baik, tercemar atau sangat tercemar pada tahun 2023.

Pada tahun 2023, sebanyak tujuh (7) stesen bagi akuakultur telah dipantau. Hasil program pengawasan yang telah dijalankan, lima (5) stesen (71%) dikategorikan sebagai baik, manakala dua (2) stesen (29%) dikategorikan sebagai sederhana (**Jadual 3.12**).

## STATUS GROUNDWATER QUALITY FOR AQUACULTURE

GWQI trend for aquaculture from the year 2019 until 2023 is shown in **Figure 3.10**. Based on **Figure 3.10**, the number of stations categorised as good and moderate were the same as compared to the previous year. No stations were in excellent, poor or very poor categories in 2023.

In 2023, a total of seven (7) stations for aquaculture were monitored. The monitoring results indicate that five (5) stations (71%) were categorised as good while two (2) stations (29%) were categorised as moderate (**Table 3.12**).



Rajah 3.10: Tren Indeks Kualiti Air Tanah bagi Akuakultur, 2019-2023

Figure 3.10: Trends of Groundwater Quality Index for Aquaculture, 2019-2023

**Jadual 3.12: Status Indeks Kualiti Air Tanah bagi Akuakultur**  
**Table 3.12: Status of Groundwater Quality Index for Aquaculture**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Akuakultur / Aquaculture	Nenasi (Agrobest)	MW(7)-C310310-1-10.5	62	61	79	68	66	Sederhana / Moderate
		Nenasi (Agrobest)	MW(7)-C310314-4-43	68	74	79	73	73	Baik / Good
		Nenasi (Agrobest)	MW(7)-C310314-5-38	72	76	82	76	74	Baik / Good
		Nenasi (Agrobest)	MW(7)-C310314-3-10	60	58	76	73	74	Baik / Good
		Nenasi (Agrobest)	MW(7)-C310314-6-10	64	82	82	76	89	Baik / Good
		Nenasi (Agrobest)	MW(7)-C310314-2-7.29	69	80	86	80	78	Baik / Good
Terengganu	Akuakultur / Aquaculture	Blue Archipelago (i-Sharp, Setiu)	MW(7)-T510208-2-14.00	66	68	59	61	64	Sederhana / Moderate

Nota / Note:

- Stesen Baru / New Station
- Tiada Data / No Data:
  - i. Tiada Air / No Water
  - ii. Stesen Rosak / Destroyed Station

#### STATUS KUALITI AIR TANAH BAGI KAWASAN PERANGINAN

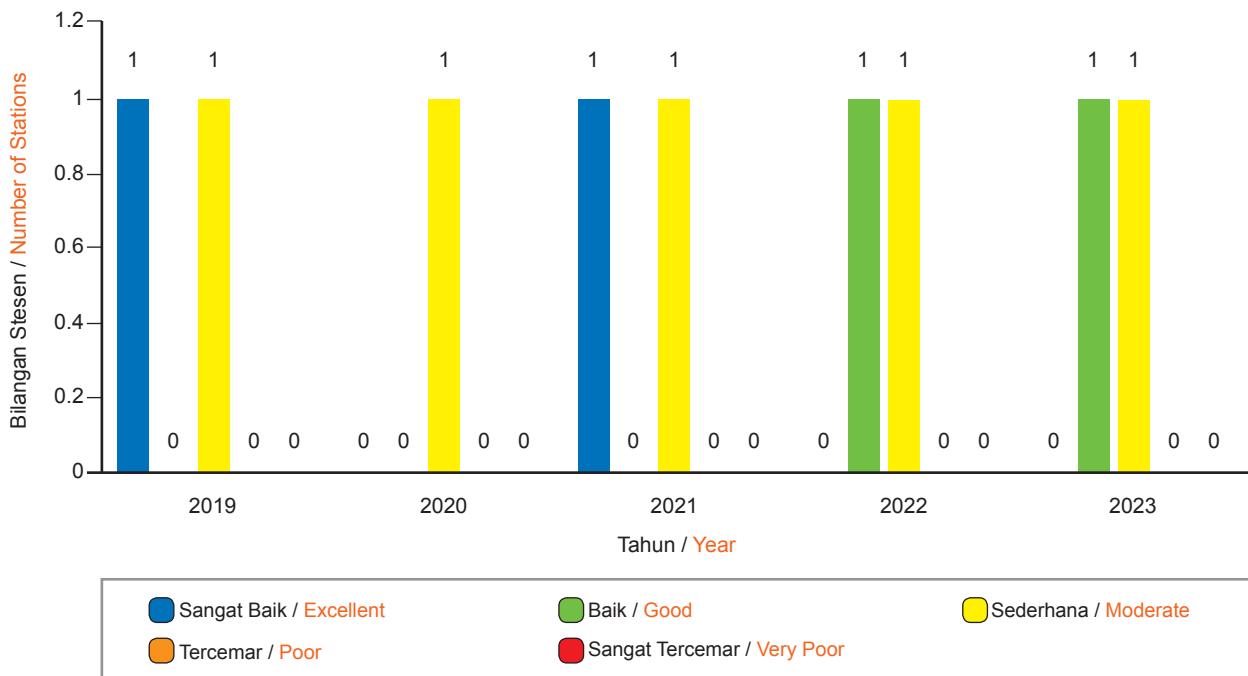
Tren IKAT mulai tahun 2019 hingga 2023 bagi kawasan peranginan adalah seperti yang ditunjukkan dalam **Rajah 3.11**. Berdasarkan **Rajah 3.11**, bilangan stesen baik dan sederhana adalah sama seperti tahun sebelumnya. Tiada stesen dalam kategori sangat baik, tercemar atau sangat tercemar.

Pada tahun 2023, sebanyak dua (2) stesen bagi kawasan peranginan telah dipantau. Hasil program pengawasan yang telah dijalankan, satu (1) stesen (50%) dikategorikan sebagai baik, manakala satu (1) stesen (50%) dikategorikan sebagai sederhana (**Jadual 3.13**).

#### STATUS OF GROUNDWATER QUALITY INDEX FOR RESORTS

GWQI trend from 2019 to 2023 for resorts is shown in **Figure 3.11**. Based on **Figure 3.11**, The number of stations categorised good and moderate were the same as the previous year. There were no stations in the excellent, poor, or very poor categories.

In 2023, a total of two (2) stations for resorts were monitored. As a result of the monitoring programme conducted, one (1) station 50% was categorised as good, while one (1) station (50%) was categorised as moderate (**Table 3.13**).



Rajah 3.11: Tren Indeks Kualiti Air Tanah bagi Kawasan Peranginan, 2019-2023

Figure 3.11: Trends of Groundwater Quality Index for Resorts, 2019-2023

Jadual 3.13: Status Indeks Kualiti Air Tanah bagi Kawasan Peranginan

Table 3.13: Status of Groundwater Quality Index for Resorts

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sabah	Kawasan Peranginan / Resort	Pulau Manukan	MW(7)-H511601-8-6.50	93	-	95	82	74	Baik / Good
Kedah	Kawasan Peranginan / Resort	Kuarters Imigresen Tanjung Rhu, Langkawi	MW(7)-KV 69912-1-10.10	68	57	79	65	60	Sederhana / Moderate

Nota / Note:

– Stesen Baru / New Station

– Tiada Data / No Data:

i. Tiada Air / No Water

ii. Stesen Rosak / Destroyed Station

**Jadual 3.14** menunjukkan Standard Kualiti Air Tanah bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) Merujuk kepada Parameter Utama dalam Penilaian Status Kualiti Air Tanah.

**Table 3.14** shows the Groundwater Quality Standards for Conventional Treatment of Raw Water (Drinking Water) with Reference to Significant Parameters in Assessing Groundwater Quality Status.

**Jadual 3.14: Standard Kualiti Air Tanah bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) Merujuk kepada Parameter Utama dalam Penilaian Status Kualiti Air Tanah**

**Table 3.14: Groundwater Quality Standards for Conventional Treatment of Raw Water (Drinking Water) with Reference to Significant Parameters in Assessing Groundwater Quality Status**

PARAMETER / PARAMETER	SIMBOL / SYMBOL	STANDARD / STANDARD	UNIT / UNIT
Koliform / Total coliform	–	5000	MPN/100 ml
Pepejal Terlarut / TDS	–	1500	mg/l
Klorida / Chloride	Cl	250	mg/l
Besi / Iron	Fe	1.0	mg/l
Keliatan / Hardness	CaCO <sub>3</sub>	500	mg/l
Mangan / Manganese	Mn	0.2	mg/l
Nitrat / Nitrate	NO <sub>3</sub>	10	mg/l
Raksa / Mercury	Hg	0.001	mg/l
Kadmium / Cadmium	Cd	0.003	mg/l
Arsenik / Arsenic	As	0.01	mg/l
Plumbum / Lead	Pb	0.05	mg/l
Kromium / Chromium	Cr	0.05	mg/l
Kuprum / Copper	Cu	1.0	mg/l
Zink / Zinc	Zn	3.0	mg/l
Sulfat / Sulphate	SO <sub>4</sub> <sup>2-</sup>	250	mg/l
Selenium / Selenium	Se	0.01	mg/l
Sebatian Fenol / Phenolics	–	0.002	mg/l

## STATUS KUALITI AIR TANAH

Penilaian terhadap kualiti air tanah adalah berdasarkan kepada nilai peratusan yang melebihi had penerimaan dalam Standard Kebangsaan Bagi Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional (Air Minuman).

Nilai peratusan tersebut adalah sebagaimana di dalam **Jadual 3.15**.

## GROUNDWATER QUALITY STATUS

The assessment of groundwater quality is based on the percentage value that exceeds the acceptance limit in the National Standards for Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water).

The value of the percentage is shown in the **Table 3.15**.

**Jadual 3.15: Peratusan Julat Nilai Pematuhan, 2023**

**Table 3.15: Percentage of Compliance, 2023**

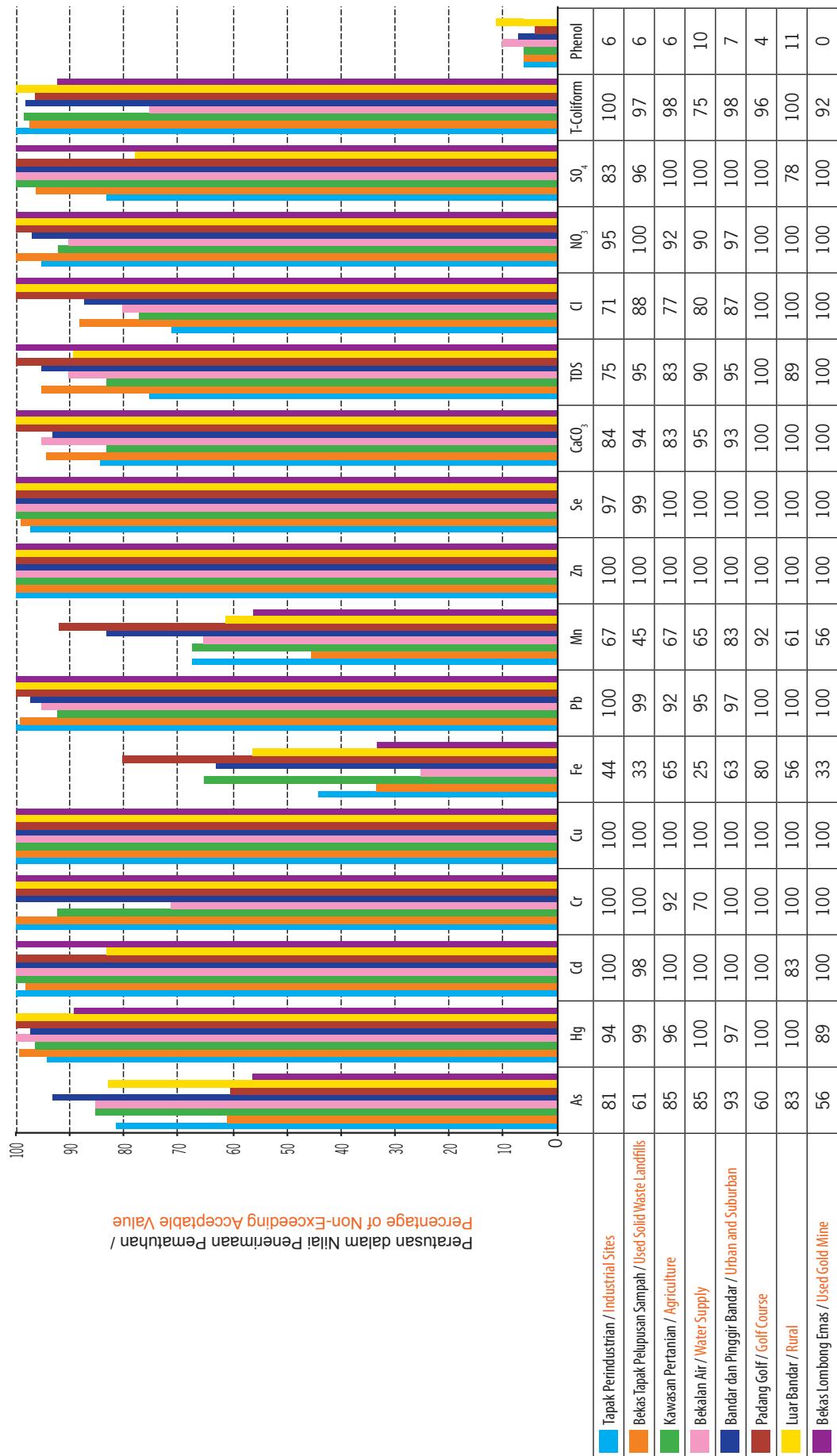
PERATUSAN JULAT NILAI PEMATUHAN (%) / PERCENTAGE OF COMPLIANCE (%)	KATEGORI / CATEGORY
0% - 49%	Rendah / Low
50% - 79%	Sederhana / Moderate
80% - 100%	Tinggi / High

## ANALISIS PERATUSAN NILAI PEMATUHAN MENGIKUT PARAMETER BERDASARKAN JENIS GUNA TANAH

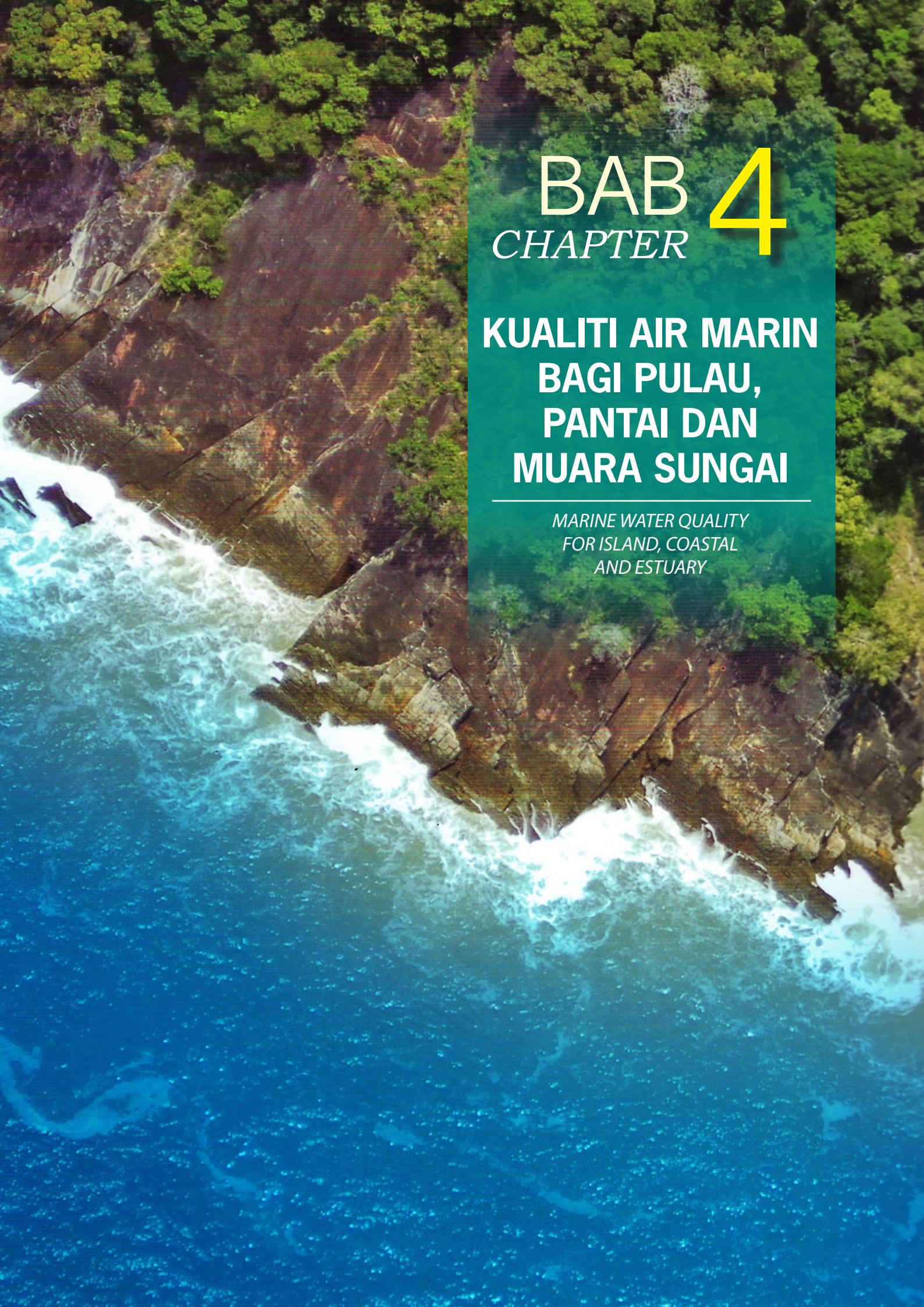
Berdasarkan **Jadual 3.15**, analisis peratusan nilai pematuhan mengikut parameter berdasarkan lapan (8) jenis guna tanah untuk parameter utama dalam penilaian status kualiti air tanah adalah seperti di **Rajah 3.12**. Berdasarkan rajah tersebut, parameter Fenol berada pada kategori Rendah (0-49%) bagi semua jenis guna tanah. Selain itu, Ferum berada pada kategori rendah di dalam Guna Tanah Tapak Perindustrian, Bekas Tapak Pelupusan Sampah, Bekalan Air dan Bekas Lombong Emas manakala Mangan berada pada kategori Rendah di guna tanah Bekas Tapak Pelupusan Sampah.

## PERCENTAGE ANALYSIS OF COMPLIANCE VALUE BY PARAMETER BASED ON TYPE OF LAND USE

Based on **Table 3.15**, the analysis of the percentage of compliance values by parameter based on eight (8) land use type with reference to significant parameters in assessing groundwater quality status is as in **Figure 3.12**. Based on the diagram, Phenol is in the Low Category (0-49%) for all types of land use. Besides that, Ferum is in the low category for Landuse of Industry, Used Solid Waste Landfill, Water Supply and Used Gold Mine while Manganese falls under Low Category for landuse of Used Solid Waste Landfill.



Rajah 3.12: Peratusan Pematuhan oleh Pencemar Terpilih Mengikut Guna Tanah, 2023  
Figure 3.12: Percentage of Compliance of Selected Contaminants by Land Use, 2023



# BAB CHAPTER 4

## KUALITI AIR MARIN BAGI PULAU, PANTAI DAN MUARA SUNGAI

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MARINE WATER QUALITY  
FOR ISLAND, COASTAL  
AND ESTUARY

# KUALITI AIR MARIN

MARINE WATER QUALITY

PENGAWASAN KUALITI  
AIR MARIN MANUAL

MANUAL MARINE WATER QUALITY  
MONITORING (MMWQM)

29

PARAMETER  
DIPANTAU /  
PARAMETERS  
MONITORED



188

Stesen Pantai  
Coastal Stations

1128

Persampelan Stesen Pantai  
Coastal Station Sampling

85

Stesen Muara Sungai  
Estuary Stations

510

Persampelan  
Stesen Muara Sungai  
Estuary Station Sampling



95

Stesen Pulau  
Island Stations

570

Persampelan Stesen Pulau  
Island Station Sampling

10

STESEN AUTOMATIK  
CONTINUOUS STATIONS

11

PARAMETER DIPANTAU  
PARAMETERS MONITORED

PENGAWASAN KUALITI AIR  
MARIN AUTOMATIK

CONTINUOUS MARINE WATER QUALITY  
MONITORING (CMWQM)

**STESEN TERBAIK  
AIR MARIN  
EXCELLENT MARINE WATER STATION**

**Stesen Pantai / Coastal Station**

BIL. NO.	NEGERI / STATE	LOKASI / LOCATION
1	Pahang	Pantai Legenda (B)
2	Johor	Pantai Sri Pantai
3	Johor	Tanjung Balau
4	Johor	Batu Layar
5	Terengganu	Pantai Chendering
6	Terengganu	Pantai Rantau Abang
7	Terengganu	Rhu 10
8	Terengganu	Tok Jembal
9	Terengganu	Kelulut
10	Terengganu	Teluk Ketapang

**Stesen Muara Sungai / Estuary Station**

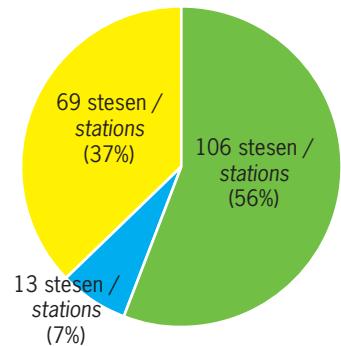
BIL. NO.	NEGERI / STATE	LOKASI / LOCATION
1	Selangor	Kuala Sungai Sepang (Kawalan)
2	Pahang	Kuala Rompin Kecil
3	Terengganu	Kuala Sungai Setiu
4	Terengganu	Tioxide Utara (Kg. Bukit Kuang, Kijal)
5	Terengganu	Tioxide Tengah (Pupuk Semangat, Kijal)
6	Terengganu	Tioxide Selatan (KSB, T. Kalong)

**Stesen Pulau / Island Station**

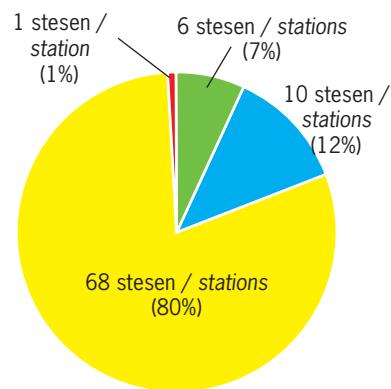
BIL. NO.	NEGERI / STATE	LOKASI / LOCATION
1	Terengganu	Gemia
2	Terengganu	Kapas
3	Terengganu	Lima
4	Terengganu	Ekor Tebu
5	Terengganu	Pinang
6	Terengganu	Lang Tengah
7	Terengganu	Redang (South)
8	Terengganu	Redang (North)
9	Terengganu	Perhentian Besar (West)
10	Terengganu	Perhentian Besar (South)

**STATUS KUALITI  
AIR MARIN 2023  
MARINE WATER QUALITY STATUS 2023**

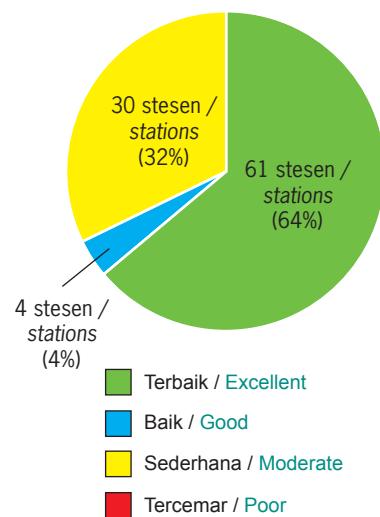
**Stesen Pantai /  
Coastal Station**



**Stesen Muara Sungai /  
Estuary Station**



**Stesen Pulau /  
Island Station**



# KUALITI AIR MARIN BAGI PULAU, PANTAI DAN MUARA SUNGAI / MARINE WATER QUALITY FOR ISLAND, COASTAL AND ESTUARY

## PENGAWASAN KUALITI AIR MARIN

Jabatan Alam Sekitar (JAS) telah menjalankan pengawasan kualiti air marin semenjak tahun 1978 di Semenanjung Malaysia dan 1985 di Sabah dan Sarawak. Objektif utama program pengawasan kualiti air marin ini adalah untuk menilai status kualiti air marin dan seterusnya untuk menentukan tahap pencemaran daripada punca-punca di daratan dan juga laut. Punca-punca pencemaran ini boleh menimbulkan ancaman terhadap kemampuan ekosistem dari segi kesihatan dan biodiversiti persekitaran marin.

Stesen-stesen pengawasan yang dibangunkan di bawah Program Pengawasan Kualiti Air Marin diklasifikasikan kepada tiga (3) kategori seperti berikut:-

1. Stesen Pantai
2. Stesen Muara Sungai
3. Stesen Pulau

Stesen pantai terletak di sepanjang pantai kira-kira 100 meter dari gigi air laut dan ia mestilah sekurang-kurangnya 500 meter dari punca yang berpotensi sebagai punca pencemaran.

Stesen muara sungai terletak di persekitaran muara sungai di mana terdapat interaksi antara air tawar dan air laut. Stesen muara sungai banyak menerima kesan daripada ekosistem sungai.

Stesen pulau pula dibahagikan kepada empat (4) kategori iaitu Kawasan Dilindungi, Taman Laut, Pembangunan dan Peranginan:

## MARINE WATER QUALITY MONITORING

The Department of Environment (DOE) has been monitoring marine water quality since 1978 in Peninsular Malaysia and since 1985 in Sabah and Sarawak. The main objective of this marine water quality monitoring programme is to assess the status of marine water quality and to further determine the level of pollution from sources on land and sea. The causes of this pollution can pose a threat to the sustainability of the ecosystem in terms of the health and biodiversity of the marine environment.

Monitoring stations established under the Marine Water Quality Monitoring Programme are classified into three (3) categories as followed:

1. Coastal Stations
2. Estuary Stations
3. Island Stations

Coastal stations are located along the coastline; approximately 100 meters from the water edge and it must be at least 500 meters away from potential point source(s).

Estuary stations are located within an estuarine environment where the freshwater and seawater interact. The estuarine stations have been impacted by the riverine ecosystem.

The island stations are divided into four (4) categories namely Protected Area, Marine Park, Development and Resort:

- i. Stesen Pulau (Kawasan Dilindungi) adalah stesen yang dibangunkan di dalam Kawasan Perlindungan Perikanan di bawah Peraturan- Peraturan Perikanan (Kawasan Larangan) 1994.
- ii. Stesen Pulau (Taman Laut) adalah stesen pengawasan yang dibangunkan di kawasan Taman Laut yang ditetapkan di bawah Perintah Taman Laut Malaysia 1994.
- iii. Stesen Pulau (Pembangunan) adalah stesen pengawasan yang dibangunkan di sekitar pulau yang sekurang-kurangnya  $90 \text{ km}^2$  dengan jumlah penduduk lebih daripada 20,000 orang; dan/ atau pulau-pulau yang ada kepentingan ekonomi.
- iv. Stesen Pulau (Peranginan) adalah stesen pengawasan di sekitar pulau yang dibangunkan untuk pelancongan, yang mempunyai pusat peranginan dan chalet sebagai pemacu ekonomi setempat bagi pulau tersebut.

Standard Kualiti Air Marin Malaysia (SKAMM) merupakan standard ambien, memberi fokus pada perlindungan dan kelestarian ekosistem aquatik serta perkhidmatan ekosistem tersebut kepada masyarakat dan mengambil kira faktor ekonomi, praktikal dan sosial. Pada tahun 2023, Jabatan Alam Sekitar telah mengemaskini maklumat stesen untuk menambahbaik keberkesanan rangkaian pengawasan kualiti air marin. Inisiatif ini adalah sejajar dengan matlamat program untuk mengoptimumkan program pengawasan, dan pengurusan kualiti air marin di negara.

Pemakaian SKAMM berdasarkan pra penentuan pengelasan air marin mengikut kegunaan di persekitaran tersebut (**Rajah 4.1**). Terdapat lima (5) kelas dikategorikan dalam SKAMM iaitu:-

- i. Kelas 1 merangkumi air di perairan yang diwartakan atau ada perlindungan berkanun dan perairan yang tidak diwartakan tetapi ada ekosistem marin yang sensitif seperti terumbu karang, rumput laut, tapak pendaratan penyu dan perairan yang terdapat habitat tertentu seperti habitat sensitif kawasan sumber makanan organisma marin.
- ii. Kelas 2 merangkumi air yang ada aktiviti perikanan dan marikultur yang berdasarkan pada zon

- i. Island Stations (Protected Area) are those stations established within the Fisheries Protected Area under the Fisheries (Prohibited Area) Regulation, 1994.
- ii. Island Stations (Marine Parks) are those established within the designated Marine Park area under the Marine Park Malaysia Order, 1994.
- iii. Island Stations (Development) are monitoring stations established around Islands that are at least  $90 \text{ km}^2$  with a total population of more than 20,000 people; and/ or islands of economic importance.
- iv. Island Stations (Resort) are those stations that have been established surrounding islands that were developed for tourism; with resorts and chalets developed on the islands as the key driver of the economy for the islands.

The Malaysian Marine Water Quality Standards (MMWQS) are ambient standards, with a focus on the protection and the sustainability of the aquatic ecosystem; the importance of the ecosystem for society; and to accomplish it in an economical, practical, and socially relevant manner. In 2023, the Department of Environment underwent a comprehensive review of station information, resulting in the enhancement of the Marine Water Quality Monitoring Network. This initiative was undertaken with the overarching goal of optimising the efficiency of monitoring and managing marine water quality in the country.

The application of the MMWQS is based on the pre-determined marine water classification according to the use in the environment (**Figure 4.1**). Five (5) classes are categorised in MMWQS:

- i. Class 1 water comprises the gazetted and statutory protected waters; and non-gazetted areas with the presence of a sensitive ecosystem including coral reefs, seagrass, turtle landing sites, and water specific to habitats and feeding grounds of sensitive marine organisms.
- ii. Class 2 water encompasses both fisheries and mariculture activities, based on the fishing zone

penangkapan ikan yang diterbitkan oleh Jabatan Perikanan Malaysia sebagai panduan. Perairan dalam Kelas 2 terdiri daripada sebahagian zon pemuliharaan (termasuk ‘Kawasan Larangan Perikanan’) sehingga ke Zon Ekonomi Eksklusif (ZEE). Aktiviti marikultur yang ditakrifkan sebagai Kelas 2 adalah aktiviti dalam badan air marin tersebut (seperti penternakan ikan dalam sangkar dan penternakan kerang) dan tidak termasuk aktiviti akuakultur perikanan darat.

- iii. Kelas 3 ialah standard untuk kualiti air marin yang terdedah kepada pelepasan efluen secara langsung daripada aktiviti antropogenik. Oleh itu, ekosistem di perairan ini akan mengalami banyak pencemaran. Tahap perlindungan adalah bertujuan untuk mengekalkan kesihatan ekosistem yang masih ada dan memulihara kualiti air marin di kawasan yang terjejas.
- iv. Kelas E (Interim) adalah standard yang banyak dipengaruhi oleh musim dan variasi diurnal. Selain itu, ciri-ciri geologi dan corak pergerakan air turut menyumbang pada sifat dinamik di perairan ini. Berdasarkan pada kepelbagaian semulajadi ini, Kelas E berhasil adalah berdasarkan ciri-ciri kualiti air muara sungai yang boleh mewakili persekitaran yang belum terganggu. Kawasan muara sungai sebegini akan dijadikan Tapak Rujukan untuk mewakili tiga (3) jenis muara utama di Malaysia. Kelas E1 dipilih untuk mewakili muara jenis dataran pantai, Kelas E2 mewakili muara jenis lagun manakala Kelas E3 akan mewakili muara sungai yang besar dan memiliki rangkaian kompleks.
- v. Kelas R adalah standard untuk kegunaan air marin bagi tujuan rekreasi. Ia merujuk pada Standard Kebangsaan Kualiti Air Rekreasi Semulajadi dan Garispanduan bagi Pemantauan Air Rekreasi Semulajadi (Air Marin & Air Tawar) yang diterbitkan oleh Kementerian Kesihatan Malaysia.

Indeks Kualiti Air Marin Malaysia (IKAMM) adalah pengagregatan parameter kualiti air marin yang paling relevan bertujuan untuk menyediakan maklumat yang berkaitan dengan status kualiti air marin bagi badan air. Indeks ini berdasarkan pada enam (6) parameter kualiti air iaitu oksigen terlarut, faecal coliform, ammonia tidak terion, nitrat, fosfat dan jumlah pepejal terampai.

established by the Department of Fisheries as a guide. Its water comprises the conservation zone (including ‘Fisheries Prohibited Area’) right up to the Economic Exclusive Zone (EEZ). Mariculture activities are defined within the marine water bodies such as marine cage culture and cockle farming; but excluding land aquaculture activities.

- iii. Class 3 is the standard for marine water which is exposed to direct discharge of effluent from anthropogenic activities. Hence, ecosystems in these areas are subjected to some degree of degradation. The corresponding level of protection is therefore aimed at sustaining the health of the remaining ecosystem and to improve water quality of the affected areas.
- iv. Class E (Interim) is the standard for estuarine water subject to both seasonal and diurnal variations. In addition, the geological characteristics and water circulation patterns also contribute to the dynamic nature of these waters. Based on these natural variations, the standards derived from the water quality is characteristic of estuarine waters deemed to represent relatively undisturbed environment. These sites, which are referred to as Reference Sites, are selected to represent the three (3) major estuary types in Malaysia. Hence, Class E1 is taken to be representative of coastal plains, Class E2 represents the lagoon-type estuary while Class E3 is to be referred to when assessing estuaries with large and complex distributary networks.
- v. Class R is the standard for recreational use of marine waters. It is based on the National Standards for Water Quality for Nature-based Recreation and Guidelines for Monitoring for Nature-based Recreation (Marine and Freshwater) by the Ministry of Health, Malaysia.

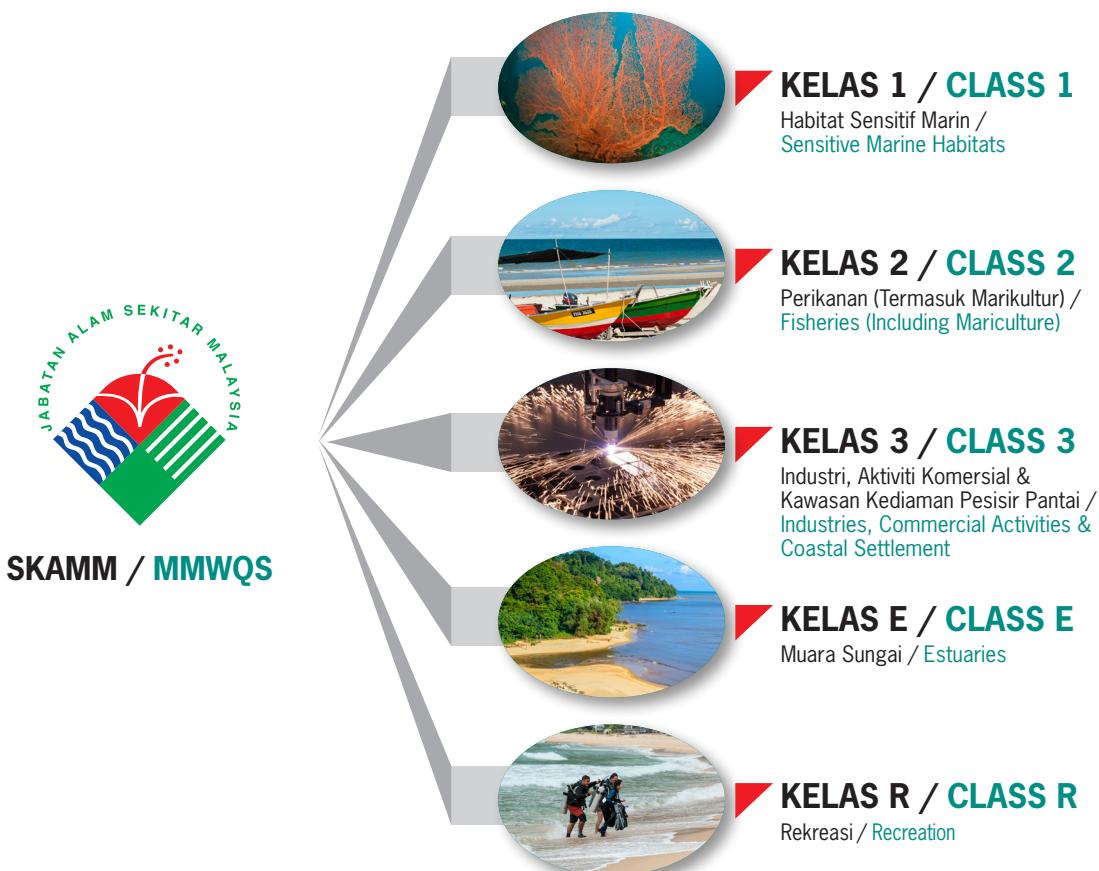
Malaysian Marine Water Quality Index (MMWQI) is an aggregation of the most relevant marine water quality parameters aimed at providing information pertinent to the marine water quality status of a water body. The index is derived based on six (6) water quality parameters, which are dissolved oxygen, faecal coliform, unionized ammonia, nitrate, phosphate and total suspended solids.

Pengagregatan IKAMM adalah dalam julat daripada 0 hingga 100, dengan 0 menunjukkan kualiti air sebagai tercemar manakala 100 menunjukkan kualiti air sebagai terbaik (**Jadual 4.1**).

Sebanyak 188 stesen pantai, 85 stesen muara sungai dan 95 stesen pulau telah dipantau pada tahun 2023. Terdapat enam (6) frekuensi persampelan bagi setiap stesen dengan jumlah sampel sebanyak 1,128 sampel untuk stesen pantai, 510 sampel untuk stesen muara sungai dan 570 sampel untuk stesen pulau. Sampel-sampel tersebut dianalisa dan hasil analisa dirumuskan berdasarkan IKAMM bagi enam (6) frekuensi persampelan.

The MMWQI aggregation is scaled from 0 to 100 where 0 indicates poor water quality while 100 indicates excellent water quality (**Table 4.1**).

A total of 188 coastal stations, 85 estuary stations and 95 island stations were monitored in the year 2023. There were six (6) sampling frequencies in total for each monitoring station amounting to 1,128 samples for coastal stations, 510 samples for estuary stations, and 570 samples for island stations. The samples were analysed and results were summarised based on the MMWQI of the six (6) sampling frequencies.



Rajah 4.1: Pemakaian Standard Kualiti Air Marin Malaysia (SKAMM) berdasarkan Pra Penentuan Pengelasan Air Marin

Figure 4.1: The Application of the Malaysian Marine Water Quality Standards (MMWQS) based on the Pre-determined Marine Water Classification

**Jadual 4.1: Klasifikasi Indeks Kualiti Air Marin Malaysia (IKAMM)**  
**Table 4.1: Malaysian Marine Water Quality Index (MMWQI) Classification**

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



Pantai Rantau Abang, Terengganu



Pantai Teluk Cempedak, Pahang



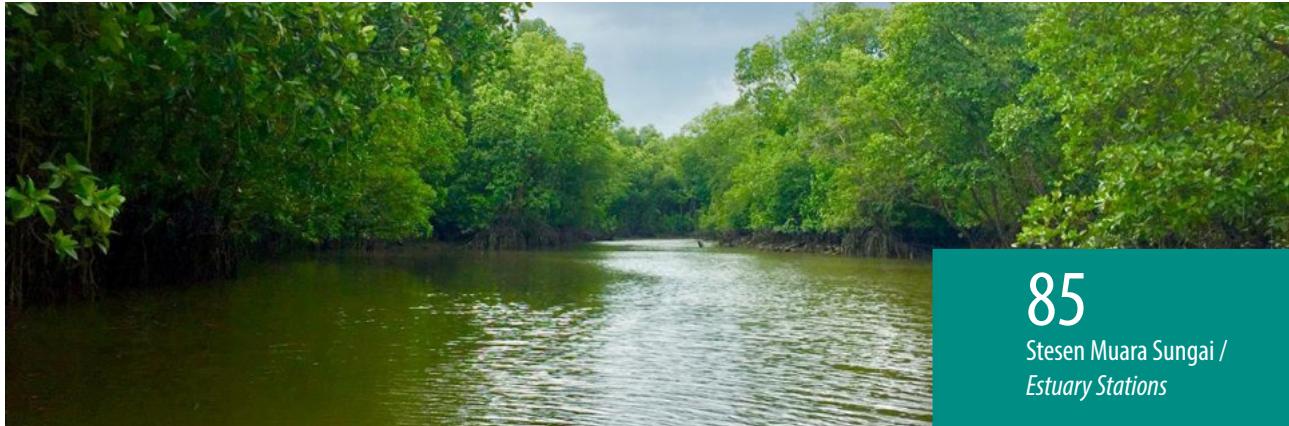
Pantai Teluk Kalong, Terengganu



Kuala Sungai Santubong, Sarawak



Kuala Sungai Marang, Terengganu



Kuala Sungai Pulai, Johor



Pangkor Laut, Perak



Pulau Dayang, Johor



Pulau Kapas, Terengganu

## STATUS STESEN-STESEN PENGAWASAN KUALITI AIR MARIN

Dalam tahun 2023, daripada 368 stesen pengawasan kualiti air marin bagi pantai, muara sungai dan pulau di negara ini, status kualiti air marin dinilai berdasarkan nilai median IKAMM bagi data yang dicerap di setiap stesen sepanjang 2023. Stesen kualiti air marin sebanyak 173 stesen dikategorikan sebagai terbaik, 27 stesen sebagai baik, sementara kualiti air marin bagi 167 stesen dikategorikan sebagai sederhana. Dalam tahun 2023, hanya satu (1) stesen sahaja yang dikategorikan sebagai tercemar. Bilangan stesen yang tercemar bagi tahun 2023 menunjukkan penurunan berbanding tahun sebelumnya iaitu daripada empat (4) stesen tercemar kepada satu (1) stesen tercemar tahun ini.

Stesen kualiti air marin yang tercemar ialah MMPE004 Kuala Sungai Pinang di negeri Pulau Pinang.

Faecal coliform, nutrien dan jumlah pepejal terampai ialah parameter utama yang menyebabkan kemerosotan kualiti air marin di stesen MMWQM. Semua stesen tercemar menerima kesan daripada muara sungai dan aktiviti antropogenik di hulu sungai.

Secara amnya, kualiti air marin yang dipantau di bawah rangkaian MMWQM menunjukkan status keseluruhan kualiti air yang terbaik di persekitaran marin Malaysia.

**Jadual 4.2, Jadual 4.3 dan Jadual 4.4** menunjukkan senarai stesen pantai, muara sungai dan pulau yang mencapai kategori terbaik berdasarkan IKAMM bagi tahun 2023.

**Rajah 4.2 - 4.7** menunjukkan status kualiti air marin berdasarkan IKAMM mengikut lokasi stesen pengawasan bagi pantai, muara sungai dan pulau tahun 2023.

## STATUS OF MARINE WATER QUALITY MONITORING STATIONS

In 2023, out of 368 marine water quality monitoring stations established at coastal, estuary and island in the country, the marine water quality status was evaluated based on the median value of MMWQI obtained from the data collected at each station in 2023. The marine water quality of 173 stations were categorised as excellent, 27 stations categorised as good while marine water quality of 167 stations were categorised as moderate. In 2023, only one (1) station was categorised as poor. The number of marine water quality stations in the poor category in 2023 reduced from four (4) stations in the previous year, to one (1) station this year.

The station in the poor category was MMPE004 Kuala Sungai Pinang in the state of Pulau Pinang.

Faecal coliform, nutrients and total suspended solids are the main parameters that deteriorated the marine water quality of the MMWQM stations. All polluted stations received impacts from the river estuaries and anthropogenic activities in the upstream area of a river.

In general, the marine water quality monitored under the MMWQM network showed an overall excellent category of water quality in the marine environment of Malaysia.

**Table 4.2, Table 4.3 and Table 4.4** show the list of coastal, estuary and island stations in the excellent category based on MMWQI in 2023.

**Figures 4.2 - 4.7** show the marine water quality status based on MMWQI according to coastal, estuary and island monitoring stations in 2023.

**Jadual 4.2: Senarai Stesen Pengawasan Kualiti Air Marin bagi Pantai dengan Status Kategori Terbaik, 2023****Table 4.2: List of Marine Water Quality Monitoring of Coastal Stations with Status of Excellent, 2023**

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Pahang	Pantai Lagenda (B)
2	Johor	Pantai Sri Pantai
3	Johor	Tanjung Balau
4	Johor	Batu Layar
5	Terengganu	Pantai Chendering
6	Terengganu	Pantai Rantau Abang
7	Terengganu	Rhu 10
8	Terengganu	Tok Jembal
9	Terengganu	Kelulut
10	Terengganu	Teluk Ketapang

Nota / Notes:

Senarai menunjukkan sepuluh (10) stesen teratas dengan status kategori terbaik /  
The list shows the top ten (10) stations in the excellent category

**Jadual 4.3: Senarai Stesen Pengawasan Kualiti Air Marin bagi Muara Sungai dengan Status Kategori Terbaik, 2023****Table 4.3: List of Marine Water Quality Monitoring of Estuary Stations with Status of Excellent, 2023**

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Selangor	Kuala Sungai Sepang (Kawalan)
2	Pahang	Kuala Rompin Kecil
3	Terengganu	Kuala Sungai Setiu
4	Terengganu	Tioxide Utara (Kg. Bukit Kuang, Kijal)
5	Terengganu	Tioxide Tengah (Pupuk Semangat, Kijal)
6	Terengganu	Tioxide Selatan (KSB, T. Kalong)

Nota / Notes:

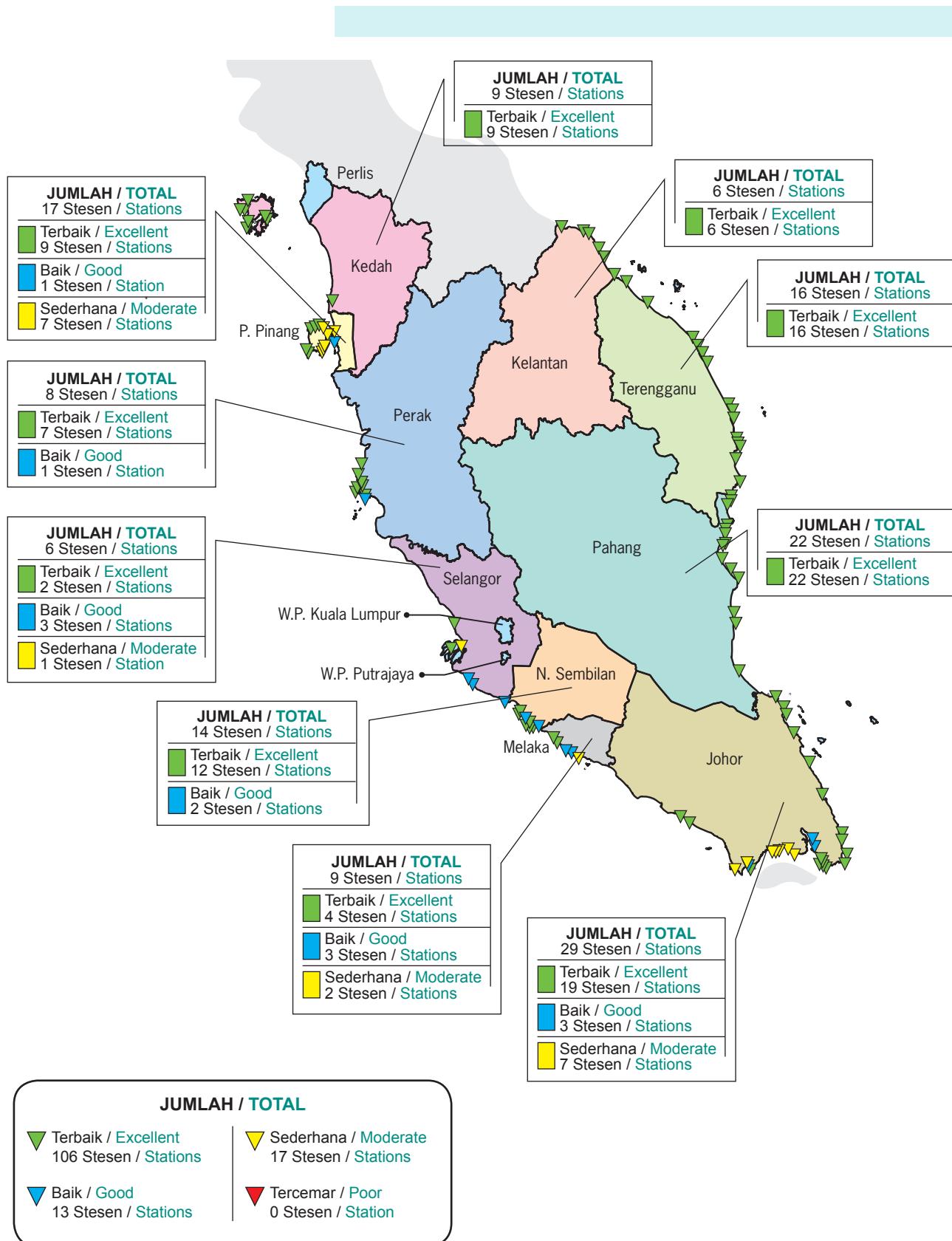
Senarai menunjukkan enam (6) stesen teratas dengan status kategori terbaik /  
The list shows the top six (6) stations in the excellent category

**Jadual 4.4: Senarai Stesen Pengawasan Kualiti Air Marin bagi Pulau dengan Status Kategori Terbaik, 2023****Table 4.4: List of Marine Water Quality Monitoring of Island Stations with Status of Excellent, 2023**

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Terengganu	Gemia
2	Terengganu	Kapas
3	Terengganu	Lima
4	Terengganu	Ekor Tebu
5	Terengganu	Pinang
6	Terengganu	Lang Tengah
7	Terengganu	Redang (South)
8	Terengganu	Redang (North)
9	Terengganu	Perhentian Besar (West)
10	Terengganu	Perhentian Besar (South)

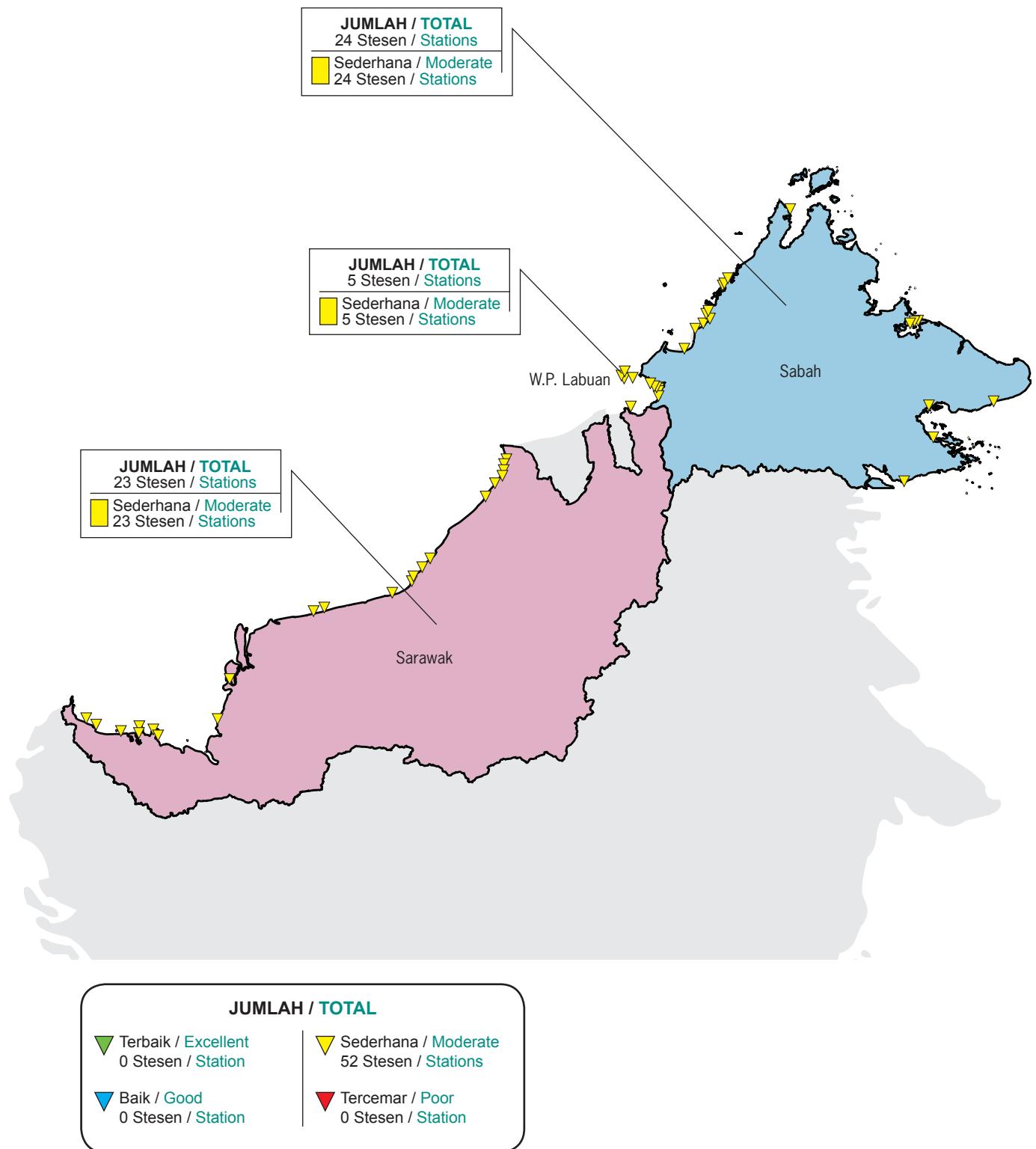
Nota / Notes:

Senarai menunjukkan sepuluh (10) stesen teratas dengan status kategori terbaik /  
The list shows the top ten (10) stations in the excellent category

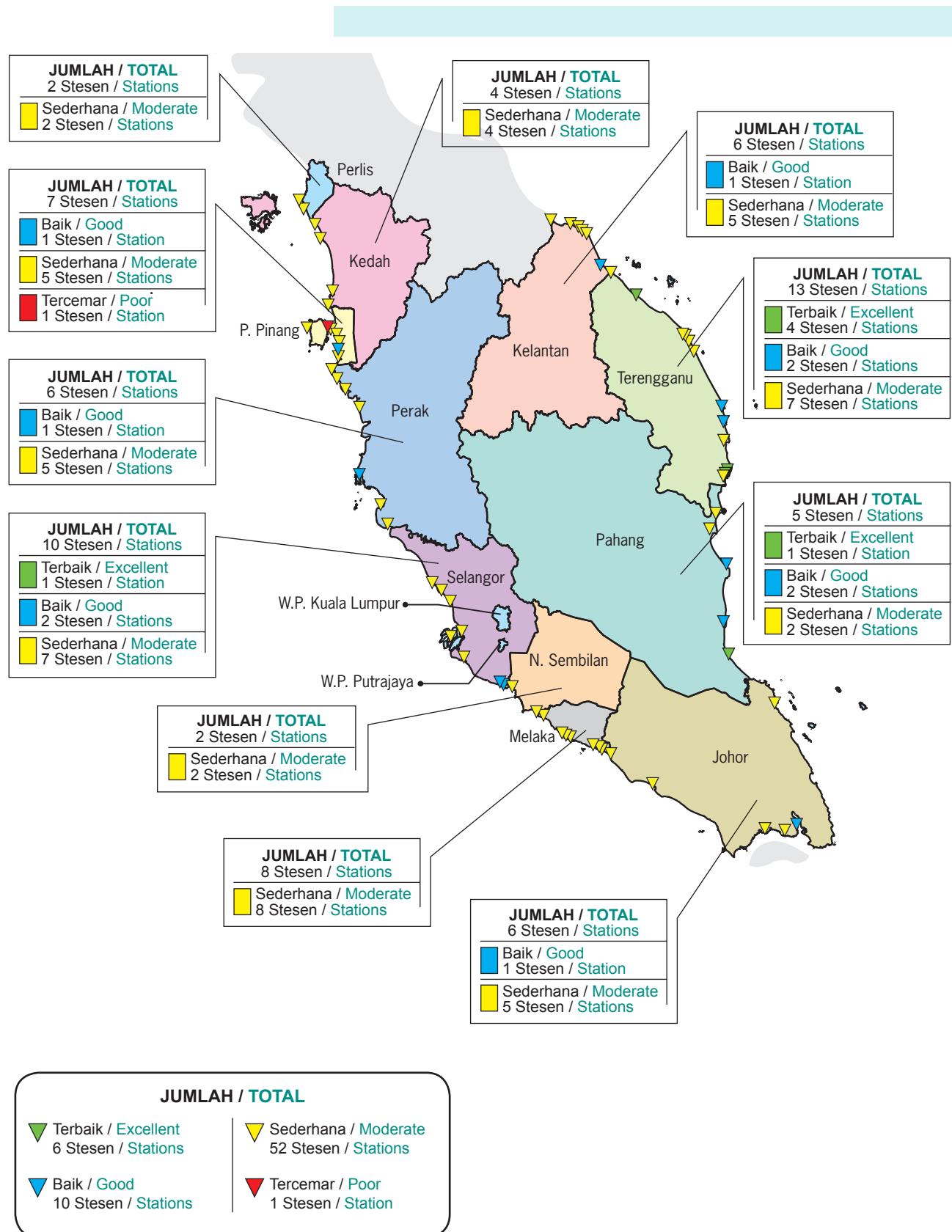


Rajah 4.2: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pantai di Semenanjung Malaysia

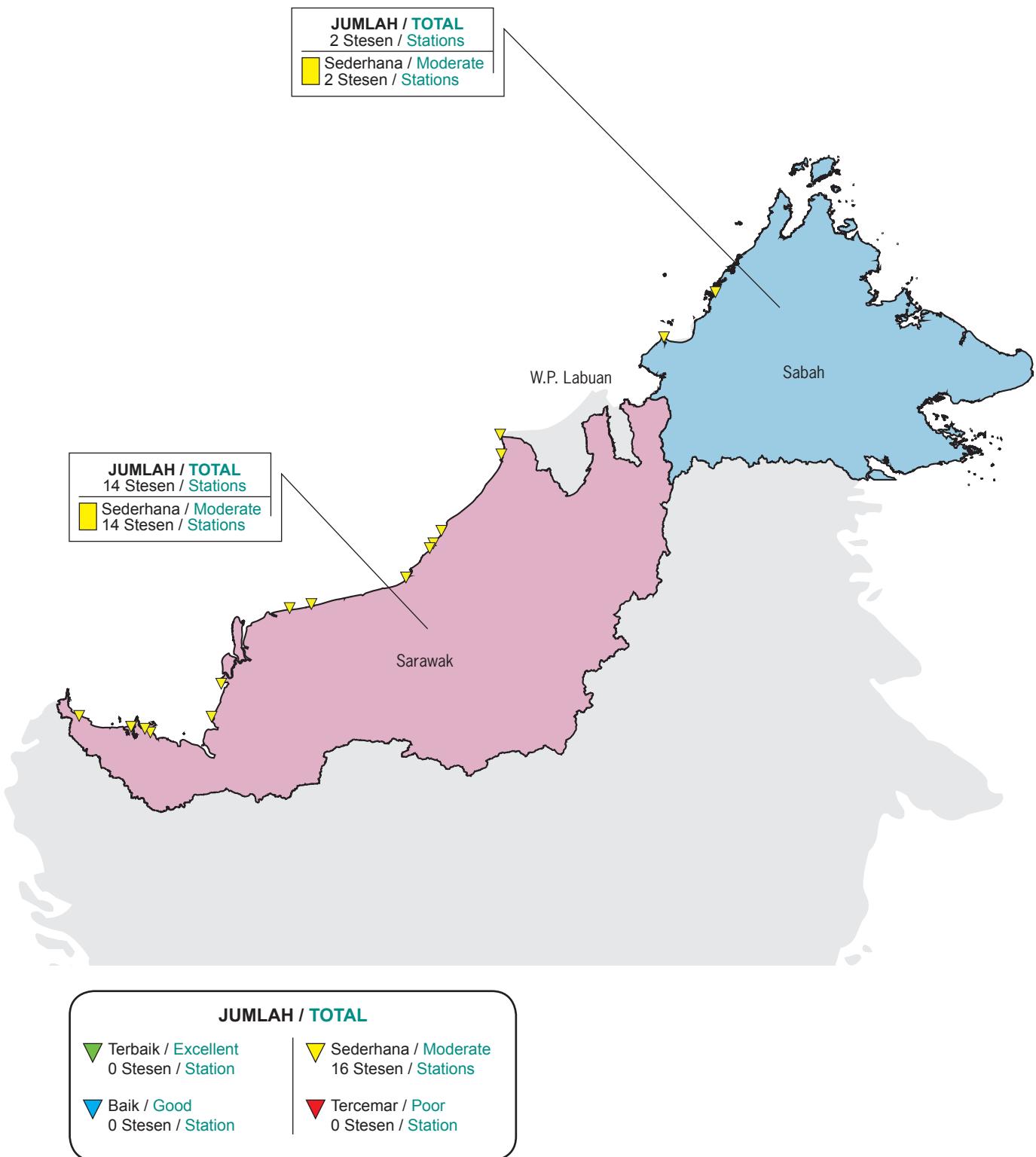
Figure 4.2: Marine Water Quality Status based on the Location of Coastal Monitoring Stations in Peninsular Malaysia



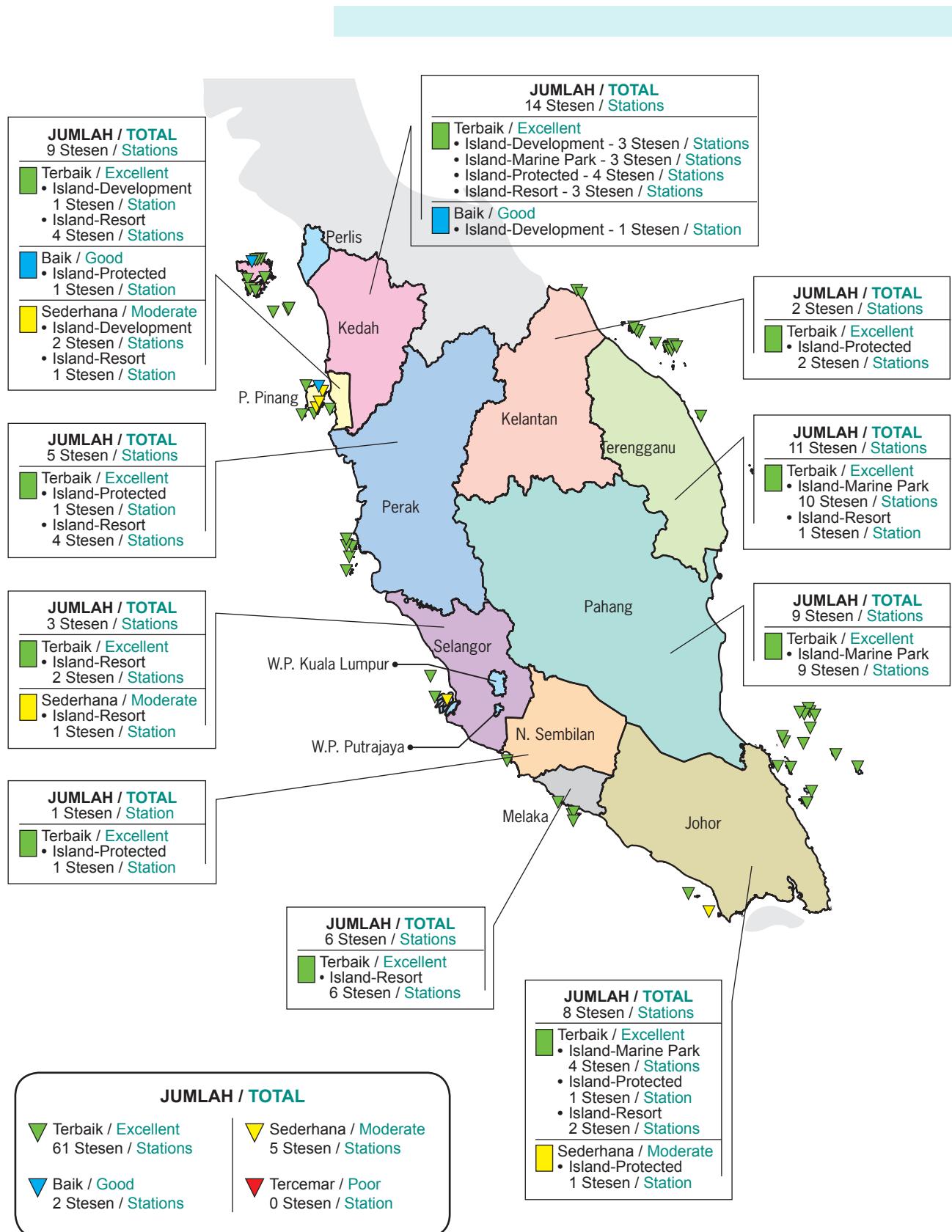
Rajah 4.3: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pantai di Sabah, Sarawak dan W.P. Labuan  
Figure 4.3: Marine Water Quality Status based on the Location of Coastal Monitoring Stations in Sabah, Sarawak and W.P. Labuan



Rajah 4.4: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Muara Sungai di Semenanjung Malaysia  
Figure 4.4: Marine Water Quality Status based on the Location of Estuary Monitoring Stations in Peninsular Malaysia

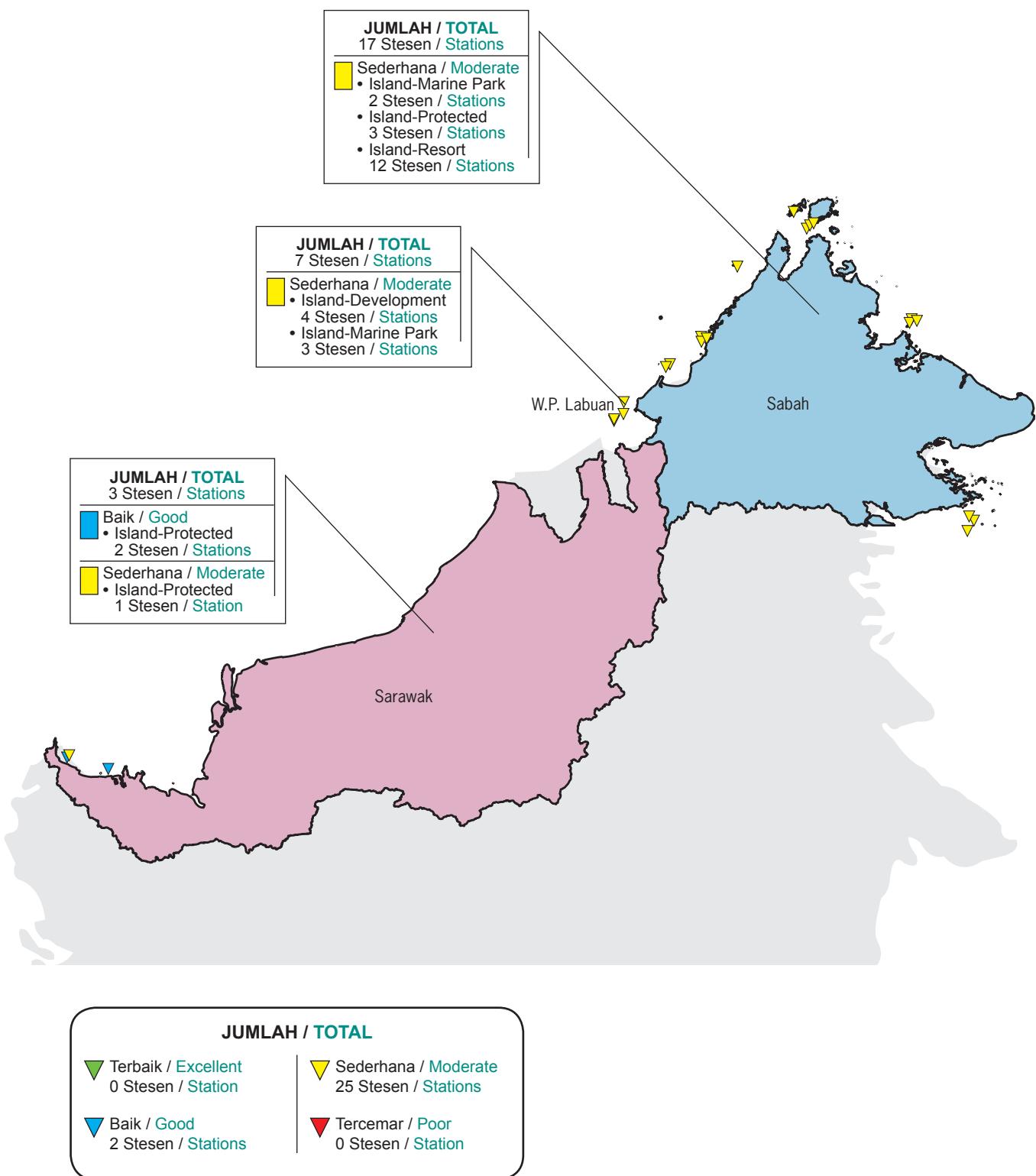


Rajah 4.5: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Muara Sungai di Sabah dan Sarawak  
 Figure 4.5: Marine Water Quality Status based on the Location Monitoring Stations for Estuary at Sabah and Sarawak



Rajah 4.6: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pulau di Semenanjung Malaysia

Figure 4.6: Marine Water Quality Status based on the Location of Island Monitoring Stations in Peninsular Malaysia



Rajah 4.7: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pulau di Sabah, Sarawak dan W.P. Labuan  
 Figure 4.7: Marine Water Quality Status based on the Location of Island Monitoring Stations in Sabah, Sarawak and W.P. Labuan

## STATUS KUALITI AIR MARIN BAGI PANTAI

Sebanyak 188 stesen pantai dipantau pada tahun 2023. Daripada 188 stesen pantai, 106 stesen (56%) dikategorikan sebagai terbaik, 13 stesen (7%) baik, 69 stesen (37%) sederhana manakala tiada stesen dikategorikan sebagai tercemar. Bilangan stesen bagi kategori terbaik telah bertambah daripada 88 stesen tahun lalu kepada 106 stesen tahun ini (**Jadual 4.5**).

## MARINE WATER QUALITY STATUS OF COASTAL AREAS

A total of 188 coastal stations were monitored for water quality in 2023. Of this number, 106 stations (56%) ranked excellent, 13 stations (7%) ranked good, 69 stations (37%) ranked moderate and no station was ranked poor. The number of stations ranked excellent increased from 88 stations last year to 106 stations this year (**Table 4.5**).

**Jadual 4.5: Status Kualiti Air Marin bagi Pantai, 2023**  
**Table 4.5: Marine Water Quality Status of Coastal Area, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kedah	Pantai / Coastal	Pantai Merdeka	MMKC001	79	71	85	88	91	Terbaik / Excellent
		Langkawi Island Resort	MMKC002	90	93	94	94	96	Terbaik / Excellent
		Pantai Kok	MMKC003	92	95	90	83	95	Terbaik / Excellent
		Pantai Kuah	MMKC004	84	89	88	90	91	Terbaik / Excellent
		Pantai Pasir Tengkorak	MMKC005	68	93	96	93	93	Terbaik / Excellent
		Pantai Teluk Burau	MMKC006	83	89	94	86	96	Terbaik / Excellent
		Pantai Teluk Nibong	MMKC007	91	94	86	92	95	Terbaik / Excellent
		Pantai Tengah	MMKC008	92	96	92	92	94	Terbaik / Excellent
		Pantai Beras Basah	MMKC009	92	95	92	96	96	Terbaik / Excellent
P. Pinang	Pantai / Coastal	Gertak Sanggul	MMPC001	58	84	81	83	94	Terbaik / Excellent
		Kawasan Perindustrian Bayan Lepas 1	MMPC002	56	56	72	60	79	Sederhana / Moderate
		Pantai Bersih	MMPC003	58	58	75	86	73	Sederhana / Moderate
		Pantai Miami	MMPC004	69	81	70	86	90	Terbaik / Excellent
		Pantai Pasir Panjang	MMPC005	81	81	93	95	93	Terbaik / Excellent
		Batu Feringgi (Casuarina)	MMPC006	60	58	83	82	93	Terbaik / Excellent
		Luar Pantai Teluk Bahang	MMPC007	57	83	81	88	94	Terbaik / Excellent
		Persiaran Gurney	MMPC008	58	59	60	79	73	Sederhana / Moderate
		Rumah Pam Baru Perai	MMPC009	56	61	68	76	88	Baik / Good
		Rumah Pam Lama Perai	MMPC010	57	60	65	59	67	Sederhana / Moderate
		Selat PP Selatan (Jelutong)	MMPC011	57	55	59	59	59	Sederhana / Moderate
		Tanjung Bungah	MMPC012	57	70	67	72	90	Terbaik / Excellent
		Tanjung Bungah 2	MMPC013	57	69	70	63	69	Sederhana / Moderate
		Batu Maung 2	MMPC014	57	56	69	58	72	Sederhana / Moderate
		Pantai Sungai Batu Ferringhi 3	MMPC015	83	84	86	92	92	Terbaik / Excellent
		Pantai Sungai Batu Ferringhi 2	MMPC016	70	74	90	94	94	Terbaik / Excellent
		Pantai Sungai Batu Ferringhi 1	MMPC017	71	85	91	91	92	Terbaik / Excellent
Perak	Pantai / Coastal	Pantai Pasir Bogak	MMAC001	80	93	95	94	92	Terbaik / Excellent
		Pantai Teluk Dalam	MMAC002	88	89	94	92	93	Terbaik / Excellent
		Pantai Teluk Batik	MMAC003	62	84	78	89	92	Terbaik / Excellent

**Jadual 4.5: Status Kualiti Air Marin bagi Pantai, 2023**  
**Table 4.5: Marine Water Quality Status of Coastal Area, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perak	Pantai / Coastal	Pantai Tanjung Batu	MMAC004	61	83	93	94	93	Terbaik / Excellent
		Pantai Teluk Rubiah	MMAC005	62	92	90	81	88	Baik / Good
		Pantai Damai Laut	MMAC006	70	93	94	91	93	Terbaik / Excellent
		Pantai Teluk Senangin	MMAC007	67	90	90	93	95	Terbaik / Excellent
		Pantai Pasir Panjang	MMAC008	70	94	91	95	94	Terbaik / Excellent
Selangor	Pantai / Coastal	Pantai Bagan Lalang	MMBC001	81	91	84	84	89	Baik / Good
		Pantai Morib	MMBC002	61	68	68	84	88	Baik / Good
		Selat Pulau Babi	MMBC003	73	73	87	91	95	Terbaik / Excellent
		Selat Klang Utara	MMBC004	56	55	62	56	79	Sederhana / Moderate
		Pantai Remis	MMBC005	58	63	83	79	92	Terbaik / Excellent
		Pantai Klanang	MMBC006	58	71	74	69	82	Baik / Good
N. Sembilan	Pantai / Coastal	Bagan Pinang	MMNC001	82	85	91	90	95	Terbaik / Excellent
		Telok Sinting	MMNC002	71	86	87	94	89	Baik / Good
		Port Dickson Bandar	MMNC003	60	74	88	88	93	Terbaik / Excellent
		Port Dickson Batu 4	MMNC004	81	86	88	89	89	Baik / Good
		Port Dickson Batu 5	MMNC005	63	67	73	81	94	Terbaik / Excellent
		Port Dickson Batu 6	MMNC006	77	90	90	93	96	Terbaik / Excellent
		Port Dickson Batu 7	MMNC007	86	92	93	95	94	Terbaik / Excellent
		Port Dickson Batu 8	MMNC008	86	85	93	95	95	Terbaik / Excellent
		Port Dickson Batu 10	MMNC009	84	92	92	97	95	Terbaik / Excellent
		Port Dickson Janakuasa TNB	MMNC010	59	89	70	90	93	Terbaik / Excellent
		Telok Pelanduk	MMNC011	87	83	91	94	92	Terbaik / Excellent
		Pantai Cermin	MMNC012	70	83	94	94	94	Terbaik / Excellent
		Pantai Teluk Kemang	MMNC013	83	94	91	95	95	Terbaik / Excellent
		Pantai Seri Purnama	MMNC014	80	90	92	96	92	Terbaik / Excellent
Melaka	Pantai / Coastal	Pantai Rombang	MMMC001	68	89	88	88	91	Terbaik / Excellent
		Pantai Kundur	MMMC002	77	90	89	83	89	Baik / Good
		Pantai Tanjung Bidara	MMMC003	78	90	69	87	92	Terbaik / Excellent
		Teluk Gong	MMMC004	76	83	60	90	90	Terbaik / Excellent
		Pulau Melaka Point A1	MMMC005	60	91	89	83	88	Baik / Good
		Pulau Melaka Point A2	MMMC006	60	79	80	83	92	Terbaik / Excellent
		Pulau Melaka Point B1	MMMC007	57	58	58	57	54	Sederhana / Moderate
		Pulau Melaka Point B2	MMMC008	57	57	57	57	55	Sederhana / Moderate
		Pantai Klebang	MMMC009	58	78	87	89	88	Baik / Good
Johor	Pantai / Coastal	Tanjung Bin	MMJC001	81	90	90	91	93	Terbaik / Excellent
		Pelabuhan Tanjung Pelepas	MMJC002	67	92	91	82	80	Baik / Good
		Hadapan Jabatan Laut	MMJC003	77	87	82	81	69	Sederhana / Moderate
		Pantai Stulang Laut	MMJC004	49	48	56	55	56	Sederhana / Moderate
		Jeti Teluk Jawa	MMJC005	52	62	70	59	64	Sederhana / Moderate
		Pelabuhan Pasir Gudang	MMJC006	54	57	59	66	58	Sederhana / Moderate
		Hadapan HSAJB	MMJC007	36	49	58	51	56	Sederhana / Moderate

Jadual 4.5: Status Kualiti Air Marin bagi Pantai, 2023

Table 4.5: Marine Water Quality Status of Coastal Area, 2023

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Johor	Pantai / Coastal	Pantai Lido	MMJC008	37	44	54	50	55	Sederhana / Moderate
		Pantai Teluk Mahkota	MMJC009	72	90	93	95	93	Terbaik / Excellent
		Pantai Tanjung Leman	MMJC010	87	83	97	94	96	Terbaik / Excellent
		Pantai Sri Pantai	MMJC011	87	87	91	95	97	Terbaik / Excellent
		Tanjung Merak	MMJC012	60	89	85	89	92	Terbaik / Excellent
		Tanjung Pengelih	MMJC013	77	90	92	88	94	Terbaik / Excellent
		Pantai Tanjong Stapa	MMJC014	86	91	72	77	93	Terbaik / Excellent
		Pantai Teluk Gorek	MMJC015	92	83	93	93	95	Terbaik / Excellent
		Pantai Air Papan	MMJC016	92	95	92	93	95	Terbaik / Excellent
		Jeti Kukup	MMJC017	58	59	62	83	70	Sederhana / Moderate
		Pasir Gogok	MMJC018	74	92	89	89	91	Terbaik / Excellent
		Tanjung Buai	MMJC019	63	75	91	87	89	Baik / Good
		Pantai Desaru	MMJC020	81	95	94	95	96	Terbaik / Excellent
		Tanjung Sepang	MMJC021	87	92	90	93	92	Terbaik / Excellent
		Tanjung Penyusup	MMJC022	62	83	93	93	95	Terbaik / Excellent
		Pantai Sungai Lurus	MMJC023	59	74	88	85	94	Terbaik / Excellent
		Punggur	MMJC024	59	69	90	79	95	Terbaik / Excellent
		Pantai Penyabung	MMJC025	80	82	95	96	94	Terbaik / Excellent
		Tanjung Resang	MMJC026	93	90	92	94	94	Terbaik / Excellent
		Tanjung Balau	MMJC027	84	93	94	94	97	Terbaik / Excellent
		Batu Layar	MMJC028	62	90	92	95	97	Terbaik / Excellent
		Tanjung Sengat	MMJC029	60	72	85	92	83	Baik/Good
Pahang	Pantai / Coastal	Pantai Cherating (Club Med A)	MMCC001	88	91	95	80	96	Terbaik / Excellent
		Pantai Cherating (Club Med B)	MMCC002	85	94	97	87	96	Terbaik / Excellent
		Pantai Cherating (Legend A)	MMCC003	88	96	93	93	96	Terbaik / Excellent
		Pantai Cherating (Legend B)	MMCC004	94	96	95	94	96	Terbaik / Excellent
		Pantai Muhibbah Balok A	MMCC005	59	73	90	93	96	Terbaik / Excellent
		Pantai Muhibbah Balok B	MMCC006	59	67	74	90	92	Terbaik / Excellent
		Pantai Batu Hitam A	MMCC007	75	76	92	93	92	Terbaik / Excellent
		Pantai Batu Hitam B	MMCC008	62	73	84	96	94	Terbaik / Excellent
		Pantai Berserah A	MMCC009	74	76	93	93	93	Terbaik / Excellent
		Pantai Berserah B	MMCC010	80	60	90	90	94	Terbaik / Excellent
		Pantai Teluk Cempedak A	MMCC011	83	84	94	95	95	Terbaik / Excellent
		Pantai Teluk Cempedak B	MMCC012	90	95	93	95	96	Terbaik / Excellent
		Pantai Teluk Gelora A	MMCC013	75	60	72	70	95	Terbaik / Excellent
		Pantai Teluk Gelora B	MMCC014	62	59	59	59	92	Terbaik / Excellent
		Pantai Sepat A	MMCC015	81	92	94	96	96	Terbaik / Excellent
		Pantai Sepat B	MMCC016	88	92	95	95	94	Terbaik / Excellent
		Pantai Legenda A	MMCC017	93	97	92	95	96	Terbaik / Excellent
		Pantai Legenda B	MMCC018	92	96	92	95	97	Terbaik / Excellent
		Pantai Kuala Api-Api	MMCC019	58	85	94	95	96	Terbaik / Excellent

**Jadual 4.5: Status Kualiti Air Marin bagi Pantai, 2023**  
**Table 4.5: Marine Water Quality Status of Coastal Area, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Pahang	Pantai / Coastal	Pantai Tanjung Batu	MMCC020	72	85	94	92	96	Terbaik / Excellent
		Pantai Chendor	MMCC021	84	87	92	84	95	Terbaik / Excellent
		Pantai Lanjut	MMCC022	86	85	94	91	95	Terbaik / Excellent
Terengganu	Pantai / Coastal	Pantai Batu Buruk	MMTC001	59	93	88	95	91	Terbaik / Excellent
		Pantai Bukit Keluang	MMTC002	86	95	96	95	96	Terbaik / Excellent
		Pantai Chendering	MMTC003	69	93	95	95	97	Terbaik / Excellent
		Pantai Rantau Abang	MMTC004	85	95	96	97	97	Terbaik / Excellent
		KIPC Utara	MMTC005	92	78	95	94	96	Terbaik / Excellent
		KIPC Tengah	MMTC006	90	88	94	94	96	Terbaik / Excellent
		KIPC Selatan	MMTC007	94	88	95	95	96	Terbaik / Excellent
		Pantai Rhu 10	MMTC008	89	95	97	90	97	Terbaik / Excellent
		Pantai Tok Jembal	MMTC009	95	96	95	96	97	Terbaik / Excellent
		Pantai Kelulut	MMTC010	95	93	96	97	97	Terbaik / Excellent
		Pantai Teluk Ketapang	MMTC011	80	95	96	96	97	Terbaik / Excellent
		Pantai Kuala Abang	MMTC012	88	94	95	97	97	Terbaik / Excellent
		Pantai Teluk Kalong	MMTC013	94	94	95	97	96	Terbaik / Excellent
		Pantai Sura	MMTC014	89	94	94	96	97	Terbaik / Excellent
		Pantai Tanjung Bidara	MMTC015	93	93	94	97	97	Terbaik / Excellent
		Pantai Kemasik	MMTC016	86	90	97	97	96	Terbaik / Excellent
Kelantan	Pantai / Coastal	Pantai Seri Tujuh	MMDC001	88	84	93	94	95	Terbaik / Excellent
		Pantai Cahaya Bulan	MMDC002	87	92	95	95	96	Terbaik / Excellent
		Pantai Sabak	MMDC003	88	89	95	95	96	Terbaik / Excellent
		Pantai Irama Bachok	MMDC004	89	66	95	93	95	Terbaik / Excellent
		Pantai Bisikan Bayu	MMDC005	95	83	95	94	96	Terbaik / Excellent
		Pantai Melawi	MMDC006	85	83	95	95	95	Terbaik / Excellent
Sarawak	Pantai / Coastal	Pantai Sematan	MMQC001	91	72	93	90	66	Sederhana / Moderate
		Pantai Pandan	MMQC002	91	75	92	86	62	Sederhana / Moderate
		Pantai Pasir Putih	MMQC003	91	80	84	85	76	Sederhana / Moderate
		Pantai Bako	MMQC004	91	85	89	91	70	Sederhana / Moderate
		Pantai Damai	MMQC005	91	68	86	89	75	Sederhana / Moderate
		Pantai Tanjung Kembang	MMQC006	88	86	77	90	58	Sederhana / Moderate
		Pantai Harmoni Mukah	MMQC007	89	60	67	73	76	Sederhana / Moderate
		Pantai Tanjung Batu	MMQC008	88	56	81	74	58	Sederhana / Moderate
		Pantai Likau	MMQC009	87	62	88	66	58	Sederhana / Moderate
		Pantai Emas	MMQC010	90	62	75	66	58	Sederhana / Moderate
		Pantai Piasau	MMQC011	87	70	85	74	72	Sederhana / Moderate
		Pantai Brighton	MMQC012	80	79	75	56	61	Sederhana / Moderate
		Pantai Esplaned	MMQC013	88	70	83	56	57	Sederhana / Moderate
		Pantai Beraya	MMQC014	90	65	83	57	58	Sederhana / Moderate
		Pantai Bungai	MMQC015	88	68	75	66	56	Sederhana / Moderate

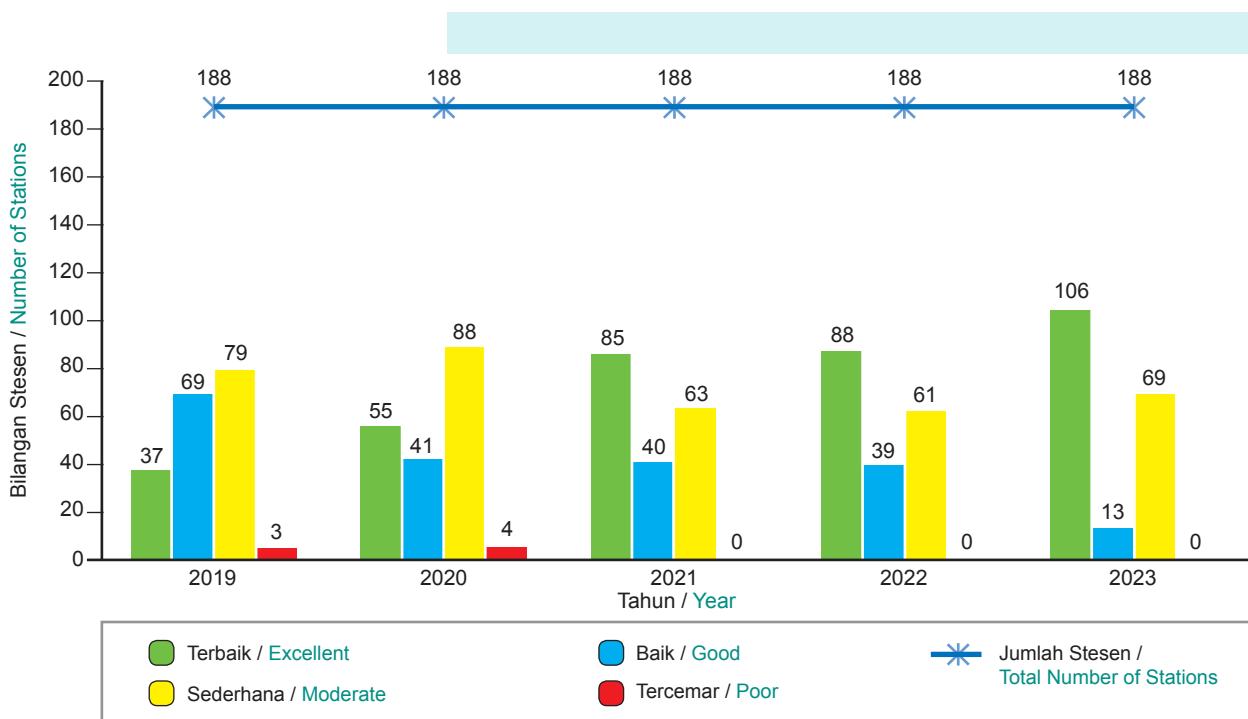
**Jadual 4.5: Status Kualiti Air Marin bagi Pantai, 2023**  
**Table 4.5: Marine Water Quality Status of Coastal Area, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Sarawak	Pantai / Coastal	Pantai Belawai	MMQC016	90	66	67	92	64	Sederhana / Moderate
		Pantai Mukah	MMQC017	87	49	89	89	76	Sederhana / Moderate
		Tanjung Kidurong	MMQC018	87	63	80	90	58	Sederhana / Moderate
		Pasir Pandak	MMQC019	90	74	91	91	66	Sederhana / Moderate
		Rambungan	MMQC020	89	69	93	83	71	Sederhana / Moderate
		Sri Tanjung Lawas	MMQC021	78	71	68	67	59	Sederhana / Moderate
		Pantai Luak	MMQC022	88	77	84	56	57	Sederhana / Moderate
		Pasir Panjang	MMQC023	91	55	86	78	58	Sederhana / Moderate
Sabah	Pantai / Coastal	Pantai Teluk Brunei 1	MMSC001	85	67	73	61	60	Sederhana / Moderate
		Pantai Teluk Brunei 2	MMSC002	94	69	84	67	59	Sederhana / Moderate
		Pantai Teluk Brunei 3	MMSC003	81	62	75	67	59	Sederhana / Moderate
		Pantai Teluk Brunei 4	MMSC004	78	72	84	60	59	Sederhana / Moderate
		Pantai Teluk Brunei 5	MMSC005	88	64	69	59	59	Sederhana / Moderate
		Pantai Teluk Brunei 6	MMSC006	94	67	58	59	59	Sederhana / Moderate
		Borneo Golf Seawater	MMSC007	88	72	59	67	59	Sederhana / Moderate
		Pantai Manis Papar	MMSC008	92	60	59	60	62	Sederhana / Moderate
		Pantai Melinsung	MMSC009	90	67	70	59	65	Sederhana / Moderate
		Pantai Tanjung Aru (Roll Skating)	MMSC010	92	67	65	57	58	Sederhana / Moderate
		Pantai Tanjung Aru (No. 3)	MMSC011	88	64	76	57	59	Sederhana / Moderate
		Pantai Lok Kawi	MMSC012	87	72	65	58	59	Sederhana / Moderate
		Pantai Dalit Tuaran	MMSC013	88	78	58	58	59	Sederhana / Moderate
		Mangrove Paradise	MMSC014	87	73	58	58	61	Sederhana / Moderate
		Pantai Sabandar	MMSC015	95	75	58	58	59	Sederhana / Moderate
		Pantai Bak-Bak Kudat	MMSC016	85	62	76	85	59	Sederhana / Moderate
		Pasir Putih Sandakan	MMSC017	84	63	83	82	58	Sederhana / Moderate
		Pantai TLDM	MMSC018	67	72	75	62	59	Sederhana / Moderate
		Pantai Batu Sapi	MMSC019	93	61	76	75	58	Sederhana / Moderate
		Pantai Ulu Tungku	MMSC020	70	66	57	58	59	Sederhana / Moderate
		Pantai Sarina Kunak	MMSC021	84	74	58	58	59	Sederhana / Moderate
		Pantai Kg. Lamak	MMSC022	79	64	57	61	59	Sederhana / Moderate
		Pantai Tinagat	MMSC023	78	58	58	68	58	Sederhana / Moderate
		Pantai Tanjung Aru (Rest Lido)	MMSC024	79	63	69	58	59	Sederhana / Moderate
Labuan	Pantai / Coastal	Pulau Papan	MMLC001	68	62	59	58	59	Sederhana / Moderate
		Kiamsam	MMLC002	64	68	58	58	59	Sederhana / Moderate
		Sungai Pagar	MMLC003	83	61	58	59	59	Sederhana / Moderate
		Layang-Layangan	MMLC004	82	69	57	58	59	Sederhana / Moderate
		Tanjung Aru	MMLC005	59	58	59	60	59	Sederhana / Moderate

Nota / Notes

<span style="background-color: #6aa84f; width: 15px; height: 15px; display: inline-block;"></span> Terbaik / Excellent	<span style="background-color: #3498db; width: 15px; height: 15px; display: inline-block;"></span> Baik / Good	<span style="background-color: #ffd700; width: 15px; height: 15px; display: inline-block;"></span> Sederhana / Moderate	<span style="background-color: #e74c3c; width: 15px; height: 15px; display: inline-block;"></span> Tercemar / Poor
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**Rajah 4.8** menunjukkan bilangan stesen MMWQM mengikut status kualiti air marin bagi kawasan pesisir pantai bagi tahun 2019 hingga 2023. Bilangan stesen terbaik meningkat daripada 88 stesen pada tahun 2022 kepada 106 stesen pada tahun 2023. Walau bagaimanapun, stesen dengan status kualiti air baik menurun daripada 39 stesen pada tahun 2022 kepada 13 stesen pada tahun 2023. Tiada stesen tercemar yang direkodkan pada tahun 2023.



Rajah 4.8: Tren Status Kualiti Air Marin bagi Kawasan Pantai, 2019-2023

Figure 4.8: The Marine Water Quality Status Trend for Coastal Area, 2019-2023

#### STATUS KUALITI AIR MARIN BAGI MUARA SUNGAI

Status kualiti air marin bagi sebanyak 85 stesen muara sungai telah dipantau pada tahun 2023. Daripada 85 stesen yang dipantau tahun ini, kualiti air marin bagi enam (6) stesen (7%) telah dikategorikan sebagai terbaik, 10 stesen (12%) baik, 68 stesen (80%) dikategorikan sebagai sederhana manakala terdapat satu (1) stesen (1%) dikategorikan sebagai tercemar. Bilangan stesen mengikut status kualiti air marin adalah lebih kurang sama seperti tahun lalu. Bilangan stesen yang disenaraikan sebagai tercemar telah berkurang daripada tiga (3) stesen tahun lalu, kepada satu (1) stesen tahun ini (**Jadual 4.6**).

**Figure 4.8** shows the number of MMWQM stations based on the marine water quality status in the coastal environment from 2019 to 2023. The number of stations ranked as excellent increased from 88 stations in 2022 to 106 stations in 2023. Nevertheless, the number of stations that ranked as good, decreased from 39 stations in 2022 to 13 stations in 2023. No station was ranked as poor in 2023.

#### MARINE WATER QUALITY STATUS OF ESTUARY

The marine water quality status of a total of 85 estuary stations was monitored in 2023. Out of the 85 stations surveyed this year, the marine water quality of six (6) stations (7%) were ranked as excellent, 10 stations (12%) ranked as good, 68 stations (80%) were ranked as moderate, while there was one (1) station (1%) ranked as poor. The number of stations based on the marine water quality status was more or less similar to last year. The number of stations that were listed as polluted was reduced from three (3) last year, down to one (1) station this year (**Table 4.6**).

**Jadual 4.6: Status Kualiti Air Marin bagi Muara Sungai**  
**Table 4.6: Marine Water Quality Status of Estuary**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Perlis	Muara Sungai / Estuary	Kuala Sungai Perlis	MMRE001	50	56	57	57	55	Sederhana / Moderate
		Kuala Sungai Baru	MMRE002	58	54	57	57	56	Sederhana / Moderate
Kedah	Muara Sungai / Estuary	Kuala Kedah	MMKE001	53	53	57	56	54	Sederhana / Moderate
		Kuala Jerlun	MMKE002	50	57	55	54	56	Sederhana / Moderate
		Kuala Segantang Garam	MMKE003	57	70	69	72	58	Sederhana / Moderate
		Kuala Sungai Muda	MMKE004	62	58	56	57	56	Sederhana / Moderate
P. Pinang	Muara Sungai / Estuary	Kuala Sungai Jawi	MMPE001	46	38	43	52	72	Sederhana / Moderate
		Kuala Sungai Juru	MMPE002	51	30	42	53	55	Sederhana / Moderate
		Kuala Sungai Kerian	MMPE003	52	54	56	73	55	Sederhana / Moderate
		Kuala Sungai Pinang	MMPE004	52	53	52	54	48	Tercemar / Poor
		Kuala Sungai Perai	MMPE005	53	43	55	55	56	Sederhana / Moderate
		Kuala Sungai Tengah	MMPE006	52	52	57	81	87	Baik / Good
		Kuala Sungai Pinang (Balik Pulau)	MMPE007	50	48	56	58	72	Sederhana / Moderate
Perak	Muara Sungai / Estuary	Kuala Sungai Manjung	MMAE001	71	75	73	85	89	Baik / Good
		Kuala Sungai Gula	MMAE002	55	53	54	79	57	Sederhana / Moderate
		Kuala Sungai Kurau	MMAE003	54	53	54	64	56	Sederhana / Moderate
		Kuala Sungai Tanjung Piandang	MMAE004	51	38	45	50	51	Sederhana / Moderate
		Kuala Sungai Sepetang	MMAE005	46	48	55	53	53	Sederhana / Moderate
		Kuala Sungai Perak	MMAE006	53	58	55	75	62	Sederhana / Moderate
Selangor	Muara Sungai / Estuary	Kuala Sungai Sepang	MMBE001	60	57	66	72	83	Baik / Good
		Kuala Sungai Sepang (Kecil)	MMBE002	61	88	80	58	82	Baik / Good
		Kuala Sungai Sepang (Kawalan)	MMBE003	70	88	81	91	90	Terbaik / Excellent
		Kuala Sungai Langat (Jugra)	MMBE004	50	44	54	58	63	Sederhana / Moderate
		Kuala Sungai Klang	MMBE005	38	35	40	43	51	Sederhana / Moderate
		Kuala Sungai Langat (Lumut)	MMBE006	49	45	54	55	60	Sederhana / Moderate
		Kuala Sungai Buloh	MMBE007	44	58	57	56	64	Sederhana / Moderate
		Kuala Sungai Selangor	MMBE008	45	45	43	51	55	Sederhana / Moderate
		Kuala Sungai Tengi	MMBE009	49	43	51	48	56	Sederhana / Moderate
		Kuala Sungai Bernam	MMBE010	52	55	55	61	54	Sederhana / Moderate

**Jadual 4.6: Status Kualiti Air Marin bagi Muara Sungai**  
**Table 4.6: Marine Water Quality Status of Estuary**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
N. Sembilan	Muara Sungai / Estuary	Kuala Sungai Linggi	MMNE001	52	64	68	55	68	Sederhana / Moderate
		Kuala Sungai Lukut	MMNE002	52	52	56	53	55	Sederhana / Moderate
Melaka	Muara Sungai / Estuary	Kuala Sungai Melaka	MMME001	55	56	60	63	56	Sederhana / Moderate
		Kuala Sungai Sri Melaka	MMME002	45	53	50	54	53	Sederhana / Moderate
		Kuala Sungai Merlimau	MMME003	52	55	58	57	53	Sederhana / Moderate
		Kuala Sungai Kesang	MMME004	54	85	74	57	57	Sederhana / Moderate
		Kuala Sungai Sebatu	MMME005	56	63	63	75	57	Sederhana / Moderate
		Kuala Sungai Melaka 2	MMME006	52	54	56	54	55	Sederhana / Moderate
		Kuala Sungai Baru	MMME007	55	56	57	64	54	Sederhana / Moderate
		Kuala Sungai Lereh	MMME008	55	57	55	56	53	Sederhana / Moderate
Johor	Muara Sungai / Estuary	Kuala Sungai Segget	MMJE001	33	41	51	46	51	Sederhana / Moderate
		Kuala Sungai Laloh	MMJE002	39	42	55	54	52	Sederhana / Moderate
		Kuala Sungai Johor	MMJE003	72	88	92	92	81	Baik / Good
		Kuala Sungai Batu Pahat	MMJE004	57	67	58	57	57	Sederhana / Moderate
		Kuala Sungai Muar	MMJE005	55	57	57	55	56	Sederhana / Moderate
		Kuala Sungai Mersing	MMJE006	59	62	59	59	78	Sederhana / Moderate
Pahang	Muara Sungai / Estuary	Kuala Kuantan	MMCE001	56	59	58	58	58	Sederhana / Moderate
		Kuala Rompin Kecil	MMCE002	69	79	72	79	90	Terbaik / Excellent
		Kuala Pahang	MMCE003	59	59	57	59	81	Baik / Good
		Kuala Nenasi	MMCE004	63	93	85	91	89	Baik / Good
		Kuala Sungai Balok	MMCE005	57	59	55	65	54	Sederhana / Moderate
Terengganu	Muara Sungai / Estuary	Kuala Sungai Besut	MMTE001	58	59	74	70	60	Sederhana / Moderate
		Kuala Sungai Dungun	MMTE002	59	60	69	59	85	Baik / Good
		Kuala Sungai Ibai	MMTE003	85	77	90	87	73	Sederhana / Moderate
		Kuala Sungai Kerteh	MMTE004	59	73	58	75	75	Sederhana / Moderate
		Kuala Sungai Marang	MMTE005	67	71	84	84	79	Sederhana / Moderate
		Kuala Sungai Paka	MMTE006	58	73	65	87	83	Baik / Good
		Kuala Sungai Setiu	MMTE007	86	64	92	75	92	Terbaik / Excellent
		Kuala Sungai Terengganu	MMTE008	59	59	66	59	69	Sederhana / Moderate

**Jadual 4.6: Status Kualiti Air Marin bagi Muara Sungai**  
**Table 4.6: Marine Water Quality Status of Estuary**

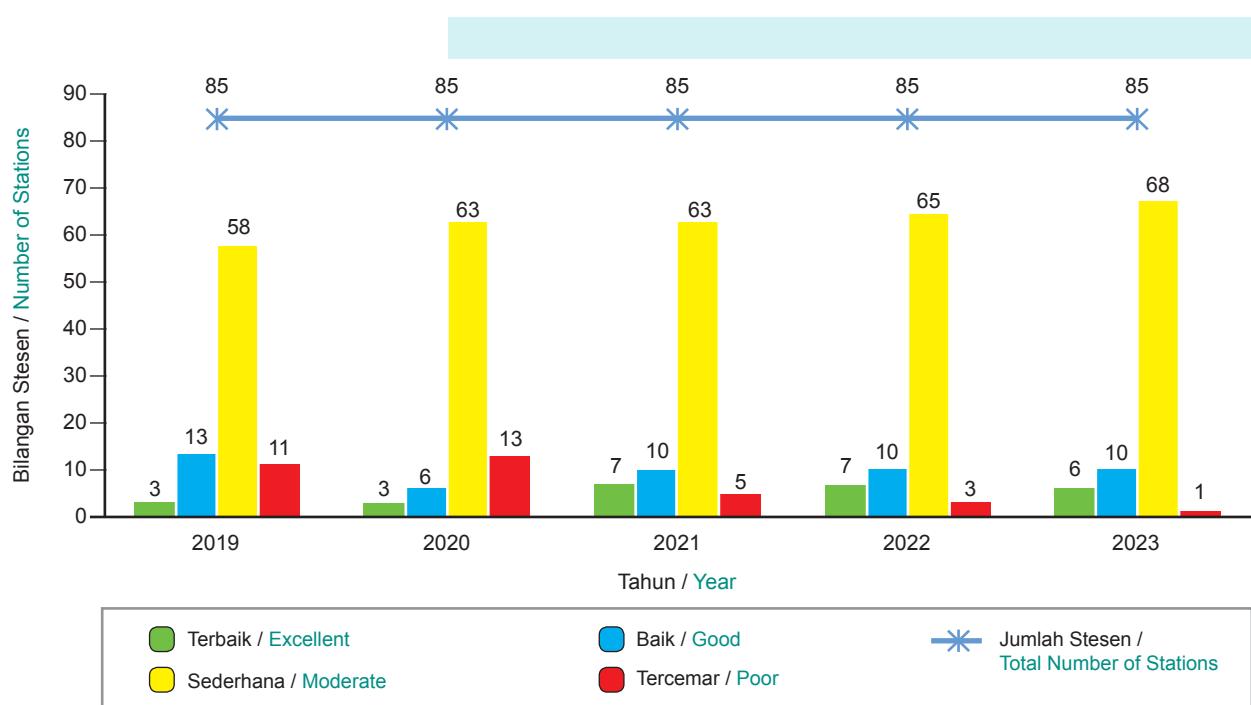
NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Terengganu	Muara Sungai / Estuary	Kuala Sungai Kemaman/Chukai	MMTE009	59	60	58	59	60	Sederhana / Moderate
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	MMTE010	95	94	94	97	95	Terbaik / Excellent
		Tioxide Tengah (Pupuk Semangat, Kijal)	MMTE011	94	87	93	96	95	Terbaik / Excellent
		Tioxide Selatan (KSB, T. Kalong)	MMTE012	85	94	86	95	95	Terbaik / Excellent
		Pulau Duyung	MMTE013	58	59	59	60	59	Sederhana / Moderate
Kelantan	Muara Sungai / Estuary	Kuala Sungai Golok	MMDE001	58	59	79	65	74	Sederhana / Moderate
		Kuala Sungai Kelantan	MMDE002	55	58	70	57	66	Sederhana / Moderate
		Kuala Sungai Pengkalan Chepa	MMDE003	53	56	64	59	61	Sederhana / Moderate
		Kuala Sungai Pengkalan Datu	MMDE004	68	59	59	69	59	Sederhana / Moderate
		Kuala Sungai Kemasin	MMDE005	39	56	59	58	63	Sederhana / Moderate
		Kuala Sungai Semerak	MMDE006	69	59	85	60	83	Baik / Good
Sarawak	Muara Sungai / Estuary	Kuala Sungai Semantan	MMQE001	91	65	90	70	71	Sederhana / Moderate
		Kuala Sungai Sarawak	MMQE002	86	64	85	82	71	Sederhana / Moderate
		Kuala Sungai Bako	MMQE003	63	56	79	88	70	Sederhana / Moderate
		Kuala Sungai Santubong	MMQE004	87	76	90	90	64	Sederhana / Moderate
		Kuala Batang Krian (Kabong)	MMQE005	80	83	71	87	58	Sederhana / Moderate
		Kuala Batang Rejang	MMQE006	89	66	85	82	59	Sederhana / Moderate
		Kuala Mukah	MMQE007	76	50	62	70	58	Sederhana / Moderate
		Kuala Batang Kemenan	MMQE008	83	53	58	55	58	Sederhana / Moderate
		Kuala Tanjung Similajau	MMQE009	84	55	85	67	59	Sederhana / Moderate
		Kuala Sungai Panipah	MMQE010	87	55	83	64	58	Sederhana / Moderate
		Kuala Pantai Nyalau	MMQE011	83	58	71	84	61	Sederhana / Moderate
		Kuala Sungai Baram	MMQE012	74	57	76	55	61	Sederhana / Moderate
		Kuala Sungai Miri	MMQE013	74	68	63	54	64	Sederhana / Moderate
		Kuala Sungai Trusan	MMQE014	80	54	64	56	58	Sederhana / Moderate
Sabah	Muara Sungai / Estuary	Kuala Penyu	MMSE001	83	63	58	66	65	Sederhana / Moderate
		Muara Sungai Inanam	MMSE002	75	57	59	58	59	Sederhana / Moderate

Nota / Notes

<span style="background-color: #6aa84f; border: 1px solid black; padding: 2px 5px;"></span> Terbaik / Excellent	<span style="background-color: #007bff; border: 1px solid black; padding: 2px 5px;"></span> Baik / Good	<span style="background-color: #ffd700; border: 1px solid black; padding: 2px 5px;"></span> Sederhana / Moderate	<span style="background-color: #dc3545; border: 1px solid black; padding: 2px 5px;"></span> Tercemar / Poor
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**Rajah 4.9** menunjukkan tren status kualiti air marin bagi stesen muara sungai mengikut bilangan stesen pengawasan. Bilangan stesen mengikut kategori status kualiti air marin pada tahun 2023 adalah lebih kurang sama seperti tahun 2022 iaitu enam (6) stesen terbaik, 10 stesen baik, 68 stesen sederhana dan satu (1) stesen tercemar pada tahun 2023. Bilangan stesen tercemar telah menurun daripada tiga (3) stesen pada tahun 2022 kepada satu (1) stesen pada tahun 2023. Bilangan stesen tercemar telah menunjukkan tren menurun selepas tahun 2020 di mana SKAMM yang lebih ketat telah diperkenalkan pada tahun tersebut.

**Figure 4.9** displays the trend of the marine water quality status trend for estuaries based on the number of monitoring stations. The number based on the marine water quality status was not very different to that of 2022 with six (6) excellent stations, 10 good stations, 68 moderate stations and, one (1) poor station in 2023. The number of stations ranked poor reduced from three (3) in 2022, to one (1) station in 2023. The number of poor water quality stations shows a declining trend after 2020. The revised MMWQS, which was more stringent was implemented in the same year.



Rajah 4.9: Tren Status Kualiti Air Marin bagi Muara Sungai, 2019-2023

Figure 4.9: The Marine Water Quality Status Trend for Estuary, 2019-2023

#### STATUS KUALITI AIR MARIN BAGI PULAU

Sebanyak 95 stesen pengawasan kualiti air marin bagi pulau dibangunkan yang meliputi 79 pulau yang telah dipantau pada tahun 2023. **Jadual 4.7** menunjukkan senarai stesen pengawasan kualiti air marin bagi pulau. Daripada 95 stesen pengawasan, 61 stesen (64%) dikategorikan sebagai terbaik, empat (4) stesen (4%) baik, 30 stesen (32%) sederhana. Tiada stesen yang kualiti airnya dikategorikan sebagai tercemar pada tahun 2023 (**Jadual 4.8**).

#### MARINE WATER QUALITY STATUS OF ISLANDS

A total of 95 island water quality monitoring stations were established for the surrounding 79 islands that were monitored in the year 2023. **Table 4.7** shows the list of marine water quality monitoring stations for islands. Out of the 95 monitoring stations, 61 stations (64%) ranked excellent, four (4) stations (4%) ranked good, the remaining 30 stations (32%) were ranked moderate. No station was ranked poor marine water quality in 2023 (**Table 4.8**).

**Jadual 4.7: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2023****Table 4.7: Marine Water Quality Monitoring Stations for Island, 2023**

NEGERI / STATE	BIL. PULAU / NO. OF ISLAND	BIL. STESEN / NO. OF STATION	PULAU / ISLAND	ID STESEN LAMA / OLD STATION ID	ID STESEN BARU / NEW STATION ID	KATEGORI / CATEGORY
Kedah	11	1	Singa Besar	7KR01	MMKR001	PERANGINAN / RESORT
		2	Dayang Bunting	7KR02	MMKR002	PERANGINAN / RESORT
			Dayang Bunting 2*	NA	MMKR003	PERANGINAN / RESORT
		1	Pulau Perak	7KP01	MMKP004	DILINDUNGI / PROTECTED
		1	Payar	7KM03	MMKM001	TAMAN LAUT / MARINE PARK
		1	Kaca	7KM04	MMKM002	TAMAN LAUT / MARINE PARK
		1	Segantang	7KM06	MMKM003	TAMAN LAUT / MARINE PARK
		4	Pantai Kuah	7KD07	MMKD001	PEMBANGUNAN / DEVELOPMENT
			Pantai Chenang	7KD09	MMKD002	PEMBANGUNAN / DEVELOPMENT
			Tanjung Rhu	7KD010	MMKD003	PEMBANGUNAN / DEVELOPMENT
			Teluk Ewa	7KD08	MMKD004	PEMBANGUNAN / DEVELOPMENT
		1	Lembu**	7KM05	NA	TAMAN LAUT / MARINE PARK
		1	Pasir*	NA	MMKP001	DILINDUNGI / PROTECTED
		1	Gasing*	NA	MMKP002	DILINDUNGI / PROTECTED
		1	Dangli*	NA	MMKP003	DILINDUNGI / PROTECTED
P. Pinang	7	1	Tanjung Tokong*	NA	MMPP001	DILINDUNGI / PROTECTED
		3	Batu Maung	7PD01	MMPD001	PEMBANGUNAN / DEVELOPMENT
			Padang Kota	7PD04	MMPD002	PEMBANGUNAN / DEVELOPMENT
			Teluk Bahang	7PD03	MMPD003	PEMBANGUNAN / DEVELOPMENT
		1	Aman	7PR05	MMPR001	PERANGINAN / RESORT
		1	Jerejak	7PR06	MMPR002	PERANGINAN / RESORT
		1	Kendi	7PR07	MMPR003	PERANGINAN / RESORT
		1	Rimau	7PR08	MMPR004	PERANGINAN / RESORT
		1	Gedong	7PR09	MMPR005	PERANGINAN / RESORT
Perak	4	2	Pantai Teluk Gedong	7AR01	MMAR001	PERANGINAN / RESORT
			Pantai Puteri Dewi	7AR02	MMAR002	PERANGINAN / RESORT
		1	Pangkor Laut	7AR03	MMAR003	PERANGINAN / RESORT
		1	Sembilan	7AR04	MMAR004	PERANGINAN / RESORT
		1	Tukun Perak	7AP05	MMAP001	DILINDUNGI / PROTECTED
Selangor	3	1	Ketam	7BR01	MMBR001	PERANGINAN / RESORT
		1	Angsa	7BR02	MMBR002	PERANGINAN / RESORT
		1	Lumut	7BR03	MMBR003	PERANGINAN / RESORT
N. Sembilan	1	1	Arang	7NP01	MMNP001	DILINDUNGI / PROTECTED

**Jadual 4.7: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2023****Table 4.7: Marine Water Quality Monitoring Stations for Island, 2023**

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
Melaka	3	2	Upah (Point A)	7MR02	MMMR001	PERANGINAN / RESORT
			Upah (Point B)	7MR02	MMMR002	PERANGINAN / RESORT
		2	Besar (Point A)	7MR01	MMMR003	PERANGINAN / RESORT
			Besar (Point B)	7MR01	MMMR004	PERANGINAN / RESORT
		2	Undan (Point A)	7MR03	MMMR005	PERANGINAN / RESORT
			Undan (Point B)	7MR03	MMMR006	PERANGINAN / RESORT
Johor	8	1	Setindan	7JR01	MMJR001	PERANGINAN / RESORT
		1	Babi Tengah	7JR02	MMJR002	PERANGINAN / RESORT
		1	Dayang	7JM03	MMJM001	TAMAN LAUT / MARINE PARK
		1	Nanga Besar	7JM08	MMJM002	TAMAN LAUT / MARINE PARK
		1	Sibu Tengah	7JM11	MMJM003	TAMAN LAUT / MARINE PARK
		1	Pemanggil	7JM15	MMJM004	TAMAN LAUT / MARINE PARK
		1	Kukup	7JP17	MMJP001	DILINDUNGI / PROTECTED
		1	Pisang	7JP18	MMJP002	DILINDUNGI / PROTECTED
Pahang	9	1	Pulau Tioman (Kg. Genting)	7CM02	MMCM001	TAMAN LAUT / MARINE PARK
		1	Pulau Tioman (Teluk Salang)	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

Jadual 4.7: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2023

Table 4.7: Marine Water Quality Monitoring Stations for Island, 2023

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
Kelantan	2	1	Panjang	7DP01	MMDP001	DILINDUNGI / PROTECTED
		1	Kundur	7DP02	MMDP002	DILINDUNGI / PROTECTED
Sarawak	3	1	Satang	7QP01	MMQP001	DILINDUNGI / PROTECTED
		1	Talang-Talang Kecil	7QP02	MMQP002	DILINDUNGI / PROTECTED
		1	Talang-Talang Besar	7QP03	MMQP003	DILINDUNGI / PROTECTED
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	MMSP001	TAMAN LAUT / MARINE PARK
		1	Kalampunian Besar	7SM11	MMSP002	TAMAN LAUT / MARINE PARK
		1	Selingan	7SP17	MMSP001	DILINDUNGI / PROTECTED
		1	Gulisan	7SP18	MMSP002	DILINDUNGI / PROTECTED
		1	Bakungan Kecil	7SP19	MMSP003	DILINDUNGI / PROTECTED
Labuan	4	1	Kuraman	7LM05	MMLM001	TAMAN LAUT / MARINE PARK
		1	Rusukan Besar	7LM07	MMLM002	TAMAN LAUT / MARINE PARK
		1	Rusukan Kecil	7LM06	MMLM003	TAMAN LAUT / MARINE PARK
		4	Pohon Batu	7LD01	MMLD001	PEMBANGUNAN / DEVELOPMENT
			Water Front	7LD02	MMLD002	PEMBANGUNAN / DEVELOPMENT
			Lubuk Temiang	7LD03	MMLD003	PEMBANGUNAN / DEVELOPMENT
			Ranca-Ranca	7LD04	MMLD004	PEMBANGUNAN / DEVELOPMENT

Nota / Notes:

\* (Stesen baru / New station)

\*\* (Stesen tutup / Closed station)

NA (Tidak berkenaan / Not available)

**Jadual 4.8: Status Kualiti Air Marin bagi Pulau, 2023**  
**Table 4.8: Marine Water Quality Status of Island, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kedah	Pulau / Island	Pantai Kuah	MMKD001	85	92	93	91	96	Terbaik / Excellent
		Pantai Chenang	MMKD002	73	93	91	89	94	Terbaik / Excellent
		Tanjung Rhu	MMKD003	91	93	91	91	96	Terbaik / Excellent
		Teluk Ewa	MMKD004	95	94	92	96	88	Baik / Good
		Payar	MMKM001	92	96	95	96	96	Terbaik / Excellent
		Kaca	MMKM002	86	95	95	94	97	Terbaik / Excellent
		Segantang	MMKM003	83	95	96	96	97	Terbaik / Excellent
		Pasir	MMKP001	94	96	96	96	96	Terbaik / Excellent
		Gasing	MMKP002	94	95	92	97	96	Terbaik / Excellent
		Dangli	MMKP003	95	95	91	97	96	Terbaik / Excellent
		Singa Besar	MMKR001	84	92	88	90	96	Terbaik / Excellent
		Dayang Bunting	MMKR002	90	87	95	91	96	Terbaik / Excellent
		Dayang Bunting 2	MMKR003	84	94	92	94	96	Terbaik / Excellent
		Pulau Perak	MMKP004	93	89	92	96	96	Terbaik / Excellent
P. Pinang	Pulau / Island	Batu Maung	MMPD001	55	57	57	59	67	Sederhana / Moderate
		Padang Kota	MMPD002	58	67	60	81	75	Sederhana / Moderate
		Teluk Bahang	MMPD003	59	85	83	87	94	Terbaik / Excellent
		Tanjung Tokong	MMPP001	57	71	68	83	88	Baik / Good
		Aman	MMPR001	60	72	72	92	91	Terbaik / Excellent
		Jerejak	MMPR002	57	58	76	59	73	Sederhana / Moderate
		Kendi	MMPR003	77	93	92	85	96	Terbaik / Excellent
		Rimau	MMPR004	85	90	92	93	96	Terbaik / Excellent
		Gedong	MMPR005	56	84	82	91	91	Terbaik / Excellent
Perak	Pulau / Island	Tukun Perak	MMAP001	88	93	96	96	92	Terbaik / Excellent
		Pantai Teluk Gedong	MMAR001	69	79	88	84	91	Terbaik / Excellent
		Pantai Puteri Dewi	MMAR002	90	95	95	94	94	Terbaik / Excellent
		Pangkor Laut	MMAR003	86	93	96	95	95	Terbaik / Excellent
		Sembilan	MMAR004	82	91	94	96	93	Terbaik / Excellent
Selangor	Pulau / Island	Ketam	MMBR001	57	68	72	85	94	Terbaik / Excellent
		Angsa	MMBR002	71	59	89	83	95	Terbaik / Excellent
		Lumut	MMBR003	47	46	50	47	53	Sederhana / Moderate
N. Sembilan	Pulau / Island	Arang	MMNP001	81	92	94	92	94	Terbaik / Excellent
Melaka	Pulau / Island	Upeh (Point A)	MMMR001	59	87	77	77	94	Terbaik / Excellent

**Jadual 4.8: Status Kualiti Air Marin bagi Pulau, 2023**  
**Table 4.8: Marine Water Quality Status of Island, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Melaka	Pulau / Island	Upah (Point B)	MMMR002	70	80	87	85	94	Terbaik / Excellent
		Besar (Point A)	MMMR003	84	95	96	95	95	Terbaik / Excellent
		Besar (Point B)	MMMR004	71	95	94	94	95	Terbaik / Excellent
		Undan (Point A)	MMMR005	83	96	96	94	95	Terbaik / Excellent
		Undan (Point B)	MMMR006	91	96	95	94	94	Terbaik / Excellent
Johor	Pulau / Island	Dayang	MMJM001	88	94	95	93	97	Terbaik / Excellent
		Nanga Besar	MMJM002	70	78	78	94	97	Terbaik / Excellent
		Sibu Tengah	MMJM003	86	86	96	96	97	Terbaik / Excellent
		Pemanggil	MMJM004	91	95	94	95	96	Terbaik / Excellent
		Kukup	MMJP001	58	62	70	89	73	Sederhana / Moderate
		Pisang	MMJP002	58	94	86	90	92	Terbaik / Excellent
		Setindan	MMJR001	91	95	97	97	96	Terbaik / Excellent
		Babi Tengah	MMJR002	94	94	93	97	97	Terbaik / Excellent
Pahang	Pulau / Island	Pulau Tioman (Kg. Genting)	MMCM001	94	89	96	96	97	Terbaik / Excellent
		Pulau Tioman (Teluk Salang)	MMCM002	83	95	96	97	97	Terbaik / Excellent
		Tulai	MMCM003	94	95	97	97	97	Terbaik / Excellent
		Labas	MMCM004	91	95	97	97	96	Terbaik / Excellent
		Cebeh	MMCM005	95	96	96	97	97	Terbaik / Excellent
		Sepui	MMCM006	95	96	97	96	97	Terbaik / Excellent
		Sembilang	MMCM007	96	94	97	97	97	Terbaik / Excellent
		Seri Buat	MMCM008	94	93	97	97	97	Terbaik / Excellent
		Tokong Bahara	MMCM009	69	69	95	97	97	Terbaik / Excellent
Terengganu	Pulau / Island	Perhentian Besar (South)	MMTM001	86	95	97	96	97	Terbaik / Excellent
		Perhentian Besar (West)	MMTM002	92	96	96	97	97	Terbaik / Excellent
		Perhentian Kecil	MMTM003	91	96	97	97	96	Terbaik / Excellent
		Redang (North)	MMTM004	88	96	96	97	97	Terbaik / Excellent
		Redang (South)	MMTM005	85	95	96	97	97	Terbaik / Excellent
		Lang Tengah	MMTM006	75	96	97	97	97	Terbaik / Excellent
		Pinang	MMTM007	94	95	96	97	97	Terbaik / Excellent
		Ekor Tebu	MMTM008	87	97	97	97	97	Terbaik / Excellent
		Lima	MMTM009	97	96	97	97	97	Terbaik / Excellent
		Kapas	MMTM010	90	94	96	97	97	Terbaik / Excellent
		Gemia	MMTR001	96	90	94	97	97	Terbaik / Excellent

Jadual 4.8: Status Kualiti Air Marin bagi Pulau, 2023

Table 4.8: Marine Water Quality Status of Island, 2023

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2023) / CATEGORY (2023)
				2019	2020	2021	2022	2023	
Kelantan	Pulau / Island	Panjang	MMDP001	82	77	92	95	95	Terbaik / Excellent
		Kundur	MMDP002	84	84	92	96	95	Terbaik / Excellent
Sarawak	Pulau / Island	Satang	MMQP001	91	76	86	89	81	Baik / Good
		Talang-Talang Kecil	MMQP002	92	69	93	86	84	Baik / Good
		Talang-Talang Besar	MMQP003	90	79	93	80	60	Sederhana / Moderate
Sabah	Pulau / Island	Sapi	MMSM001	85	65	81	58	59	Sederhana / Moderate
		Kalampunian Besar	MMSM002	89	67	58	64	60	Sederhana / Moderate
		Selingan	MMSP001	85	60	74	81	59	Sederhana / Moderate
		Gulisan	MMSP002	80	65	70	72	59	Sederhana / Moderate
		Bakungan Kecil	MMSP003	83	59	75	88	59	Sederhana / Moderate
		Gaya	MMSR001	86	68	72	58	58	Sederhana / Moderate
		Mabul	MMSR002	60	58	71	74	59	Sederhana / Moderate
		Sipadan (N)	MMSR003	63	59	66	86	58	Sederhana / Moderate
		Sipadan (W)	MMSR004	77	58	61	62	62	Sederhana / Moderate
		Manukan	MMSR005	85	75	86	57	59	Sederhana / Moderate
		Tiga	MMSR006	87	72	58	61	71	Sederhana / Moderate
		Kapalai	MMSR007	77	58	77	69	63	Sederhana / Moderate
		Molleangan Besar	MMSR008	91	61	61	85	59	Sederhana / Moderate
		Banggi (South)	MMSR009	79	65	58	81	59	Sederhana / Moderate
		Banggi (East)	MMSR010	93	75	60	85	58	Sederhana / Moderate
Labuan	Pulau / Island	Balambangan	MMSR011	88	69	71	85	59	Sederhana / Moderate
		Mantanani Besar	MMSR012	95	72	58	58	59	Sederhana / Moderate
		Pohon Batu	MMLD001	86	67	58	58	59	Sederhana / Moderate
		Water Front	MMLD002	61	59	58	63	59	Sederhana / Moderate
		Lubuk Temiang	MMLD003	67	69	58	63	58	Sederhana / Moderate
		Ranca-Ranca	MMLD004	90	59	60	59	59	Sederhana / Moderate
		Kuraman	MMLM001	88	67	58	58	59	Sederhana / Moderate
		Rusukan Besar	MMLM002	88	59	58	64	59	Sederhana / Moderate
		Rusukan Kecil	MMLM003	90	64	58	59	59	Sederhana / Moderate

Nota / Notes

 Terbaik / Excellent Baik / Good Sederhana / Moderate Tercemar / Poor

**Rajah 4.10** memaparkan tren bilangan stesen mengikut status kualiti air marin bagi stesen pulau. Bilangan stesen yang dikategorikan sebagai terbaik kualiti air marin telah meningkat daripada 54 stesen pada tahun 2022 kepada 61 stesen pada tahun 2023. Namun, bilangan stesen baik telah menurun daripada 20 stesen pada tahun 2022 kepada empat (4) stesen pada tahun 2023. Bilangan stesen sederhana telah meningkat daripada 20 stesen tahun lalu kepada 30 stesen. Tiada stesen tercemar dilaporkan pada tahun ini.

**Figure 4.10** indicates the trend of the marine water quality status for island stations. The number of stations ranked as excellent increased from 54 stations in 2022 to 61 stations in 2023. However, the number of stations ranked good decreased from 20 stations in 2022 down to four (4) stations in 2023. The number of moderate stations increased from 20 stations in 2022 to 30 stations in 2023. There were no poor water quality stations in 2023.



Rajah 4.10: Tren Status Kualiti Air Marin bagi Pulau, 2019-2023

Figure 4.10: The Trend of Marine Water Quality Status for Island, 2019-2023

**Jadual 4.9** menunjukkan status kualiti air marin mengikut bilangan stesen dan kategori stesen bagi tahun 2022 dan 2023. **Jadual 4.10** menunjukkan status kualiti air marin mengikut peratusan bilangan stesen dan kategori stesen bagi tahun 2022 dan 2023.

**Table 4.9** shows the marine water quality status by number of stations and station categories for 2022 and 2023. **Table 4.10** shows the marine water quality status by number of stations and station categories on a percentage basis for 2022 and 2023.

**Jadual 4.9: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen, 2022-2023**  
**Table 4.9: Marine Water Quality Status by Number of Stations and Station Categories, 2022-2023**

KATEGORI STESEN / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
	2022	2023	2022	2023	2022	2023	2022	2023
Pantai / Coastal	88	106	39	13	61	69	0	0
Muara Sungai / Estuary	7	6	10	10	65	68	3	1
Pulau / Island	54	61	20	4	20	30	1	0
Pulau - Pembangunan / Island - Development	3	4	3	1	5	6	0	0
Pulau - Taman Laut / Island - Marine Park	26	26	0	0	5	5	0	0
Pulau - Dilindungi / Island - Protected	9	9	7	3	1	5	0	0
Pulau - Peranginan / Island - Resort	16	22	10	0	9	14	1	0
<b>JUMLAH / TOTAL</b>	<b>149</b>	<b>173</b>	<b>69</b>	<b>27</b>	<b>146</b>	<b>167</b>	<b>4</b>	<b>1</b>

**Jadual 4.10: Status Kualiti Air Marin  
Mengikut Peratusan Bilangan Stesen dan Kategori Stesen, 2022-2023**  
**Table 4.10: Marine Water Quality Status by Number of Stations on Percentage Basis  
and Station Categories 2022-2023**

KATEGORI STESEN / STATION CATEGORY	TERBAIK / EXCELLENT (%)		BAIK / GOOD (%)		SEDERHANA / MODERATE (%)		TERCEMAR / POOR (%)	
	2022	2023	2022	2023	2022	2023	2022	2023
Pantai / Coastal	47	56	21	7	32	37	0	0
Muara Sungai / Estuary	8	7	12	12	76	80	4	1
Pulau / Island	57	64	21	4	21	32	1	0
Pulau - Pembangunan / Island - Development	28	36	27	9	45	55	0	0
Pulau - Taman Laut / Island - Marine Park	84	84	0	0	16	16	0	0
Pulau - Dilindungi / Island - Protected	53	53	41	18	6	29	0	0
Pulau - Peranginan / Island - Resort	44	61	28	0	25	39	3	0
<b>JUMLAH / TOTAL</b>	<b>40</b>	<b>47</b>	<b>19</b>	<b>7</b>	<b>40</b>	<b>45</b>	<b>1</b>	<b>1</b>

**Jadual 4.11** menunjukkan status kualiti air marin mengikut bilangan stesen dan kategori stesen untuk negeri bagi tahun 2022 dan 2023. **Jadual 4.12** menunjukkan status kualiti air marin mengikut peratusan bilangan stesen dan kategori stesen untuk negeri bagi tahun 2022 dan 2023.

**Table 4.11** shows the marine water quality status by number of stations and station categories for the states for 2022 and 2023. **Table 4.12** shows the marine water quality status of stations and station categories for the state for 2022 and 2023 on a percentage basis.

**Jadual 4.11: Status Kualiti Air Marin  
Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2022-2023**  
**Table 4.11: Marine Water Quality Status by Number of Stations and  
Station Category for the State, 2022-2023**

BIL./ NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2022	2023	2022	2023	2022	2023	2022	2023
1.	Perlis		0	0	0	0	2	2	0	0
		Pantai / Coastal	-	-	-	-	-	-	-	-
		Muara Sungai / Estuary	0	0	0	0	2	2	0	0
		Pulau / Island	-	-	-	-	-	-	-	-
2.	P. Pinang		7	14	10	3	16	15	0	1
		Pantai / Coastal	4	9	5	1	8	7	0	0
		Muara Sungai / Estuary	0	0	1	1	6	5	0	1
		Pulau / Island	3	5	4	1	2	3	0	0
		Pulau - Pembangunan / Island - Development	0	1	2	0	1	2	0	0
		Pulau - Dilindungi / Island - Protected	0	0	1	1	0	0	0	0
		Pulau - Peranginan / Island - Resort	3	4	1	0	1	1	0	0
3.	Kedah		19	22	4	1	4	4	0	0
		Pantai / Coastal	6	9	3	0	0	0	0	0
		Muara Sungai / Estuary	0	0	0	0	4	4	0	0
		Pulau / Island	13	13	1	1	0	0	0	0
		Pulau - Pembangunan / Island - Development	3	3	1	1	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	3	3	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	4	4	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	3	3	0	0	0	0	0	0
4.	Perak		10	12	4	2	5	5	0	0
		Pantai / Coastal	6	7	2	1	0	0	0	0
		Muara Sungai / Estuary	0	0	1	1	5	5	0	0
		Pulau / Island	4	5	1	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	1	1	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	3	4	1	0	0	0	0	0
5.	Selangor		2	5	4	5	10	9	3	0
		Pantai / Coastal	1	2	2	3	3	1	0	0
		Muara Sungai / Estuary	1	1	0	2	7	7	2	0
		Pulau / Island	0	2	2	0	0	1	1	0
		Pulau - Peranginan / Island - Resort	0	2	2	0	0	1	1	0
6.	N. Sembilan		12	13	3	2	2	2	0	0
		Pantai / Coastal	11	12	3	2	0	0	0	0
		Muara Sungai / Estuary	0	0	0	0	2	2	0	0
		Pulau / Island	1	1	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	1	1	0	0	0	0	0	0
7.	Melaka		5	10	7	3	11	10	0	0
		Pantai / Coastal	1	4	6	3	2	2	0	0
		Muara Sungai / Estuary	0	0	0	0	8	8	0	0
		Pulau / Island	4	6	1	0	1	0	0	0
		Pulau - Peranginan / Island - Resort	4	6	1	0	1	0	0	0

Nota / Notes:

'-' (Tiada tesen / No station)

**Jadual 4.11: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2022-2023**  
**Table 4.11: Marine Water Quality Status by Number of Stations and Station Category for the State, 2022-2023**

BIL./ NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2022	2023	2022	2023	2022	2023	2022	2023
8.	Johor		22	26	9	4	11	13	1	0
		Pantai / Coastal	14	19	8	3	7	7	0	0
		Muara Sungai / Estuary	1	0	0	1	4	5	1	0
		Pulau / Island	7	7	1	0	0	1	0	0
		Pulau - Taman Laut / Island - Marine Park	4	4	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	1	1	1	0	0	1	0	0
		Pulau - Peranginan / Island - Resort	2	2	0	0	0	0	0	0
9.	Pahang		27	32	3	2	6	2	0	0
		Pantai / Coastal	17	22	3	0	2	0	0	0
		Muara Sungai / Estuary	1	1	0	2	4	2	0	0
		Pulau / Island	9	9	0	0	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	9	9	0	0	0	0	0	0
10.	Terengganu		30	31	3	2	7	7	0	0
		Pantai / Coastal	16	16	0	0	0	0	0	0
		Muara Sungai / Estuary	3	4	3	2	7	7	0	0
		Pulau / Island	11	11	0	0	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	10	10	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	1	1	0	0	0	0	0	0
11.	Kelantan		8	8	0	1	6	5	0	0
		Pantai / Coastal	6	6	0	0	0	0	0	0
		Muara Sungai / Estuary	0	0	0	1	6	5	0	0
		Pulau / Island	2	2	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	2	2	0	0	0	0	0	0
12.	Sabah		0	0	9	0	34	43	0	0
		Pantai / Coastal	0	0	2	0	22	24	0	0
		Muara Sungai / Estuary	0	0	0	0	2	2	0	0
		Pulau / Island	0	0	7	0	10	17	0	0
		Pulau - Taman Laut / Island - Marine Park	0	0	0	0	2	2	0	0
		Pulau - Dilindungi / Island - Protected	0	0	2	0	1	3	0	0
		Pulau - Peranginan / Island - Resort	0	0	5	0	7	12	0	0
13.	Sarawak		7	0	13	2	20	38	0	0
		Pantai / Coastal	6	0	5	0	12	23	0	0
		Muara Sungai / Estuary	1	0	5	0	8	14	0	0
		Pulau / Island	0	0	3	2	0	1	0	0
		Pulau - Dilindungi / Island - Protected	0	0	3	2	0	1	0	0
14.	W.P. Labuan		0	0	0	0	12	12	0	0
		Pantai / Coastal	0	0	0	0	5	5	0	0
		Muara Sungai / Estuary	-	-	-	-	-	-	-	-
		Pulau / Island	0	0	0	0	7	7	0	0
		Pulau - Pembangunan / Island - Development	0	0	0	0	4	4	0	0
		Pulau - Taman Laut / Island - Marine Park	0	0	0	0	3	3	0	0

Nota / Notes:

'-' (Tiada tesen / No station)

**Jadual 4.12: Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2022-2023**  
**Table 4.12: Marine Water Quality Status of Station Categories by State on Percentage Basis 2022-2023**

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT (%)		BAIK / GOOD (%)		SEDERHANA / MODERATE (%)		TERCEMAR / POOR (%)	
			2022	2023	2022	2023	2022	2023	2022	2023
1.	Perlis		0	0	0	0	100	100	0	0
		Pantai / Coastal	-	-	-	-	-	-	-	-
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	-	-	-	-	-	-	-	-
		Pulau - Dilindungi / Island - Protected	-	-	-	-	-	-	-	-
2.	P. Pinang		21.22	42.42	30.30	9.10	48.48	45.45	0	3.03
		Pantai / Coastal	23.53	52.94	29.41	5.88	47.06	41.18	0	0
		Muara Sungai / Estuary	0	0	14.29	14.29	85.71	71.42	0	14.29
		Pulau / Island	33.34	55.56	44.44	11.11	22.22	33.33	0	0
		Pulau - Pembangunan / Island - Development	0	33.33	66.67	0	33.33	66.67	0	0
		Pulau - Dilindungi / Island - Protected	0	0	100	100	0	0	0	0
		Pulau - Peranginan / Island - Resort	60.00	80.00	20.00	0	20.00	20.00	0	0
3.	Kedah		70.38	81.49	14.81	3.70	14.81	14.81	0	0
		Pantai / Coastal	66.67	100	33.33	0	0	0	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	92.86	92.86	7.14	7.14	0	0	0	0
		Pulau - Pembangunan / Island - Development	75.00	75.00	25.00	25.00	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	100	100	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	100	100	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	100	100	0	0	0	0	0	0
4.	Perak		52.63	63.15	21.05	10.53	26.32	26.32	0	0
		Pantai / Coastal	75.00	87.50	25.00	12.50	0	0	0	0
		Muara Sungai / Estuary	0	0	16.67	16.67	83.33	83.33	0	0
		Pulau / Island	80.00	100	20.00	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	100	100	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	75.00	100	25.00	0	0	0	0	0
5.	Selangor		10.53	26.32	21.05	26.32	52.63	47.36	15.79	0
		Pantai / Coastal	16.67	33.33	33.33	50.00	50.00	16.67	0	0
		Muara Sungai / Estuary	10.00	10.00	0	20.00	70.00	70.00	20.00	0
		Pulau / Island	0	66.67	66.67	0	0	33.33	33.33	0
		Pulau - Peranginan / Island - Resort	0	66.67	66.67	0	0	33.33	33.33	0
6.	N. Sembilan		70.59	76.48	17.65	11.76	11.76	11.76	0	0
		Pantai / Coastal	78.57	85.71	21.43	14.29	0	0	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	100	100	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	100	100	0	0	0	0	0	0
7.	Melaka		21.74	43.48	30.43	13.04	47.83	43.48	0	0
		Pantai / Coastal	11.11	44.45	66.67	33.33	22.22	22.22	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	66.66	100	16.67	0	16.67	0	0	0
		Pulau - Peranginan / Island - Resort	66.66	100	16.67	0	16.67	0	0	0

Nota / Notes:

'-' (Tiada tesen / No station)

**Jadual 4.12: Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2022-2023****Table 4.12: Marine Water Quality Status of Station Categories by State on Percentage Basis 2022-2023**

BIL./ NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN/ KATEGORI STESEN MARINE WATER QUALITY STATUS/ STATION CATEGORY	TERBAIK / EXCELLENT (%)		BAIK / GOOD (%)		SEDERHANA / MODERATE (%)		TERCEMAR / POOR (%)	
			2022	2023	2022	2023	2022	2023	2022	2023
8.	Johor		51.16	60.47	20.93	9.30	25.58	30.23	2.33	0
		Pantai / Coastal	48.28	65.52	27.58	10.34	24.14	24.14	0	0
		Muara Sungai / Estuary	16.66	0	0	16.67	66.67	83.33	16.67	0
		Pulau / Island	87.50	87.50	12.50	0	0	12.50	0	0
		Pulau - Taman Laut / Island - Marine Park	100	100	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	50	50	50	0	0	50	0	0
		Pulau - Peranginan / Island - Resort	100	100	0	0	0	0	0	0
9.	Pahang		75.00	88.88	8.33	5.56	16.67	5.56	0	0
		Pantai / Coastal	77.27	100	13.64	0	9.09	0	0	0
		Muara Sungai / Estuary	20.00	20.00	0	40.00	80.00	40.00	0	0
		Pulau / Island	100	100	0	0	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	100	100	0	0	0	0	0	0
10.	Terengganu		75.00	77.50	7.50	5.00	17.50	17.50	0	0
		Pantai / Coastal	100	100	0	0	0	0	0	0
		Muara Sungai / Estuary	23.08	30.77	23.08	15.38	53.84	53.85	0	0
		Pulau / Island	100	100	0	0	0	0	0	0
		Pulau - Taman Laut / Island - Marine Park	100	100	0	0	0	0	0	0
		Pulau - Peranginan / Island - Resort	100	100	0	0	0	0	0	0
11.	Kelantan		57.14	57.14	0	7.14	42.86	35.72	0	0
		Pantai / Coastal	100	100	0	0	0	0	0	0
		Muara Sungai / Estuary	0	0	0	16.67	100	83.33	0	0
		Pulau / Island	100	100	0	0	0	0	0	0
		Pulau - Dilindungi / Island - Protected	100	100	0	0	0	0	0	0
12.	Sabah		0	0	20.93	0	79.07	100	0	0
		Pantai / Coastal	0	0	8.33	0	91.67	100	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	0	0	41.18	0	58.82	100	0	0
		Pulau - Taman Laut / Island - Marine Park	0	0	0	0	100	100	0	0
		Pulau - Dilindungi / Island - Protected	0	0	66.67	0	33.33	100	0	0
		Pulau - Peranginan / Island - Resort	0	0	41.67	0	58.33	100	0	0
13.	Sarawak		17.50	0	32.50	5.00	50.00	95.00	0	0
		Pantai / Coastal	26.09	0	21.74	0	52.17	100	0	0
		Muara Sungai / Estuary	7.14	0	35.72	0	57.14	100	0	0
		Pulau / Island	0	0	100	66.67	0	33.33	0	0
		Pulau - Dilindungi / Island - Protected	0	0	100	66.67	0	33.33	0	0
14.	W.P. Labuan		0	0	0	0	100	100	0	0
		Pantai / Coastal	0	0	0	0	100	100	0	0
		Muara Sungai / Estuary	-	-	-	-	-	-	-	-
		Pulau / Island	0	0	0	0	100	100	0	0
		Pulau - Pembangunan / Island - Development	0	0	0	0	100	100	0	0
		Pulau - Taman Laut / Island - Marine Park	0	0	0	0	100	100	0	0

Nota / Notes:

'-' (Tiada tesen / No station)

## Stesen Marin dalam Kategori Tercemar

**Jadual 4.13** memaparkan stesen marin yang mana kualiti airnya dikategorikan sebagai tercemar pada tahun 2023. Nilai sub-indeks yang rendah memberi gambaran tahap impak ke atas status kualiti air marin secara keseluruhan. Justeru, faecal coliform merupakan faktor utama kemerosotan kualiti air marin di stesen tercemar tersebut, diikuti dengan kepekatan oksigen terlarut dan kandungan fosfat.

## Marine Stations in The Poor Category

**Table 4.13** shows the list of MMWQM stations that were ranked poor in 2023. The low value of a sub-index implies a greater degree of impact on the overall status of the marine water quality. Hence, faecal coliform was the primary factor that deteriorated the marine water quality of the stations ranked poor, followed by dissolved oxygen level and phosphate concentration.

**Jadual 4.13: Senarai Stesen Pengawasan Kualiti Air Marin**

**dengan Status Kategori Tercemar dan Peratusan Sub-Indeks Mengikut Parameter, 2023**

**Table 4.13: List of Marine Water Quality Monitoring Stations under the Category of Poor Status and their Sub-Index Percentages by Parameter, 2023**

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	LOKASI / LOCATION	STESEN ID / ID STATION	IKAMM / MMWQI	PERATUSAN SUB-INDEKS (%) / SUB-INDEX PERCENTAGE (%)					
					OKSIGEN TERLARUT / DISSOLVED OXYGEN	AMMONIA (TIDAK TERION) / AMMONIA (UNIONIZED)	FAECAL COLIFORM	JUMLAH PEPEJAL TERAMPALI / TOTAL SUSPENDED SOLID	NITRAT / NITRATE	FOSFAT / PHOSPHATE
P. Pinang	Muara Sungai / Estuary	Kuala Sungai Pinang	MMPE004	48	63	88	8	93	89	65

## PENGAWASAN KUALITI AIR MARIN AUTOMATIK

Rangkaian Pengawasan Kualiti Air Marin Automatik (CMWQM) bertujuan untuk menyediakan data kualiti air marin hampir waktu sebenar bagi sepuluh (10) lokasi stesen yang ditetapkan.

**Jadual 4.14** menyenaraikan lokasi stesen-stesen pengawasan kualiti air marin automatik dan kategori kelas kegunaan air marin berdasarkan SKAMM manakala **Rajah 4.11** menunjukkan lokasi Stesen CMWQM.

Supaya kualiti air marin di sekeliling stesen dapat dipantau dan diurus dengan lebih berkesan, kelas SKAMM bagi stesen CM02M telah dipertingkatkan daripada Kelas 2 kepada Kelas 1, manakala kelas SKAMM bagi CM04J telah dikemas kini daripada Kelas E kepada Kelas 2. Di samping itu, kelas SKAMM bagi CM11Q Santubong, Sarawak daripada Kelas E dikemas kini kepada Kelas E3.

## CONTINUOUS MARINE WATER QUALITY MONITORING

The Continuous Marine Water Quality Monitoring (CMWQM) network aims to provide near real-time marine water quality data in ten (10) designated locations.

**Table 4.14** lists the location of the continuous marine water quality monitoring stations and their respective class categories based on MMWQS while **Figure 4.11** shows the location of the CMWQM stations.

In order to monitor and manage the marine water quality surrounding the stations in a more efficient manner, the MMWQS class of CM02M was amended from Class 2 to Class 1, while the MMWQS of CM04J was revised from Class E to Class 2. Meanwhile, the MMWQS class of CM11Q Santubong, Sarawak was updated from Class E to Class E3.

Pada tahun 2023, purata dan median untuk parameter kualiti air marin yang dipantau di semua stesen CMWQM menunjukkan kadar pematuhan yang tinggi mengikut kelas kualiti air marin sepertimana ditetapkan dalam SKAMM, kecuali bagi paras oksigen terlarut di CM11Q Santubong, Sarawak. Kadar kepatuhan yang rendah di stesen tersebut adalah disebabkan oleh sifat muara semulajadi, bukan berpunca daripada kesan pencemaran.

Kepekatan untuk kebanyakan parameter yang direkodkan di stesen adalah mengikut sifat semulajadi, mengambil kira faktor sedia ada di sekeliling stesen. Kualiti air marin yang dipantau dalam Rangkaian Kualiti Air Marin Automatik menunjukkan kesan musim tengkujuh terhadap kualiti air marin.

Kualiti air marin untuk stesen CMWQM dilaporkan mempunyai tahap turun naik yang lebih tinggi semasa Monsun Timur Laut disebabkan oleh isipadu hujan yang lebih tinggi. Kualiti air marin secara relatifnya adalah stabil di kebanyakan stesen kecuali CM04J di Tanjung Piai, Johor, CM05J di Tanjung Pengelih, Johor, CM10L di Wilayah Persekutuan Labuan, CM11Q di Santubong, Sarawak, CM12A di Pulau Mentagor, Perak dan CM13T Pulau Kapas, Terengganu. Stesen-stesen ini tertakluk kepada pengaruh input air tawar.

Kualiti air marin di stesen CM11Q yang terletak di Santubong, Sarawak menunjukkan pengaruh pasang surut yang jelas disebabkan oleh interaksi yang kompleks antara air tawar dan air laut yang seterusnya membentuk ciri hidrologi muara Santubong.

Parameter oksigen terlarut (DO), jumlah pepejal terampai (TSS) dan polycyclic aromatic hydrocarbon (PAHs) didapati mematuhi SKAMM. Seperti yang direkodkan pada tahun sebelumnya, ketidakpatuhan DO adalah paling tinggi di CM11Q Santubong oleh perubahan sifat hidrologi hasil daripada kitaran pasang surut. Selain stesen CM11Q di Santubong, stesen CM12A di Pulau Mentagor dan CM13T di Pulau Kapas juga telah menunjukkan trend ketidakpatuhan DO.

In 2023, the average and median of all water quality parameters monitored by the CMWQM network showed high conformance to their respective marine water quality classes as stipulated in the MMWQS, except for the dissolved oxygen level at CM11Q Santubong, Sarawak. The lower compliance of the station was due to the natural estuary characteristic, rather than a pollution event.

The concentration for most of the parameters captured at the stations were typical of its nature, taking into account the factors present nearby the stations. Marine water quality monitored by the Continuous Marine Water Quality Network showed the influence of the monsoon seasons on the water quality.

Marine water quality of the CMWQM stations reported a higher degree of variation during the North-East Monsoon due to higher volume of precipitation. Marine water quality is relatively stable in most of the stations except for CM04J Tanjung Piai, Johor, CM05J Tanjung Pengelih, Johor, CM10L Wilayah Persekutuan Labuan, CM11Q Santubong, Sarawak, CM12A Pulau Mentagor, Perak and CM13T Pulau Kapas, Terengganu. These stations are subjected to the freshwater influent.

The marine water quality at station CM11Q located in Santubong, Sarawak shows clear tidal influences due to the complex interaction between freshwater and seawater, which subsequently forms the hydrological characteristics of the Santubong estuary.

Dissolved oxygen (DO), total suspended solids (TSS), and polycyclic aromatic hydrocarbons (PAHs) all complied with the MMWQS. As recorded in the previous year, the highest non-compliance of DO was observed in CM11Q Santubong due to changes in hydrological characteristics caused by the tidal cycle. Apart from the CM11Q Santubong station, the CM12A Pulau Mentagor and CM13T Pulau Kapas stations have also shown trends of DO non-compliance.

Berdasarkan kepada SKAMM, semua stesen melaporkan kadar pematuhan PAH yang sangat baik, melebihi 90% daripada data CMWQM tahun ini. Tahap ketidakpatuhan tertinggi bagi PAH dilaporkan di stesen CM11Q Santubong, Sarawak diikuti dengan stesen CM03N Port Dickson, Negeri Sembilan.

Pada tahun 2023, kualiti air marin yang dipantau secara keseluruhannya di semua rangkaian CMWQM adalah berada pada status baik. Tiada amaran pencemaran yang dijana oleh rangkaian CMWQM pada tahun 2023.

**Jadual 4.15** menunjukkan tahap pematuhan stesen CMWQM terhadap kelas masing-masing pada tahun 2023.

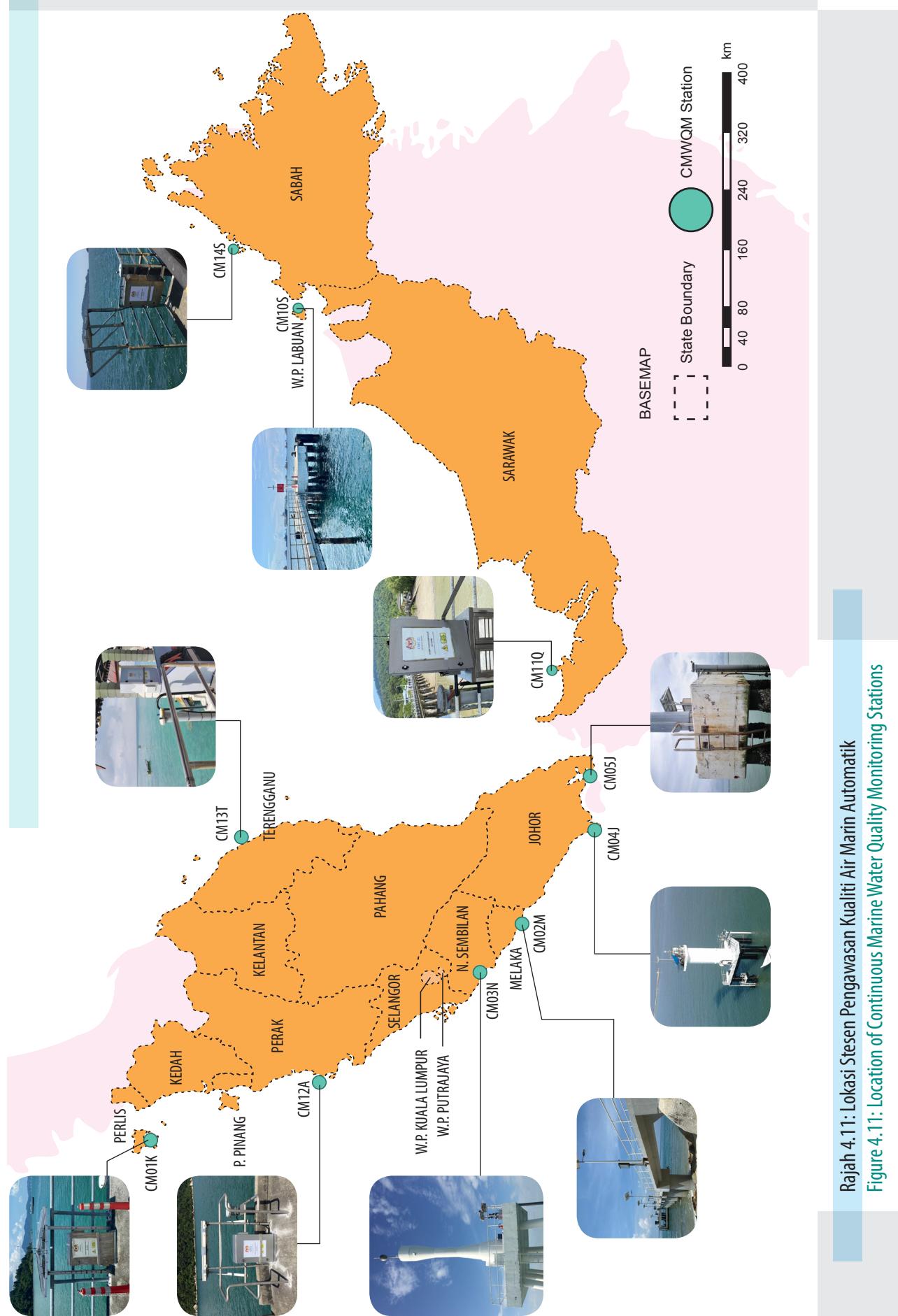
With reference to the MMWQS, all stations reported an excellent PAH compliance rate of more than 90% of the CMWQM data this year. The highest PAH non-conformance was reported at CM11Q Santubong, Sarawak, followed by CM03N Port Dickson, Negeri Sembilan.

In 2023, the overall marine water quality monitored by the CMWQM network was deemed good. There were no pollution warnings generated under the CMWQM network in 2023.

**Table 4.15** illustrates that the CMWQM stations complied with their respective classes in 2023.

**Jadual 4.14: Stesen Pengawasan Kualiti Air Marin Automatik**  
**Table 4.14: Continuous Marine Water Quality Monitoring Stations**

BIL. / NO.	LOKASI STESEN / STATION LOCATION	ID STESEN / STATION ID	STRUKTUR / STRUCTURE	KATEGORI STESEN / STATION CATEGORY	KEGUNAAN BERFAEDAH / BENEFICIAL USES
1	Pulau Langkawi, Kedah	CM01K	Jeti / Jetty	Kelas 2 / Class 2	Perikanan (Termasuk Marikultur) / Fisheries (Including Mariculture)
2	Jeti Pulau Undan, Melaka	CM02M	Jeti / Jetty	Kelas 1 / Class 1	Habitat Sensitif Marin / Sensitive Marine Habitats
3	Port Dickson, N. Sembilan	CM03N	Beacon	Kelas 2 / Class 2	Perikanan (Termasuk Marikultur) / Fisheries (Including Mariculture)
4	Tanjung Piai, Johor	CM04J	Beacon	Kelas 2 / Class 2	Perikanan (Termasuk Marikultur) / Fisheries (Including Mariculture)
5	Tanjung Pengelih, Johor	CM05J	Jeti / Jetty	Kelas 3 / Class 3	Industri, Aktiviti Komersial & Kawasan Kediaman Pesisir Pantai / Industrial, Commercial Activities & Coastal Settlements
6	W.P. Labuan	CM10L	Jeti / Jetty	Kelas 3 / Class 3	Industri, Aktiviti Komersial & Kawasan Kediaman Pesisir Pantai / Industrial, Commercial Activities & Coastal Settlements
7	Santubong, Sarawak	CM11Q	Jeti / Jetty	Kelas E3 / Class E3	Muara Sungai (Rangkaian Kompleks) / Estuaries (Complex Distributary Network)
8	Pulau Mentagor, Perak	CM12A	Jeti / Jetty	Kelas 2 / Class 2	Perikanan (Termasuk Marikultur) / Fisheries (Including Mariculture)
9	Pulau Kapas, Terengganu	CM13T	Jeti / Jetty	Kelas 1 / Class 1	Habitat Sensitif Marin / Sensitive Marine Habitats
10	Teluk Sepanggar, Sabah	CM14S	Jeti / Jetty	Kelas 3 / Class 3	Industri, Aktiviti Komersial & Kawasan Kediaman Pesisir Pantai / Industrial, Commercial Activities & Coastal Settlements



Rajah 4.11: Lokasi Stesen Pengawasan Kualiti Air Marin Automatik  
Figure 4.11: Location of Continuous Marine Water Quality Monitoring Stations

**Jadual 4.15: Peratusan Pematuhan Parameter DO, TSS dan PAHs mengikut Kelas (SKAMM)****Table 4.15: Percentage of DO, TSS and PAHs Parameters Compliance according to Their Station Classes (MMWQS)**

NEGERI / STATE	LOKASI STESEN / STATION LOCATION	ID STESEN / STATION ID	KELAS / CLASS	PERATUSAN PEMATUHAN (%) / PERCENTAGE OF COMPLIANCE (%)		
				OKSIGEN TERLARUT / DISSOLVED OXYGEN (DO)	JUMLAH PEPEJAL TERAMPAI / TOTAL SUSPENDED SOLID (TSS)	POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)
Kedah	Pulau Langkawi	CM01K	2	99.08	99.92	100
Melaka	Jeti Pulau Undan	CM02M	1	81.30	99.97	100
N. Sembilan	Port Dickson	CM03N	2	99.94	99.93	99.31
Johor	Tanjung Piai	CM04J	2	99.82	98.93	100
	Tanjung Pengelih	CM05J	3	100	99.92	100
W.P. Labuan	W.P. Labuan	CM10L	3	100	99.96	100
Sarawak	Santubong	CM11Q	E3	44.57	98.13	99.39
Perak	Pulau Mentagor	CM12A	2	90.46	99.81	100
Terengganu	Pulau Kapas	CM13T	1	82.87	99.70	100
Sabah	Teluk Sepanggar	CM14S	3	100	99.96	100



Pulau Langkawi, Kedah

# BAB 5

CHAPTER

## INVENTORI PUNCA PENCEMARAN

*INVENTORY OF POLLUTION SOURCES*



# INVENTORI PUNCA PENCEMARAN

INVENTORY OF POLLUTION SOURCES

**5**

## Punca Utama Pencemaran Air Main Sources of Water Pollution

### Industri Pembuatan Manufacturing Industries



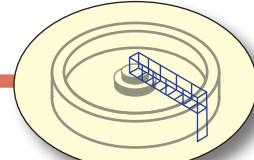
### Industri Berasaskan Pertanian Agriculture-Based Industries



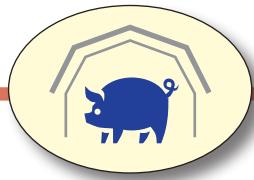
### Pasar Basah Wet Markets



### Sistem Pengolahan Kumbahan Sewage Treatment Systems



### Ternakan Babi Pig Farming



**3**

### Parameter Utama Main Parameters

BOD  
---  
SS  
---  
AN

#### Parameter Parameters

**BOD & AN**

**SS**

#### Punca Utama / Main Sources

Sistem Pengolahan Kumbahan  
Sewage Treatment Systems

Ternakan Babi  
Pig Farming

#### Jumlah Beban dalam Tan/Hari Total Load in Tonnes/Day

**BOD 444.63 | SS 636.42 | AN 160.36**

# KUALITI UDARA / AIR QUALITY

**65** Stesen Pengawasan Kualiti Udara /  
Air Quality Monitoring Stations

**4**

**Punca Utama  
Pencemaran Udara**  
Main Sources of Air Pollution

- Loji Janakuasa / Power Plants
- Industri / Industry
- Kenderaan Bermotor / Motor Vehicle
- Lain-Lain / Other

**4**

**Parameter Utama  
Main Parameters**

$\text{SO}_2$	$\text{PM}$
$\text{NO}_2$	$\text{CO}$

Parameter / Parameters	Punca Utama / Main Sources
$\text{SO}_2$	Loji Janakuasa / Power Plants
$\text{NO}_2$	Loji Janakuasa / Power Plants
$\text{PM}$	Industri / Industry Loji Janakuasa / Power Plants
$\text{CO}$	Kenderaan Bermotor / Motor Vehicle

**Jumlah Beban dalam Tan Metrik / Total Load in Metric Tonnes**

**CO** 1,847,312 |  **$\text{NO}_2$**  882,330 |  **$\text{SO}_2$**  284,304 | **PM** 25,950

**Buangan  
Terjadual  
*Scheduled  
Wastes***

**5,841,596.82 MT**

**Buangan Terjadual yang Terhasil / Scheduled Wastes Generated**

Debu, sanga, dros atau abu merupakan kategori buangan yang dihasilkan dengan kuantiti tertinggi iaitu = **44.71%**

Jumlah BT yang mengaplikasikan konsep 4R (Reduce, Reuse, Recycle, Recover) =  **$1.38 \text{ MT} \times 10^6$**

Dust, slag, dross or ash is the category of waste produced with the highest quantity which is 44.71%

Total BT that applies the 4R concept (Reduce, Reuse, Recycle, Recover) =  $1.38 \text{ MT} \times 10^6$

Pengurangan sebanyak **1.24%** berbanding 5,915,073.84 tan metrik yang dilaporkan pada 2022



A reduction of **1.24%** compared to the 5,915,073.84 metric tonnes reported in 2022

# INVENTORI PUNCA PENCEMARAN /

## INVENTORY OF POLLUTION SOURCES

### BEBAN PENCEMARAN AIR

Sungai merupakan antara ekosistem yang mempunyai keupayaan asimilasi untuk mengurangkan kesan pencemaran melalui proses daripada penguraian, penyebaran dan pelarutan. Namun begitu, keupayaan ini mempunyai batas dan sekiranya melebihi, kualiti air sungai akan merosot.

Keupayaan asimilasi sungai ini berkait rapat dengan beban pencemaran yang dilepaskan ke dalam sungai pada sesuatu masa. Ianya dipengaruhi oleh kadar aliran jasad air dan kepekatan bahan pencemar yang dibawa oleh jasad air.

Beban pencemaran air merupakan salah satu kriteria penting dalam menentukan strategi dan perancangan tindakan untuk mencegah dan mengawal pencemaran air. Pelaksanaan kawalan beban pencemaran air merupakan usaha untuk meningkatkan kualiti air sungai demi mengekalkan kegunaan berfaedah sungai sebagai sumber bekalan air, rekreasi, akuakultur, pertanian serta menampung keperluan sistem ekologi.

Punca beban pencemaran air terbahagi kepada dua (2) kategori iaitu punca tetap dan punca tidak tetap. Punca tetap beban pencemaran air adalah punca yang mempunyai takat pelepasan yang tetap dan tidak berubah dalam tempoh masa yang singkat. Sektor seperti industri pembuatan, ternakan dan sistem pengolahan kumbahan adalah termasuk di dalam kategori ini.

Manakala punca tidak tetap pula merupakan punca yang tidak mempunyai takat pelepasan yang tetap dan sering berubah-ubah yang menyukarkan anggaran pelepasan beban pencemaran dibuat. Aktiviti pertanian, kerja tanah, perlombongan dan kumbahan bukan najis (air cucian dapur dan bilik air selain kumbahan) merupakan punca bagi kategori ini. Pada masa ini, kajian berkaitan beban pencemaran bagi

### WATER POLLUTION LOAD

Rivers are one of the ecosystems that have the assimilation capacity to reduce the impacts from pollution through the processes of degradation, dispersion, and dilution. However, this ability has a limit and if exceeded, the quality of river water will deteriorate.

The assimilation capacity of the river is closely related to the pollution load discharged into the river at a certain time. It is influenced by the flow rate of the water body and the concentration of pollutants carried by the water body.

The water pollution load is one of the important criteria in determining strategies and planning for actions to prevent and control water pollution. The implementation of water pollution load control is one of the efforts to enhance the river water quality in order to maintain the beneficial uses of the river as a source of water supply, recreation, aquaculture, agriculture as well as to sustain the needs of the ecological system.

The sources of water pollution load can be divided into two (2) categories which are point sources and non-point sources. Point sources are pollution sources that have specific identifiable discharge points and do not change in a short period of time. Sectors such as manufacturing industries, livestock and sewage treatment systems fall into this category.

On the other hand, non-point sources are the sources that do not have specific identifiable discharge points and the locations are varied which makes it difficult to estimate the amount of pollution loads discharged. Agricultural activities, earthworks, mining, and sullage (domestic wastewater other than sewage such as kitchen and bathroom wastewater) are the sources under this category. Currently, studies related to the

punca dari kategori ini tidak banyak tersedia untuk rujukan khususnya di Malaysia.

### PENGIRAAN BEBAN PENCEMARAN AIR

Beban pencemaran air yang dilaporkan adalah berdasarkan kepada lima (5) jenis punca pencemaran iaitu industri pembuatan, industri berasaskan pertanian, sistem pengolahan kumbahan, ternakan babi dan pasar basah yang mempunyai aktiviti penyembelihan.

Sumber data bagi industri pembuatan dan industri berasaskan pertanian diperolehi daripada Jabatan Alam Sekitar (JAS) Negeri manakala bagi sistem pengolahan kumbahan adalah daripada pihak operator loji seperti Indah Water Konsortium Sdn. Bhd. dan pihak berkuasa tempatan. Data berkaitan aktiviti ternakan babi diperolehi daripada Jabatan Perkhidmatan Veterinar dan data bilangan pasar basah adalah daripada Kementerian Perumahan dan Kerajaan Tempatan.

Pengiraan beban pencemaran air adalah berdasarkan kepada tiga (3) parameter yang memberikan kesan ketara kepada kualiti air sungai iaitu Keperluan Oksigen Biokimia (BOD), Pepejal Terampai (SS) dan Ammoniacal Nitrogen (AN).

pollution load from sources for this category are not widely available for reference particularly in Malaysia.

### WATER POLLUTION LOAD CALCULATION

The water pollution load reported is based on five (5) types of pollution sources, namely manufacturing industry, agriculture-based industry, sewage treatment system, pig farming and wet market which have slaughtering activities.

The source of data for manufacturing industry and agricultural-based industry are obtained from the Department of Environment (DOE) State offices while data for sewage treatment system are from plant operators such as Indah Water Konsortium Sdn. Bhd. and local authorities. Data related to pig farming activity are acquired from the Department of Veterinary Services and data on the number of wet market from the Ministry of Housing and Local Government.

The calculation of water pollution load is based on three (3) parameters that have significant impact on river water quality, namely Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Ammoniacal Nitrogen (AN).



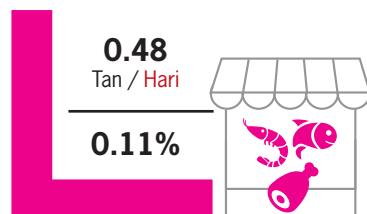
## Beban Keperluan Oksigen Biokimia

Pada tahun 2023, anggaran jumlah beban pencemaran bagi BOD yang dilepaskan ke sungai adalah sebanyak 444.63 tan/hari. Pelepasan daripada sistem pengolahan kumbahan adalah penyumbang beban pencemaran BOD tertinggi iaitu sebanyak 235.77 tan/hari (53.02%), diikuti dengan aktiviti ternakan babi 160.89 tan/hari (36.18%), industri pembuatan 29.78 tan/hari (6.70%), industri berdasarkan pertanian 17.72 tan/hari (3.99%) dan pasar basah 0.48 tan/hari (0.11%) (**Rajah 5.1**).

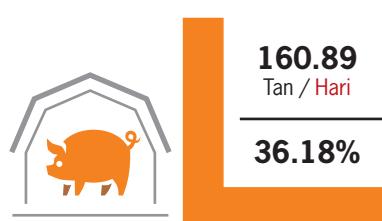
## Biochemical Oxygen Demand Load

In year 2023, the estimated total pollution load for BOD discharged into the river is 444.63 tonne/day. Discharge from sewage treatment plants remain the highest BOD load contributor with a total load of 235.77 tonnes/day (53.02%), followed by pig farming activities 160.89 tonnes/day (36.18%), manufacturing industries 29.78 tonnes/ day (6.70%), agriculture-based industries 17.72 tonnes/ day (3.99%) and wet markets 0.48 tonnes/day (0.11%) (**Figure 5.1**).

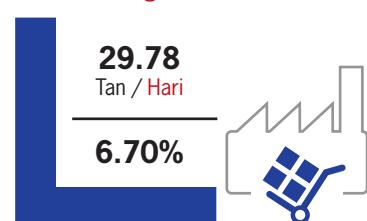
### Pasar Basah Wet Markets



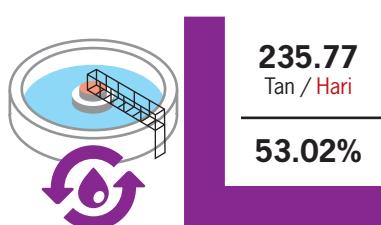
### Ternakan Babi Pig Farming



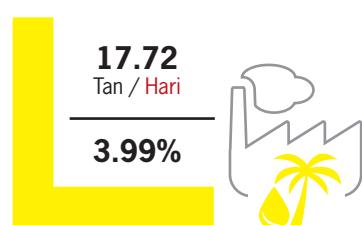
### Industri Pembuatan Manufacturing Industries



### Sistem Pengolahan Kumbahan Sewage Treatment Systems



### Industri Berasaskan Pertanian Agriculture-Based Industries



Rajah 5.1: Anggaran Beban BOD (Tan/Hari) mengikut Punca Pencemaran Air, 2023

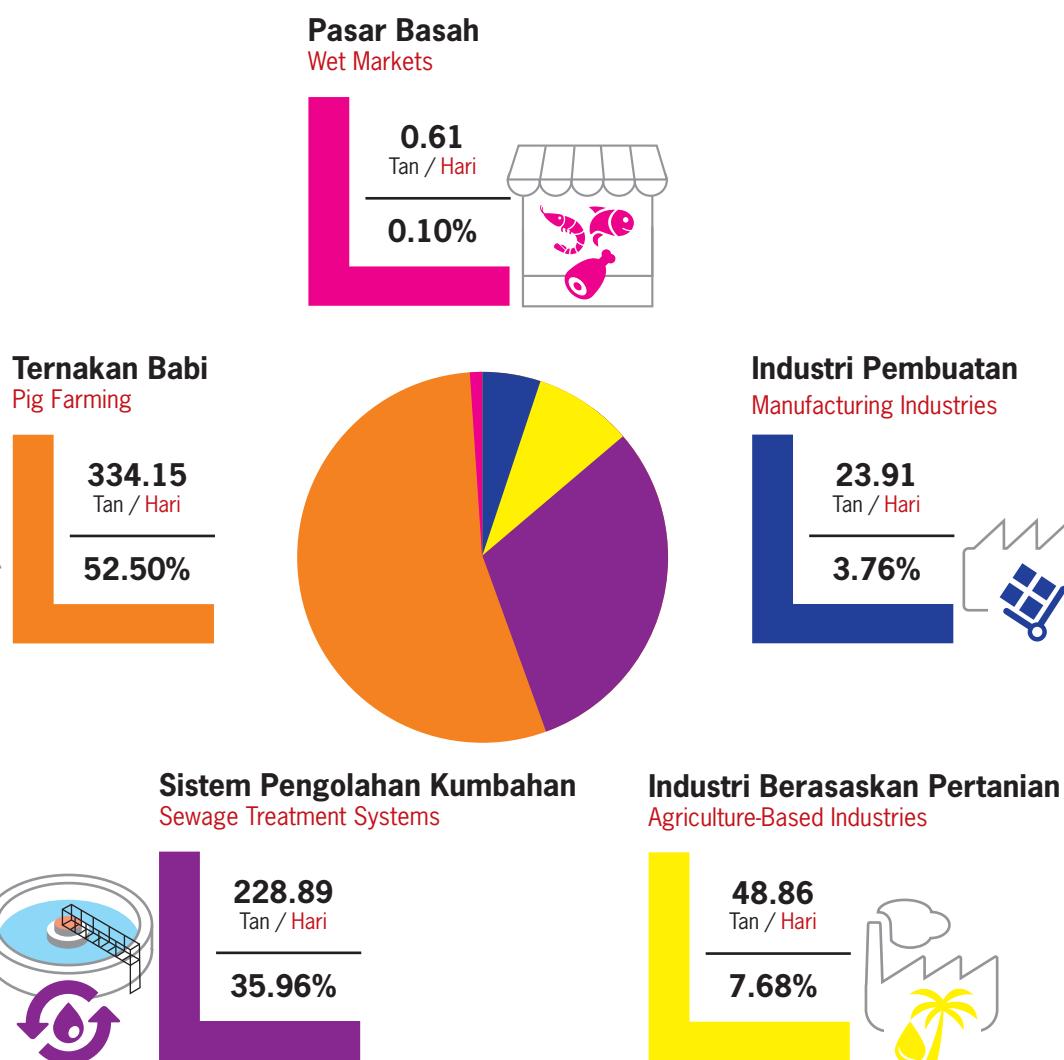
Figure 5.1: Estimation of BOD Load (Tonnes/Day) by Sources of Water Pollution, 2023

## Beban Pepejal Terampai

Pada tahun 2023, anggaran jumlah beban pencemaran bagi SS yang dilepaskan ke sungai adalah sebanyak 636.42 tan/hari. Pelepasan daripada ternakan babi adalah penyumbang beban pencemaran SS tertinggi iaitu sebanyak 334.15 tan/hari (52.50%), diikuti dengan sistem pengolahan kumbahan 228.89 tan/hari (35.96%). Industri berdasarkan pertanian pula menyumbang sebanyak 48.86 tan/hari (7.68%) diikuti industri pembuatan 23.91 tan/hari (3.76%) dan pasar basah 0.61 tan/hari (0.10%) (**Rajah 5.2**).

## Suspended Solids Load

In year 2023, the estimated total pollution load for SS discharged into the river is 636.42 tonnes/day. Discharge from pig farming activities shows the highest SS load contributor with a total load of 334.15 tonnes/day (52.50%) followed by sewage treatment system with 228.89 tonnes/day (35.96%). Agriculture based industry contributed 48.86 tonnes/day (7.68%) followed by manufacturing industry 23.91 tonnes/day (3.76%) and wet market 0.61 tonnes/day (0.10%) (**Figure 5.2**)



Rajah 5.2: Anggaran Beban SS (Tan/Hari) mengikut Punca Pencemaran Air, 2023

Figure 5.2: Estimation of SS Load (Tonnes/Day) by Sources of Water Pollution, 2023

## Beban Ammoniakal Nitrogen

Pada tahun 2023, anggaran jumlah beban pencemaran bagi AN yang dilepaskan ke sungai adalah sebanyak 160.36 tan/hari. Pelepasan daripada sistem pengolahan kumbahan adalah penyumbang beban pencemaran AN tertinggi iaitu sebanyak 119.20 tan/hari (74.33 %), diikuti ternakan babi 19.80 tan/hari (12.35 %), industri berdasarkan pertanian 16.84 tan/hari (10.50 %), industri pembuatan 4.49 tan/hari (2.80 %) dan pasar basah 0.03 tan/hari (0.02%) (**Rajah 5.3**).

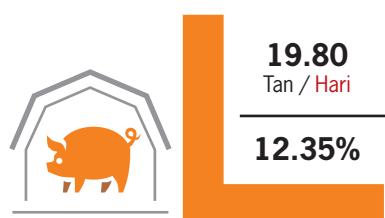
## Ammoniacal Nitrogen Load

In year 2023, the estimated total pollution load for AN discharged into the river is 160.36 tonnes/day. Discharge from sewage treatment system shows the highest AN load contributor with a total load of 119.20 tonnes/day (74.33%) followed by pig farming activities with 19.80 tonnes/day (12.35 %), agriculture-based industries 16.84 tonnes/day (10.50 %), manufacturing industries 4.49 tonnes/day (2.80 %) and wet markets 0.03 tonnes/day (0.02 %) (**Figure 5.3**).

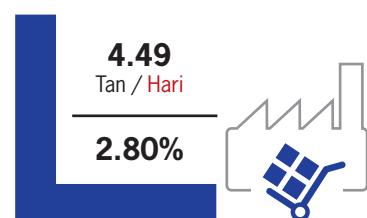
### Pasar Basah Wet Markets



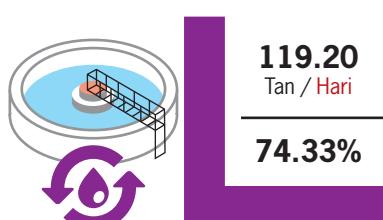
### Ternakan Babi Pig Farming



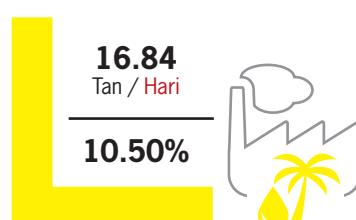
### Industri Pembuatan Manufacturing Industries



### Sistem Pengolahan Kumbahan Sewage Treatment Systems



### Industri Berasaskan Pertanian Agriculture-Based Industries



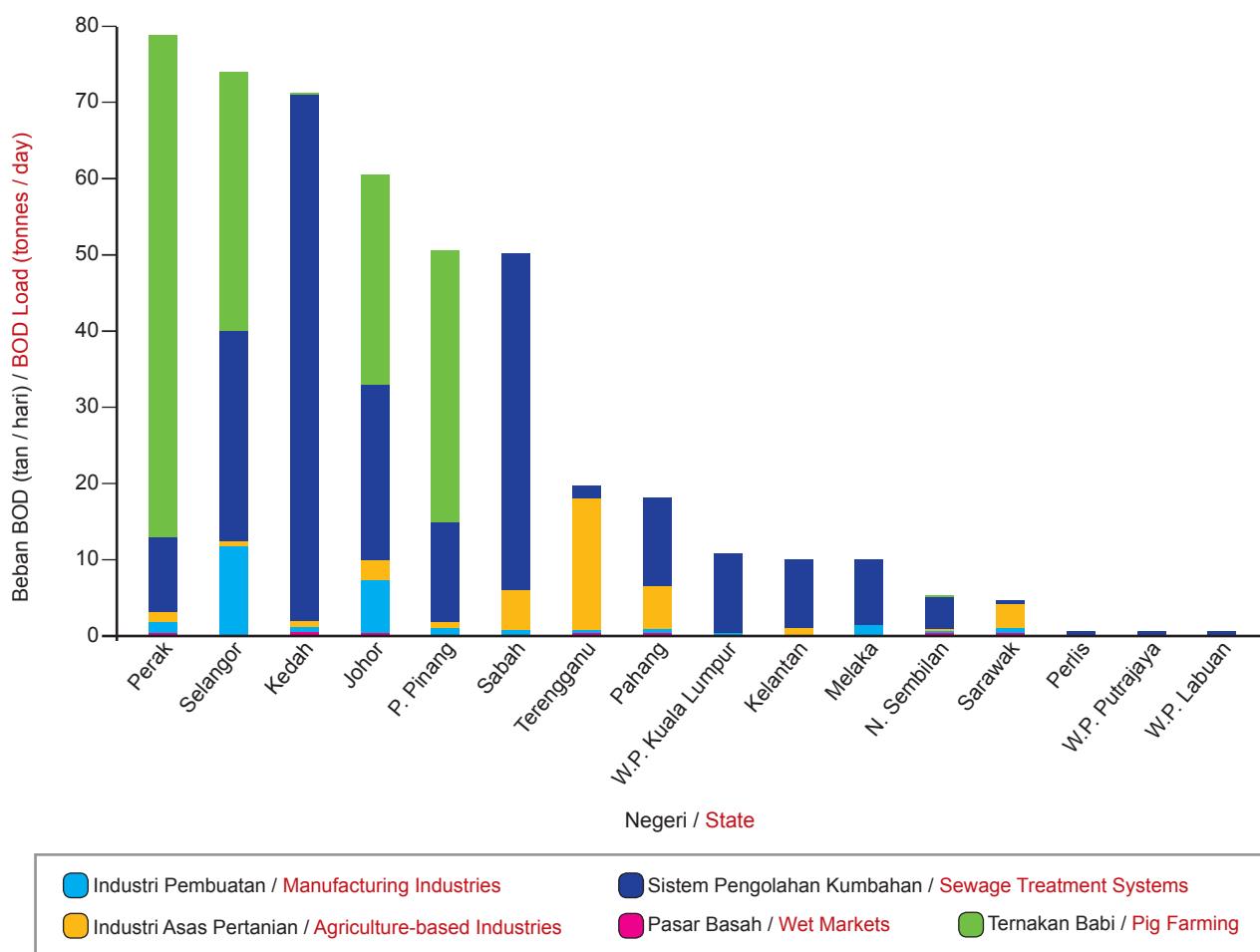
Rajah 5.3: Anggaran Beban AN (Tan/Hari) mengikut Punca Pencemaran Air, 2023,  
Figure 5.3: Estimation of AN Load (Tonnes/Day) by Sources of Water Pollution, 2023

## Beban Pencemaran Keperluan Oksigen Biokimia mengikut Negeri

Pada tahun 2023, negeri yang melepaskan beban pencemaran BOD ke sungai yang tertinggi adalah negeri Perak iaitu sebanyak 76.23 tan/hari, diikuti oleh negeri Selangor 73.44 tan/hari, Kedah 71.47 tan/hari, Johor 60.39 tan/hari, Pulau Pinang 50.44 tan/hari dan Sabah 50.00 tan/hari. Beban BOD bagi lain-lain negeri termasuk Wilayah Persekutuan Labuan dan Putrajaya adalah kurang daripada 20.00 tan/hari. Beban pencemaran BOD mengikut negeri ditunjukkan pada **Rajah 5.4**.

## Biochemical Oxygen Demand Load by States

In 2023, the state that discharge the highest BOD pollution load into the river is Perak with a 76.23 tonnes/day, followed by Selangor 73.44 tonnes/day, Kedah 71.47 tonnes/day, Johor 60.39 tonnes/day, Pulau Pinang 50.44 tonnes/day and Sabah 50.00 tonnes/day. The BOD load for other states including the Federal Territory of Labuan and Putrajaya is less than 20.00 tonnes/day. The BOD pollution loads by states are shown in **Figure 5.4**.



Rajah 5.4: Taburan Anggaran Beban BOD (Tan/Hari) dan Punca Pencemaran Air mengikut Negeri, 2023

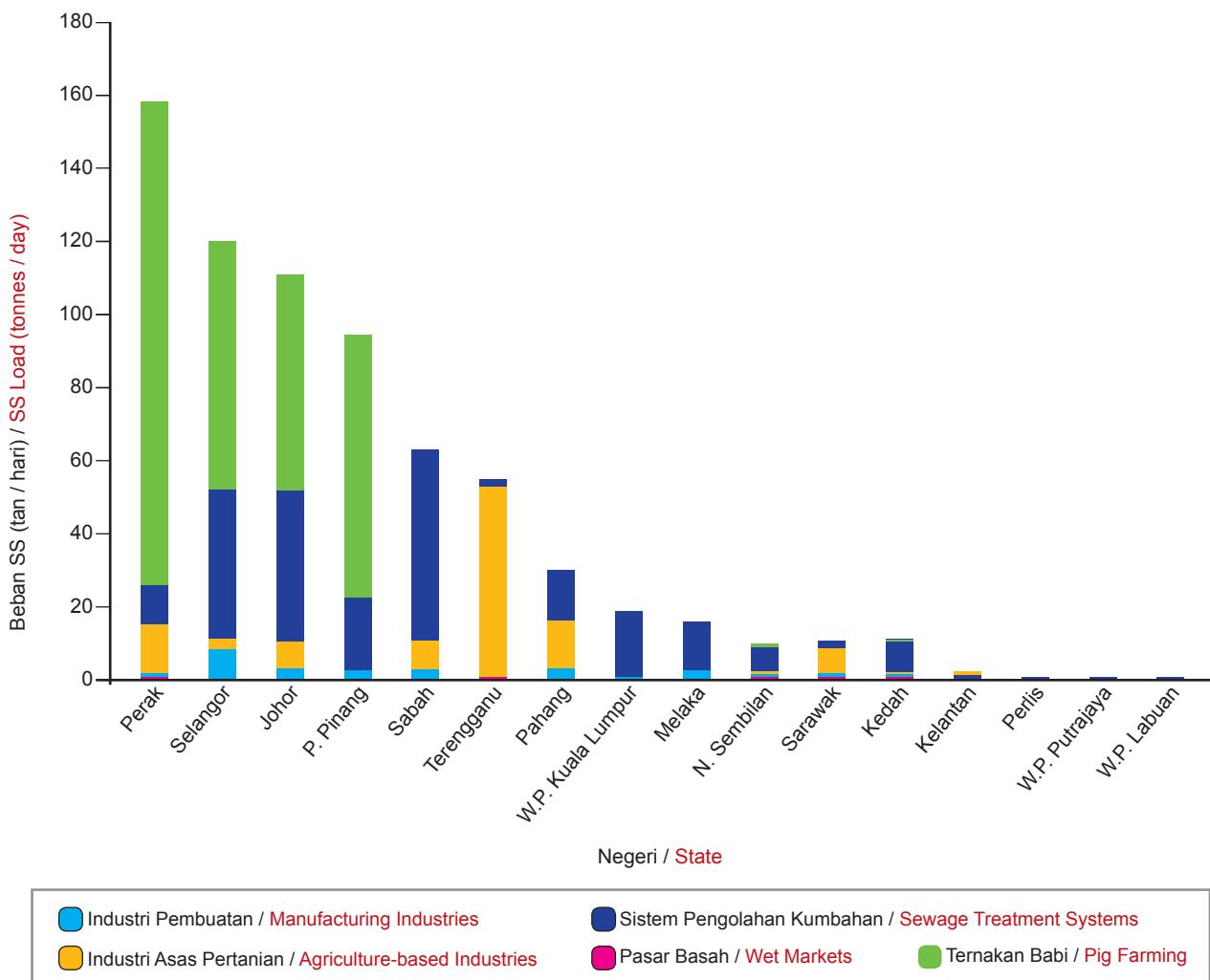
Figure 5.4: Estimation Distribution of BOD Load (Tonnes/Day) and Sources of Water Pollution by States, 2023

## Beban Pencemaran Pepejal Terampai mengikut Negeri

Anggaran pelepasan beban pencemaran SS ke sungai di negeri Perak adalah yang tertinggi iaitu sebanyak 158.09 tan/hari, diikuti Selangor 119.82 tan/hari, Johor 107.77 tan/hari, Pulau Pinang 94.95 tan/hari dan Sabah 64.13 tan/hari. Beban pencemaran SS untuk lain-lain negeri termasuk Wilayah Persekutuan Labuan dan Putrajaya adalah kurang daripada 60.00 tan/hari. Beban pencemaran SS mengikut negeri ditunjukkan pada **Rajah 5.5**.

## Suspended Solids Load by States

The estimated SS pollution load discharge to the river in Perak is the highest which is 158.09 tonnes/day, followed by Selangor 119.82 tonnes/day, Johor 107.77 tonnes/day, Pulau Pinang 94.95, and Sabah 64.13. The SS pollution load for other states including the Federal Territory of Labuan and Putrajaya is less than 60.00 tonnes/day. The SS pollution loads by states are shown in **Figure 5.5**.



Rajah 5.5: Taburan Anggaran Beban SS (Tan/Hari) dan Punca Pencemaran Air mengikut Negeri, 2023

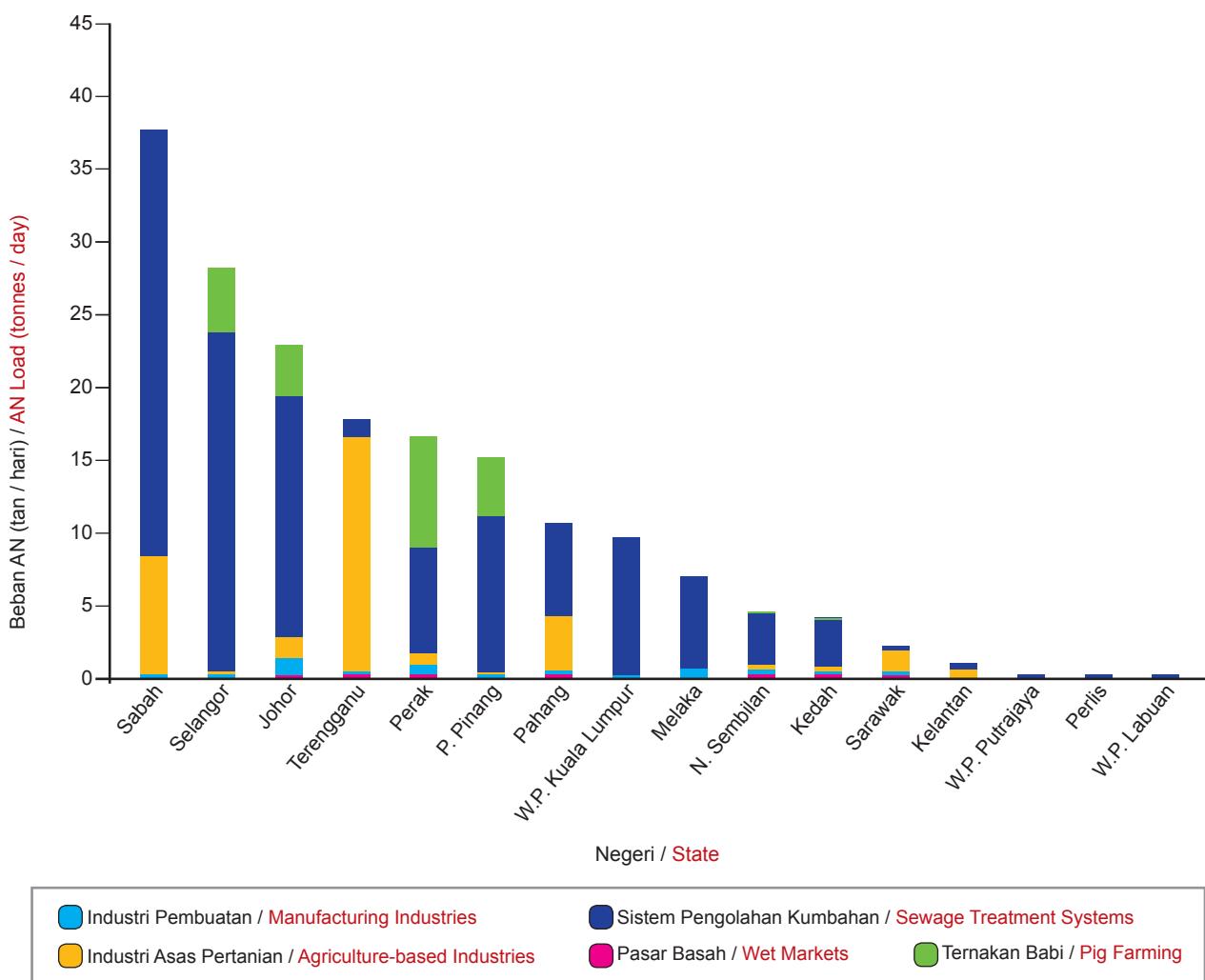
Figure 5.5: Estimation Distribution of SS Load (Tonnes/Day) and Sources of Water Pollution by States, 2023

## Beban Pencemaran Ammoniakal Nitrogen mengikut Negeri

Anggaran pelepasan beban pencemaran AN ke sungai di negeri Sabah adalah yang tertinggi iaitu sebanyak 37.32 tan/hari, diikuti Selangor 27.80 tan/hari, Johor 22.49 tan/hari, Terengganu 17.89 tan/hari dan Perak 16.46 tan/hari. Beban pencemaran AN untuk lain-lain negeri termasuk Wilayah Persekutuan Labuan dan Putrajaya adalah kurang daripada 16.00 tan/hari. Beban pencemaran AN mengikut negeri ditunjukkan pada **Rajah 5.6**.

## Ammoniacal Nitrogen Load by States

The estimated AN pollution load discharge to the river in Sabah is the highest which is 37.32 tonnes/day, followed by Selangor 27.80 tonnes/day, Johor 22.49 tonnes/day, Terengganu 17.89 tonnes/day, and Perak 16.46 tonnes/day. The AN pollution load for other states including the Federal Territory of Labuan and Putrajaya is less than 16.00 tonnes/day. The AN pollution loads by states are shown in **Figure 5.6**.



Rajah 5.6: Taburan Anggaran Beban AN (Tan/Hari) dan Punca Pencemaran Air mengikut Negeri, 2023

Figure 5.6: Estimation Distribution of AN Load (Tonnes/Day) and Sources of Water Pollution by States, 2023

## PUNCA-PUNCA PENCEMARAN UDARA

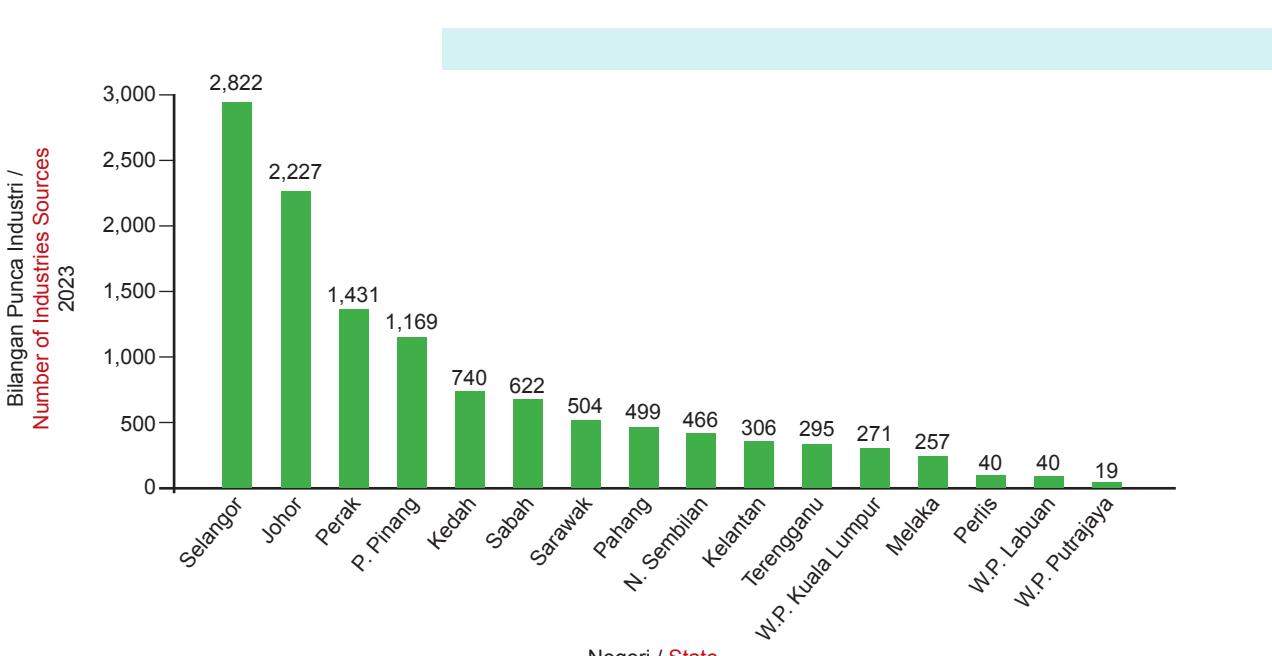
Pencemaran udara yang terhasil daripada peningkatan punca industri hendaklah dikawal secara sistematik. Pemasangan sistem kawalan pencemaran udara yang sesuai adalah penting bagi setiap punca baharu yang berpotensi melepaskan pencemar udara.

Pada tahun 2023, jumlah punca industri yang melepaskan bahan pencemar ke udara adalah sebanyak 11,708. Bilangan punca pencemar yang tertinggi adalah di Selangor 2,822 (24.1%) diikuti Johor 2,227 (19.0%) dan Perak 1,431 (12.2%) seperti ditunjukkan dalam **Rajah 5.7**.

## SOURCES OF AIR POLLUTION

Air Pollution resulting from the increasing sources of industry should be systematically controlled. The installation of suitable air pollution control equipment is essential for every potential new source of emission.

In 2023, a total of 11,708 industrial sources were emitting air pollutants. The highest pollution sources were in Selangor 2,822 (24.1%) followed by Johor 2,227 (19.0%) and Perak 1,431 (12.2%) as indicated in **Figure 5.7**.



Rajah 5.7: Punca Pencemaran Udara Industri mengikut Negeri Tahun 2023

Figure 5.7: Industrial Air Pollution Sources by State in Year 2023

## Kenderaan Bermotor

Sektor pengangkutan merupakan salah satu nadi penting dalam pembangunan ekonomi. Peningkatan bilangan kenderaan berpotensi menyebabkan kandungan gas pencemar udara seperti nitrogen dioksida, hidrokarbon dan karbon monoksida. Di kawasan bandar besar, bilangan kenderaan bermotor yang padat dikenal pasti sebagai sumber utama pencemaran udara dan menjadi punca kepada masalah kesihatan di kalangan masyarakat di kawasan tersebut.

## Motor Vehicles

The transportation sector is one of the main element in economic development. The increase in the number of vehicles potentially leads to the emission of air pollutants such as nitrogen dioxide, hydrocarbons, and carbon monoxide. In large urban areas, the high density of motor vehicles is identified as the main source of air pollution and is a cause of health problems among the population in those areas.

Pada tahun 2023, terdapat peningkatan bagi jumlah terkumpul keseluruhan kenderaan bermotor yang berdaftar berbanding tahun sebelumnya. Jumlah terkumpul keseluruhan kenderaan bermotor berdaftar bagi tahun 2023 adalah sebanyak 35,888,209 sementara tahun 2022 adalah sebanyak 34,206,872. Motosikal, motokar dan bas masing-masing menunjukkan peningkatan sebanyak 21.20%, 39.90% dan 2.06%. Sementara itu bilangan teksi, kereta sewa pandu sendiri dan kenderaan barang termasuk van dan lori turut menunjukkan peningkatan iaitu masing-masing sebanyak 0.37%, 12.93% dan 3.29%. Bilangan terkumpul kenderaan bermotor yang berdaftar yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2022 dan 2023 adalah seperti yang ditunjukkan dalam **Rajah 5.8**.

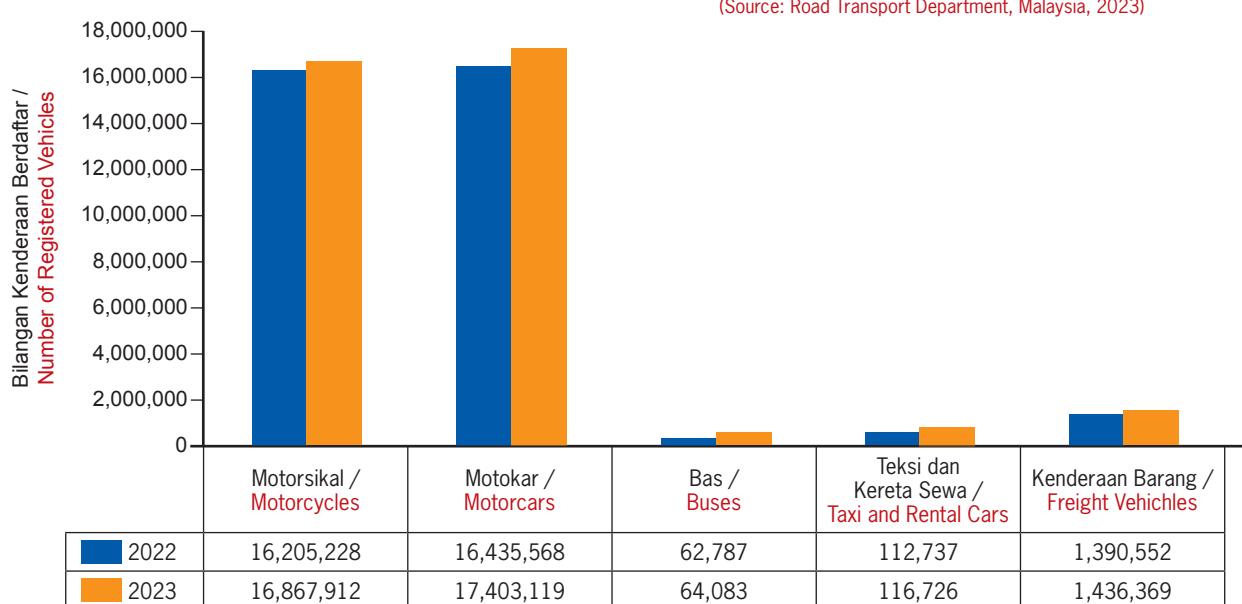
Sementara itu, jumlah bilangan pendaftaran kenderaan baru juga didapati meningkat di mana untuk tahun 2023 adalah sebanyak 1,533,332 unit berbanding dengan tahun sebelumnya iaitu sebanyak 1,520,761 unit. Bilangan tertinggi yang didaftarkan adalah kenderaan jenis motokar iaitu sebanyak 821,634 unit pada tahun 2023 berbanding jumlah bilangan yang didaftarkan pada tahun sebelumnya iaitu sebanyak 737,372 unit.

Jumlah kenderaan berdaftar yang sedang digunakan (aktif) didapati berkurangan sebanyak 14.59% berbanding dengan tahun 2022 di mana jumlah kenderaan berdaftar aktif yang dilaporkan pada tahun 2023 adalah sebanyak 18,352,418 unit sementara tahun sebelumnya adalah sebanyak 21,488,340 unit. Pengurangan bilangan kenderaan aktif ini adalah kerana kenderaan-kenderaan lama yang sudah tidak digunakan lagi di atas jalan raya yang sekaligus menunjukkan peningkatan kepada jumlah pendaftaran kenderaan-kenderaan baru. Pengurangan bilangan kenderaan aktif ini merangkumi semua kategori kenderaan yang mana bilangan kereta persendirian berkurangan sebanyak 7.72%. Teksi berkurangan sebanyak 17.44%, bas mencatatkan pengurangan tertinggi iaitu sebanyak 46.19%, kenderaan barang menunjukkan peratusan pengurangan dari tahun sebelumnya iaitu sebanyak 25.37% dan bilangan peratusan motosikal juga turut menurun sebanyak 24.72%. Bilangan kenderaan berdaftar yang sedang digunakan (aktif) adalah seperti ditunjukkan dalam **Rajah 5.9**.

In 2023, there was an increase in the overall number of cumulative registered motor vehicles. Total cumulative registered motor vehicles for 2023 was 35,888,209 units compared to 2022 which was 34,206,872 units. Registered motorcycles, motorcars and buses increased by 21.20%, 39.90% and 2.06%. Taxis, self-driving rental cars and freight vehicles including vans and lorries increased as well by 0.37%, 12.93% and 3.29%. The cumulative number of registered motor vehicles recorded by the Road Transport Department in 2022 and 2023 is as shown in **Figure 5.8**.

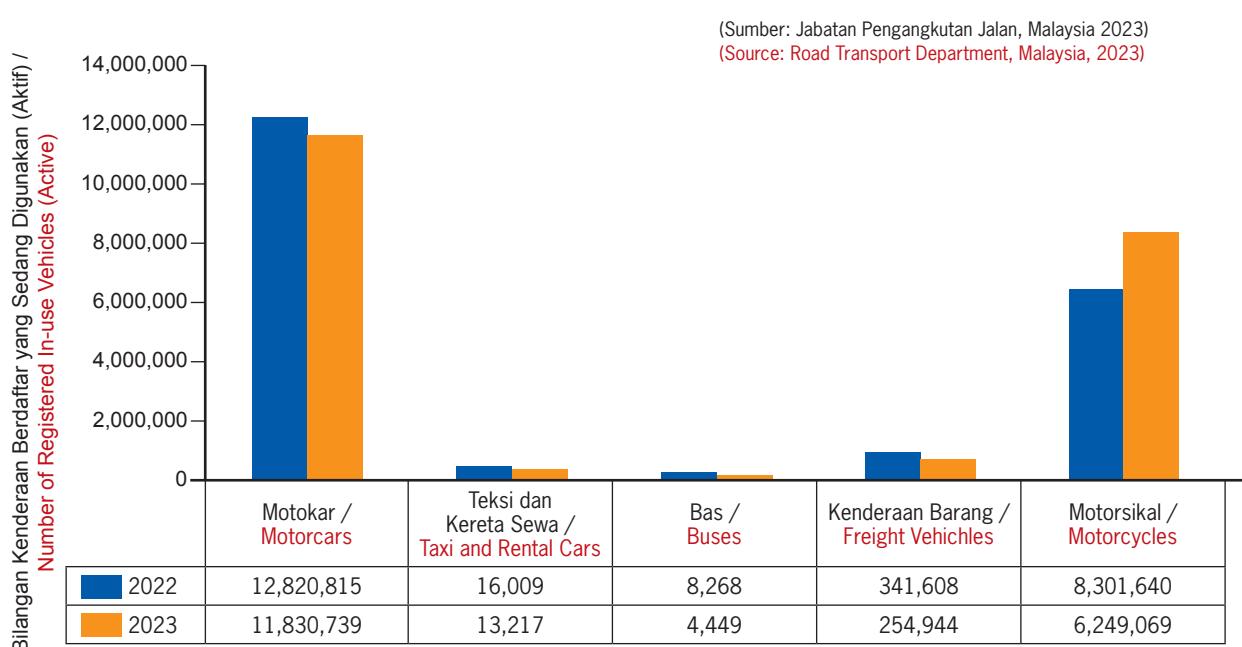
The number of new vehicle registrations was found to increase, with a total of 1,533,332 units registered in 2023 compared to the previous year's total of 1,520,761 units. The highest number registered was motorcars, with a total of 821,634 units in 2023 compared to the previous year's total of 737,372 units.

Meanwhile, the number of registered in-use (active) vehicles decreased by 14.59% compared to the year 2022 where number of registered in-use vehicles in 2023 was 18,352,418 units compared to 2022 which was 21,488,340 units. The reduction in the number of active vehicles is due to old vehicles that are no longer used on the road, which at the same time shows increment in the number of new vehicle registrations. The decrement in the number of active vehicles includes all vehicles categories where the number of private cars decreased by 7.72%. Taxi decreased by 17.44%, buses showed highest decrement by 46.19%, freight vehicles decreased by 25.37% compared to year before and motorcycles decreased as well by 24.72%. Number of registered in-use vehicles (active) are shown in **Figure 5.9**.



Rajah 5.8: Bilangan Kenderaan Berdaftar Terkumpul, 2022-2023

Figure 5.8: Number of Registered Vehicles, 2022-2023



Rajah 5.9: Bilangan Kenderaan Berdaftar yang Sedang Digenakan (Aktif), 2022-2023

Figure 5.9: Number of Registered In-Use Vehicles (Active), 2022-2023

## BEBAN PENCEMARAN PENCEMAR UDARA

### Beban Pencemaran Secara Menyeluruhan

Dianggarkan pada tahun 2023, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 1,847,312 tan metrik, 882,330 tan metrik bagi nitrogen dioksida ( $\text{NO}_2$ ), 284,304 tan metrik bagi sulfur dioksida ( $\text{SO}_2$ ) dan 25,950 tan metrik bagi jirim zarahan (PM). Perbandingan keseluruhan beban pencemaran bagi tahun 2021, 2022 dan 2023 seperti ditunjukkan dalam **Rajah 5.10**.

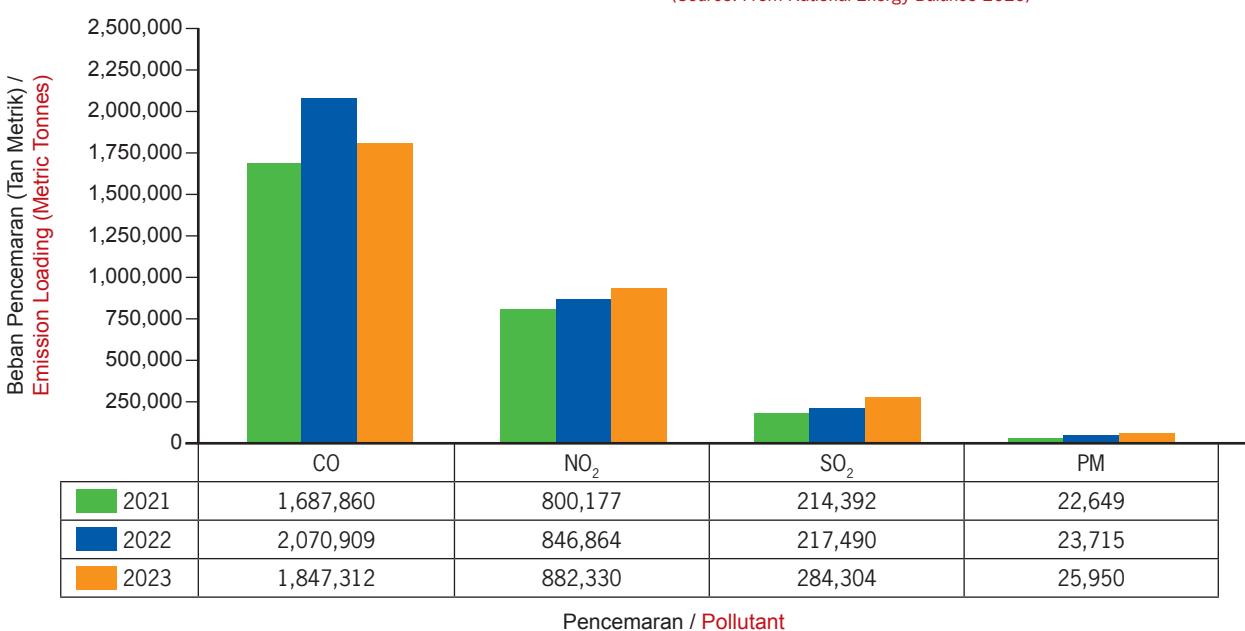
Secara keseluruhannya, beban pencemar bagi parameter  $\text{NO}_2$ ,  $\text{SO}_2$  dan PM didapati meningkat pada tahun 2023 kecuali bagi parameter CO dimana terdapat penurunan. Peningkatan adalah sebanyak 4.19% bagi beban pencemar  $\text{NO}_2$ . Manakala, beban pencemar  $\text{SO}_2$  menunjukkan peningkatan sebanyak 30.72% dan beban pencemar PM menunjukkan peningkatan sebanyak 9.42% berbanding dengan tahun 2022.

## AIR POLLUTION EMISSION LOAD

### Overall Emission Load

It was estimated that in 2023 the overall cumulative air pollutant emission load was 1,847,312 metric tonnes of carbon monoxide (CO), 882,330 metric tonnes of nitrogen dioxide ( $\text{NO}_2$ ), 284,304 metric tonnes of sulphur dioxide ( $\text{SO}_2$ ) and 25,950 metric tonnes of particulate matter (PM). A comparison of the combined air pollutants emission load in 2021, 2022 and 2023 is shown in **Figure 5.10**.

Overall, there was an increase in emission loads for  $\text{NO}_2$ ,  $\text{SO}_2$  and PM. However, CO emissions decreased slightly during that period. The increase in emission load for  $\text{NO}_2$  was 4.19%, while the emission load of  $\text{SO}_2$  pollutants increased by 30.72% and PM pollutants have increased by 9.42% compared to the year 2022.



Rajah 5.10: Beban Pencemaran Bahan Pencemar Udara dari Semua Punca, 2021-2023

Figure 5.10: Air Pollutant Emission Load from All Sources, 2021-2023

## Punca Beban Pencemaran

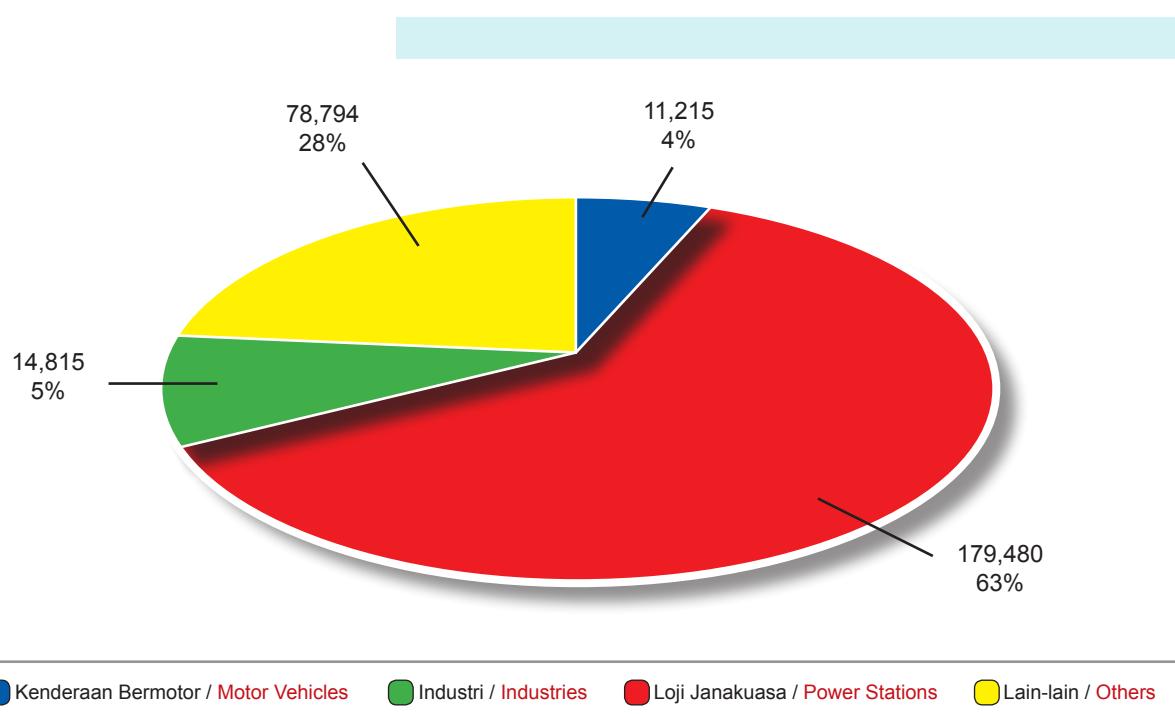
Loji janakuasa merupakan penyumbang utama kepada beban pencemar  $\text{SO}_2$  (63%), diikuti dengan lain-lain kategori (28%), industri (5%) dan kenderaan bermotor (4%) (**Rajah 5.11**). Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada loji janakuasa (38%), industri (29%), diikuti lain-lain kategori (23%) dan kenderaan bermotor (10%) (**Rajah 5.12**).

Penyumbang terbesar bagi  $\text{NO}_2$  adalah daripada loji janakuasa (70%) diikuti kenderaan bermotor (19%), industri (8%) dan lain-lain kategori (3%) (**Rajah 5.13**). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95%) (**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. Anggaran pencemaran yang dihasilkan oleh beban pencemar udara daripada kenderaan bermotor iaitu HC, CO, PM,  $\text{NO}_2$  dan  $\text{SO}_2$  pada tahun 2022 dan 2023 ditunjukkan dalam **Rajah 5.15**.

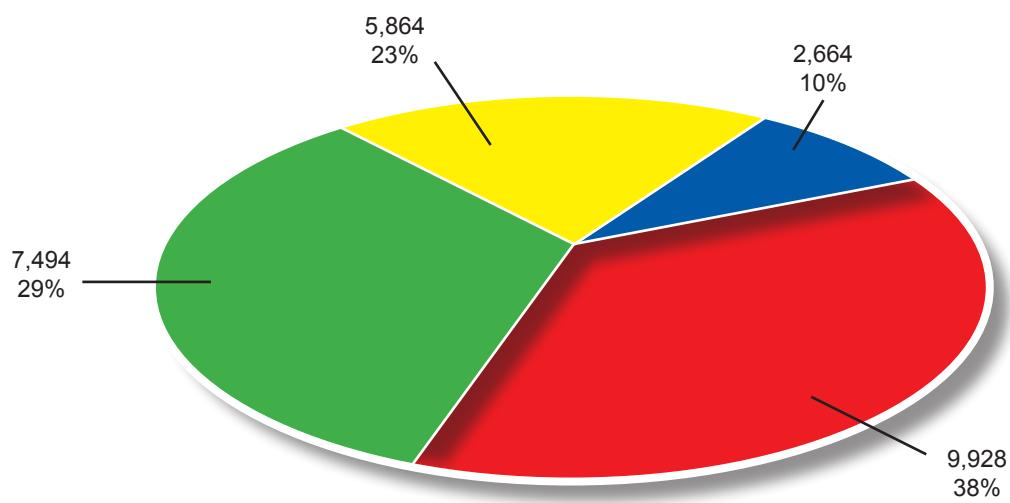
## Emission Load by Sources

Power plants contributed the highest  $\text{SO}_2$  emission load (63%), followed by other categories (28%), industries (5%) and motor vehicles (4%) (**Figure 5.11**). As for PM, the highest contributors were power plants (38%) followed by industries (29%), others (23%) and motor vehicles (10%) (**Figure 5.12**).

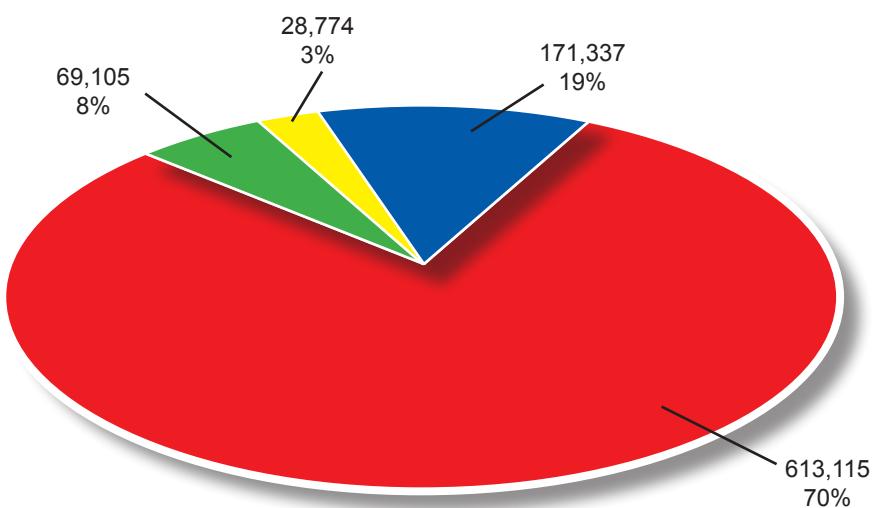
The highest contributors of  $\text{NO}_2$  were power plants (70%) followed by motor vehicles (19%), industries (8%), and others (3%) (**Figure 5.13**). However, motor vehicles remained the highest contributor of CO (95%) (**Figure 5.14**). 'Others' in the figures represent air pollutant emissions from residential, commercial and non-energy use sources. The estimated annual air pollutant emission loads of HC, CO, PM,  $\text{NO}_2$  and  $\text{SO}_2$  from motor vehicles for 2022 and 2023 are shown in **Figure 5.15**.



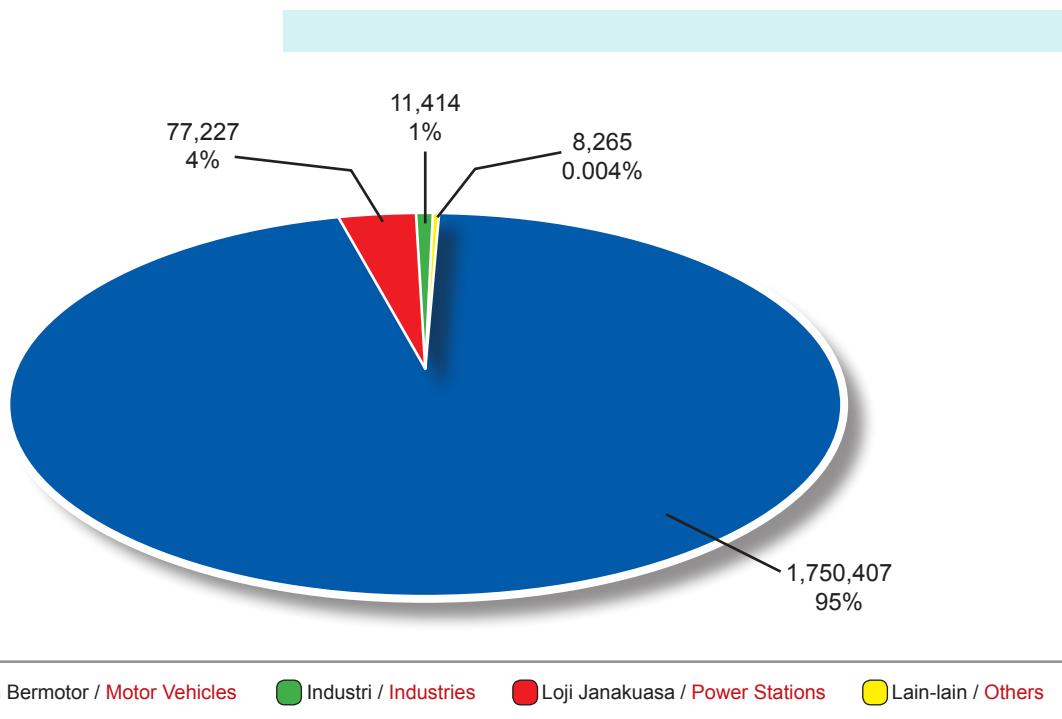
Rajah 5.11: Punca Beban Pencemaran  $\text{SO}_2$  (Ton Metrik), 2023  
Figure 5.11:  $\text{SO}_2$  Emission Load by Sources (Metric Tonnes), 2023



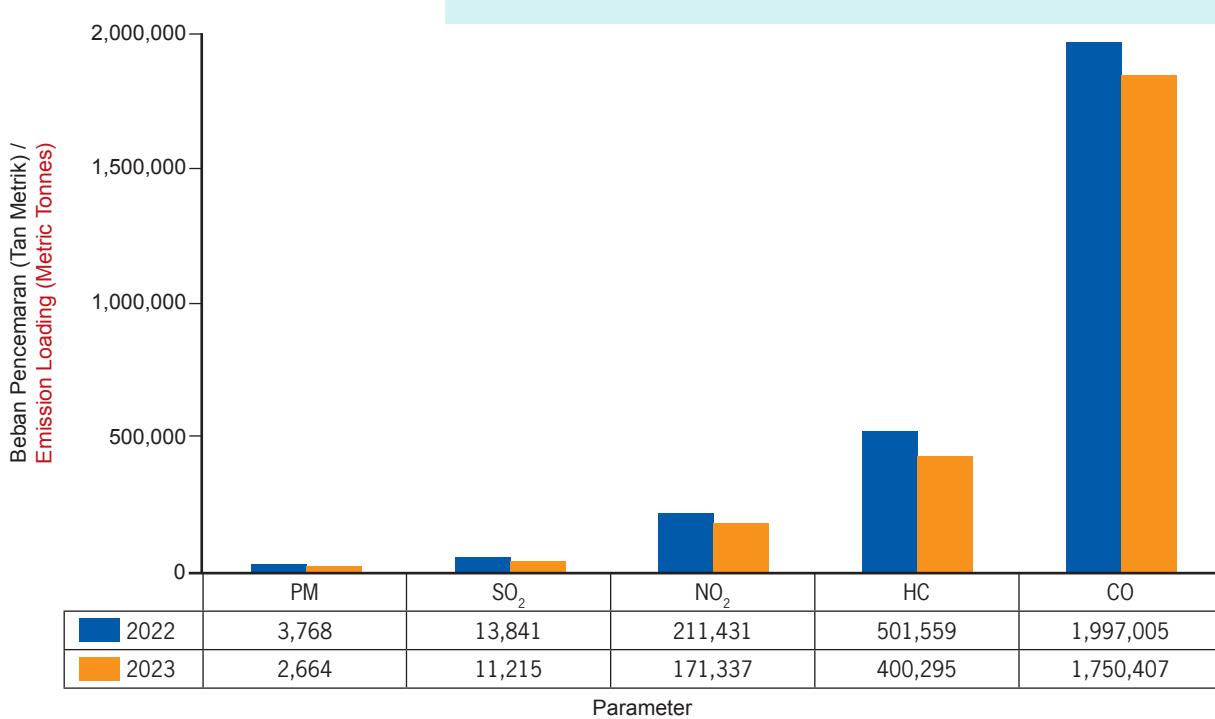
Rajah 5.12: Punca Beban Pencemaran PM (Tan Metrik), 2023  
Figure 5.12: PM Emission Load by Sources (Metric Tonnes), 2023



Rajah 5.13: Punca Beban Pencemaran NO<sub>2</sub> (Tan Metrik), 2023  
Figure 5.13: NO<sub>2</sub> Emission Load by Sources (Metric Tonnes), 2023



Rajah 5.14: Punca Beban Pencemaran CO (Tan Metrik), 2023  
 Figure 5.14: CO Emission Load by Sources (Metric Tonnes), 2023



Rajah 5.15: Beban Pencemar Udara dari Kenderaan Bermotor, 2022-2023 (Metrik Tan)  
 Figure 5.15: Air Pollutant Emission Load from Motor Vehicles, 2022-2023 (Metric Tonnes)

## INVENTORI BUANGAN TERJADUAL

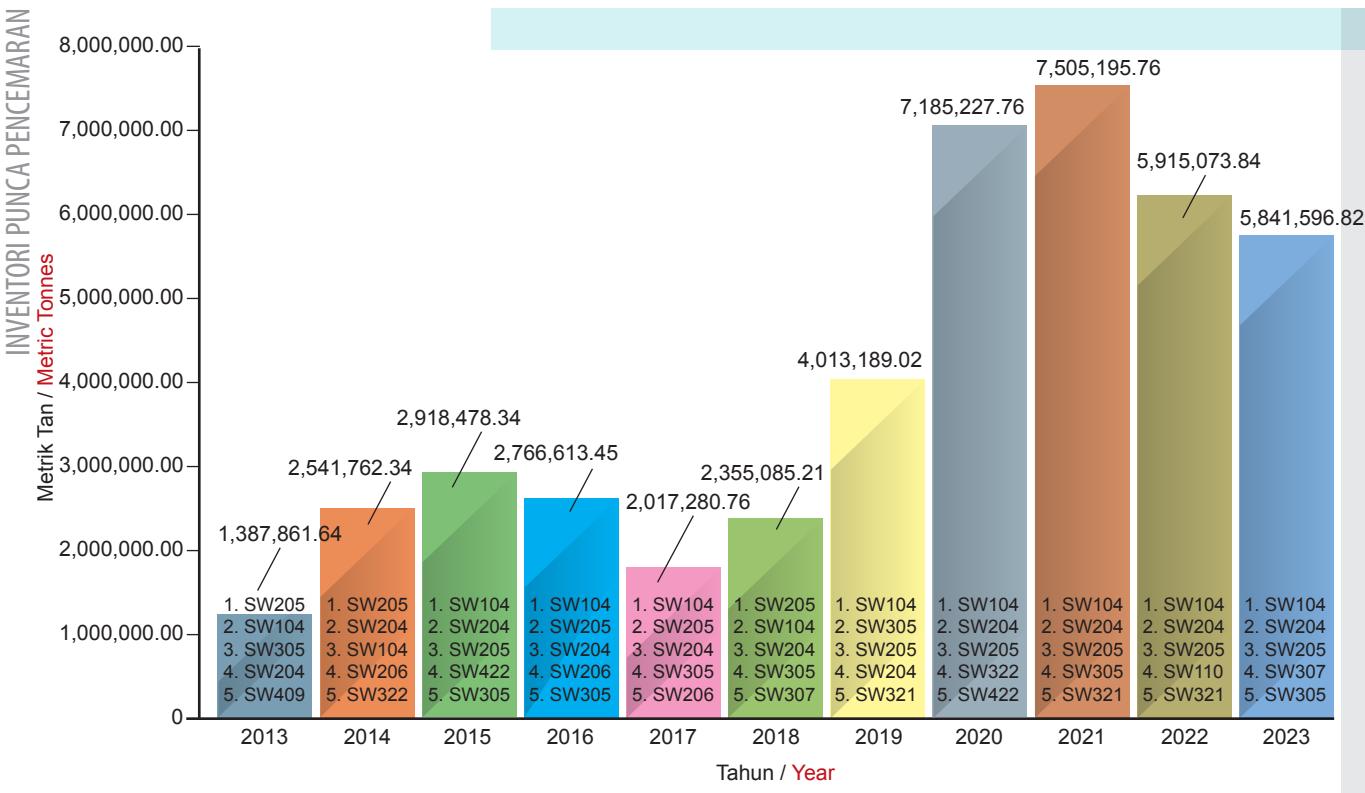
Pada tahun 2023 sebanyak 5,841,596.82 tan metrik buangan terjadual telah dihasilkan. Ini merupakan pengurangan sebanyak 1.24% berbanding 5,915,073.84 tan metrik yang dilaporkan pada 2022. **Rajah 5.16** menunjukkan perbezaan jumlah penghasilan buangan terjadual bagi tahun 2013-2023. Kategori utama buangan yang dihasilkan adalah dros/sanga/klinker/abu, enapcemar logam berat dan buangan gipsum (**Jadual 5.1**). **Rajah 5.17** menunjukkan jumlah penghasilan buangan terjadual berdasarkan kepada kumpulan di dalam jadual pertama PPKAS (BT) 2005 bagi tahun 2023. Negeri Selangor telah menghasilkan jumlah terbesar buangan terjadual (27%), diikuti oleh Johor (21%), Sarawak (11%), Perak (9%), Negeri Sembilan (9%), Pahang (7%) manakala 10 negeri-negeri yang lain menghasilkan sebanyak (18%) (**Rajah 5.18**). Berdasarkan jumlah buangan terjadual yang dihasilkan mengikut jenis industri, loji janakuasa didapati menghasilkan buangan terjadual yang tertinggi sebanyak 1,809, 917.70 tan metrik diikuti pengilangan logam 1,114,619.21 tan metrik dan industri kimia 574,076.24 tan metrik (**Jadual 5.2**). Trend pengurusan buangan terjadual dalam negara adalah seperti di **Rajah 5.19**.

## SCHEDULED WASTES INVENTORY

In 2023, a total of 5,841,596.82 metric tonnes of scheduled wastes were generated. This represents an overall decrease of 1.24 % as compared to 5,915,073.84 metric tonnes reported in 2022. **Figure 5.16** illustrates the variation in scheduled waste generation from 2013 to 2023. The main categories of waste generated were dross/slag/clinker/ash, heavy metal sludge and gypsum (**Table 5.1**). **Figure 5.17** shows the amount of scheduled waste generated in 2023, categorized according to the groups in the first scheduled of the Environmental Quality (Scheduled Waste) Regulations 2005. The state of Selangor generated the largest amount of scheduled wastes (27%), followed by Johor (21%), Sarawak (11%), Perak (9%), Negeri Sembilan (9%), Pahang (7%) whilst the other 10 states generated a total of 18% (**Figure 5.18**). Based on the scheduled waste generated by industry, power plant generated the largest with a total of 1,809, 917.70 metric tonnes followed by metal refinery 1,114,619.21 metric tonnes and chemical industry 574,076.24 metric tonnes (**Table 5.2**). The scheduled waste management trend in the country is as shown in **Figure 5.19**.

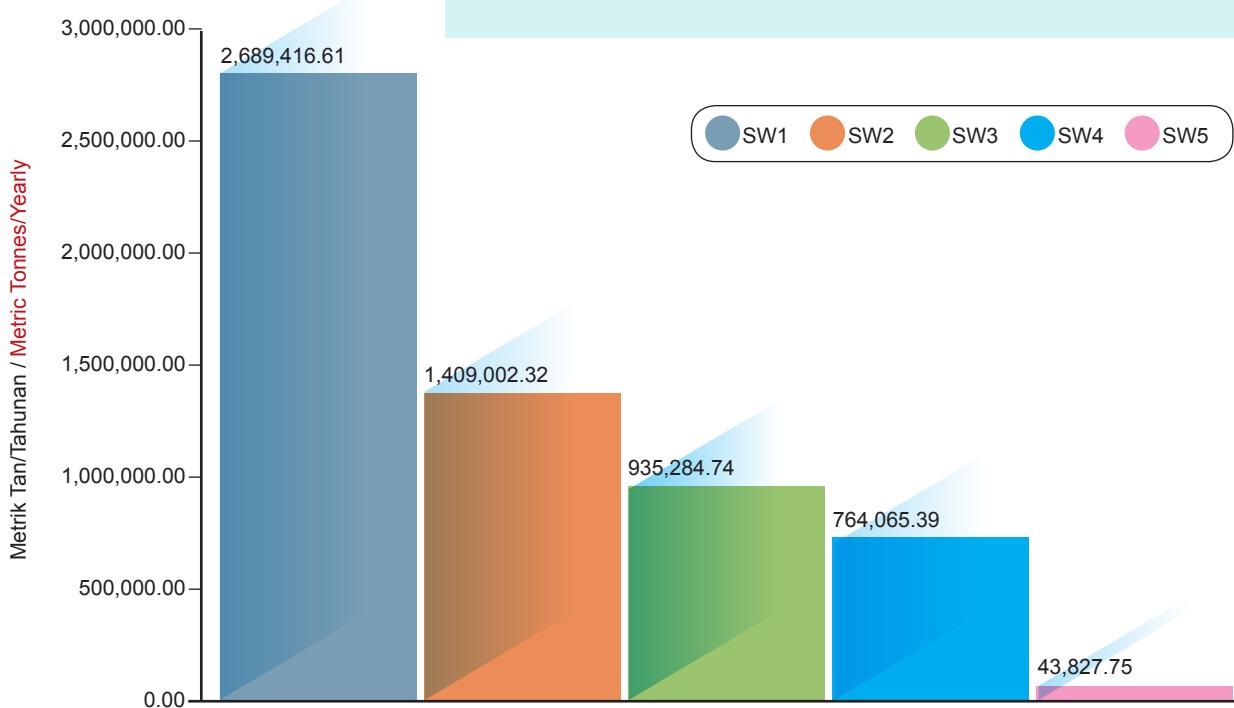


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Rajah 5.16: Jumlah Penghasilan Buangan Terjadual, 2013-2023

Figure 5.16: Total Scheduled Wastes Generation, 2013-2023



Rajah 5.17: Jumlah Penghasilan Buangan Terjadual mengikut Jadual Pertama Peraturan-Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005

Figure 5.17: Total Scheduled Wastes Generation According to the First Schedule Environmental Quality (Schedule Wastes) Regulations 2005

**Jadual 5.1: Jumlah Buangan Terjadual yang Dihasilkan mengikut Kod Kategori Buangan Terjadual, 2023**

**Table 5.1: Quantity of Scheduled Wastes Generated by Scheduled Waste Category Code, 2023**

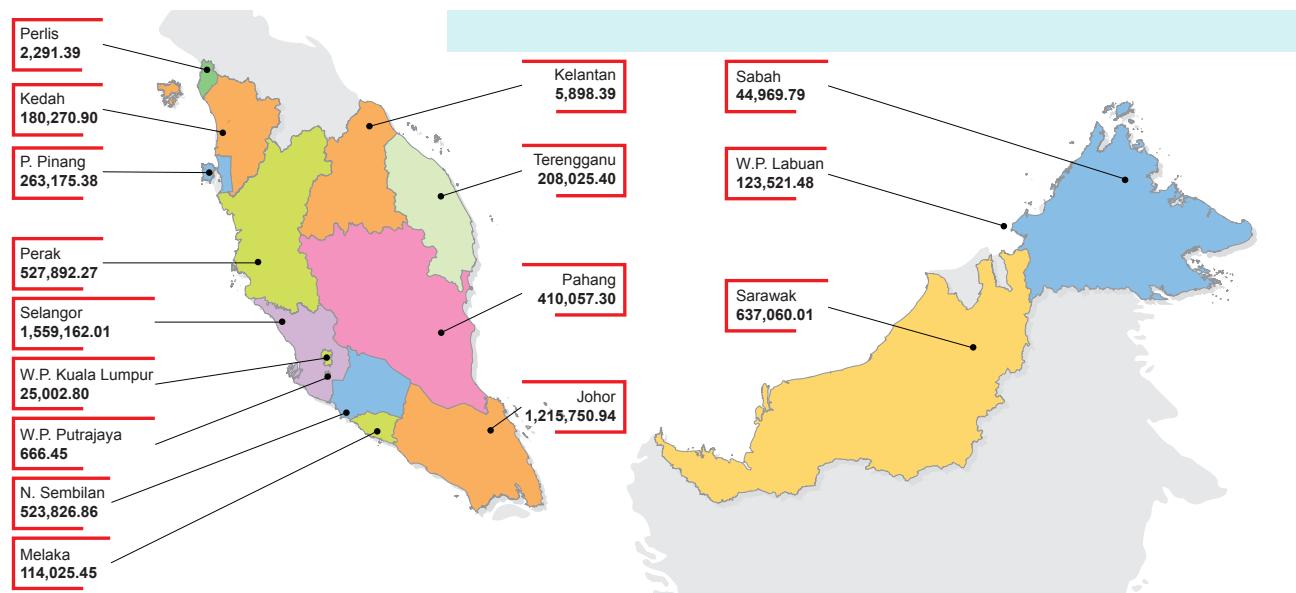
BIL. / NO.	NAMA BUANGAN / NAME OF WASTE	KOD KATEGORI BUANGAN / WASTE CATEGORY CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT / TAHUN) / (MT / YEAR)	PERATUSAN (%) / PERCENTAGE (%)
1	Debu, sanga, dros atau abu yang mengandungi arsenic, raksa, plumbum, kadmium, kromium, nikel, kuprum, vanadium, berilium, antimony, tellurium, talium, atau selenium, tidak termasuk sanga daripada kilang besi dan keluli / Dust, slag, dross or ash containing arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory	SW 104	2,611,858.21	44.71%
2	Enap cemar yang mengandungi satu atau beberapa logam termasuklah kromium, kuprum, nikel, zink, plumbum, kadmium, aluminium, timah vanadium dan berilium / Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium	SW 204	637,112.23	10.91%
3	Buangan gypsum yang terhasil daripada proses industri kimia atau loji janakuasa / Waste gypsum arising from chemical industry or power plant	SW 205	564,540.55	9.66%
4	Emulsi minyak mineral-air terpakai / Spent mineral oil-water emulsion	SW 307	237,593.46	4.07%
5	Minyak pelincir terpakai / Spent lubricating oil	SW 305	211,530.55	3.62%
6	Enap cemar mineral termasuklah enap cemar kalsium hidroksida, enap cemar pemfosfatan, enap cemar kalsium sulfit dan enap cemar karbonat / Mineral sludges including calcium hydroxide sludges, phosphating sludges, calcium sulphite sludges and carbonates sludges	SW 427	173,732.68	2.97%
7	Campuran buangan terjadual dan buangan tidak terjadual / Mixture of scheduled waste & non-scheduled waste	SW 422	163,732.23	2.80%
8	Buangan atau enap cemar getah atau lateks yang mengandungi pelarut organic atau logam berat / Rubber or latex wastes or sludge containing organic solvents or heavy metals	SW 321	155,395.51	2.66%
9	Buangan pelarut organic bukan terhalogen / Waste of non-halogenated solvent	SW 322	126,727.88	2.17%
10	Buangan minyak atau enap cemar berminyak / Waste oil or oily sludges	SW 311	118,155.31	2.02%
11	Enap cemar yang mengandungi fluoride / Sludge containing fluoride	SW 207	101,438.02	1.74%
12	Asid tidak organik terpakai / Spent inorganic acids	SW 206	88,558.20	1.52%
13	Kain buruk, plastik, kertas atau turas yang dicemari dengan buangan terjadual / Rags, plastics, papers or filters contaminated with scheduled wastes	SW 410	87,893.90	1.50%
14	Bekas, beg atau kelengkapan yang dilupuskan yang dicemari dengan bahan kimia, racun mahkluk perosak, minyak mineral atau buangan terjadual / Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes	SW 409	85,971.05	1.47%
15	Buangan dakwat, cat, pigmen, lakuer, perwarna atau varnis / Waste of inks, paints, pigments, lacquer, dye or varnish	SW 417	77,605.43	1.33%
16	Buangan daripada pemasangan elektrikal dan elektronik yang mengandungi komponen seperti akumulator, suis raksa, kaca daripada tiub sinar katod dan kaca teraktif atau kapasitor bifenil terpoliklorin yang lain, atau yang dicemari dengan kadmium, raksa, plumbum, nikel, kromium, kuprum, litium, perak, mangani, atau bifenil terpoliklorin / Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl	SW 110	65,280.14	1.12%
17	Apa-apa sisa daripada pengolahan atau pemerolehan kembali buangan terjadual / Any residues from treatment or recovery of scheduled wastes	SW 501	43,827.75	0.75%
18	Buangan patogenik, buangan klinikal atau bahan yang dikuarantinkan / Pathogenic wastes, clinical wastes or quarantined materials	SW 404	41,794.25	0.72%
19	Enap cemar dakwat, cat pigmen, lakuer, perwarna atau varnis / Sludges of inks, paints, pigments, lacquer, dye or varnish	SW 416	32,520.54	0.56%
20	Campuran minyak-air seperti air ballast / Oil-water mixture such as ballast water	SW 309	28,832.58	0.49%
21	Buangan resin tidak matang yang mengandungi pelarut organic atau logam berat termasuklah resin epoksi dan resin fenolik / Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin	SW 325	22,127.18	0.38%
22	Larutan pemprosesan terpakai, bahan kimia fotografi terbuang atau buangan fotografi terbuang / Spent processing solution, discarded photographic chemicals or discarded photographic wastes	SW 423	21,119.93	0.36%
23	Bahan kimia yang terbuang atau tidak mengikut spesifikasi / Chemicals that are discarded or off-specification	SW 429	16,580.91	0.28%
24	Campuran buangan terjadual / A mixture of scheduled wastes	SW 421	15,446.33	0.26%
25	Buangan mangkin / Waste catalyst	SW 202	15,156.50	0.26%

**Jadual 5.1: Jumlah Buangan Terjadual yang Dihasilkan mengikut Kod Kategori Buangan Terjadual, 2023**  
**Table 5.1: Quantity of Scheduled Wastes Generated by Scheduled Waste Category Code, 2023**

BIL. / NO.	NAMA BUANGAN / NAME OF WASTE	KOD KATEGORI BUANGAN / WASTE CATEGORY CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT / TAHUN) / (MT / YEAR)	PERATUSAN (%) / PERCENTAGE (%)
26	Produk dakwat, cat, pigmen, lakuer, perwana atau varnish yang terbuang atau yang tidak mengikut spesifikasi yang mengandungi pelarut organic / Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent	SW 418	13,967.97	0.24%
27	Alkali terpakai yang mengandungi logam berat / Spent alkalis containing heavy metals	SW 401	12,284.98	0.21%
28	Buangan bateri asid plumbo dalam bentuk sempurna atau hancur / Waste of lead acid batteries in whole or crushed form	SW 102	7,749.41	0.13%
29	Karbon teraktif yang terpakai tidak termasuk karbon daripada pengolahan air boleh diminum dan proses industri makanan dan penghasilan vitamin / Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production	SW 411	6,759.02	0.12%
30	Buangan pelarut organik terhalogen / Waste of halogenated organic solvents	SW 323	6,636.45	0.11%
31	Minyak hidraulik terpakai / Spent hydraulic oil	SW 306	6,319.08	0.11%
32	Klinker, sangan, abu, dari penunu buangan terjadual / Clinker, slag and ashes from scheduled wastes incinerator	SW 406	4,812.14	0.08%
33	Buangan cecair terma (permindahan haba) seperti glikol etilena / Waste of thermal fluids (heat transfer) such as ethylene glycol	SW 327	4,349.16	0.07%
34	Enap cemar kapal tangki minyak / Oil tanker sludges	SW 308	4,169.66	0.07%
35	Buangan pelekat atau glu yang mengandungi pelarut organic tidak termasuk bahan polimer pepejal / Adhesive or glue waste containing organic solvents excluding solid polymeric materials	SW 303	3,812.74	0.07%
36	Alkali terpakai dengan pH yang lebih daripada atau sama dengan 11.5 yang mengakis atau berbahaya / Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous	SW 402	3,644.65	0.06%
37	Tanah, puing, atau bahan tercemar yang terhasil daripada pembersihan tumpahan bahan kimia, minyak mineral, atau buangan terjadual / Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes	SW 408	3,292.11	0.06%
38	Sisa berminyak dari bengkel automotif, stesen servis minyak atau perangkap gris / Oily residue from automotive workshop, service station, oil or grease interceptor	SW 312	3,033.44	0.05%
39	Buangan bateri yang mengandungi kadmium dan nikel atau raksa atau litium / Waste of batteries containing cadmium and nickel or mercury or lithium	SW 103	2,802.17	0.05%
40	Asid organic terpakai dengan pH yang kurang daripada atau sama dengan 2 yang mengakis atau berbahaya / Spent organic acids with pH less or equal to 2 which are corrosive or hazardous	SW 301	1,768.27	0.03%
41	Buangan yang mengandungi raksa atau sebatiannya / Waste containing mercury or its compound	SW 109	1,594.79	0.03%
42	Buangan asbestos dalam bentuk enap cemar, debu atau gentian / Asbestos wastes in sludges, dust or fibre forms	SW 201	1,329.76	0.02%
43	Enap cemar dari tangki penyimpanan minyak mineral / Sludge from mineral oil storage tank	SW 310	1,246.81	0.02%
44	Buangan yang mengandungi formaldehid / Waste containing formaldehyde	SW 320	1,123.87	0.02%
45	Larutan alkali berair terpakai yang mengandungi sianida / Spent aqueous alkaline solution containing cyanide	SW 414	1,019.77	0.02%
46	Minyak atau enap cemar daripada operasi penyenggaraan loji penapisan minyak / Oil or sludge from oil refinery plant maintenance operation	SW 314	1,019.52	0.02%
47	Buangan terjadual tidak boleh bergerak termasuklah enap cemar yang ditetapkan secara kimia, dikapsulkan, dipejalkan atau distabilkan / Immobilized scheduled wastes including chemically fixed, encapsulated, solidified or stabilized sludges	SW 203	867.07	0.01%
48	Tar atau sisa bertar dari loji penapisan minyak atau loji petrokimia / Tar or tarry residues from oil refinery or petrochemical plant	SW 315	632.38	0.01%
49	Dadah terbuang yang mengandungi bahan psikotropik atau yang mengandungi bahan yang bertoksik berbahaya, karsinogenik, mutagenik atau teratogenik / Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic	SW 403	599.67	0.01%
50	Buangan yang terhasil daripada penyediaan dan pengeluaran barang farmaseutikal / Waste arising from the preparation and production of pharmaceutical product	SW 405	552.46	0.01%
51	Bahan kimia makmal yang usang / Obsolete laboratory chemicals	SW 430	372.99	0.01%
52	Tanah yang dicemari minyak daripada penapisan semula minyak pelincir terpakai / Oil contaminated earth from re-refining of used lubricating oil	SW 313	320.83	0.01%
53	Buangan sisa penyulingan tidak berair terhalogen atau bukan terhalogen yang terhasil daripada proses permeolehan kembali pelarut organik / Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process	SW 324	259.32	0.00%

**Jadual 5.1: Jumlah Buangan Terjadual yang Dihasilkan mengikut Kod Kategori Buangan Terjadual, 2023**  
**Table 5.1: Quantity of Scheduled Wastes Generated by Scheduled Waste Category Code, 2023**

BIL. / NO.	NAMA BUANGAN / NAME OF WASTE	KOD KATEGORI BUANGAN / WASTE CATEGORY CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT / TAHUN) / (MT / YEAR)	PERATUSAN (%) / PERCENTAGE (%)
54	Buangan fluks yang mengandungi campuran asid organic, pelarut atau sebatian ammonium klorida / Flux waste containing mixture of organic acids, solvents or compounds of ammonium chloride	SW 302	196.93	0.00%
55	Buangan daripada pengeluaran, formulasi, perdagangan atau penggunaan racun mahkluk perosak, racun herba atau biosid / Wastes from the production, formulation, trade or use of pesticides, herbicides or biocides	SW 425	136.00	0.00%
56	Sisa daripada pemerolehan kembali likuor penjerukan asid / Residues from recovery of acid pickling liquor	SW 106	79.27	0.00%
57	Produk yang tidak mengikut spesifikasi daripada pengeluaran, formulasi, perdagangan, atau penggunaan racun mahkluk perosak, racun herba, atau biosid / Off-specification products from the production, formulation, trade or use of pesticides, herbicides or biocides	SW 426	72.68	0.00%
58	Buangan yang mengandungi arsenic atau sebatiananya / Waste containing arsenic or its compound	SW 101	47.65	0.00%
59	Agen pengoksidaan terpakai / Spent oxidizing agent	SW 424	47.41	0.00%
60	Diisosianat terpakai dan sisa sebatian isosianat tidak termasuk bahan berpolimer pepejal daripada proses pengilangan busa / Spent di-isocyanates and residues of isocyanate compounds excluding solid polymeric material from foam manufacturing process	SW 419	42.30	0.00%
61	Buangan yang mengandungi, yang terdiri daripada, atau yang dicemari dengan peroksida / Waste containing, consisting of or contaminated with, peroxides	SW 432	28.15	0.00%
62	Buangan daripada pengilangan atau pemprosesan atau penggunaan bahan letupan / Waste from manufacturing or processing or use of explosives	SW 431	23.88	0.00%
63	Buangan fenol atau sebatian fenol termasuklah klorofenol dalam bentuk cecair atau enapcemar / Waste of phenols or phenol compounds including chlorophenol in the form of liquids or sludges	SW 319	18.56	0.00%
64	Buangan daripada operasi pengawetan kayu yang menggunakan garam tidak organik yang mengandungi kuprum, kromium, atau arsenik daripada sebatian fluoride atau yang menggunakan sebatian yang mengandungi fenol berklorin atau kreosot / Wastes from wood preserving operation using inorganic salts containing copper, chromium or arsenic or fluoride compounds or using compound containing chlorinated phenol or creosote	SW 428	10.53	0.00%
65	Enap cemar asid / Acid sludge	SW 316	9.47	0.00%
66	Buangan, bahan dan artikel yang mengandungi atau yang dicemari dengan bifenil terpoliklorin (BFT) atau trifenil terpoliklorin (TFT) / Waste, substances and articles containing or contaminated with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT)	SW 318	4.80	0.00%
67	Sisa larutan resap daripada pemprosesan zink dalam bentuk debu dan enap cemar / Leaching residues from zinc processing in dust and sludges form	SW 108	3.43	0.00%
68	Sanga daripada pemprosesan kuprum bagi pemprosesan lanjut atau penapisan yang mengandungi arsenic, plumbum, atau kadmium / Slags from copper processing for further processing or refining containing arsenic, lead or cadmium	SW 107	1.54	0.00%
69	Garam terpakai yang mengandungi sianida / Spent salt containing cyanide	SW 413	0.96	0.00%
70	Buangan sebatian fosforus organik / Waste of organic phosphorus compound	SW 326	0.89	0.00%
71	Enap cemar yang mengandungi sianida / Sludges containing cyanide	SW 412	0.48	0.00%
72	Sebatian organologam terpakai termasuklah plumbum tetraethyl, plumbum tetrametyl dan sebatian organotimah / Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds	SW 317	0.10	0.00%
73	Buangan yang mengandungi dioksin dan furan / Waste containing dioxins or furans	SW 407	0.02	0.00%
74	Enap cemar galvani / Galvanic sludges	SW 105	-	0.00%
75	Kek tekan daripada prapengolahan lai sabun gliserol / Press cake from pretreatment of glycerol soap lye	SW 304	-	0.00%
76	Minyak pelindapan terpakai yang mengandungi sianida / Spent quenching oils containing cyanides	SW 415	-	0.00%
77	Larutan resap dari tapak pelupusan buangan terjadual / Leachate from scheduled waste landfill	SW 420	-	0.00%
<b>JUMLAH / TOTAL</b>			<b>5,841,596.82</b>	<b>100.00%</b>



Rajah 5.18 : Penghasilan Buangan Terjadual (Tan Metrik) mengikut Negeri 2023

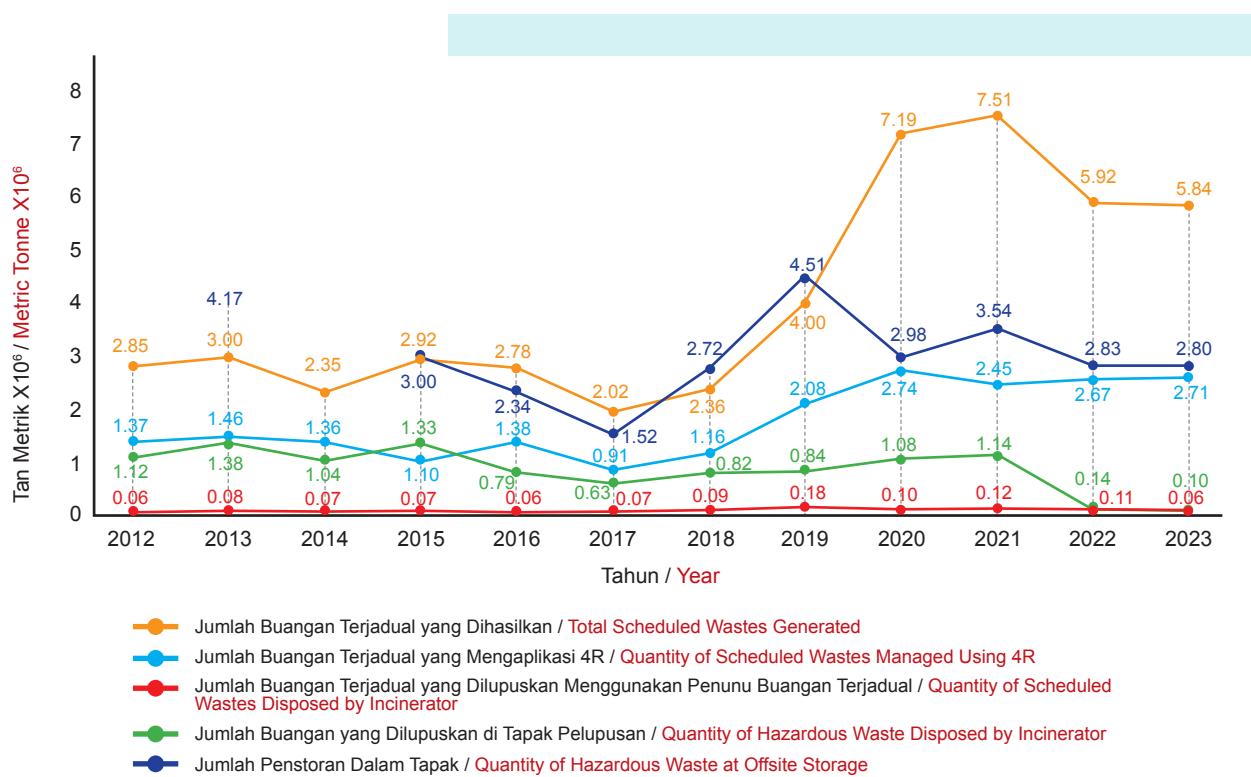
Figure 5.18 : Distribution of Scheduled Waste (Metric Tonnes) Generated by State 2023

**Jadual 5.2: Jumlah Buangan Terjadual yang Dihasilkan Mengikut Jenis Industri, 2023****Table 5.2: Quantity of Scheduled Wastes Generated by Industry, 2023**

BIL. / NO.	JENIS INDUSTRI / TYPE OF INDUSTRY	MT/TAHUN / MT/YEAR	PERATUSAN(%) / PERCENTAGE (%)
1	Loji Janakuasa / Power Plant	1,809,917.70	30.98%
2	Pengilangan Logam / Metal Refinery	1,114,619.21	19.08%
3	Industri Kimia / Chemical Industry	574,076.24	9.83%
4	Elektrik dan Elektronik / Electric and Electronic	380,770.03	6.52%
5	Premis Buangan Terjadual (PYDT) / Scheduled Waste Treatment and Disposal Facilities	364,574.96	6.24%
6	Bengkel / Workshop	258,061.68	4.42%
7	Kenderaan / Vehicle	223,877.90	3.83%
8	Berasaskan Getah / Rubber Base	213,995.77	3.66%
9	Jentera / Machinery	179,830.59	3.08%
10	Galian Bukan Logam / Excavation Non Metal	102,202.36	1.75%
11	Penapisan Petroleum / Petroleum Refinery	101,302.22	1.73%
12	Loji Rawatan Air / Water Treatment Plant	94,251.95	1.61%
13	Penyudahan Logam dan Sadur Elektrik / Metal Finishing and Coating	78,595.83	1.35%
14	Lain-lain / Others	69,293.74	1.19%
15	Kertas / Paper	52,864.84	0.90%
16	Perubatan / Health Care Services	47,512.58	0.81%
17	Percetakan / Printing	30,904.00	0.53%
18	Perlombongan / Mining	28,086.25	0.48%
19	Fabrikasi Logam / Metal Fabrication	22,127.73	0.38%
20	Penapisan Minyak Makan / Edible Oil Refinery	16,250.37	0.28%
21	Makanan & Minuman / Food & Drink	14,021.45	0.24%
22	Gudang / Warehouse	11,187.80	0.19%
23	Plastik / Plastic	9,028.94	0.15%
24	Tekstil / Textiles	8,324.26	0.14%
25	Pembuatan Payung dan Lain-lain Industri Pembuatan / Others Manufacturing	7,598.33	0.13%
26	Berasaskan Kayu / Wood Base	6,538.68	0.11%

**Jadual 5.2: Jumlah Buangan Terjadual yang Dihasilkan mengikut Jenis Industri, 2023**  
**Table 5.2: Quantity of Scheduled Wastes Generated by Industry, 2023**

BIL. / NO.	JENIS INDUSTRI / TYPE OF INDUSTRY	MT/TAHUN / MT/YEAR	PERATUSAN(%) / PERCENTAGE (%)
27	Kilang Kelapa Sawit (PYDT) / Palm Oil Mill	5,015.95	0.09%
28	Kuari / Quarry	4,302.33	0.07%
29	Pertanian / Agriculture	3,524.23	0.06%
30	Simen / Cement	2,792.13	0.05%
31	Perkhidmatan / Services	1,695.74	0.03%
32	Kilang Getah (PYDT) / Rubber Factory	1,439.42	0.02%
33	Peralatan Sukan dan Permainan / Sports Equipment and Games	960.89	0.02%
34	Hotel / Hotel	677.03	0.01%
35	Kulit / Leather	576.73	0.01%
36	Peralatan Pejabat dan Alat Tulis / Office Supplies and Stationery	350.25	0.01%
37	Loji Pengolahan Kumbahan ( IWK, Majari, PBT) / Sewage Treatment Plant (IWK, Majari, PBT)	147.33	0.00%
38	Tapak Pelupusan Sampah / Sanitary Landfill	108.02	0.00%
39	Loji Pengolahan Kumbahan Persendirian / Private Sewage Treatment Plant	78.56	0.00%
40	Makanan Ternakan / Livestock Food	51.23	0.00%
41	Rokok dan Tembakau / Cigarettes and Tobacco	44.66	0.00%
42	Kilang Padi / Rice Mill	8.89	0.00%
43	Perhutanan / Forestry	6.95	0.00%
44	Perikanan / Fishery	0.82	0.00%
45	Restoran / Restaurant	0.21	0.00%
46	Penternakan / Husbandry	0.06	0.00%
<b>JUMLAH / TOTAL</b>		<b>5,841,596.82</b>	<b>100.00%</b>



Rajah 5.19: Tren Pengurusan Buangan Terjadual, 2012-2023

Figure 5.19: Scheduled Waste Management Trend, 2012-2023

Sebanyak 518,695.85 tan metrik (8.88%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara. Ini menunjukkan peningkatan sebanyak 23.05% berbanding 421,536.62 tan metrik pada tahun 2022. Daripada jumlah itu, 467,286.85 tan metrik (8.00%) daripada buangan terjadual yang diperoleh kembali di kemudahan pemerolehan kembali luar tapak tempatan manakala 51,409.00 tan metrik (0.88%) telah diberi kebenaran eksport untuk pemerolehan kembali di kemudahan di luar negara.

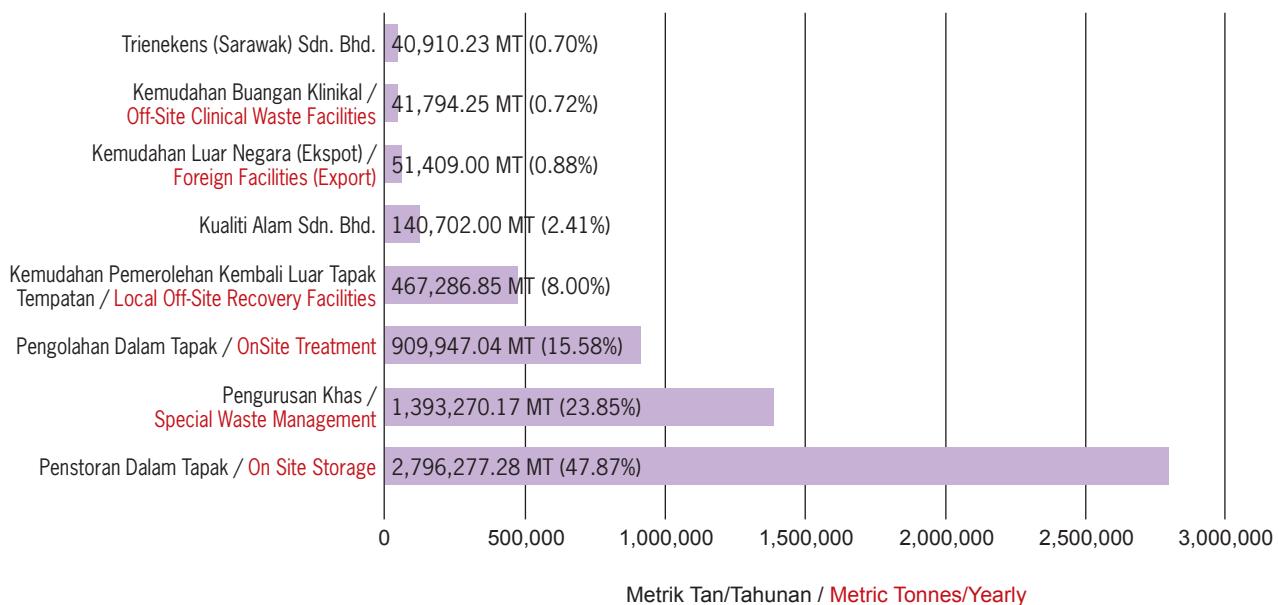
Sebanyak 223,406.48 tan metrik (3.83%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan iaitu di Kualiti Alam Sdn. Bhd (140,702.00 tan metrik), Trienekens (Sarawak) Sdn. Bhd (40,910.23 tan metrik) dan 41,794.25 tan metrik daripada buangan klinikal telah dibakar dan dilupuskan di kemudahan luar tapak yang dilesenkan. Jumlah ini menunjukkan penurunan sebanyak 17.76% daripada sejumlah 271,648.18 tan metrik buangan berjadual dilupuskan pada tahun 2022. Sebanyak 909,947.04 tan metrik (15.58%) daripada buangan terjadual berhasil telah diolah di tapak; manakala 2,796,277.28 tan metrik (47.87%) distor di premis pengeluar buangan (**Rajah 5.20**).

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2023, 1,393,270.17 tan metrik (23.85%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005 (**Jadual 5.3**). Jumlah ini merupakan peningkatan sebanyak 27.16% berbanding 1,095,654.76 tan metrik pada tahun 2022. Buangan yang terlibat adalah kebanyakannya abu dari loji jana kuasa arang batu (70.85%), enap cemar daripada kemudahan rawatan air minuman (4.21%), dan lain-lain (24.94%).

A total of 518,695.85 metric tonnes (8.88%) of scheduled waste had gone through recovery process both locally and abroad. This showed increase of 23.05% as compared to 421,536.62 metric tonnes in 2022. About 467,286.85 metric tonnes (8.00%) of scheduled wastes were recovered at local off-site facilities while 51,409.00 metric tonnes (0.88%) were given consent for recovery abroad.

A total of 223,406.48 metric tonnes (3.83%) of waste were treated and finally disposed at Kualiti Alam Sdn. Bhd. (140,702.00 metric tonnes), Trienekens (Sarawak) Sdn. Bhd. (40,910.23 metric tonnes) and 41,794.25 metric tonnes of clinical wastes were managed at licensed off-site facilities. The amount showed decrease of 17.76% from a total of 271,648.18 metric tonnes of scheduled waste disposed in 2022. A sum of 909,947.04 metric tonnes (15.58%) of scheduled waste were treated on-site; while 2,796,277.28 metric tonnes (47.87%) were stored on-site at waste generators' premises (**Figure 5.20**).

Of the total wastes produced in 2023, 1,393,270.17 metric tonnes (23.85%) were granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations, 2005 (**Table 5.3**). The amount represented increase of 27.16% as compared to 1,095,654.76 metric tonnes in 2022. These waste streams are mostly ashes from coal-fired power plant (70.85%), sludges from drinking water treatment facilities (4.21%), and others (24.94%).



Rajah 5.20: Kemudahan yang Mengendalikan Buangan Terjadual, 2023

Figure 5.20: Facilities Handling Scheduled Wastes, 2023

**Jadual 5.3: Buangan Terjadual yang Diuruskan di Bawah Pengurusan Khas 2023****Table 5.3: Scheduled Waste Managed under Special Management, 2023**

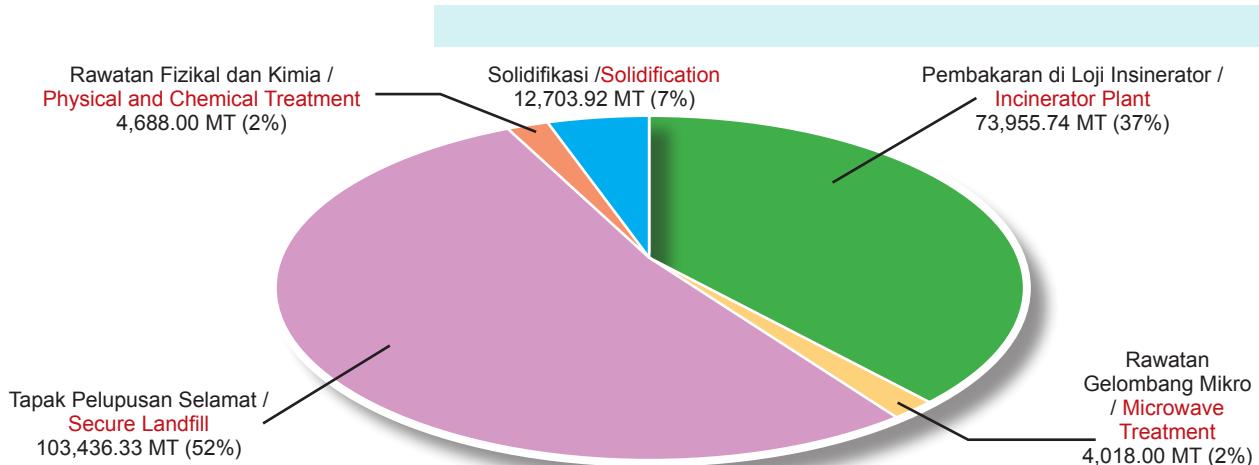
BIL / NO.	KATEGORI BUANGAN / WASTE CATEGORY	KOD BUANGAN / WASTE CODE	PUNCA / SOURCE	TAN METRIK / METRIC TONNES	PERATUSAN / PERCENTAGE (%)	KAEDAH PELUPUSAN / METHOD OF DISPOSAL
1	Debu, sanga, dros atau abu yang mengandungi arsenic, raksa, plumbum, kadmium, kromium, nikel, kuprum, vanadium, berilium, antimony, tellurium, talium, atau selenium, tidak termasuk sanga daripada kilang besi dan keluli / Dust, slag, dross or ash containing arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory	SW 104	Loji Janakuasa Arang Batu / Coal-Fired Power Plant	987,183.07	70.85	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
			Industri / Industry	283,044.64	20.32	
2	Enap cemar yang mengandungi satu atau beberapa logam termasuklah kromium, kuprum, nikel, zink, plumbum, kadmium, aluminium, timah vanadium dan berilium / Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium	SW 204	Loji Rawatan Air Minuman / Drinking Water Treatment Plant	58,682.47	4.21	Tapak Pelupusan Sanitari / Sanitary Landfill
			Industri / Industry	3,505.58	0.25	
			Industri / Industry	56,523.28	4.06	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
3	Karbon teraktif yang terpakai tidak termasuk karbon daripada pengolahan air boleh diminum dan proses industri makanan dan penghasilan vitamin / Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production	SW 411	Industri / Industry	3,480.00	0.25	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product

**Jadual 5.3: Buangan Terjadual yang Diuruskan di Bawah Pengurusan Khas 2023**  
**Table 5.3: Scheduled Waste Managed under Special Management, 2023**

BIL / NO.	KATEGORI BUANGAN / WASTE CATEGORY	KOD BUANGAN / WASTE CODE	PUNCA / SOURCE	TAN METRIK / METRIC TONNES	PERATUSAN / PERCENTAGE (%)	KAEDAH PELUPUSAN / METHOD OF DISPOSAL
4	Buangan yang mengandungi formaldehid / Waste containing formaldehyde  Buangan resin tidak matang yang mengandungi pelarut organic atau logam berat termasuklah resin epoksi dan resin fenolik / Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin  Produk dakwat, cat, pigmen, lakuer, perwarna atau varnish yang terbuang atau yang tidak mengikut spesifikasi yang mengandungi pelarut organic / Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent	SW 320 SW 325 SW 418	Industri / Industry	827.13	0.06	Tapak Pelupusan Sanitari / Sanitary Landfill
5	Buangan daripada pengilangan atau pemprosesan atau penggunaan bahan letupan / Waste from manufacturing or processing or use of explosives	SW 431	Industri / Industry	23.88	0.00	Kaedah Pembakaran / Burning Method
6	Bekas, beg atau kelengkapan yang dilupuskan yang dicemari dengan bahan kimia, racun mahkluk perosak, minyak mineral atau buangan terjadual / Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes	SW 409	Industri / Industry	0.12	0.00	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
<b>JUMLAH / TOTAL</b>				<b>1,393,270.17</b>	<b>100.00</b>	

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. Seperti yang ditunjukkan dalam **Rajah 5.21**, sisa dihantar ke Kualiti Alam Sdn. Bhd. dan Trienekens Sdn. Bhd. adalah dibakar dengan menggunakan kaedah tapak pelupusan selamat (52%), pembakaran di loji insinerator (37%), solidifikasi (7%), rawatan gelombang mikro (2%) dan kaedah rawatan fizikal dan kimia (2%).

The categories of wastes sent to the licensed premises (Kualiti Alam Sdn.Bhd. and Trienekens (Sarawak) Sdn. Bhd. for final disposal were sludges containing one or several heavy metals, mixed wastes, dust/slag/ dross or ash containing arsenic/ mercury and spent inorganic acid. As shown in **Figure 5.21**, wastes sent to Kualiti Alam Sdn. Bhd. and Trienekens Sdn. Bhd. were secure landfilled (52%), followed by incinerator plant (37%), solidification (7%), microwave treatment (2%) and physical and chemical treatment (2%).



**Rajah 5.21: Kualiti Alam Sdn. Bhd. dan Trienekens Sdn. Bhd. : Jenis Rawatan dan Pelupusan Buangan Terjadual, 2023**

**Figure 5.21: Kualiti Alam Sdn. Bhd. and Trienekens Sdn. Bhd. : Types of Scheduled Wastes Treatment and Disposal, 2023**

# ANNEX



## PENGIRAAN INDEKS PENCEMAR UDARA (IPU) / AIR POLLUTANT INDEX (API) CALCULATION

Pengiraan IPU ini berdasarkan sistem *Pollution Standard Index* (PSI) yang diterimakan di peringkat antarabangsa oleh United States Environmental Protection Agency (USEPA).

API calculation is based on Pollution Standard Index (PSI) that has been accepted at the international level by United States Environmental Protection Agency (USEPA).

### PENGUKURAN 6 PARAMETER PENCEMAR / MEASUREMENT OF 6 POLLUTANT PARAMETERS

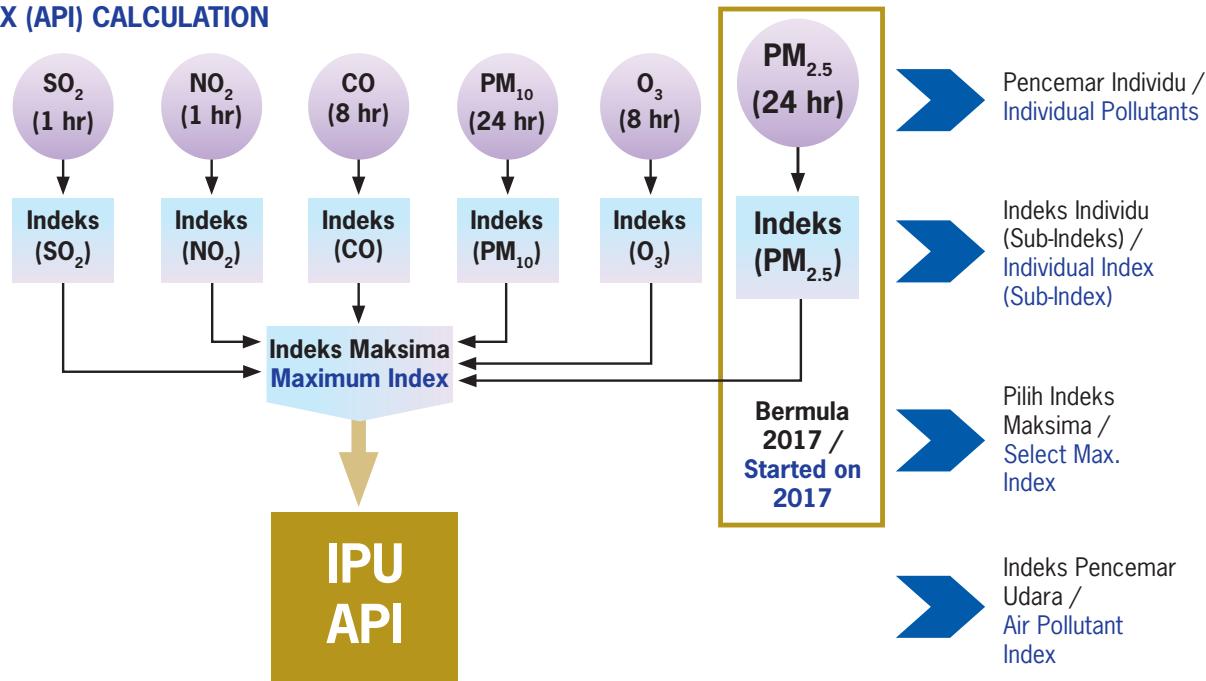
Sulfur Dioksida / Sulphur Dioxide
Habuk Halus ( $PM_{10}$ ) / Particulate Matter ( $PM_{10}$ )
Habuk Halus ( $PM_{2.5}$ ) / Particulate Matter ( $PM_{2.5}$ )
Ozon / Ozone
Nitrogen Dioksida / Nitrogen dioxide
Karbon Monoksida / Carbon monoxide

- Kiraan purata bagi setiap parameter diambil mengikut tempoh masa berlainan.  
The average calculation for each parameter is taken at different range of periods.
- Hal ini kerana had tempoh pendedahan yang berlainan yang boleh diterima oleh manusia.  
This is because they have different exposure periods that are acceptable to humans.

PARAMETER PENCEMAR / POLLUTANT PARAMETERS	TEMPOH PURATA / AVERAGING PERIOD
Sulfur Dioksida / Sulphur Dioxide	1 Jam / 1 Hour
Habuk Halus ( $PM_{10}$ ) / Particulate Matter ( $PM_{10}$ )	24 Jam / 24 Hours
Habuk Halus ( $PM_{2.5}$ ) / Particulate matter ( $PM_{2.5}$ )	24 Jam / 24 Hours
Ozon / Ozone	8 Jam / 8 Hours
	1 Jam / 1 Hour
Nitrogen Dioksida / Nitrogen Dioxide	1 Jam / 1 Hour
Karbon Monoksida / Carbon Monoxide	8 Jam / 8 Hours

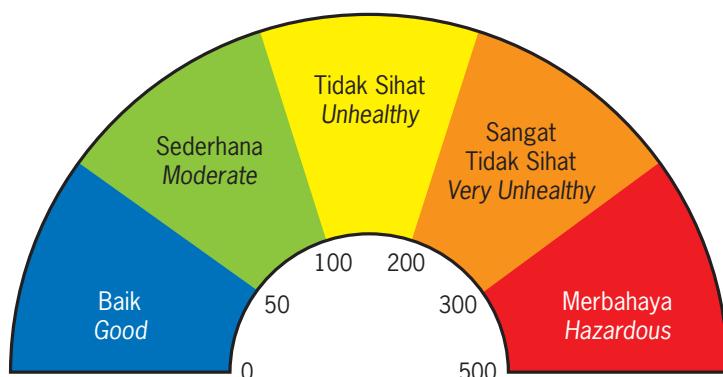
- Purata kepekatan bagi setiap pencemar mengikut tempoh yang tertentu ini seterusnya diseragamkan menggunakan formula matematik khusus bagi menghasilkan satu nilai yang tidak berunit yang dinamakan sebagai **SUB-INDEKS**.  
The average concentration of each pollutant over a given period is then standardized using a specific mathematical formula to produce a non-unitary value called SUB-INDEX.
- Setiap pencemar akan menghasilkan sub-indeks tersendiri.  
Each pollutant will produce its sub-index.
- Sub-index tertinggi secara relatif akan diambil kira sebagai bacaan IPU.  
The highest relative sub-index will be considered as API reading.
- Lazimnya, bacaan IPU adalah ditentukan oleh **kepekatan habuk halus** yang merupakan pencemar dominan pada kebanyakan masa terutamanya semasa berlakunya jerebu di Malaysia.  
Usually, API readings are determined by the **concentration of particulate matter** that is the dominant pollutant most of the time especially during haze in Malaysia.

## PENENTUAN PENGIRAAN INDEKS PENCEMAR UDARA (IPU) / DETERMINATION OF AIR POLLUTION INDEX (API) CALCULATION



### FORMULA SUB-INDEKS BAGI PM<sub>2.5</sub> YANG TELAH DIMODIFIKASI MENGIKUT STANDARD USEPA / SUB-INDEX FORMULA FOR PM<sub>2.5</sub> THAT HAS BEEN MODIFIED ACCORDING TO USEPA STANDARD

API	Breakpoint of Concentration	Equation for API
$X = \text{PM}_{2.5} \text{ (24 h average, unit: } \mu\text{g/m}^3\text{)}$		
0 - 50	$0 \leq X \leq 12.0$	$\text{API} = 4.1667 \times X$
51 - 100	$12.1 \leq X \leq 75.5$	$\text{API} = 0.7741 \times (X - 12.1) + 51$
101 - 200	$75.5 \leq X \leq 150.4$	$\text{API} = 1.3218 \times (X - 75.5) + 101$
201 - 300	$150.5 \leq X \leq 250.4$	$\text{API} = 0.9909 \times (X - 150.5) + 201$
301 - 400	$250.4 \leq X \leq 350.4$	$\text{API} = 0.9909 \times (X - 250.5) + 301$
401 - 500	$350.5 \leq X \leq 500.4$	$\text{API} = 0.6604 \times (X - 350.5) + 401$



PETUNJUK STATUS KUALITI UDARA  
AIR QUALITY STATUS INDICATION

## NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS				
		I	IIA/IIB	III#	IV	V
Al	mg/l	-	(0.06)	0.5		
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 (VI)	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 <sub>2</sub>	mg/l	-	(0.02)	-		
CN	mg/l	0.02	0.06 (0.02)	-		
F	mg/l	1.5	10	1		
NO <sub>2</sub>	mg/l	0.4	0.4 (0.03)	-		
NO <sub>3</sub>	mg/l	7	-	5		
P	mg/l	0.2	0.1	-		
Silica	mg/l	50	-	-		
SO <sub>4</sub>	mg/l	250	-	-		
S	mg/l	0.05	(0.001)	-		
CO <sub>2</sub>	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	mg/l	500	-	-		
MBAS/BAS	mg/l	500	5000 (200)	-		
O & G (Mineral)	mg/l	40; N	N	-		
O & G (Emulsified Edible)	mg/l	7000; N	N	-		
PCB	mg/l	0.1	6 (0.05)	-		
Phenol	mg/l	10	-	-		
Aldrin/Dieldrin	mg/l	0.02	0.2 (0.01)	-		
BHC	mg/l	2	9 (0.1)	-		
Chlordane	mg/l	0.08	2 (0.02)	-		
t-DDT	mg/l	0.1	(1)	-		
Endosulfan	mg/l	10	-	-		
Heptachlor/Epoxide	mg/l	0.05	0.9 (0.06)	-		
Lindane	mg/l	2	3 (0.4)	-		
2,4-D	mg/l	70	450	-		
2,4,5-T	mg/l	10	160	-		
2,4,5-TP	mg/l	4	850	-		
Paraquat	mg/l	10	1800	-		

LEVEL ABOVE IV

NATURAL LEVEL OR ABSENT

Notes:

\* = At hardness 50 mg/l CaCO<sub>3</sub>

# = Maximum (unbracketed) and 24-hour average (bracketed) concentrations

N = Free from visible film sheen, discolouration and deposits

## NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Dissolved Oxygen	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5 - 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	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) <sup>a</sup>	5000 (20000) <sup>a</sup>	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000

Notes:

N : No visible floatable materials or debris, no objectional odour or no objectional taste

\* : Related parameters, only one recommended for use

\*\* : Geometric mean

a : Maximum not to be exceeded

## WATER CLASSES AND USES

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

## DOE WATER QUALITY CLASSIFICATION BASED ON WATER QUALITY INDEX

SUB INDEX & WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand (BOD)	91 - 100	80 - 90	0 - 79
Ammoniacal Nitrogen ( $\text{NH}_3\text{-N}$ )	92 - 100	71 - 91	0 - 70
Suspended Solids (SS)	76 - 100	70 - 75	0 - 69
Water Quality Index (WQI)	81 - 100	60 - 80	0 - 59

## DOE WATER QUALITY INDEX CLASSIFICATION

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

## WQI FORMULA AND CALCULATION

### Formula

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

where;

SIDO = Subindex DO (% saturation)

SIBOD = Subindex BOD

SICOD = Subindex COD

SIAN = Subindex  $\text{NH}_3\text{-N}$

SISS = Subindex SS

SlpH = Subindex pH

$0 \leq \text{WQI} \leq 100$

### Best Fit Equations for the Estimation of Various Subindex Values

#### Subindex for DO (in % saturation)

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

#### Subindex for BOD

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

**Subindex for COD**

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

**Subindex for NH<sub>3</sub>-N**

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

**Subindex for SS**

$$\begin{aligned} \text{SISS} &= 97.5 * \exp(-0.00676x) + 0.05x && \text{for } x \leq 100 \\ \text{SISS} &= 71 * \exp(-0.0016x) - 0.015x && \text{for } 100 < x < 1000 \\ \text{SISS} &= 0 && \text{for } x \geq 1000 \end{aligned}$$

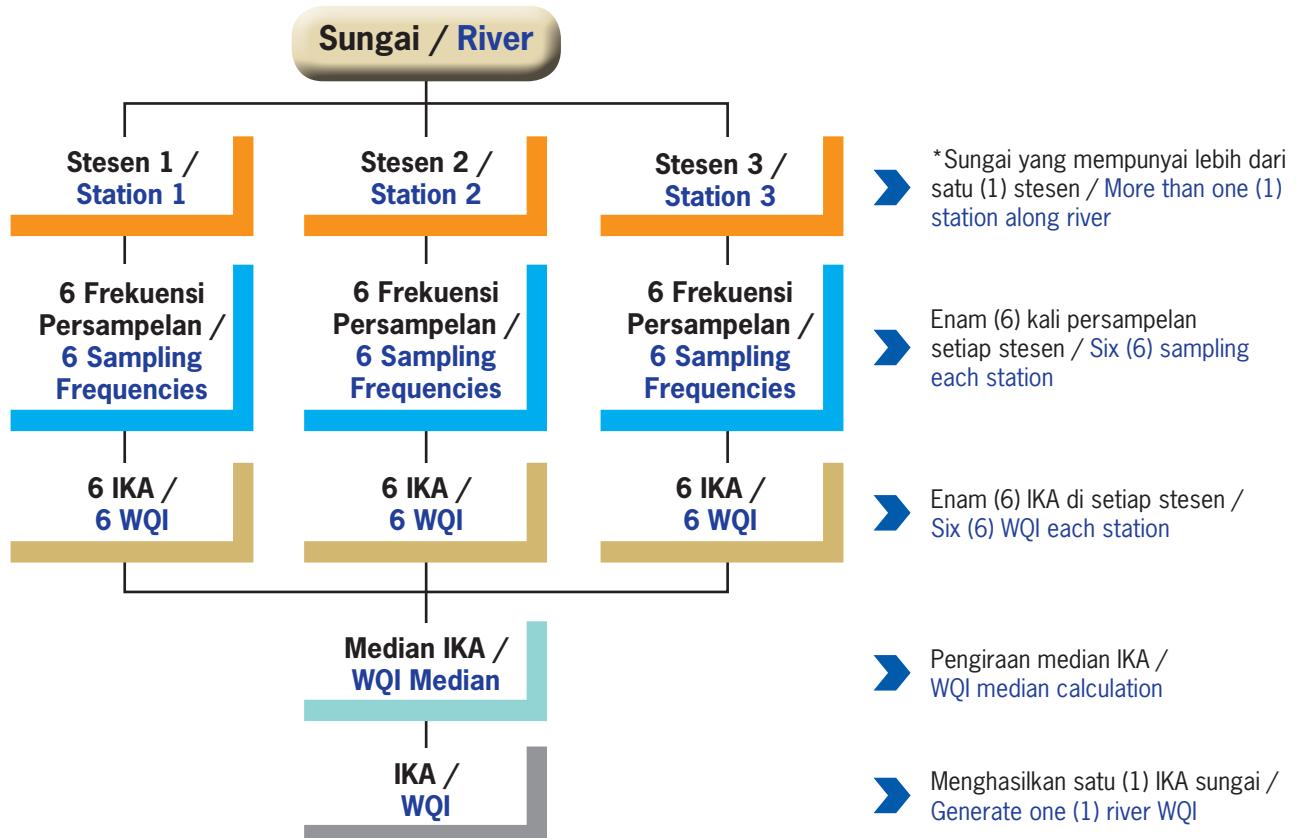
**Subindex for pH**

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

Note:

\*means multiply with

## PENENTUKAN INDEKS KUALITI AIR MENGIKUT SUNGAI / DETERMINATION OF WATER QUALITY INDEX BY RIVER



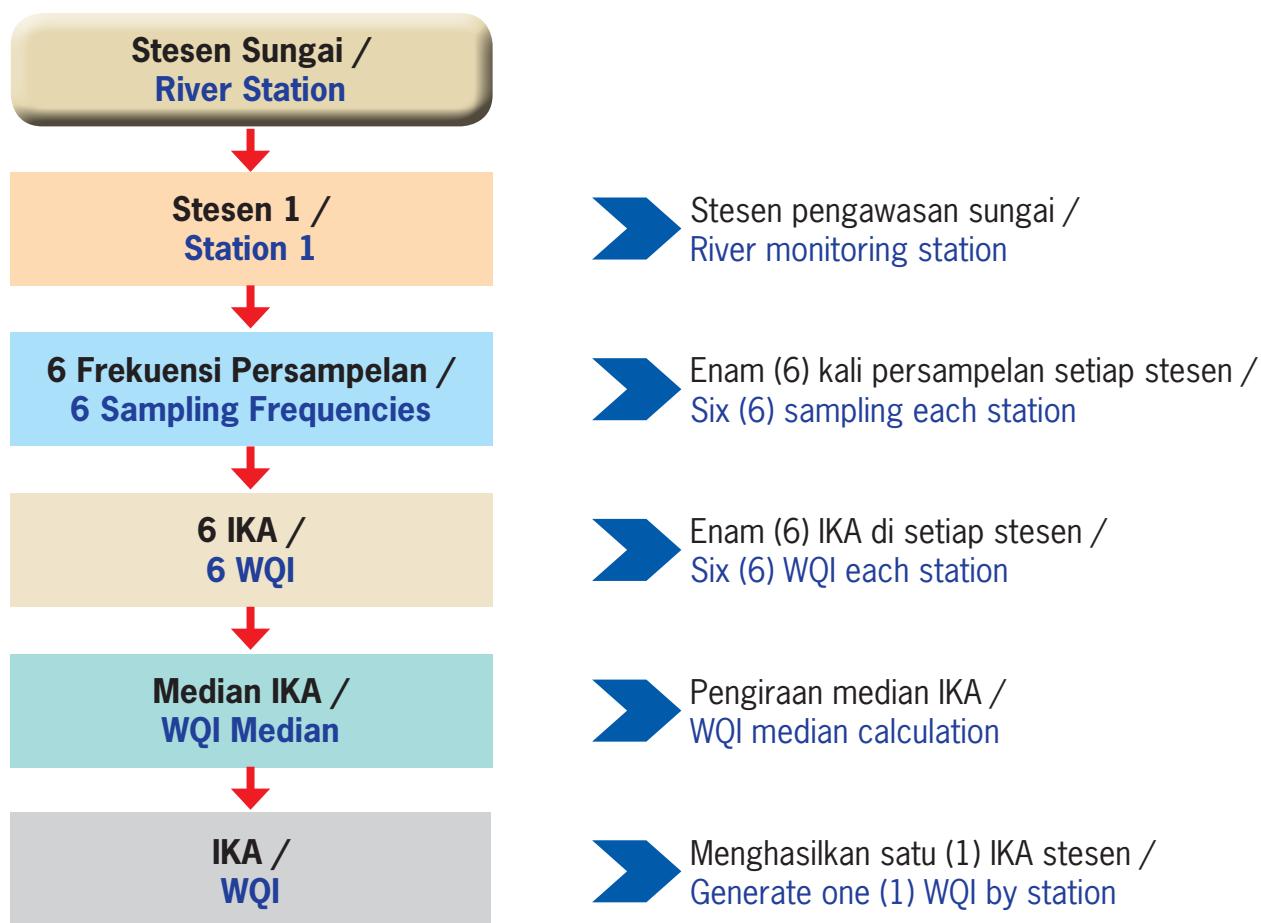
\* Bilangan stesen adalah berbeza mengikut sungai yang dipantau.

Bagi contoh ini, pengiraan median adalah ke atas 18 data IKA /

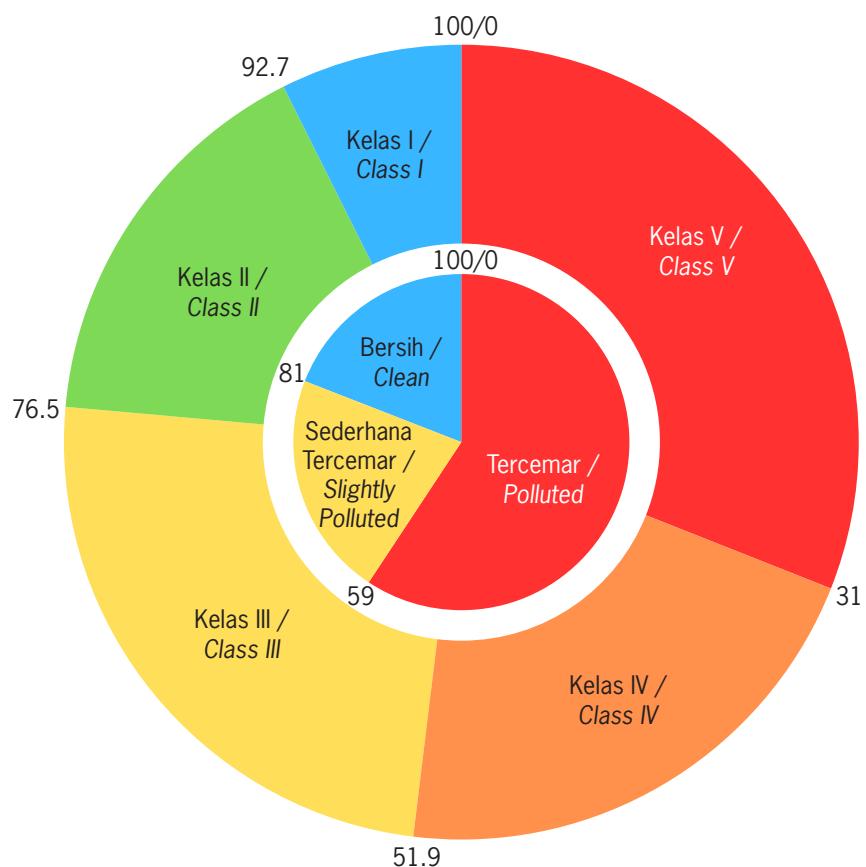
The number of stations varies according to the river monitored.

For this example, the median calculation is on 18 WQI data

**PENENTUKAN INDEKS KUALITI AIR MENGIKUT STESEN /  
DETERMINATION OF WATER QUALITY INDEX BY STATION**



**PENGKELASAN SUNGAI  
BERDASARKAN INDEKS  
KUALITI AIR (IKA) /  
RIVER CLASSIFICATION  
BASED ON WATER QUALITY  
INDEX (WQI)**



**GROUNDWATER QUALITY STANDARDS FOR CONVENTIONAL RAW WATER TREATMENT (DRINKING WATER)**

PARAMETER	STANDARD (mg/L)
Total coliform	5000 MPN/100 ml
E coli	5000 MPN/100 ml
Kekeruhan	1000 NTU
Warna	300 TCU
pH	5.5-9.0
Suhu	Normal ± 2°C
Konduktiviti	1000 µS/cm #
Jumlah Pepejal Terlarut	1500
Klorida	250
Ammonia	1.5
Nitrat	10
Besi	1.0
Fluorida	1.5
Kekerasan	500
Mangan	0.2
COD	10
MBAS	1.0
BOD	6
Nitrit	0.4 #
Raksa	0.001
Kadmium	0.003
Arsenik	0.01
Sianida	0.07
Plumbum	0.05
Kromium	0.05
Kuprum	1.0
Zink	3.0
Natrium	200
Sulfat	250
Selenium	0.01
Perak	0.05
Magnesium	150
Minyak	0.3
Racun Perosak (Pesticides)	0.00003-0.03*
Fenol	0.002
Nikel	0.05
Gross alpha	0.1 Bq/l
Gross beta	1.0 Bq/l

\* Aldrin / Dieldrin, DDT, Heptachlor, Methoxychlor, Lindane, Chlordane, Endosulfan, Hexachlorobenzene, 2,4,5 -T, 2,4 -D, 2, 4 -DB, Alachlor, Aldicarb, Carbofuran, MCPA, Permethrin

# Diambil dari Class IIA, National Water Quality Standards

## GROUNDWATER QUALITY INDEX (GWQI) FORMULA AND CALCULATION

To calculate the GWQI, the additive equation is used as follows:

$$GWQI = \sum W_i q_i$$

or

$$GWQI = 0.13Si(pH) + 0.17Si(Fe) + 0.17Si(E. coli) + 0.04Si(TDS) + 0.09Si(SO_4^{2-}) + 0.22Si(NO_3^{-}) + 0.17Si(Phenol)$$

The sub-indices of all the parameters used for generating the GWQI are as follows

### pH Sub Index

pH	Si(pH)	
<3.0	0	Acidic
3 – 4	10	
4 – 5.5	30	
5.5 – 9	100	
9 – 10	30	Alkaline
10 – 11	10	
>11.0	0	

### Iron Sub Index

$$Si(Fe) = (1 - C_i / 5.0) \times 100$$

$Si(Fe) = 0$ , if  $C_i$  exceeds 5.0 mg/L;  $C_i$  is the concentration of iron determined in the groundwater sample.

### Total Dissolved Solid Sub Index

$$Si(TDS) = (1 - C_i / 3000) \times 100$$

$Si(TDS) = 0$ , if  $C_i$  exceeds 3000 mg/L;  $C_i$  is the concentration of total dissolved solid determined in the groundwater sample.

### Nitrate Sub Index

$$Si(NO_3^{-}) = (1 - C_i / 100) \times 100$$

$Si(NO_3^{-}) = 0$ , if  $C_i$  exceeds 100 mg/L;  $C_i$  is the concentration of nitrate determined in the groundwater sample.

### Sulfate Sub Index

$$Si(SO_4^{2-}) = (1 - C_i / 1000) \times 100$$

$Si(SO_4^{2-}) = 0$ , if  $C_i$  exceeds 1000 mg/L;  $C_i$  is the concentration of sulfate determined in the groundwater sample.

### Phenol Sub Index

$$Si(Phenol) = (1 - C_i / 0.015) \times 100$$

$Si(Phenol) = 0$ , if  $C_i$  exceeds 0.015 mg/L;  $C_i$  is the concentration of phenol determined in the groundwater sample.

### E.coli Sub Index

$$Si(E.coli) = (1 - C_i / 5000) \times 100$$

$Si(E.coli) = 0$ , if  $C_i$  exceeds 5000 MPN/100ml;  $C_i$  is the MPN *E.coli* measured in the groundwater sample.

## MALAYSIAN MARINE WATER QUALITY STANDARDS

PARAMETER ( $\mu\text{g/l}$ ) UNLESS OTHERWISE STATED	CLASSIFICATION					
	CLASS 1	CLASS 2	CLASS 3	INTERIM CLASS E1	INTERIM CLASS E2	INTERIM CLASS E3
	SENSITIVE MARINE HABITATS	FISHERIES (INCLUDING MARICULTURE)	INDUSTRY, COMMERCIAL ACTIVITIES & COASTAL SETTLEMENTS	COASTAL PLAIN	ESTUARIES	COMPLEX DISTRIBUTORY NETWORK
Dissolved Oxygen (mg/l)	>6.0	>5.0	>3.0	>5.0	>5.0	>5.0
Suspended Solids (mg/l)	25.0	50.0	100.0	30.0	30.0	30.0
Phosphate	5.0	75.0	670.0	100.0	180.0	180.0
Nitrate	10.0	60.0	700.0	200.0	570.0	430.0
Ammonia	35.0	50.0	320.0	5.0	10.0	10.0
Mercury	0.04	0.04	0.04	0.04	0.04	0.04
Cadmium	0.50	2.00	3.00	1.00	1.00	1.00
Chromium (VI)	0.14	10.00	20.00	10.00	10.00	10.00
Copper	1.30	2.90	8.00	1.00	1.00	1.00
Cynide	2.00	7.00	14.00	5.00	5.00	5.00
Lead	2.20	8.50	12.00	1.30	2.00	2.00
Zinc	7.00	50.00	100.00	16.00	5.00	5.00
Arsenic (III)	1.00	3.00	3.00	3.00	1.00	1.00
Aluminium	27.00	27.00	55.00	27.00	27.00	27.00
TBT	0.001	0.010	0.050	0.002	0.002	0.002
PAH	100.0	200.0	1000.0	5.0	5.0	5.0
Total Phenol	1.0	10.0	100.0	10.0	10.0	10.0
Oil & Grease (mg/l)	0.01	0.14	5.00	1.00	1.00	1.00
Faecal Coliform (cfu/100ml)	70	70	70	70	70	70
Temperature (°C)	$\leq 2^\circ\text{C}$ increase over maximum ambient					
pH	6.5 - 9.0					
Marine Litter	Free from marine litter					

## MALAYSIAN MARINE WATER QUALITY INDEX (MMWQI) FORMULA AND CALCULATION

$$\text{MMWQI} = q_i \text{DO}^{0.18} \times q_i \text{FC}^{0.19} \times q_i \text{NH}_3^{0.15} \times q_i \text{NO}_3^{0.16} \times q_i \text{PO}_4^{0.17} \times q_i \text{TSS}^{0.15}$$

whereby;

$q_i \text{DO}$  = Subindex Dissolved Oxygen

$q_i \text{FC}$  = Subindex Faecal Coliform

$q_i \text{NH}_3$  = Subindex Unionized Ammonia

$q_i \text{NO}_3$  = Subindex Nitrate

$q_i \text{PO}_4$  = Subindex Phosphate

$q_i \text{TSS}$  = Subindex Total Suspended Solids

\*Salinity of the marine water quality data shall be higher than 10 ppt

## Best Fit Equations for the Estimation of Various Subindex Values

### Dissolved Oxygen (DO) in mg/l

$qi\ DO = -85.816 + 55.4768(DO) - 4.142(DO)^2$   
If DO is less than (<) 3 mg/l, or more than (>) 10 mg/l,  $qi\ DO = 10$

### Faecal Coliform (FC) in cfu/100ml

$qi\ FC = 100 * EXP(-0.005(Faecal\ Coliform))$   
If FC is more than (>) 500 cfu/100ml,  $qi\ FC = 8$

### Unionized Ammonia ( $NH_3$ ) in $\mu g/l$

$qi\ NH_3 = 100 * EXP(-0.0046(Unionized\ Ammonia))$   
If Ammoniacal Nitrogen ( $NH_3-N$ ) is measured, convert the value into unionized ammonia.

### Nitrate ( $NO_3$ ) in $\mu g/l$

$qi\ NO_3 = 94.8 * EXP(-0.00035(Nitrate))$

### Phosphate ( $PO_4$ ) in $\mu g/l$

$qi\ PO_4 = 95.2 * EXP(-0.002(Phosphate))$   
If  $PO_4$  is more than (>) 900  $\mu g/l$ ,  $qi\ PO_4 = 10$

### Total Suspended Solids (TSS) in mg/l

$qi\ TSS = 95.8 * EXP(-0.0043(Total\ Suspended\ Solid))$   
If TSS is more than (>) 100 mg/l,  $qi\ TSS = 20$

## 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)

$$IS = \frac{19.9273 * \text{Salinity}}{(1000 - 1.005109 * \text{Salinity})}$$

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

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

### d. Calculation of mole fraction for unionized ammonia

Mole Fraction =

equation 1:

$$\text{Ammoniacal nitrogen } (NH_3-N) \times \text{mole fraction} \times 17/14$$

Ammoniacal nitrogen should be measured in  $\mu g/l$



## JABATAN ALAM SEKITAR

Kementerian Sumber Asli dan  
Kelestarian Alam

Aras 1 - 4, Podium 2 & 3, Wisma Sumber Asli,  
No.25, Persiaran Perdana, Presint 4,  
Pusat Pentadbiran Kerajaan Persekutuan,  
62574 Putrajaya, Malaysia

Talian Aduan: **03-8889 1972**

Hotline: **1-800-88-2727**

Telefon: **03-8871 2000/2200**

Faks: **03-8889 1973/1975**

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