KEMENTERIAN
ALAM SEKITAR DAN AIR
Ministry of Environment and Water

JABATAN ALAM SEKITAR
Department of Environment

LAPORAN KUALITI ALAM SEKELILING

2021

ENVIRONMENTAL QUALITY REPORT

ISSN 2636-9834

Designed and Printed by:
Alamedia Sdn.Bhd.

No.14, Jalan LP 1a/5, Lestari Perdana,
43300 Seri Kembangan, Selangor
T : 03-8945 0420

Printed on Recycled Paper

KANDUNGAN / CONTENTS

PRAKATA

"Alam Sekitar, Tanggungjawab Bersama"

Saya amat berbesar hati untuk membentangkan Laporan Kualiti Alam Sekeliling 2021 seperti yang dikehendaki di bawah Seksyen 3(1)(i) Akta Kualiti Alam Sekeliling 1974.

Kualiti udara keseluruhan bagi Malaysia pada tahun 2021 kebanyakannya adalah berstatus baik dan sederhana. Bacaan IPU yang dikira berdasarkan kepekatan enam (6) parameter pencemar utama telah menunjukkan tren yang berbeza mengikut kawasan. Pada tahun 2021 bacaan parameter tersebut sedikit meningkat atau terkesan berbanding pada tahun 2020 disebabkan aktiviti industri, komersial, sosial serta peningkatan bilangan kenderaan di jalan raya setelah kelonggaran arahan Perintah Kawalan Pergerakan (PKP) dilaksanakan dalam tahun 2021.

Kualiti air sungai yang ditentukan dari segi Indeks Kualiti Air (IKA) telah menunjukkan peningkatan pada tahun 2021. Sebanyak 1,351 stesen pengawasan kualiti air manual dipantau dalam tahun 2021. Peratus bilangan stesen sungai meningkat dengan ketara kepada 75% pada tahun 2021 berbanding 67% pada tahun sebelumnya. Peratus bilangan sungai yang tercemar telah berlaku penurunan daripada 6% pada tahun 2020 kepada 3% pada tahun 2021.

Pada tahun 2021, 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 mangan (Mn), jumlah kolifom, besi (Fe) 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 2021, daripada 368 stesen pengawasan kualiti air marin bagi pantai, muara sungai dan pulau di negara ini, sebanyak 145 stesen adalah terbaik, 60 stesen baik, 158 stesen sederhana manakala 5 stesen dikategorikan tercemar. Semua stesen tercemar berada di Kawasan muara sungai.

Sebanyak 7,505,195.76 tan metrik buangan terjadual telah dihasilkan. Ini mewakili peningkatan keseluruhan sebanyak 4.45% berbanding 7,185,227.76 tan metrik yang dilaporkan pada 2020. JAS akan terus mengukuhkan dan melaksanakan strategi, program dan aktivitinya dengan berkesan dalam menguruskan alam sekitar secara lestari.

WAN ABDUL LATIFF BIN WAN JAFFAR
Ketua Pengarah Kualiti Alam Sekeliling Malaysia /
Director-General of Environmental Quality Malaysia

FOREWORD

"Environment, Our Shared Responsibility"

It is my pleasure to present the Environmental Quality Report 2021 as required under Section 3(1)(i) of the Environmental Quality Act 1974.

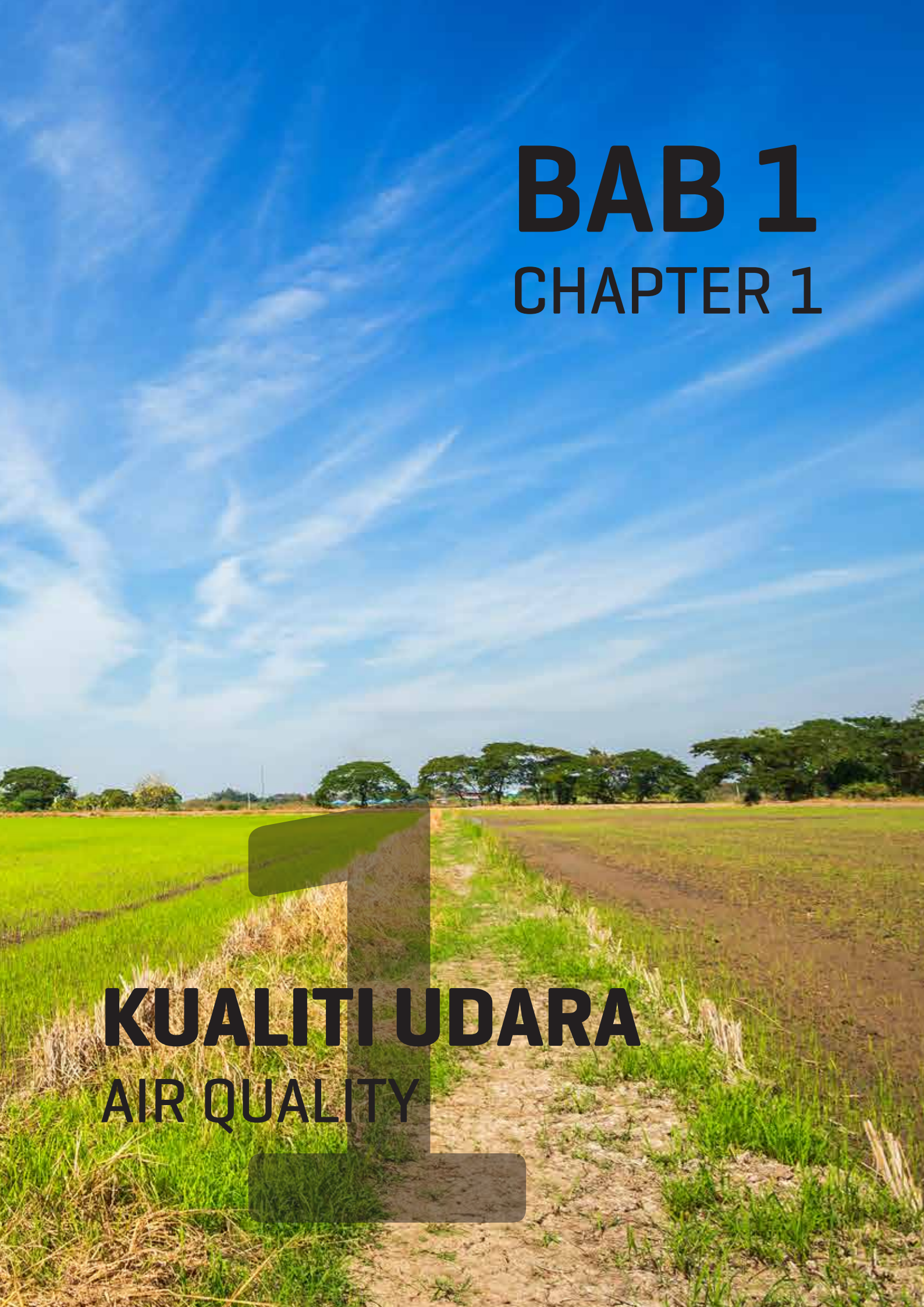
The overall air quality for Malaysia was at good and moderate levels most of the time. The API reading which is calculated based on the concentration of six (6) major pollutants in the air has shown different trends according to areas. In 2021, the parameter reading has slightly increased or affected as compared to 2020 as most industrial, commercial and social activities were resumed and due to the increase in the number of vehicles on the road during the Recovery Movement Control Order (RMCO) in 2021.

The river quality in terms of Water Quality Index (WQI) showed an increase in 2021. A total of 1,351 river station were monitored for water quality in 2021. The percentage of river stations categorized as clean increased significantly to 75% in 2021 compared to 67% in the previous year. The percentage of polluted river stations has decreases from 6% in 2020 to 3% in 2021.

In 2021, 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), total coliform and phenolics which had a low range of Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water) value.

Out of the 368 marine water quality monitoring stations at coastal, estuary and islands in the country, 145 stations were excellent, 60 were good, 158 were moderate while the remaining 5 stations were categorised as poor in 2021. All poor water quality stations were located at the estuary.

A total of 7,505,195.76 metric tonnes of scheduled wastes were generated. This represents an overall increase of 4.45% as compared to 7,185,227.76 metric tonnes reported in 2020. DOE will continue to strengthen and implement its strategies, programmes and activities effectively in managing the environment sustainably.



BAB 1
CHAPTER 1

KUALITI UDARA
AIR QUALITY

KUALITI UDARA
AIR QUALITY

PENGAWASAN KUALITI UDARA

Malaysia telah berhadapan dengan Perintah Kawalan Pergerakan (PKP) yang lebih longgar bagi tahun 2021 berbanding tahun 2020 di mana kebanyakan aktiviti industri, komersial dan sosial telah berjalan seperti biasa. Keadaan ini telah memberi kesan kepada status kualiti udara di dalam negara sepanjang tahun tersebut.

Status kualiti udara di Malaysia ditunjukkan menerusi bacaan Indeks Pencemar Udara (IPU) dan bacaan IPU seluruh negara sentiasa dipaparkan di laman sesawang Jabatan Alam Sekitar (JAS), Air Pollutant Index Management System (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), habuk halus bersaiz kurang dari 10 mikron (PM_{10}) dan habuk halus bersaiz kurang dari 2.5 mikron ($PM_{2.5}$). IPU ini dikategorikan sebagai baik, sederhana, tidak sihat, sangat tidak sihat dan berbahaya seperti yang dinyatakan dalam **Jadual 1.1**.

AIR QUALITY MONITORING

Malaysia adapted to a more lenient Movement Control Order (PKP) for 2021 compared to 2020 where most industrial, commercial and social activities have run as usual. This situation has affected the status of air quality in the country throughout the year.

The air quality status is reported in terms of Air Pollutant Index (API) and the reading is always displayed on the website of the Department of Environment (DOE), Air Pollutant Index Management System (APIMS). The API is calculated based on concentration of six (6) major pollutants which are ground level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter of less than 10 microns in size (PM_{10}) and particulate matter of less than 2.5 microns in size ($PM_{2.5}$). The API is categorized as good, moderate, unhealthy, very unhealthy and hazardous as presented 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

STATUS KUALITI UDARA

Berdasarkan Indeks Pencemar Udara (IPU), kualiti udara keseluruhan bagi Malaysia pada tahun 2021 kebanyakannya adalah berstatus baik dan sederhana. Bacaan IPU yang dikira berdasarkan kepekatan enam (6) parameter pencemar utama telah menunjukkan tren yang berbeza mengikut kawasan. Pada tahun 2021 bacaan parameter tersebut sedikit meningkat atau terkesan berbanding pada tahun 2020 disebabkan aktiviti manusia beransur pulih setelah mengalami situasi Perintah Kawalan Pergerakan akibat pandemik Covid 19 pada tahun 2020.

Pelepasan asap kenderaan, aktiviti perindustrian dan aktiviti pembakaran kawasan perladangan dan tapak pelupusan sampah masih lagi menjadi punca utama penurunan kualiti udara di Malaysia. Ini ditunjukkan di dalam tren kepekatan purata harian $PM_{2.5}$ di kawasan Klang, yang didapati lebih tinggi pada tahun 2021 berbanding dengan tahun 2020 seperti yang ditunjukkan di dalam **Rajah 1.1(a)**. Di samping itu, tiada kejadian jerebu merentas sempadan direkodkan bagi tahun 2021 disebabkan oleh keadaaan cuaca yang lebih lembap sepanjang tahun dan keadaan ini telah mengurangkan jumlah bilangan titik panas (hotspots) di dalam negara dan di negara ASEAN.

Rajah 1.1(b) menunjukkan perbandingan kepekatan purata harian $PM_{2.5}$ bagi ketiga-tiga jenis kategori stesen terpilih di kawasan bandar (Klang), pinggir bandar (Kuantan) dan luar bandar (Kapit). Tren menunjukkan kepekatan purata harian $PM_{2.5}$ adalah lebih tinggi di kawasan bandar berbanding kawasan pinggir bandar dan luar bandar. Tren kepekatan $PM_{2.5}$ bagi kawasan Klang menunjukkan peningkatan pada masa-masa tertentu sehingga melebihi Standard Kualiti Udara Ambien Malaysia IT-2. Peningkatan $PM_{2.5}$ di pinggir bandar dan di luar bandar pula sering dikaitkan dengan aktiviti pembakaran terbuka daripada kawasan pertanian yang dilakukan secara sengaja dan tidak sengaja serta menyumbang kepada penurunan kualiti udara di kawasan tersebut.

AIR QUALITY STATUS

In 2021, based on API, the overall air quality for Malaysia was at good and moderate levels most of the time. The API reading which is calculated based on the concentration of six (6) major pollutants in the air has shown different trends according to areas. In 2021, the parameter reading has slightly increased or affected compared to 2020 due to gradual recovery of human activities after experiencing the Movement Control Order due to the Covid 19 Pandemic in 2020.

Vehicle emissions, industrial activities and burning activities from plantation areas and landfills were still the main causes of the decline in air quality in Malaysia. This was shown in the trend of daily average concentration of $PM_{2.5}$ in the Klang area, which was found to be higher in 2021 compared to 2020 as shown in **Figure 1.1 (a)**. In addition, no transboundary haze incidents were recorded for 2021 due to wetter weather conditions throughout the year and this situation has reduced the total number of hotspots within the country and in neigbouring countries in ASEAN

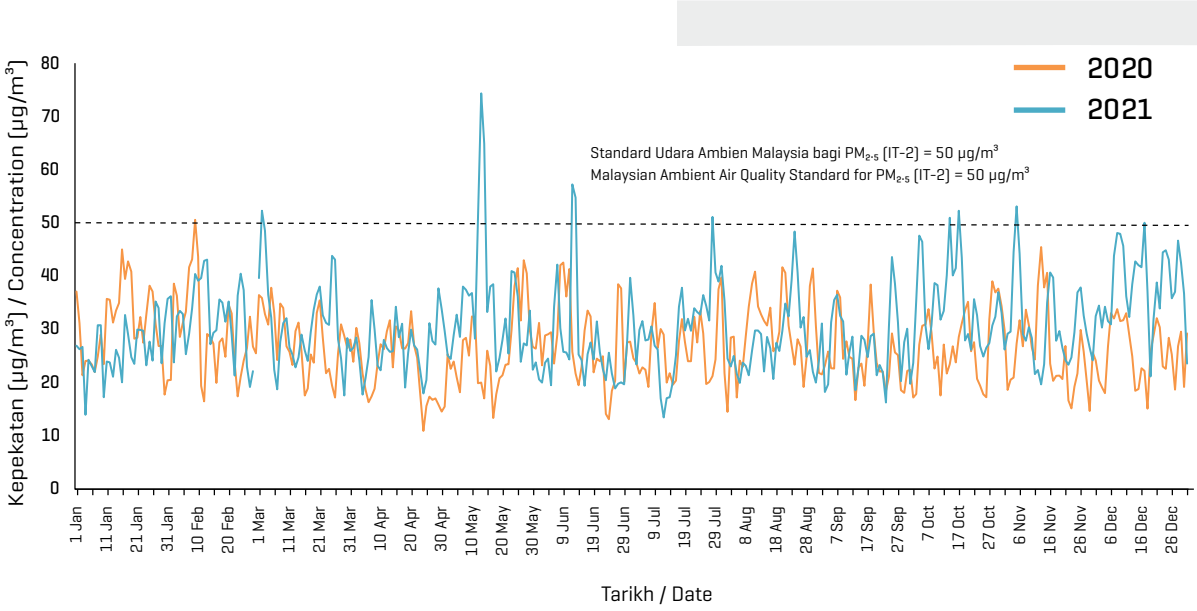
Figure 1.1(b) shows the daily concentrations of $PM_{2.5}$ for the three category selected stations in urban (Klang), suburban (Kuantan) and rural (Kapit) areas in the country. The trend showed higher levels of $PM_{2.5}$ in urban area compared to the suburban and rural areas. The trend of $PM_{2.5}$ concentrations for the Klang area showed an increase at certain times to exceed the Malaysian Ambient Air Quality Standard IT-2. The increase in $PM_{2.5}$ in the suburban and in rural areas were often associated with open burning activities from agricultural areas carried out intentionally and unintentionally that contribute to the deterioration of air quality in those areas.

Selain pencemar $PM_{2.5}$, ozon permukaan bumi (O_3) merupakan pencemar udara yang menjadi perhatian. Ia merupakan gas pencemar udara sekunder yang terhasil daripada tindak balas sebatian-sebatian organik meruap volatile organic compounds (VOCs) dan oksid-oksid nitrogen (NO_x) dengan kehadiran cahaya matahari. Cuaca panas terik menggalakkan lagi pembentukan pencemar O_3 .Punca utama VOCs dan NO_x adalah daripada pelepasan industri dan ekzos kenderaan bermotor terutama di bandar-bandar besar. Ini dapat ditunjukkan berdasarkan peningkatan kepekatan O_3 di beberapa lokasi di Lembah Klang seperti di dalam **Rajah 1.1(c)** dan **Rajah 1.1 (d).**

Selain kawasan di Lembah Klang, beberapa kawasan di Kedah, Perak dan N. Sembilan menunjukkan kepekatan maksimum harian O_3 dalam tempoh 1 jam yang hampir melebihi Standard Kualiti Udara Ambien Malaysia seperti yang ditunjukkan di dalam **Rajah 1.1 (e).** Keadaan ini adalah disebabkan oleh pelepasan gas-gas pencetus ozon aras bumi seperti NO_x dan VOCs di kawasan kepadatan trafik yang tinggi. Selain itu, faktor geografi dan meteorologi juga memainkan peranan penting dalam peningkatan ozon aras bumi di kawasan tersebut.

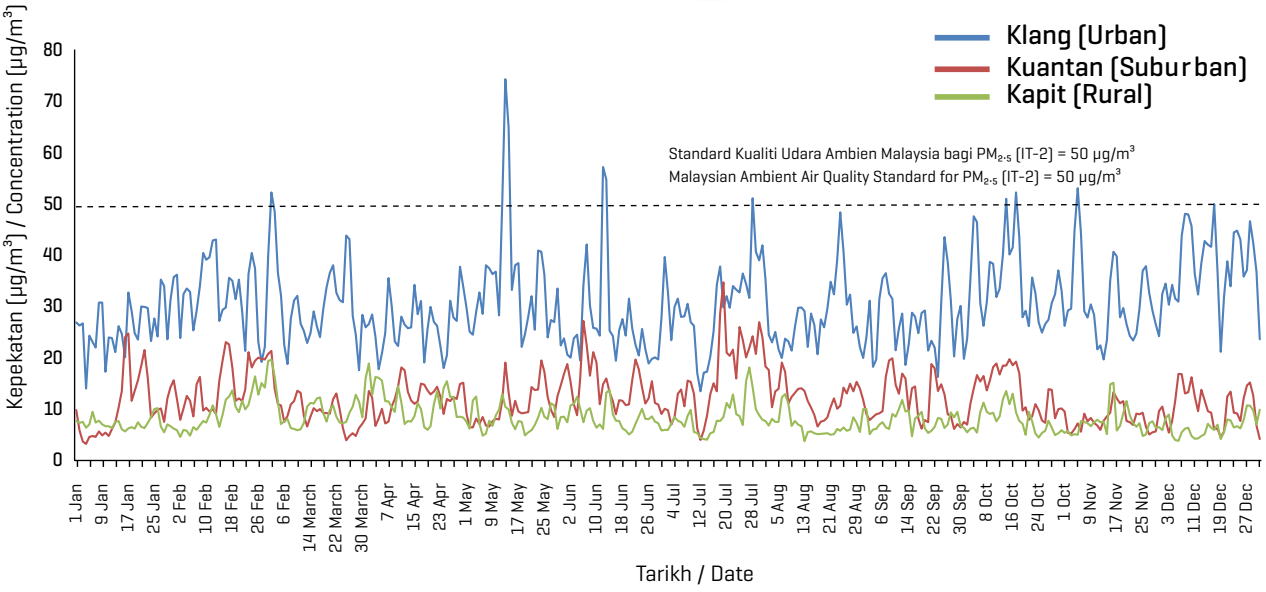
Besides $PM_{2.5}$, ground level ozone (O_3) remained the pollutant of concern. It is a secondary air pollutant gas that results from the reaction of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. Formation of O_3 enhanced during hot and sunny day. Major sources of VOCs and NO_x emissions were from industries and motor vehicles particularly in urban areas. This is shown from increment of O_3 at various locations in the Klang Valley in **Figure 1.1 (c)** and **Figure 1.1 (d)**.

Apart from the Klang Valley, several areas in Kedah, Perak and Negeri Sembilan indicated maximum daily concentration of O_3 within 1 hour which almost exceeded the Malaysian Ambient Air Quality Standard as illustrated in **Figure 1.1 (e).** This situation is caused by the release of ground-level ozone-triggering gases such as NO_x and VOCs in some areas with heavy traffic volumes. Furthermore, geographical and meteorological factors also play important roles in the increase of ground level ozone in these areas.



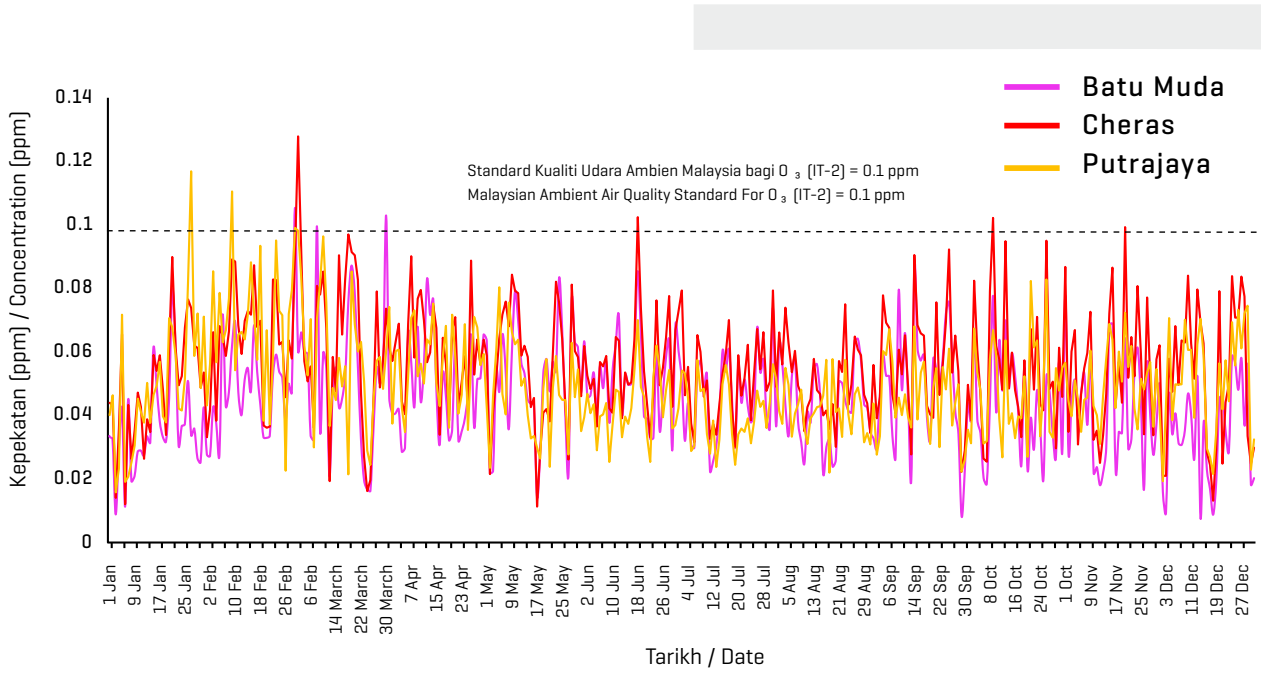
Rajah 1.1(a) : Tren Kepekatan 24 jam bagi Habuk Halus ($PM_{2.5}$), Klang 2020 - 2021

Figure 1.1(a) : Trend of 24-hour Concentration of Particulate Matter ($PM_{2.5}$), Klang 2020 - 2021



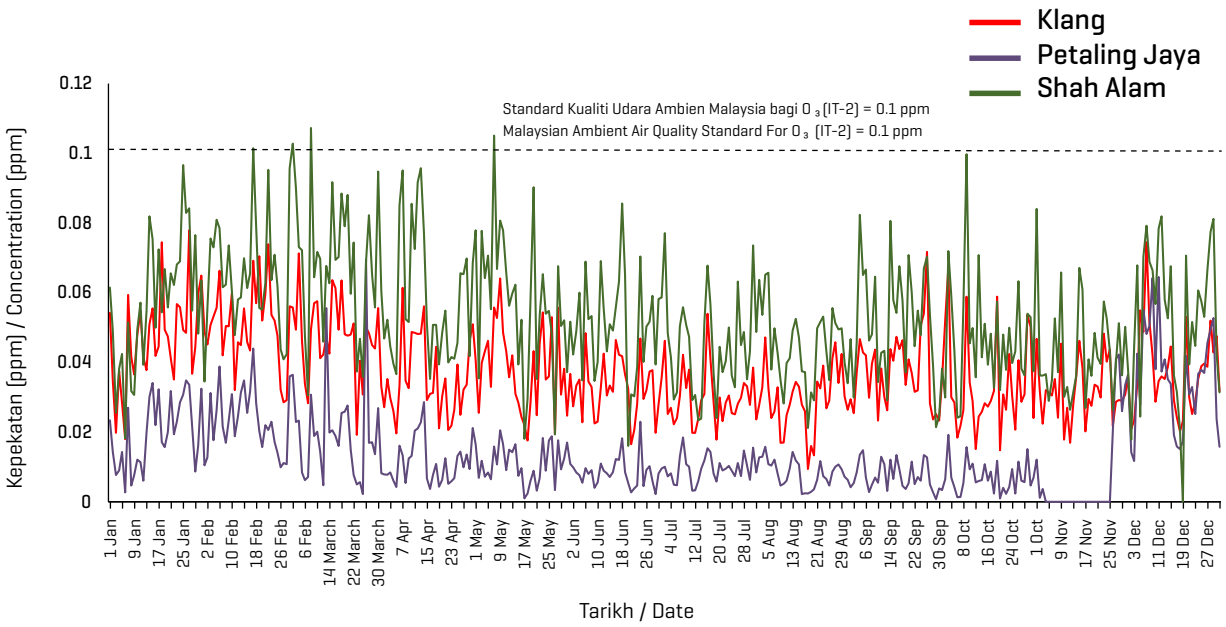
Rajah 1.1(b) : Tren Kepekatan 24 jam bagi Habuk Halus ($PM_{2.5}$), 2021

Figure 1.1(b) : Trend of 24-hour Concentration of Particulate Matter ($PM_{2.5}$), 2021



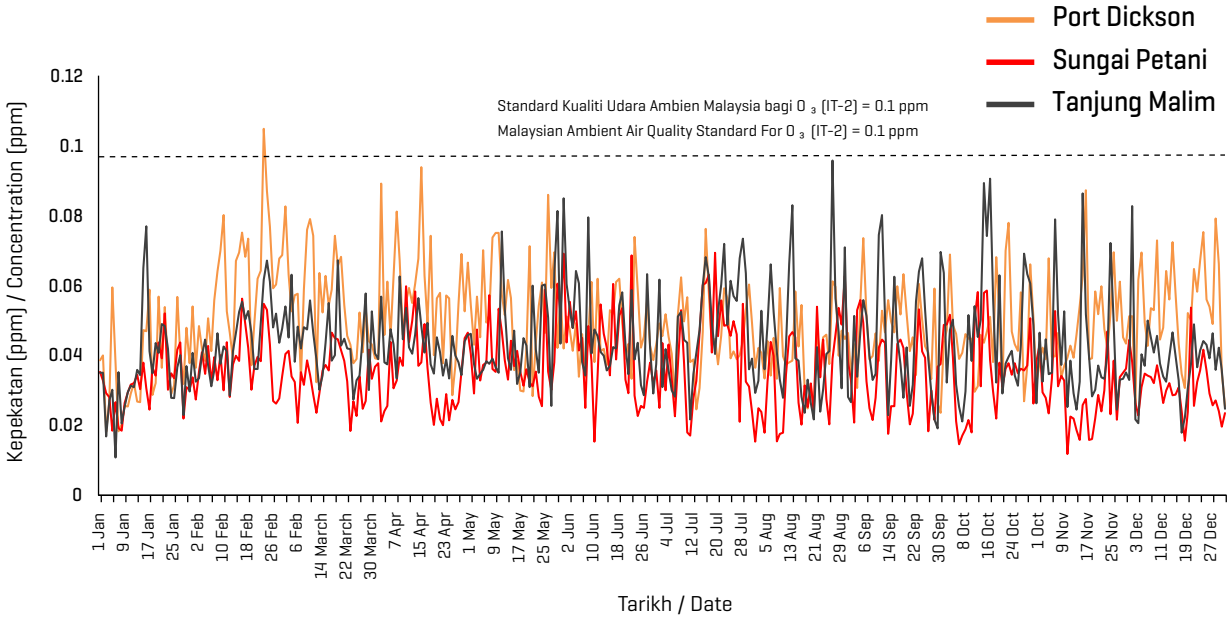
Rajah 1.1(c) : Tren Kepekatan Maksimum Harian Ozon (O_3) 1 jam, Lembah Klang, 2021

Figure 1.1(c) : Trend of Daily Maximum 1-hour Concentration of Ozone (O_3), Klang Valley 2021



Rajah 1.1(d) : Tren Kepekatan Maksimum Harian Ozon (O_3) 1 jam, Lembah Klang, 2021

Figure 1.1(d) : Trend of Daily Maximum 1-hour Concentration of Ozone (O_3), Klang Valley 2021



Rajah 1.1(e) : Tren Kepekatan Maksimum Harian Ozon (O_3) 1 jam, 2021

Figure 1.1(e) : Trend of Daily Maximum 1-hour Concentration of Ozone (O_3) 2021

STATUS KUALITI UDARA DI PANTAI BARAT

Lembah Klang

Pada tahun 2021, status kualiti udara di Lembah Klang menunjukkan semua stesen mencatatkan bacaan hari IPU sederhana yang lebih tinggi berbanding hari IPU baik sepanjang masa. Status kualiti udara di Lembah Klang secara keseluruhannya ditunjukkan seperti di **Rajah 1.2.** Putrajaya mencatatkan bilangan hari IPU baik yang lebih tinggi di Lembah Klang iaitu 57 hari manakala Klang mencatatkan bilangan hari IPU sederhana yang tertinggi iaitu 363 hari. Tiada bilangan hari IPU baik direkodkan di stesen Klang.

Semua stesen di Lembah Klang mencatatkan bilangan hari IPU tidak sihat kecuali Kuala Selangor dengan rekod tertinggi adalah di Petaling Jaya (8 hari), Banting (5 hari), Putrajaya (4 hari), Cheras (4 hari), Shah Alam (2 hari), Klang (1 hari) dan Batu Muda (1 hari) seperti yang ditunjukkan di dalam **Rajah 1.2(a)**. Peningkatan bahan pencemar $PM_{2.5}$ dan pembentukan O_3 daripada pelepasan asap kenderaan di kawasan trafik yang tinggi dan aktiviti pembakaran terbuka di kawasan pertanian adalah punca peningkatan bilangan hari IPU tidak sihat di Lembah Klang.

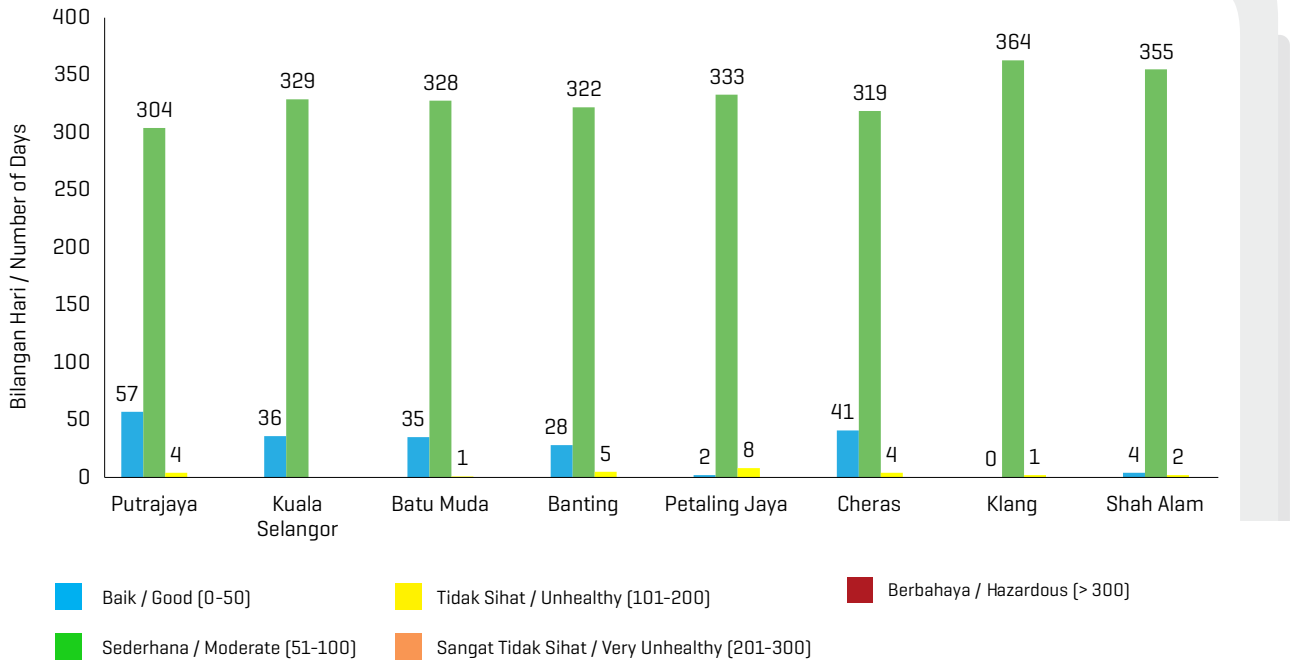
AIR QUALITY STATUS IN THE WEST COAST

Klang Valley

In 2021, the air quality status in the Klang Valley shows that all stations recorded a higher "average API days" compared to "good API days". The air quality status in the Klang Valley as a whole is shown in **Figure 1.2**. Putrajaya recorded a higher number of good API in the Klang Valley at 57 days while Klang recorded the highest number of moderate API at 363 days. No number of good API days were recorded at Klang station.

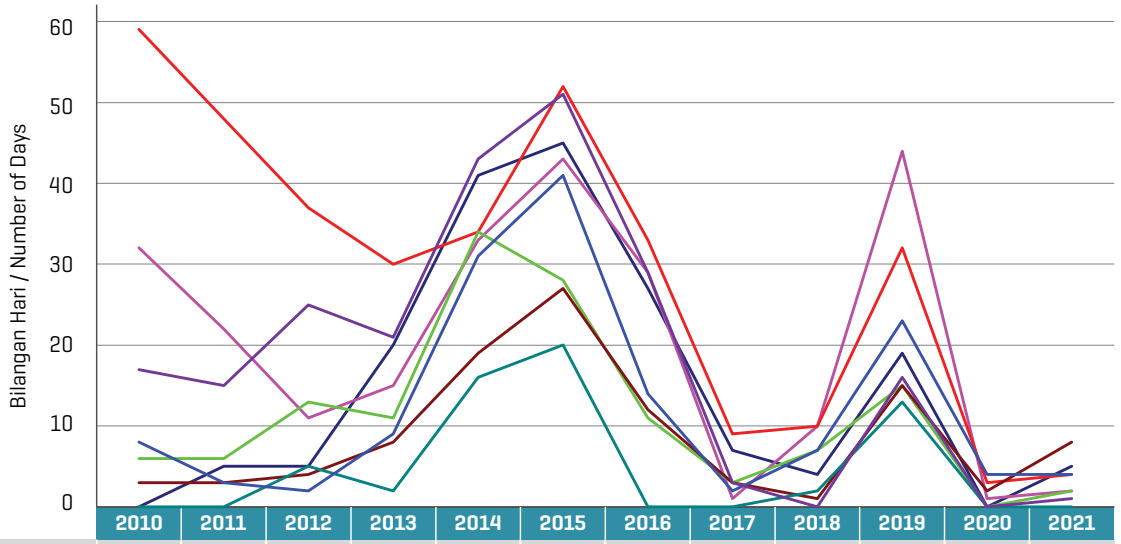
All stations in Klang Valley recorded API reading in unhealthy days except Kuala Selangor with the highest record being in Petaling Jaya (8 days), Banting (5 days), Putrajaya (4 days), Cheras (4 days), Shah Alam (2 days), Klang (1 day) and Batu Muda (1 day) as shown in **Figure 1.2 (a)**. Increased $PM_{2.5}$ pollutants and the formation of O_3 from vehicle smoke emissions in high traffic areas and open burning activities in agricultural areas are the cause of the increase in the number of unhealthy days in the Klang Valley.

Cameron Highland, Pahang



Rajah 1.2 : Status Kualiti Udara, Lembah Klang 2021

Figure 1.2 : Air Quality Status, Klang Valley 2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Banting	0	5	5	20	41	45	27	7	5	19	0	5
Shah Alam	32	22	11	15	33	43	29	1	10	45	1	2
Cheras	59	48	37	30	34	52	33	9	10	32	3	4
Klang	6	6	13	11	34	28	11	3	8	15	0	2
Petaling Jaya	3	3	4	8	19	27	12	3	1	15	2	8
Kuala Selangor	0	0	5	2	16	20	0	0	2	13	0	0
Putrajaya	8	3	2	9	31	41	14	2	7	23	4	4
Batu Muda	17	15	25	21	43	51	29	3	1	16	0	1

Rajah 1.2(a) : Bilangan Hari Tidak Sihat, Lembah Klang, 2010-2021

Figure 1.2(a) : Number of Unhealthy Days, Klang Valley, 2010-2021

Wilayah Utara

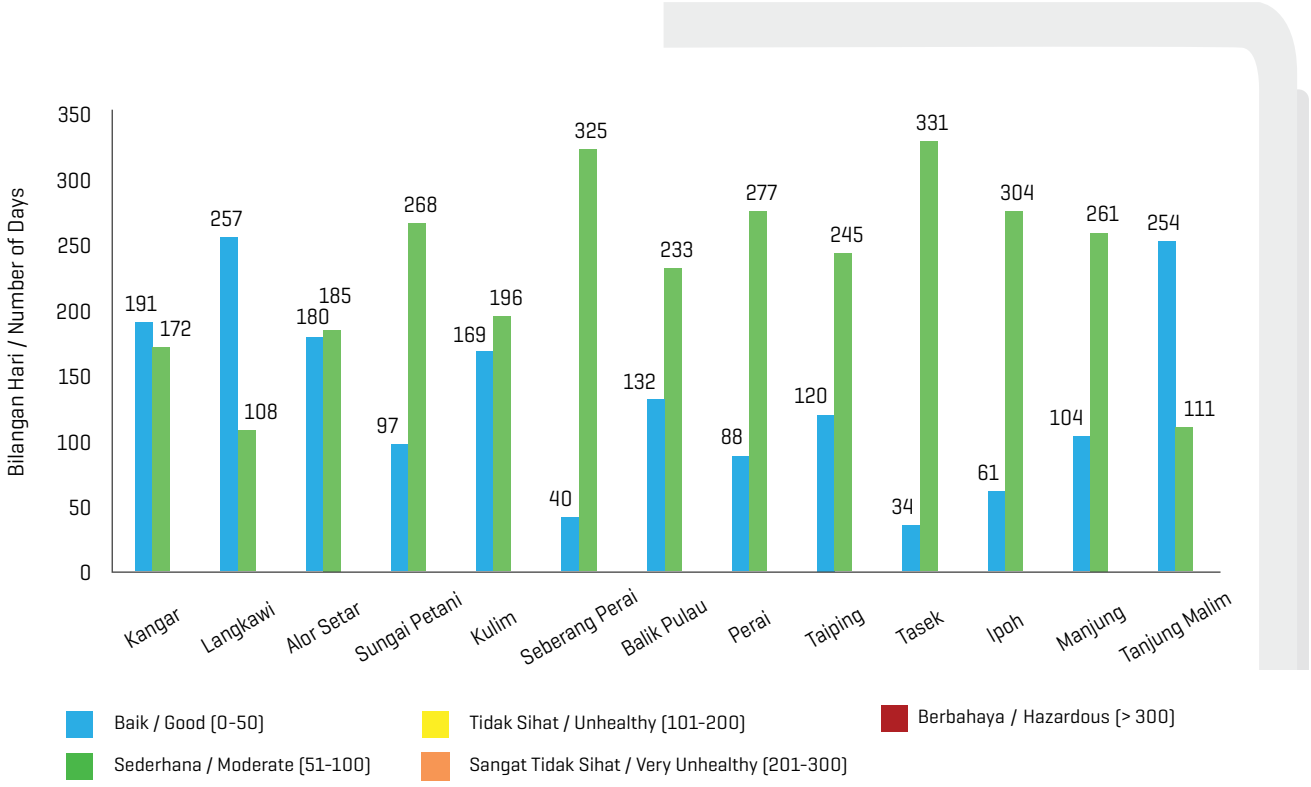
Secara keseluruhan, status kualiti udara di utara Pantai Barat Semenanjung Malaysia yang meliputi Perlis, Kedah, Pulau Pinang dan Perak adalah pada tahap baik dan sederhana sepanjang masa. Langkawi, Kedah mencatatkan bacaan hari IPU baik yang lebih tinggi (257 hari) berbanding stesen-stesen yang lain manakala Tasek, Perak mencatatkan bacaan hari IPU sederhana tertinggi iaitu 331 hari. Tiada stesen yang mencatatkan bacaan hari IPU tidak sihat sepanjang tahun 2021 di utara Pantai Barat Semenanjung Malaysia.

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

Northern Region

Overall, the air quality status in the North-West Coast States of Peninsular Malaysia covering Perlis, Kedah, Pulau Pinang and Perak, were within good and moderate levels most of the times. Langkawi, Kedah recorded higher good API reading (257 days) compared with the other stations while Tasek, Perak recorded highest moderate API reading with 331 days. No station recorded unhealthy API readings during 2021 in northern region of the West Coast of Peninsular Malaysia.

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



Rajah 1.3 : Status Kualiti Udara, Wilayah Utara Pantai Barat Semenanjung Malaysia, 2021

Figure 1.3 : Air Quality Status, Northern Region of The West Coast Peninsular Malaysia, 2021

Wilayah Selatan

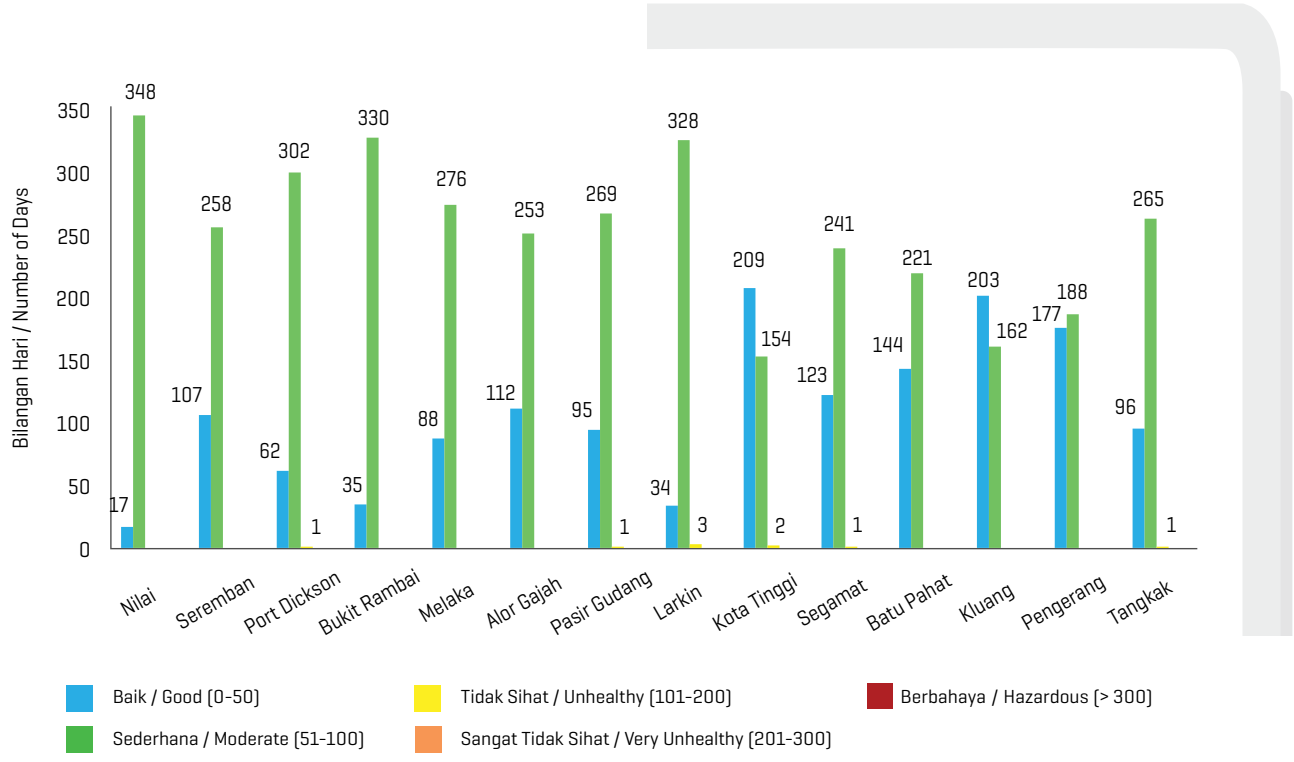
Kualiti udara di Wilayah Selatan Pantai Barat Semenanjung Malaysia (N.Sembilan, Melaka dan Johor) adalah berada pada tahap IPU baik dan sederhana sepanjang masa. Kota Tinggi, Johor mencatatkan bilangan bacaan hari IPU baik yang tertinggi di wilayah selatan iaitu 209 hari manakala Nilai, N.Sembilan mencatatkan bacaan hari IPU sederhana tertinggi iaitu 348 hari. Enam (6) stesen yang mencatatkan bacaan hari IPU yang tidak sihat iaitu Larkin (3 hari), Kota Tinggi (2 hari), Port Dickson (1 hari), Pasir Gudang (1 hari), Segamat (1 hari) dan Tangkak (1 hari). Keadaan ini kemungkinan disebabkan oleh pelepasan $PM_{2.5}$ dan pembentukan O_3 di udara daripada kepadatan trafik yang tinggi di kawasan bandar dan aktiviti pembakaran pertanian di kawasan pinggir bandar.

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

Southern Region

The air quality in the South-West Coast Region of Peninsular Malaysia (N.Sembilan, Melaka and Johor) was within good and moderate levels of API most of the time. Kota Tinggi recorded the highest good API reading in southern region with 209 days while Nilai, N.Sembilan recorded the highest moderate API reading with 348 days. Six (6) stations recorded unhealthy API readings namely Larkin (3 days), Kota Tinggi (2 days), Port Dickson (1 day), Pasir Gudang (1 day), Segamat (1 day) dan Tangkak (1 day). This situation was likely due to the release of $PM_{2.5}$ and O_3 formation into the air from high traffic densities in urban areas and burning activities of crops in suburban areas.

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



Rajah 1.4 : Status Kualiti Udara, Wilayah Selatan Pantai Barat Semenanjung Malaysia, 2021

Figure 1.4 : Air Quality Status, Southern Region of The West Coast Peninsular Malaysia, 2021

STATUS KUALITI UDARA DI PANTAI TIMUR

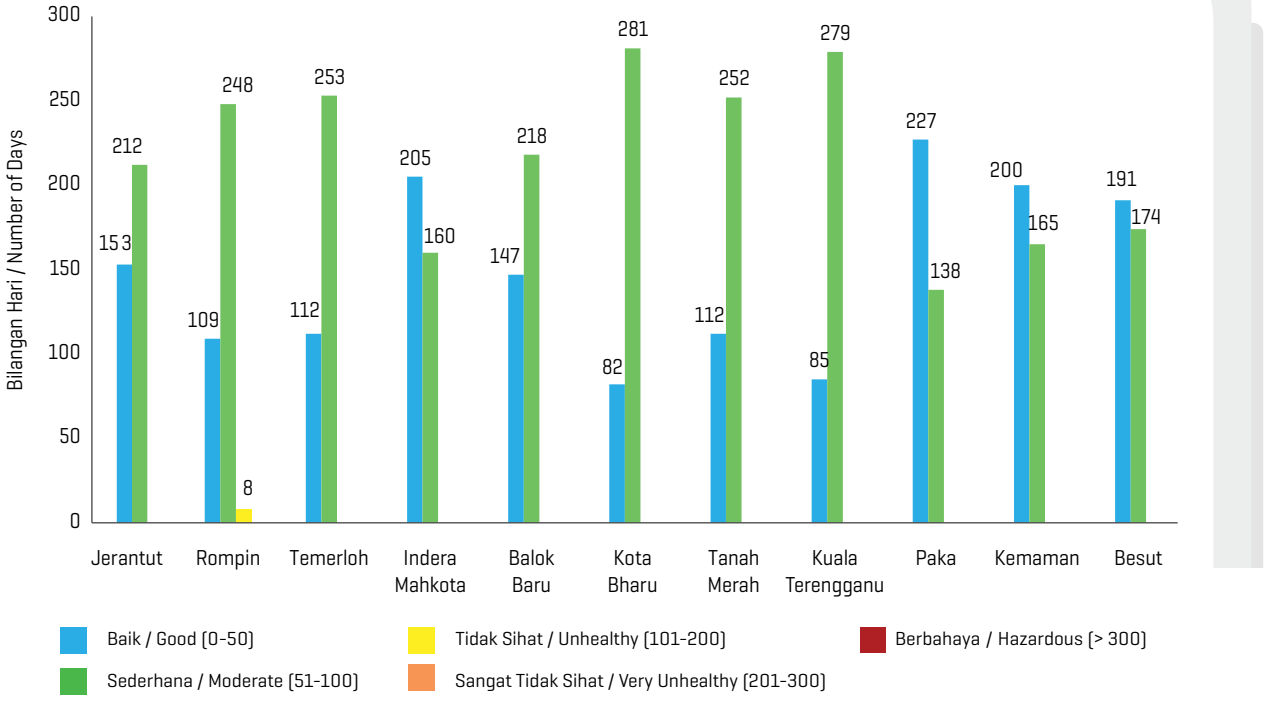
Kualiti udara di Pantai Timur Semenanjung Malaysia (Pahang, Terengganu, Kelantan dan timur Johor) bagi tahun 2021 berstatus baik dan sederhana pada kebanyakan masa. Paka, Terengganu mencatatkan bilangan bacaan hari IPU baik tertinggi iaitu 227 hari dan Kota Bharu, Kelantan merekodkan bacaan hari IPU sederhana tertinggi iaitu 281 hari. Hanya satu stesen mencatatkan status kualiti udara tidak sihat di Pantai Timur Semenanjung Malaysia iaitu Rompin, Pahang (8 hari) yang disebabkan oleh peningkatan kepekatan $PM_{2.5}$ akibat kebakaran hutan dan belukar di kawasan setempat.

Status kualiti udara di Pantai Timur Semenanjung Malaysia secara keseluruhan adalah seperti di **Rajah 1.5**

AIR QUALITY STATUS IN THE EAST COAST

The air quality in the East Coast States of Peninsular Malaysia (Pahang, Terengganu, Kelantan and eastern Johor) for the year 2021 was at "good and moderate" status most of the time. Paka, Terengganu recorded the highest good API reading in east coast region with 227 days and Kota Bharu, Kelantan recorded the highest moderate API reading with 281 days. Only one stations recorded unhealthy air quality status throughout the year, namely Rompin, Pahang (8 days) due to the increase in $PM_{2.5}$ concentrations as a result of forest and bush fires in the local area.

The overall air quality status in the East Coast of Peninsular Malaysia is shown in **Figure 1.5**.



Rajah 1.5 : Status Kualiti Udara, Pantai Timur Semenanjung Malaysia, 2021

Figure 1.5 : Air Quality Status, East Coast Peninsular Malaysia, 2021

STATUS KUALITI UDARA DI SABAH, LABUAN DAN SARAWAK

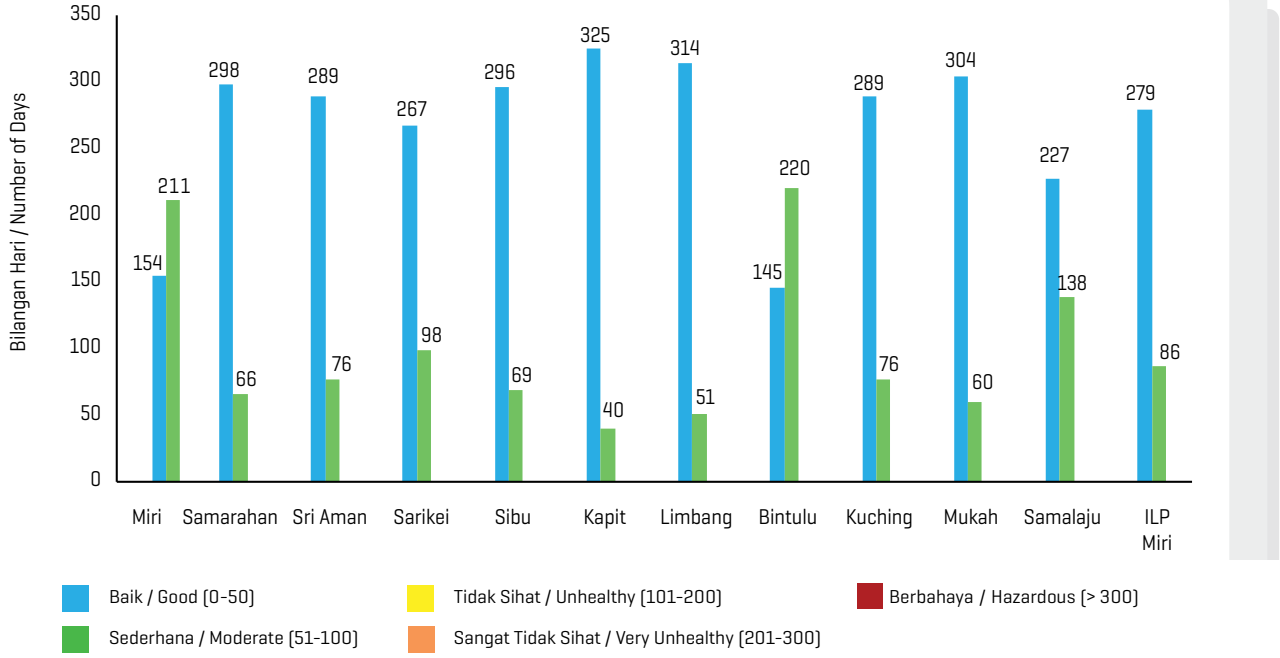
Kualiti udara di Sabah, Labuan dan Sarawak adalah pada tahap baik dan sederhana sepanjang masa bagi tahun 2021. Stesen Kapit merekodkan bacaan hari IPU baik yang paling tinggi di Sarawak iaitu 325 hari dan stesen Tawau merekodkan bacaan hari IPU baik yang tertinggi di Sabah iaitu 345 hari. Manakala bagi stesen Labuan, bacaan hari IPU sederhana lebih tinggi dicatatkan iaitu 200 hari berbanding dengan bacaan hari IPU baik iaitu 165 hari. Tiada stesen di Sarawak, Sabah dan Labuan mencatatkan bacaan tidak sihat bagi tahun 2021.

Status kualiti udara di Sarawak secara keseluruhan ditunjukkan dalam **Rajah 1.6** dan di Sabah dan Labuan ditunjukkan dalam **Rajah 1.7.**

AIR QUALITY STATUS IN SABAH, LABUAN AND SARAWAK

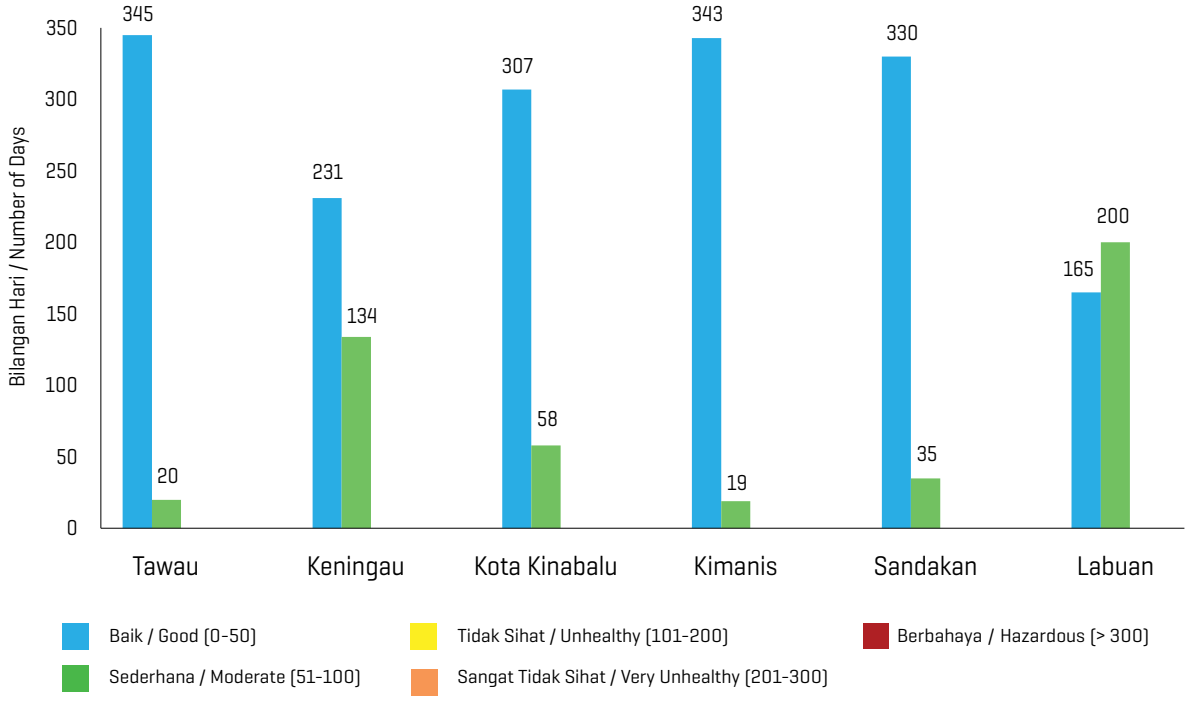
The air quality in Sabah, Labuan and Sarawak remained between good to moderate levels most of the time for the year 2021. Kapit recorded the highest good API reading in Sarawak with 325 days and Tawau recorded the highest good API reading in Sabah with 345 days. While for Labuan, moderate API reading was higher recorder which was 200 days compared with good API reading which was 165 days. No station in Sarawak, Sabah and Labuan recorded unhealthy day in year 2021.

The overall air quality status in Sarawak is shown in **Figure 1.6** and **Figure 1.7** shows the overall air quality in Sabah and Labuan.



Rajah 1.6 : Status Kualiti Udara, Sarawak, 2021

Figure 1.6 : Air Quality Status, Sarawak, 2021



Rajah 1.7 : Status Kualiti Udara, Sabah dan Labuan, 2021

Figure 1.7 : Air Quality Status, Sabah and Labuan, 2021

TREN KUALITI UDARA

Enam (6) pencemar udara iaitu habuk halus bersaiz 10 mikron (PM_{10}), habuk 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 buah lokasi. Parameter $PM_{2.5}$ mula dipantau sepenuhnya pada tahun 2018. Tren kualiti udara dari tahun 2010 hingga 2021 ditentukan dengan mengambil kira 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 2021, Standard Kualiti Udara Ambien Malaysia IT-2 digunakan.

AIR QUALITY TREND

Six (6) air pollutants, namely particulate matter (PM_{10}), particulate matter ($PM_{2.5}$), ground level ozone (O_3), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) were monitored continuously at 65 locations. Parameter of $PM_{2.5}$ were fully monitored starting the year 2018. The air quality trend for the period of 2010 to 2021 was computed by averaging annual air quality data received from the monitoring sites and with reference to Malaysia Ambient Air Quality Standard as shown in **Table 1.2**. For 2021, Malaysia 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/ AVERAGING TIME	UNIT	GARIS PANDUAN SEDIA ADA/ EXISTING GUIDELINES	STANDARD KUALITI UDARA AMBIEN MALAYSIA / MALAYSIAN AMBIENT AIR QUALITY		
				IT-1 (2015)	IT-2 (2018)	STANDARD (2020)
PM_{10}	1 Tahun	µg/m³	50	50	45	40
	24 Jam	µg/m³	150	150	120	100
$PM_{2.5}$	1 Tahun	µg/m³	-	35	25	15
	24 Jam	µg/m³	-	75	50	35
SO_2	1 Jam	µg/m³	350	350	300	250
		ppm	0.135	0.135	0.115	0.095
	24 Jam	µg/m³	105	105	90	80
		ppm	0.040	0.040	0.035	0.030
*CO	1 Jam	mg/m³	35	35	35	30
		ppm	30.6	30.6	30.6	26.2
	8 Jam	mg/m³	10	10	10	10
		ppm	8.75	8.75	8.75	8.75
NO_2	1 Jam	µg/m³	320	320	300	280
		ppm	0.170	0.170	0.160	0.150
	24 Jam	µg/m³	75	75	75	70
		ppm	0.040	0.040	0.040	0.037
O_3	1 Jam	µg/m³	200	200	200	180
		ppm	0.100	0.100	0.100	0.090
	8 Jam	µg/m³	120	120	120	100
		ppm	0.060	0.060	0.060	0.050

Nota: *mg/m³ IT-Interim Tier (tahun)

HABUK HALUS (PM_{10})

Tren purata tahunan kepekatan PM_{10} dalam udara ambien bagi tahun 2010 hingga tahun 2021 adalah seperti yang ditunjukkan dalam **Rajah 1.8**. Pada tahun 2021, nilai purata kepekatan tahunan PM_{10} dalam udara ambien adalah 21 µg/m³ iaitu masih belum melebihi had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu sebanyak 45 µg/m³. Bacaan PM_{10} bagi tahun 2021 menunjukkan sedikit peningkatan berbanding tahun sebelumnya.

Berdasarkan kategori guna tanah, kawasan bandar merekodkan bacaan PM_{10} yang lebih tinggi berbanding kawasan yang lain seperti

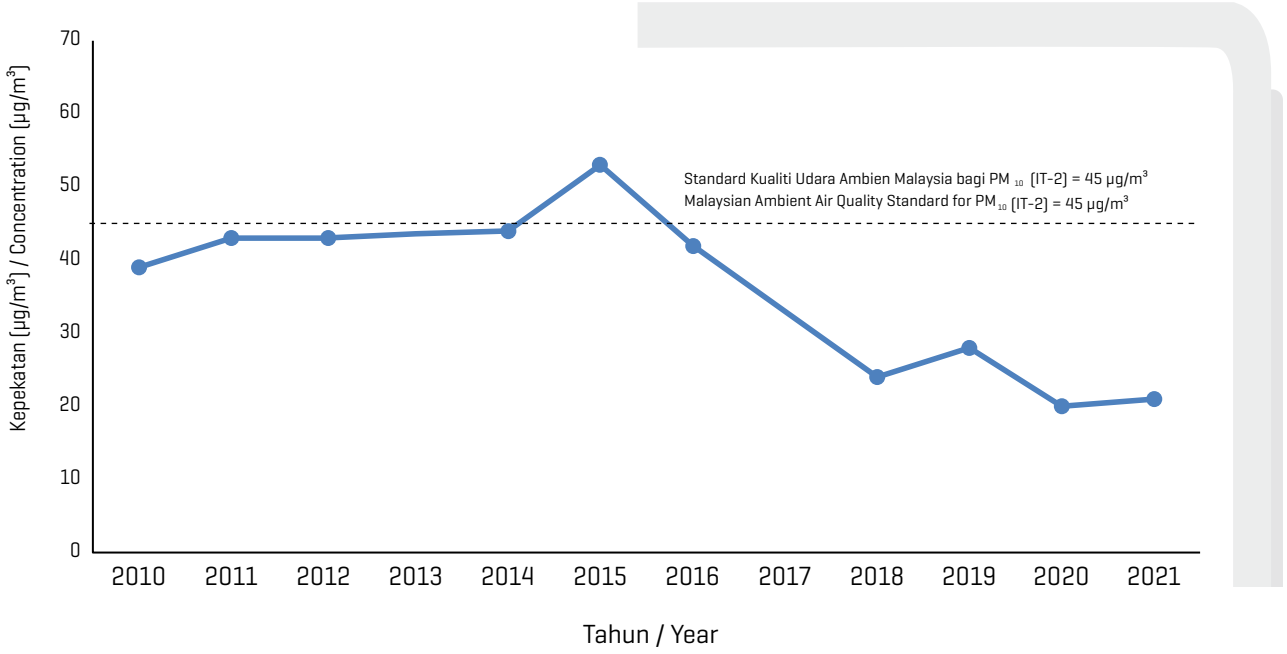
PARTICULATE MATTER (PM_{10})

The trend of the annual average levels of PM_{10} concentration in the ambient air for the year 2010 until 2021 are as shown in **Figure 1.8**. In 2021, the annual average value of PM_{10} in the ambient air was 21 µg/m³ which lower from the Malaysian Ambient Air Quality Standard value of IT-2 which is 45 µg/m³. The PM_{10} reading for 2021 shows a slight increase over the previous year.

Based on the land use category, urban areas recorded higher PM_{10} readings than other areas as shown in **Figure 1.8(a)**. The leniency

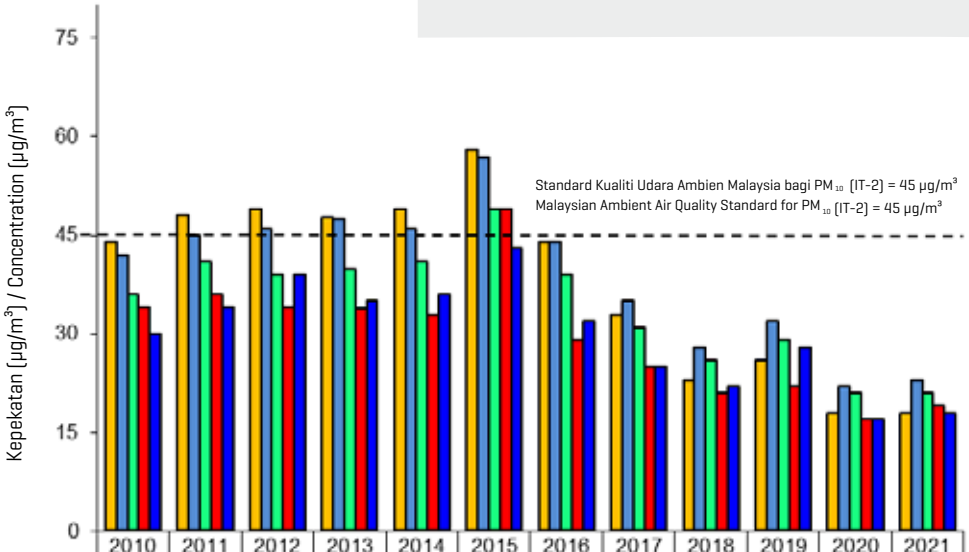
yang ditunjukkan dalam **Rajah 1.8 (a).** Kelonggaran arahan PKP yang dikeluarkan oleh kerajaan untuk segala aktiviti industri, aktiviti komersial dan sosial serta peningkatan bilangan kenderaan di jalan raya telah menyebabkan peningkatan kepekatan PM_{10} di kawasan bandar dan pinggir bandar pada tahun 2021 berbanding tahun 2020.

in MCO by the government for all industrial, commercial and social activities throughout 2021 as well as vehicles back on the road has resulted in an increase in PM_{10} concentrations in the urban and sub urban areas compared to year 2020.



Rajah 1.8 : Purata Kepekatan Tahunan Habuk Halus (PM_{10}), 2010-2021

Figure 1.8 : Annual Average Concentration of Particulate Matter (PM_{10}), 2010-2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industri / Industrial	44	48	49	48	49	58	44	33	23	26	18	18
Bandar / Urban	42	45	46	48	46	57	44	35	28	32	22	23
Pinggir Bandar / Suburban	36	41	39	40	41	49	39	31	26	29	21	21
Latarbelakang / Background	34	36	34	34	33	49	29	25	21	22	17	19
Luar Bandar / Rural	30	34	39	35	36	43	32	25	22	28	17	18

Rajah 1.8(a) : Purata Kepekatan Tahunan Habuk Halus (PM_{10}) mengikut Guna Tanah, 2010 - 2021

Figure 1.8(a) : Annual Average Concentration of Particulate Matter (PM_{10}) by Land Use, 2010 – 2021

HABUK HALUS ($PM_{2.5}$)

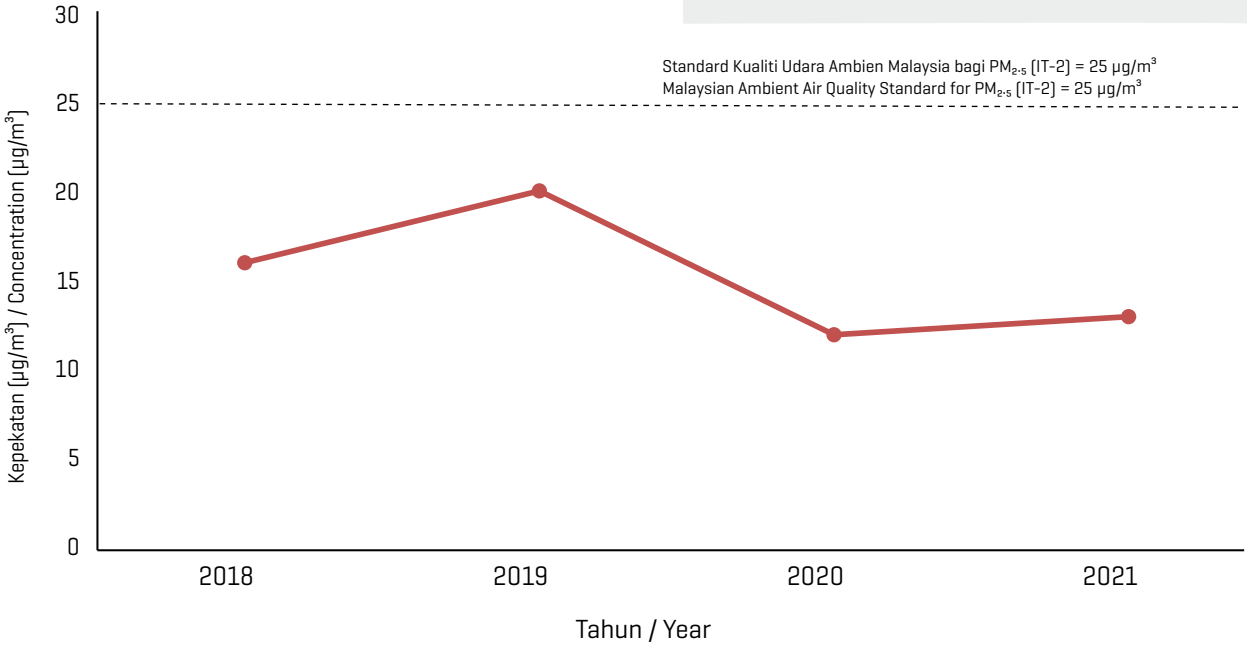
$PM_{2.5}$ mula diukur dan dianalisis bermula pada pertengahan tahun 2017 dan mula dilaporkan di dalam Laporan Kualiti Alam Sekeliling bermula pada tahun 2018. Nilai purata tahunan $PM_{2.5}$ dalam udara ambien bagi tahun 2021 adalah 13 µg/m³ iaitu tinggi sedikit dari tahun 2020 dan masih belum melebihi had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia bagi IT-2 iaitu sebanyak 25 µg/m³ seperti yang ditunjukkan di dalam **Rajah 1.8**.

Berdasarkan kategori guna tanah, nilai purata kepekatan tahunan $PM_{2.5}$ tertinggi adalah di kawasan bandar dan diikuti dengan kawasan pinggir bandar, luar bandar dan industri seperti yang ditunjukkan dalam **Rajah 1.8 (b).** Peningkatan kepekatan $PM_{2.5}$ di udara adalah merujuk kepada aktiviti pembakaran bahan bakar daripada kenderaan, aktiviti kerja tanah dan juga kegiatan pembakaran terbuka perladangan dan tapak pelupusan sampah.

PARTICULATE MATTER

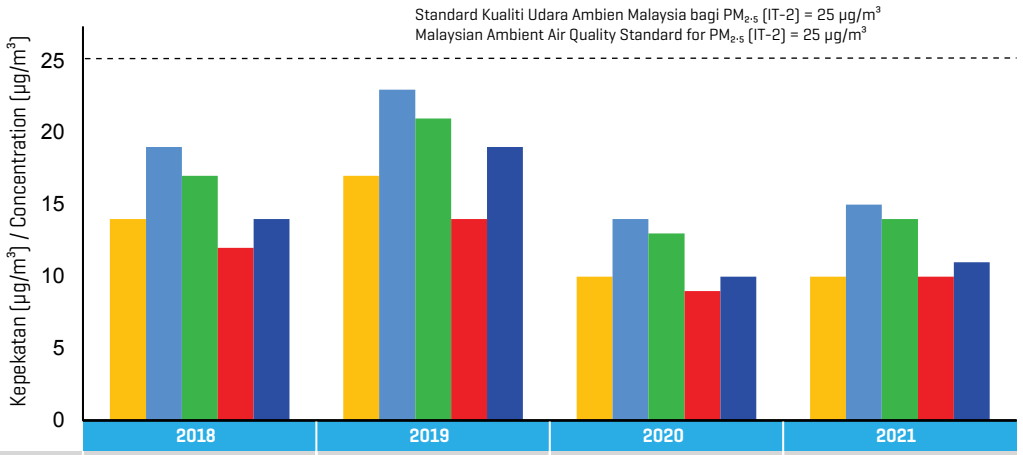
$PM_{2.5}$ started to be measured and analysed in the mid-year of 2017 and it was first reported in the Environmental Quality Report in 2018. The annual average value of $PM_{2.5}$ in the ambient air in year 2021 was 13 µg/m³ which was slightly higher from year 2020 and still lower from the Malaysian Ambient Air Quality Standard value of IT-2 which is 25 µg/m³ as shown in **Figure 1.8**.

Based on land use category, the highest average annual concentration values of $PM_{2.5}$ were in urban areas and followed by suburban, rural and industrial areas as shown in **Figure 1.8 (b)**. The increase in $PM_{2.5}$ concentration in the air refers to fuel burning activities from vehicles, earthworks activities as well as open burning activities of vegetation and landfills burnings.



Rajah 1.8 (b) : Purata Kepekatan Tahunan Habuk Halus ($PM_{2.5}$), 2018-2021

Figure 1.8 (b) : Annual Average Concentration of Particulate Matter ($PM_{2.5}$), 2018-2021



	2018	2019	2020	2021
Industri / Industrial	14	17	10	10
Bandar / Urban	19	23	14	15
Pinggir Bandar / Suburban	17	21	13	14
Latar Belakang / Background	12	14	9	10
Luar Bandar / Rural	14	19	10	11

Rajah 1.8(c) : Purata Kepekatan Tahunan Habuk Halus ($PM_{2.5}$) mengikut Guna Tanah, 2018-2021

Figure 1.8(c) : Annual Average Concentration of Particulate Matter ($PM_{2.5}$) by Land Use, 2018- 2021

OZON PERMUKAAN BUMI (O_3)

Pada tahun 2021, purata tahunan kepekatan maksimum harian ozon didapati sedikit menurun berbanding dengan tahun 2020 dengan bacaan 0.0280 ppm. Secara keseluruhannya, tren purata tahunan kepekatan maksimum ozon tempoh 8 jam dalam udara ambien adalah mematuhi had sebanyak 0.06 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2 dan seperti yang ditunjukkan dalam **Rajah 1.9.**

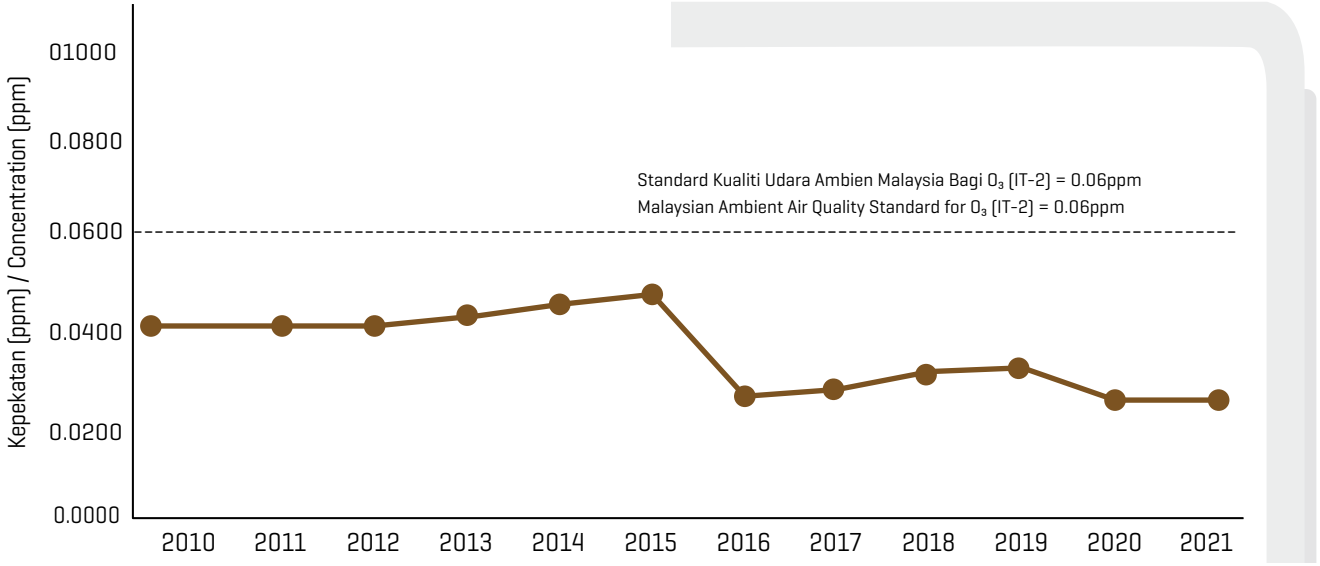
Rajah 1.9 (a) menunjukkan kepekatan ozon permukaan bumi untuk pelbagai kategori guna tanah dari tahun 2010 hingga 2021. Bermula tahun 2018, tiada pemantauan ozon dilakukan di kawasan industri kerana untuk memberi keutamaan pemantauan ozon di kawasan bandar. Kawasan bandar mencatatkan bacaan ozon lebih tinggi disebabkan oleh jumlah trafik yang lebih tinggi dan keadaan atmosfera yang kondusif menyebabkan pembentukan ozon. Pencemaran ozon permukaan bumi juga ketara di beberapa kawasan pinggir bandar dan luar bandar disebabkan oleh pergerakan angin yang membawa pencetus pencemar ozon aras bumi iaitu oksida-oksid nitrogen (NO_x) dan sebatian organik meruap (VOC) yang kebanyakannya dilepaskan daripada kenderaan bermotor dan industri.

GROUND LEVEL OZONE (O_3)

In 2021, the annual average daily maximum daily ozone concentrations slightly decreased compared to the 2020 with the reading of 0.0280 ppm. The overall trend on the annual average daily maximum eight-hour ozone concentrations in ambient air were well below the limit of 0.06 ppm as stipulated in the Malaysia Ambient Quality Standard IT-2 and as shown in **Figure 1.9**.

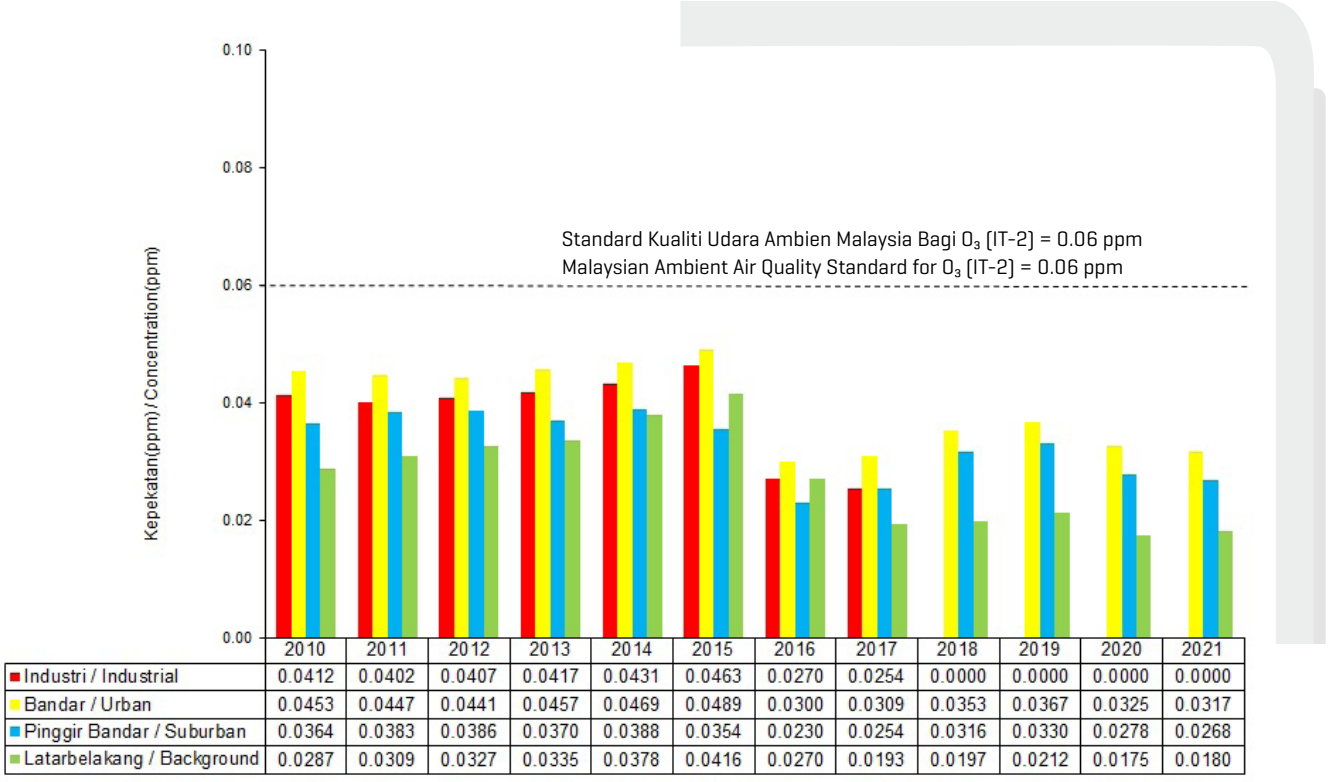
Figure 1.9 (a) shows the ground level ozone concentration for various land use categories between 2010 and 2021. Starting in 2018, no ozone monitoring is carried out in industrial areas to prioritize ozone monitoring in urban areas. Urban areas recorded higher levels of ground level ozone due to higher traffic volume and a conducive atmospheric condition resulting in ozone formation. Ground level ozone pollution was also dominant in some suburban and rural areas due to downwind effect transporting ground level ozone pollutant precursors namely nitrogen oxides (NO_x) and volatile organic compound (VOC) were emitted mainly from motor vehicles and industries.

Gunung Kinabalu



Rajah 1.9 : Purata Kepekatan Tahunan Ozon (O_3) , 2010-2021

Figure 1.9 : Annual Average Concentration of Ozone (O_3) , 2010-2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industri / Industrial	0.0412	0.0402	0.0407	0.0417	0.0431	0.0463	0.0270	0.0254	0.0000	0.0000	0.0000	0.0000
Bandar / Urban	0.0453	0.0447	0.0441	0.0457	0.0469	0.0489	0.0300	0.0309	0.0353	0.0367	0.0325	0.0317
Pinggir Bandar / Suburban	0.0364	0.0383	0.0386	0.0370	0.0388	0.0354	0.0230	0.0254	0.0316	0.0330	0.0278	0.0268
Latarbelakang / Background	0.0287	0.0309	0.0327	0.0335	0.0378	0.0416	0.0270	0.0193	0.0197	0.0212	0.0175	0.0180

Rajah 1.9(a) : Purata Kepekatan Tahunan Ozon (O_3), Mengikut Guna Tanah 2010-2021

Figure 1.9(a) : Annual Average Concentration of Ozone (O_3) by Land Use, 2010-2021

SULFUR DIOKSIDA (SO_2)

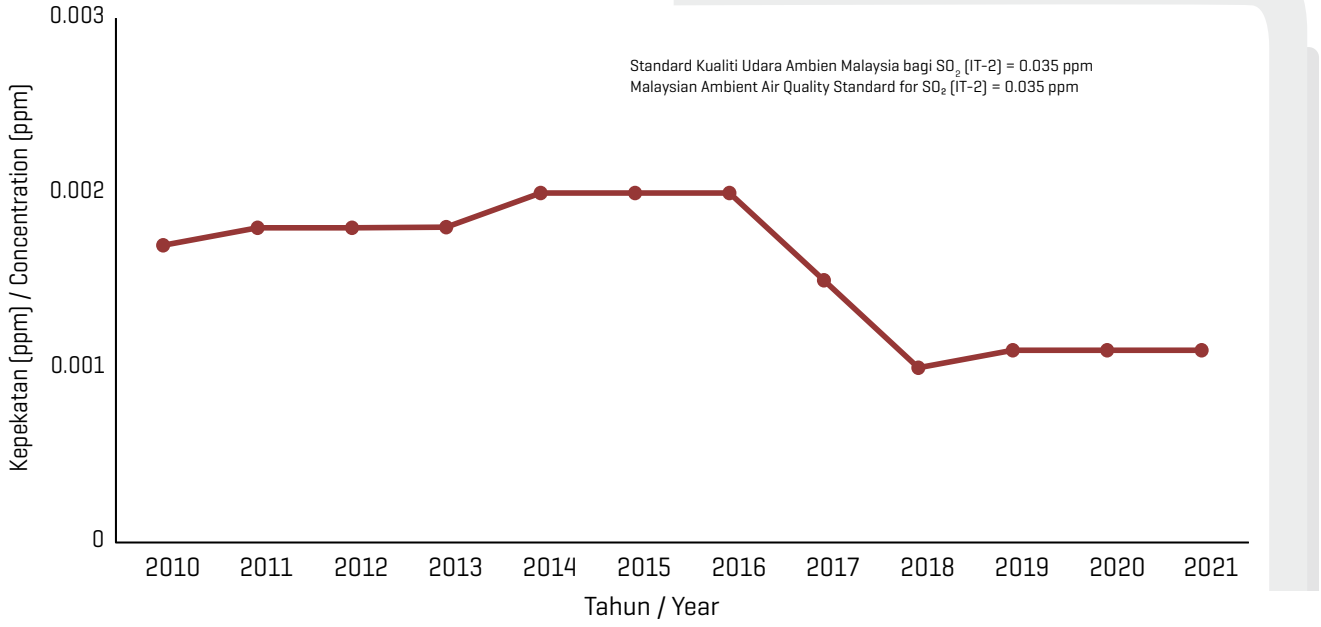
Purata kepekatan tahunan SO_2 yang direkodkan pada tahun 2021 adalah sama seperti tahun 2020 iaitu 0.0011 ppm dan ia adalah jauh di bawah had sebanyak 0.035 ppm seperti yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2 (**Rajah 1.10**). JAS dan beberapa agensi berkaitan telah melaksanakan beberapa strategi dalam mengurangkan kepekatan SO_2 di Malaysia dan di antaranya adalah menggalakkan penggunaan bahan api berkualiti EURO2M dan menggalakkan penggunaan gas asli secara meluas dalam proses industri dan kegunaan kenderaan. Mulai 1 September 2015, EURO4M RON97 telah dilaksanakan dan pada November 2015, EURO5 Diesel yang mengandungi kandungan sulfur kurang dari 10 mg/l pula telah diperkenalkan di pasaran. Strategi-strategi ini sedikit sebanyak mempengaruhi tren pelepasan SO_2 di kawasan industri dan bandar yang menunjukkan semakin berkurangan pelepasan SO_2.

Rajah 1.10 (a) menunjukkan kepekatan purata tahunan bagi SO_2 mengikut kategori guna tanah. Berdasarkan kepada rajah tersebut, keadaan menunjukkan bahawa kepekatan SO_2 di kawasan-kawasan bandar dan pinggir bandar pada tahun 2021 adalah lebih tinggi sedikit berbanding dengan tahun 2020. Ini menunjukkan bahawa peningkatan bilangan kenderaan di jalan raya memberi kesan kepada peningkatan gas SO_2 di udara apabila arahan PKP telah ditarik balik oleh kerajaan dan kenderaan bebas untuk bergerak.

SULPHUR DIOXIDE (SO_2)

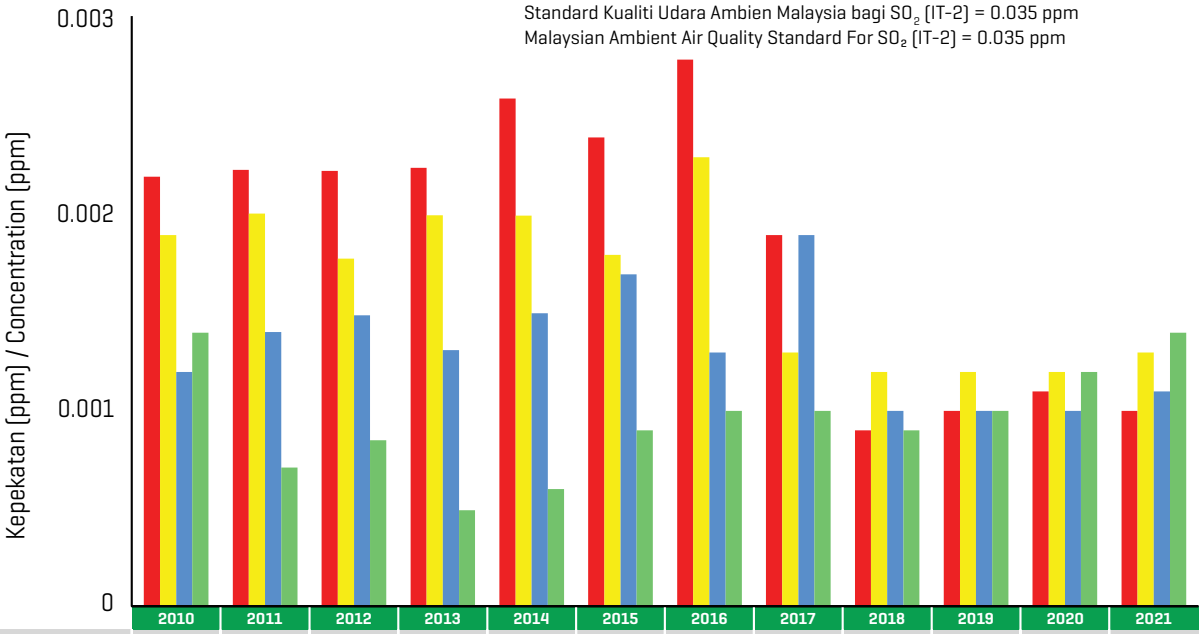
The average annual concentration of SO_2 recorded in 2021 is the same as in 2020 which is 0.0011 ppm and it is well below the limit of 0.035 ppm as stipulated in the Malaysian Ambient Air Quality Standard IT-2 (**Figure 1.10**). DOE and several related agencies have implemented several strategies in reducing the concentration of SO_2 in Malaysia and among them is to encourage the use of EURO2M quality fuel and encouraging the widespread use of natural gas in industrial processes and vehicle use. Starting from 1st September 2015, petrol EURO4M RON 97 had been implemented and on November 2015, EURO5 Diesel with the sulfur content less than 10 mg/l had been introduced in the market. These strategies to some extent influence the trend of SO_2 emissions in industrial and urban areas which show declining SO_2 emissions.

Figure 1.10 (a) shows the annual average concentrations of SO_2 from different categories of land use. From the figure, the situation shows that the concentration of SO_2 in urban and sub urban areas in 2021 is slightly higher than in 2020. This indicates that the increase in the number of vehicles on the road affected the increase in SO_2 gas in the air when the MCO directive was lifted by the government and vehicles were free to move.



Rajah 1.10 : Purata Kepekatan Tahunan Sulfur Dioksida (SO_2), 2010-2021

Figure 1.10 : Annual Average Concentration of Sulfur Dioxide (SO_2) , 2010-2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industri / Industrial	0.0022	0.0022	0.0022	0.0022	0.0026	0.0024	0.0028	0.0019	0.0009	0.0010	0.0011	0.0010
Bandar / Urban	0.0019	0.0020	0.0018	0.0020	0.0020	0.0018	0.0023	0.0013	0.0012	0.0012	0.0012	0.0013
Pinggir Bandar / Suburban	0.0012	0.0014	0.0015	0.0013	0.0015	0.0017	0.0013	0.0019	0.0010	0.0010	0.0010	0.0011
Latar Belakang / Background	0.0014	0.0007	0.0009	0.0005	0.0006	0.0009	0.0010	0.0010	0.0009	0.0010	0.0012	0.0014

Rajah 1.10(a) : Purata Kepekatan Tahunan Sulfur Dioksida (SO_2) mengikut Guna Tanah, 2010-2021

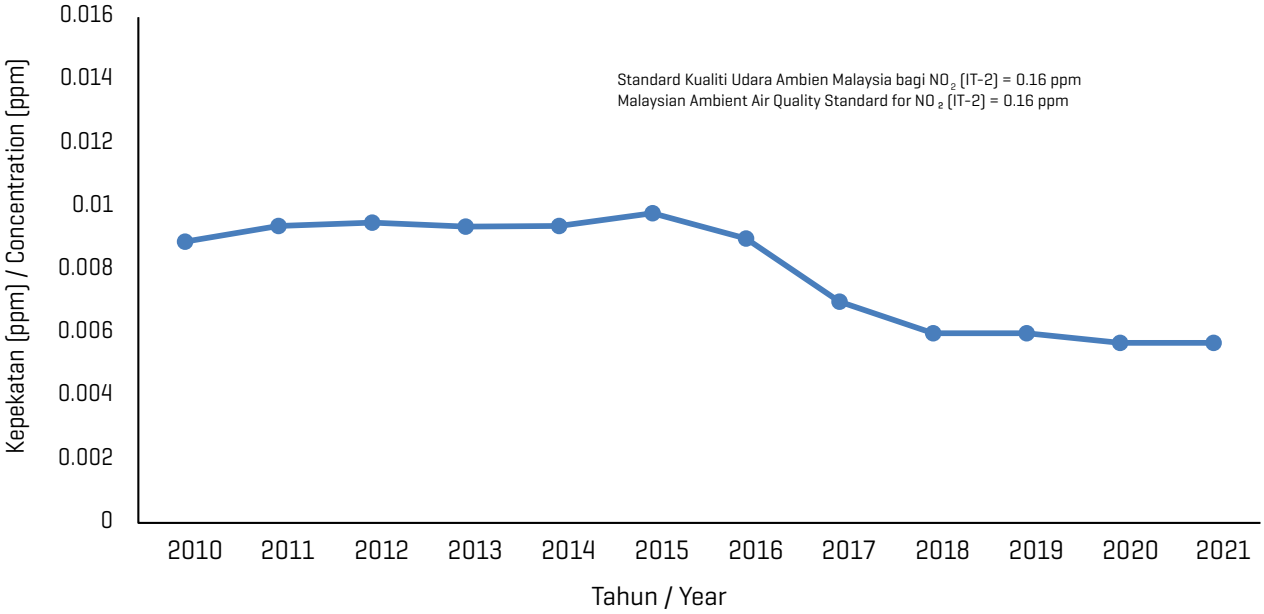
Figure 1.10(a) : Annual Average Concentration of Sulfur Dioxide (SO_2) by Land Use, 2010-2021

NITROGEN DIOKSIDA (NO_2)

Pada tahun 2021, kepekatan purata tahunan NO_2 adalah sama seperti tahun 2020 iaitu dengan bacaan 0.0057 ppm dan jauh berada di bawah had yang ditetapkan dalam Standard Kualiti Udara Ambien Malaysia IT-2. seperti yang ditunjukkan di dalam **Rajah 1.11**. Walau bagaimanapun, kepekatan NO_2 kekal tinggi di kawasan bandar seperti yang ditunjukkan di dalam **Rajah 1.11 (a).** Keadaan ini mungkin berpunca daripada pelepasan asap kenderaan bermotor yang mempunyai bilangan kenderaan yang amat tinggi di kawasan bandar. Anggaran beban pelepasan NO_2 menunjukkan sebanyak 66 peratus adalah daripada loji janakuasa, 25 peratus daripada pelepasan kenderaan bermotor, 7 peratus daripada industri dan 2 peratus adalah daripada lain-lain sumber.

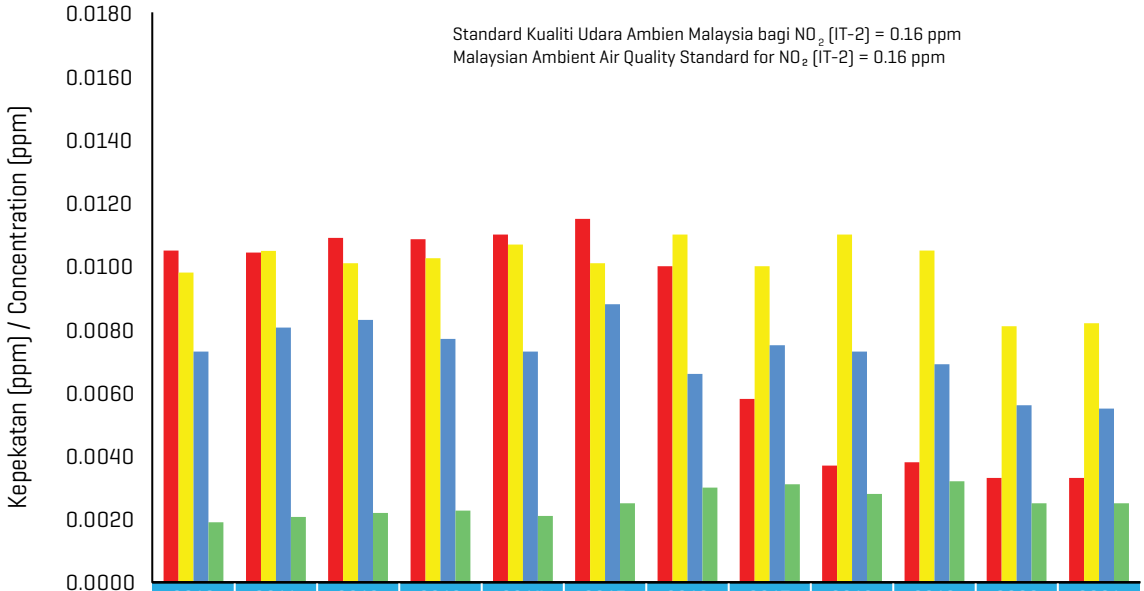
NITROGEN DIOXIDE (NO_2)

In 2021, NO_2 annual average concentration was same as in the 2020 with a reading of 0.0057 ppm and was still below the Malaysia Ambient Air Quality Standard IT-2 as depicted in **Figure 1.11.** However, NO_2 concentrations remained high in urban areas as shown in **Figure 1.11 (a)**. This situation may be due to smoke emissions from motor with high number of vehicles in urban areas. Estimation on NO_2 emission load indicated that 66 percent were from powerplants while 25 percent from motor vehicles, 7 percent from industries and 2 percent from other sources.



Rajah 1.11 : Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2), 2010-2021

Figure 1.11 : Annual Average Concentration of Nitrogen Dioxide (NO_2), 2010-2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industri / Industrial	0.0105	0.0104	0.0109	0.0109	0.0110	0.0115	0.0100	0.0058	0.0037	0.0038	0.0033	0.0033
Bandar / Urban	0.0098	0.0105	0.0101	0.0103	0.0107	0.0101	0.0110	0.0100	0.0110	0.0105	0.0081	0.0082
Pinggir Bandar / Suburban	0.0073	0.0081	0.0083	0.0077	0.0073	0.0088	0.0066	0.0075	0.0073	0.0069	0.0056	0.0055
Latar Belakang / Background	0.0019	0.0021	0.0022	0.0023	0.0021	0.0025	0.0030	0.0031	0.0028	0.0032	0.0025	0.0025

Rajah 1.11(a) : Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2) mengikut Guna Tanah, 2010-2021

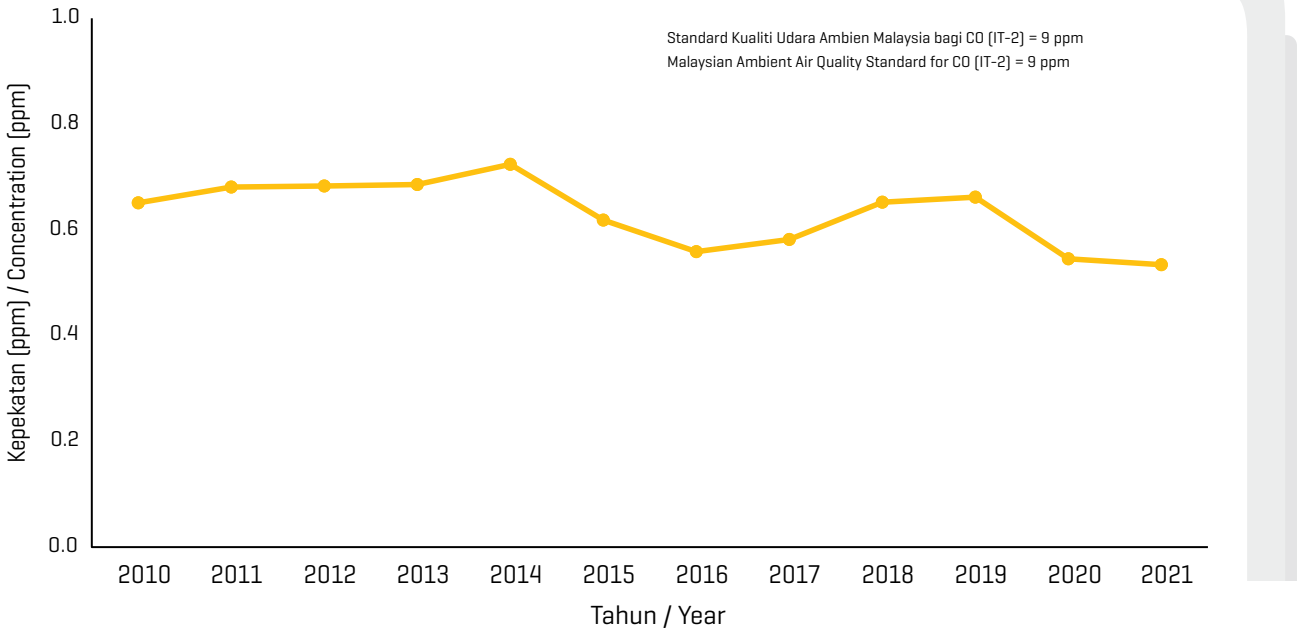
Figure 1.11(a) : Annual Average Concentration of Nitrogen Dioxide (NO_2) by Land Use, 2010-2021

KARBON MONOKSIDA (CO)

Kepekatan purata tahunan CO pada tahun 2021 menunjukkan sedikit penurunan berbanding tahun 2020 iaitu dengan bacaan 0.5339 ppm dan mematuhi Standard Kualiti Udara Ambien Malaysia IT-2 [**Rajah 1.12**]. Bermula pada tahun 2018, tiada lagi bacaan CO direkodkan di kawasan industri. **Rajah 1.12 (a)** menunjukkan kepekatan CO untuk pelbagai kategori guna tanah di mana kawasan bandar masih merekodkan bacaan purata tahunan CO tertinggi berbanding dengan kawasan yang lain. Kepekatan CO yang signifikan adalah disebabkan oleh pelepasan dari ekzos kenderaan motor yang menyumbang sebanyak 95 peratus daripada beban pelepasan CO pada tahun 2021.

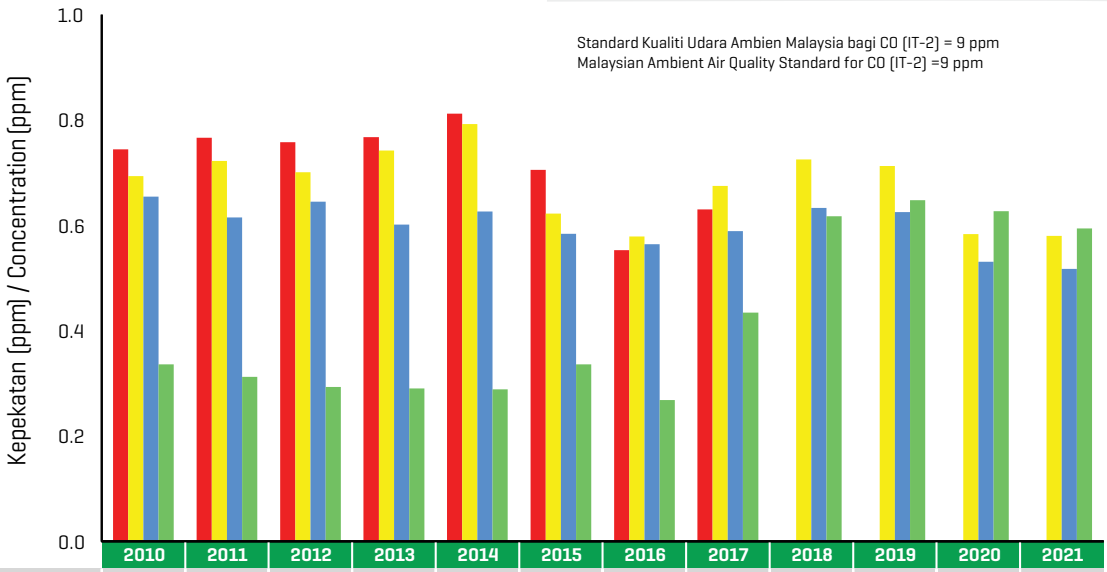
CARBON MONOXIDE (CO)

There was slightly decrease of CO levels in 2021 compared to 2020 with a reading of 0.5339 ppm and well in compliance to the Malaysian Ambient Air Quality Standard IT-2 [**Figure 1.12**]. Starting in 2018, no more CO readings were recorded in industrial areas. **Figure 1.12 (a)** shows CO concentrations for various categories of land use where urban areas record significant CO concentration readings, whereby 95 percent burden in 2021 was attributed to motor vehicle exhaust emissions.



Rajah 1.12 : Purata Kepekatan Tahunan Karbon Monoksida (CO), 2010-2021

Figure 1.12 : Annual Average Concentration of Carbon Monoxide (CO), 2010-2021



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Industri / Industrial	0.7439	0.7662	0.7576	0.7670	0.8116	0.7050	0.5527	0.6303	0.0000	0.0000	0.0000	0.0000
Bandar / Urban	0.6933	0.7221	0.7004	0.7418	0.7923	0.6219	0.5784	0.6745	0.7247	0.7126	0.5831	0.5800
Pinggir Bandar / Suburban	0.6541	0.6146	0.6447	0.6012	0.6258	0.5840	0.5637	0.5889	0.6329	0.6250	0.2304	0.5172
Latar Belakang / Background	0.3357	0.3123	0.2932	0.2899	0.2886	0.3357	0.2680	0.4340	0.6170	0.6476	0.6265	0.5940

Rajah 1.12(a) : Purata Kepekatan Tahunan Karbon Monoksida (CO) mengikut Guna Tanah, 2010-2021

Figure 1.12(a) : Annual Average Concentration of Carbon Monoxide (CO) by Land Use, 2010-2021

STATUS KUALITI UDARA SEBELUM DAN SEPANJANG TEMPOH PERINTAH KAWALAN PERGERAKAN (PKP)

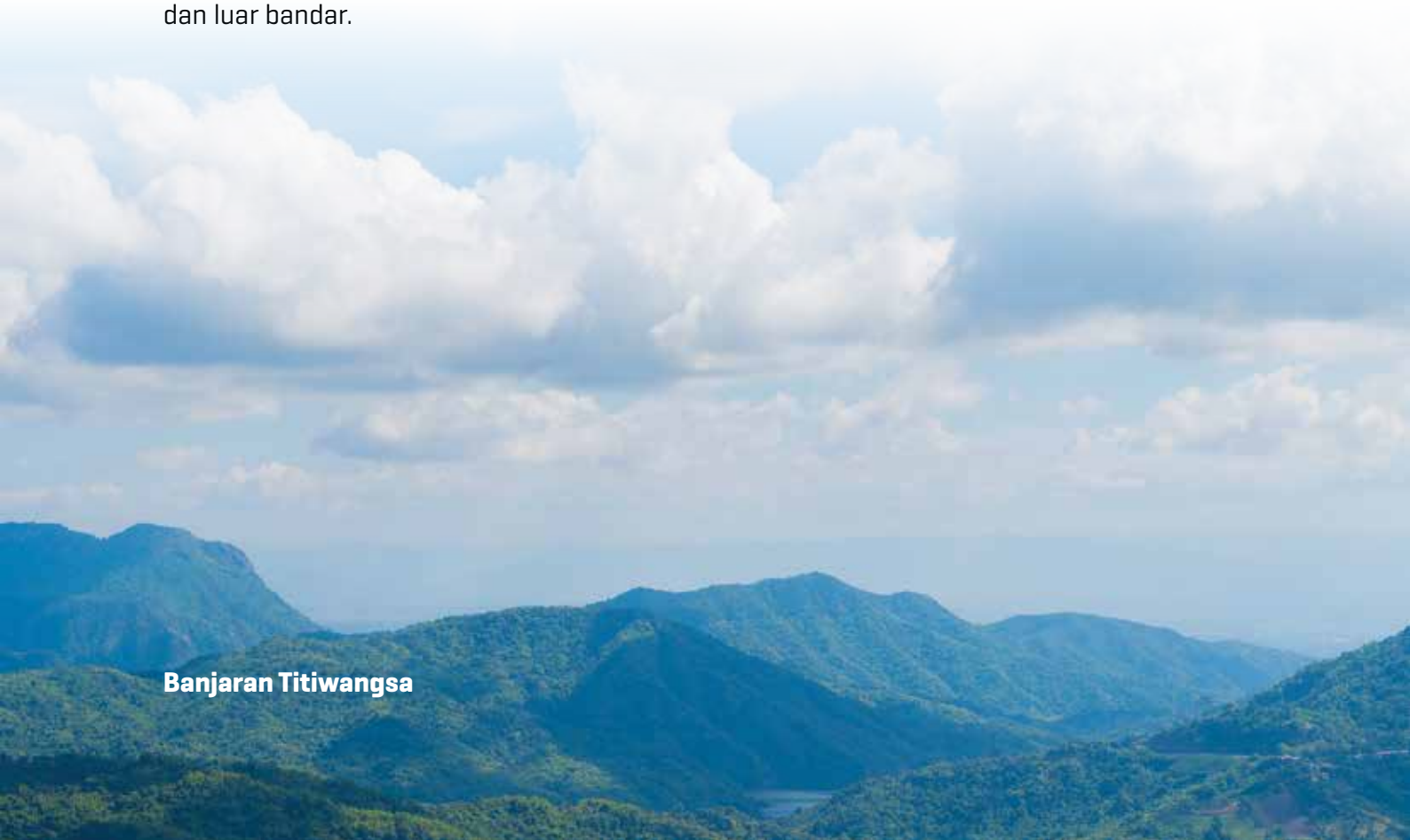
Analisis kualiti udara semasa tempoh pelaksanaan PKP 3.0 bermula dari 1 Mei 2021 sehingga 13 Jun 2021 dan telah dibuat perbandingan bagi melihat kesan kepada kualiti udara di seluruh negara sebelum tempoh PKP 3.0 iaitu dari 1 Mei 2021 sehingga 31 Mei 2021.

Bagi meninjau perbandingan status kualiti udara sebelum dan semasa PKP 3.0, analisis dilakukan ke atas enam [6] parameter utama iaitu habuk halus PM_{10} dan $PM_{2.5}$, gas-gas pencemar udara iaitu nitrogen dioksida (NO_2), sulfur dioksida (SO_2), karbon monoksida (CO) dan ozon permukaan bumi (O_3). Manakala 65 stesen pengawasan kualiti udara di seluruh Malaysia dibuat perbandingan dengan mengikut pecahan kepada lima [5] kawasan iaitu utara, tengah, selatan dan timur Semenanjung Malaysia serta Sabah, Sarawak dan Labuan. Analisis perbandingan kualiti udara juga turut dilakukan mengikut kategori stesen iaitu bandar, pinggir bandar, industri dan luar bandar.

AIR QUALITY STATUS BEFORE AND DURING THE MOVEMENT CONTROL ORDER (MCO) PERIOD

Air quality analysis during the implementation period of MCO 3.0 from 1 May 2021 to 13 June 2021 and was compared to see the impact on air quality throughout the country before the period of MCO 3.0 from 1 May 2021 to 31 May 2021.

To review the comparison of air quality status before and during MCO 3.0, analysis was performed on six [6] main parameters, namely particulate matter PM_{10} and $PM_{2.5}$, air pollutant gases namely nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and ground level ozone (O_3). Meanwhile, 65 air quality monitoring stations throughout Malaysia were compared according to the breakdown into five [5] areas, namely north, central, south and east of Peninsular Malaysia as well as Sabah, Sarawak and Labuan. Comparative analysis of air quality was also done according to station categories, namely urban, suburban, industrial and rural.



Banjaran Titiwangsa

STATUS KUALITI UDARA SEBELUM DAN SEPANJANG TEMPOH PERINTAH KAWALAN PERGERAKAN DENGAN MENGIKUTKAWASAN

Secara keseluruhannya didapati bahawa parameter pencemar udara menunjukkan penurunan yang ketara semasa pelaksanaan PKP 3.0 berbanding dengan tempoh sebelum PKP seperti di dalam **Jadual 1.3**. Nitrogen dioksida (NO_2) menunjukkan penurunan di semua kawasan di seluruh Malaysia iaitu dari 12% hingga 38%. Manakala sulfur dioksida (SO_2) menunjukkan penurunan di antara 11% hingga 35% di kawasan utara Semenanjung Malaysia, Sabah dan Labuan. Karbon monoksida (CO) menunjukkan penurunan di antara 5% hingga 18% di semua kawasan kecuali Labuan manakala ozon permukaan bumi (O_3) pula menunjukkan penurunan di antara 2% hingga 15% di semua kawasan kecuali kawasan timur Semenanjung Malaysia. Walau bagaimanapun, habuk halus PM_{10} dan $PM_{2.5}$ menunjukkan pengurangan di kawasan tengah Semenanjung Malaysia iaitu di antara 10% hingga 14% manakala Sabah dan Sarawak menunjukkan penurunan bagi habuk halus PM_{10} iaitu di antara 3% hingga 14%.

Kawasan tengah Semenanjung Malaysia menunjukkan penurunan bagi semua parameter pencemar udara kecuali SO_2. Ini menunjukkan bahawa pelaksanaan PKP memberi perubahan yang ketara kepada status pencemar udara bagi kawasan yang mempunyai populasi penduduk dan bilangan kenderaan yang tinggi.

AIR QUALITY STATUS BEFORE AND DURING THE PERIOD OF MOVEMENT CONTROL ORDER ACCORDING TO AREAS

Overall, it was found that air pollutant parameter showed a significant decrease during the implementation of MCO 3.0 compared to the period before MCO as shown in **Table 1.3**. Nitrogen dioxide gas (NO_2) showed a decrease in all areas throughout Malaysia from 12% to 38%. Meanwhile, sulfur dioxide (SO_2) showed a decrease of between 11% to 35% in the northern regions of Peninsular Malaysia, Sabah and Labuan. Carbon monoxide (CO) gas showed a decrease of between 5% to 18% in all areas except Labuan while ground level ozone (O_3) showed a decrease of between 2% to 15% in all areas except the eastern part of Peninsular Malaysia. However, PM_{10} and $PM_{2.5}$ showed a reduction in the central region of Peninsular Malaysia which was between 10% to 14% while Sabah and Sarawak showed a decrease for PM_{10} which was between 3% to 14%.

The central region of Peninsular Malaysia which consists of stations located in high population areas showed a decrease for all air pollutant parameters except SO_2. This indicates that the implementation of MCO provides significant changes of air pollutants status for areas with high population and transportation.

Jadual 1.3 : Perbezaan Peratus Pencemar Udara Semasa PKP 3.0 mengikut Kawasan di Malaysia

Table 1.3 : Percentage Differences of Air Pollutants During and Before MCO 3.0 according to Areas in Malaysia

KAWASAN / AREA	BIL STESEN / NO. STATION	PM_{10}	$PM_{2.5}$	NO_2	SO_2	CO	O_3
Utara / North	14	0.86	10.64	-19.09	-10.55	-13.99	-0.69
Tengah / Central	11	-13.58	-10.08	-34.46	13.52	-17.99	-15.40
Timur / East	11	8.68	24.47	-38.09	3.62	-9.02	1.41
Selatan / South	11	6.79	16.05	-28.40	1.86	-5.17	-3.46
Sarawak	12	-3.04	10.86	-11.86	9.89	-7.85	-10.67
Sabah	5	-14.12	12.11	-19.96	-35.26	-5.06	-2.04
Labuan	1	30.43	51.98	-13.94	-28.97	21.55	-3.54

STATUS KUALITI UDARA SEBELUM DAN SEPANJANG TEMPOH PERINTAH KAWALAN PERGERAKAN MENGIKUT KATEGORI STESEN

Berdasarkan analisis yang dilakukan ke atas perbandingan kualiti udara sebelum dan semasa PKP 3.0 mengikut kategori stesen, adalah didapati NO_2 menunjukkan penurunan bagi semua kategori stesen iaitu di antara 22% hingga 31%, manakala penurunan SO_2 berlaku di stesen kategori industri sahaja iaitu sebanyak 4%. CO dan O_3 menunjukkan penurunan di semua stesen kategori bandar dan pinggir bandar. Walau bagaimanapun, $PM_{2.5}$ menunjukkan peningkatan bagi semua kategori stesen iaitu tertinggi direkodkan bagi stesen kategori industri iaitu 32% dan diikuti dengan kategori luar bandar iaitu 16%. Perbezaan bacaan parameter kualiti udara sebelum dan selepas PKP ditunjukkan di dalam **Jadual 1.4**.

AIR QUALITY STATUS BEFORE AND DURING THE PERIOD OF MOVEMENT CONTROL ORDER ACCORDING TO STATION CATEGORY

Based on the analysis done on the comparison of air quality before and during MCO 3.0 by station category, it was found that NO_2 pollutants showed a decrease for all station categories which is between 22% to 31%, while the decrease of SO_2 occurred in industrial category stations only which is 4%. CO and O_3 showed decreases at all urban and suburban category stations. However, $PM_{2.5}$ showed an increase for all station categories which was the highest recorded for industrial category stations which was 32% and followed by the rural category which was 16%. The differences in air quality parameter readings before and after MCO are shown in **Table 1.4**.

Semasa tempoh PKP 3.0, stesen kategori bandar dan pinggir bandar menunjukkan penurunan kepekatan pencemar udara yang ketara bagi parameter PM_{10}, NO_2, CO dan juga O_3. Tiada perubahan yang ketara bagi stesen yang dikategorikan luar bandar. Ini menunjukkan bahawa kesan pelaksanaan PKP terhadap penurunan kepekatan bahan pencemar udara diperhatikan di kawasan yang mempunyai intensiti antropogenik yang tinggi khususnya di kawasan yang menerima kesan daripada pelepasan asap kenderaan.

Kesimpulannya, status kualiti udara semasa PKP 3.0 menunjukkan peningkatan terutama di kawasan yang mempunyai populasi penduduk dan bilangan kenderaan yang tinggi. Parameter NO_2 menunjukkan penurunan kepekatan bagi semua kawasan manakala parameter pencemar udara yang lain menunjukkan penurunan kepekatan di sesetengah kawasan sahaja. Peningkatan penggunaan kenderaan dan juga aktiviti industri memainkan peranan penting dalam mempengaruhi tren kualiti udara di dalam negara.

During the MCO 3.0 period, urban and suburban category stations showed a significant decrease in air pollutant concentrations for PM_{10}, NO_2, CO and even O_3 parameters. There were no significant changes for stations categorized as rural. This indicates that the effect of MCO implementation on the reduction of air pollutant concentrations was observed in areas with high anthropogenic intensity, especially in areas that were affected by vehicle smoke emissions.

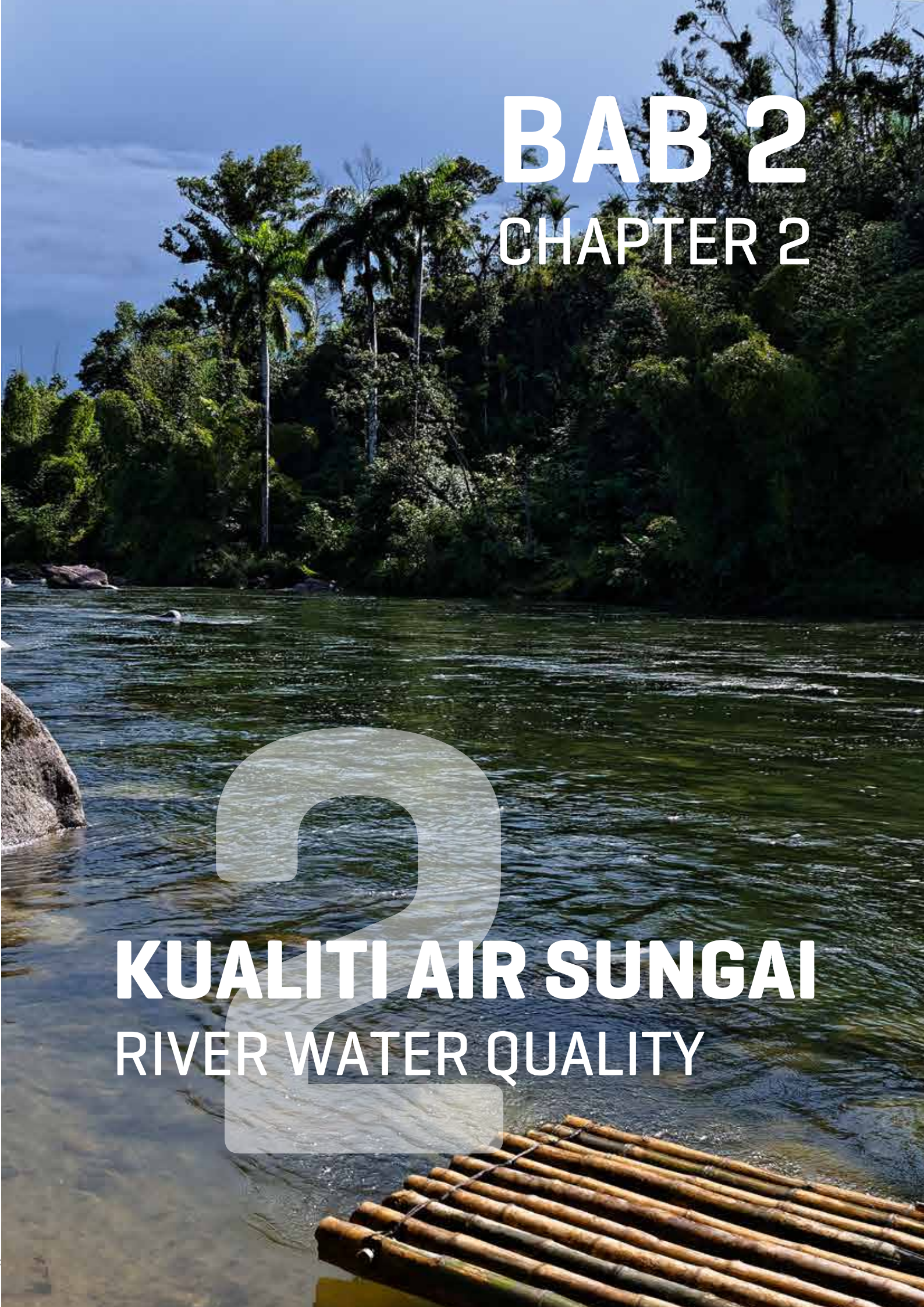
In conclusion, the current air quality status of MCO 3.0 shows an improvement especially in areas with high population and transportation. The NO_2 parameter showed a decrease in concentration for all areas while the other air pollutant parameters showed a decrease in concentration in some areas only. Increased use of vehicles as well as industrial activities play an important role in determining air quality trends in the country.

Jadual 1.4 : Perbezaan Peratus Pencemar Udara Semasa PKP 3.0 mengikut Kategori Stesen di Malaysia

Table 1.4 : Percentage Differences of Air Pollutants During and Before MCO 3.0 according to Station Category in Malaysia

KATEGORI STESEN / STATION CATEGORY	BIL.STESEN / NO.STATION	PM_{10}	$PM_{2.5}$	NO_2	SO_2	CO	O_3
Industri / Industrial	7	7.15	32.31	-22.14	-4.02	*NM	*NM
Luar Bandar / Rural	12	7.68	16.01	*NM	*NM	*NM	*NM
Pinggir Bandar / Suburban	34	-2.02	7.45	-25.76	4.73	-9.41	-2.99
Bandar / Urban	11	-3.22	4.91	-30.93	4.73	-15.94	-6.43

*NM - Not Measured (Tiada Pengukuran)



BAB 2
CHAPTER 2

KUALITI AIR SUNGAI
RIVER WATER QUALITY

KUALITI AIR SUNGAI
RIVER WATER QUALITY

PENGAWASAN KUALITI AIR SUNGAI MANUAL

Jabatan Alam Sekitar (JAS) meneruskan program pengawasan kualiti air sungai pada tahun 2021 bagi menentukan kualiti air sungai dan mengesan perubahan ke atas kualiti air sungai. Sampel-sampel air sungai diambil daripada stesen-stesen yang telah ditetapkan dan diukur kualitinya secara in-situ serta dihantar ke makmal untuk dianalisis bertujuan menentukan kriteria dari segi fizik-kimia dan biologi. Indeks Kualiti Air (IKA) digunakan untuk mengukur tahap pencemaran dan kesesuaian jenis guna air seperti yang digariskan oleh Standard Kualiti Air Negara **(ANNEX).**

IKA telah mengambil kira parameter oksigen terlarut (DO), keperluan oksigen biokimia (BOD), keperluan oksigen kimia (COD), ammoniakal nitrogen (AN), pepejal terampai (SS) dan pH.

Pada tahun 2021, terdapat perubahan dan penambahbaikan kepada pelaporan kualiti air sungai yang telah dilakukan bagi tujuan menyediakan maklumat yang lebih tepat dalam melaporkan kualiti air sungai. Antara perubahan tersebut adalah pelaporan kualiti air sungai sebelum ini dilaporkan mengikut sungai akan dilaporkan mengikut stesen sungai yang dipantau di seluruh Malaysia. Selain itu, pelaporan juga bukan hanya terhad kepada IKA, tetapi diperincikan juga mengikut pengkelasan setiap stesen sungai bagi tempoh lima (5) tahun bagi memastikan tiada lokasi stesen yang terlepas untuk dipantau dan diketahui statusnya. Pelaporan bagi logam berat juga turut diperincikan mengikut negeri dan dilaporkan bilangan sampel mengikut bilangan stesen pengawasan sungai.

MANUAL RIVER WATER QUALITY MONITORING

The Department of Environment (DOE) continues the river water quality monitoring programme in 2021 to determine the status of river water quality and to detect changes in river water quality. Water samples were collected from designated stations for in-situ and laboratory analysis to determine its physic-chemical and biological characteristics. The Water Quality Index (WQI) is used to indicate the level of pollution and the corresponding suitability in terms of water uses according to the National Water Quality Standards for Malaysia (NWQS) **(ANNEX).**

The WQI takes into consideration parameters including dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen (AN), suspended solids (SS) and pH.

In 2021, there are changes and improvements to river water quality reporting that have been done for the purpose of providing more accurate information in reporting river water quality. Among the changes is that river water quality reporting previously reported by river will be reported by river stations that are monitored throughout Malaysia. In addition, reporting is not only limited to IKA, but is also detailed according to the classification of each river station for a period of five (5) years to ensure that no station location is missed to be monitored and its status known. The reporting of heavy metals is also detailed by state and the number of samples is reported according to the number of river monitoring stations.

STATUS KUALITI AIR SUNGAI

Pada tahun 2021, kualiti air sungai telah dinilai berdasarkan 8,059 sampel air sungai yang telah diambil daripada 1,351 stesen pengawasan manual yang merangkumi 670 sungai di Malaysia.

Sejumlah 489 (73%) sungai daripada 670 sungai yang dipantau telah menunjukkan IKA bersih, 158 (24%) adalah sederhana tercemar, manakala 23 (3%) tercemar **(Rajah 2.1)**.

Parameter BOD, AN dan SS adalah indikator utama yang diukur kerana ia sangat berkaitan dengan pencemaran akibat pelepasan beban bahan pencemar samada daripada punca tetap atau bukan punca tetap yang boleh menjejaskan kualiti air sungai.

BOD adalah jumlah oksigen yang diperlukan oleh bakteria atau mikro organisma 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.

RIVER WATER QUALITY STATUS

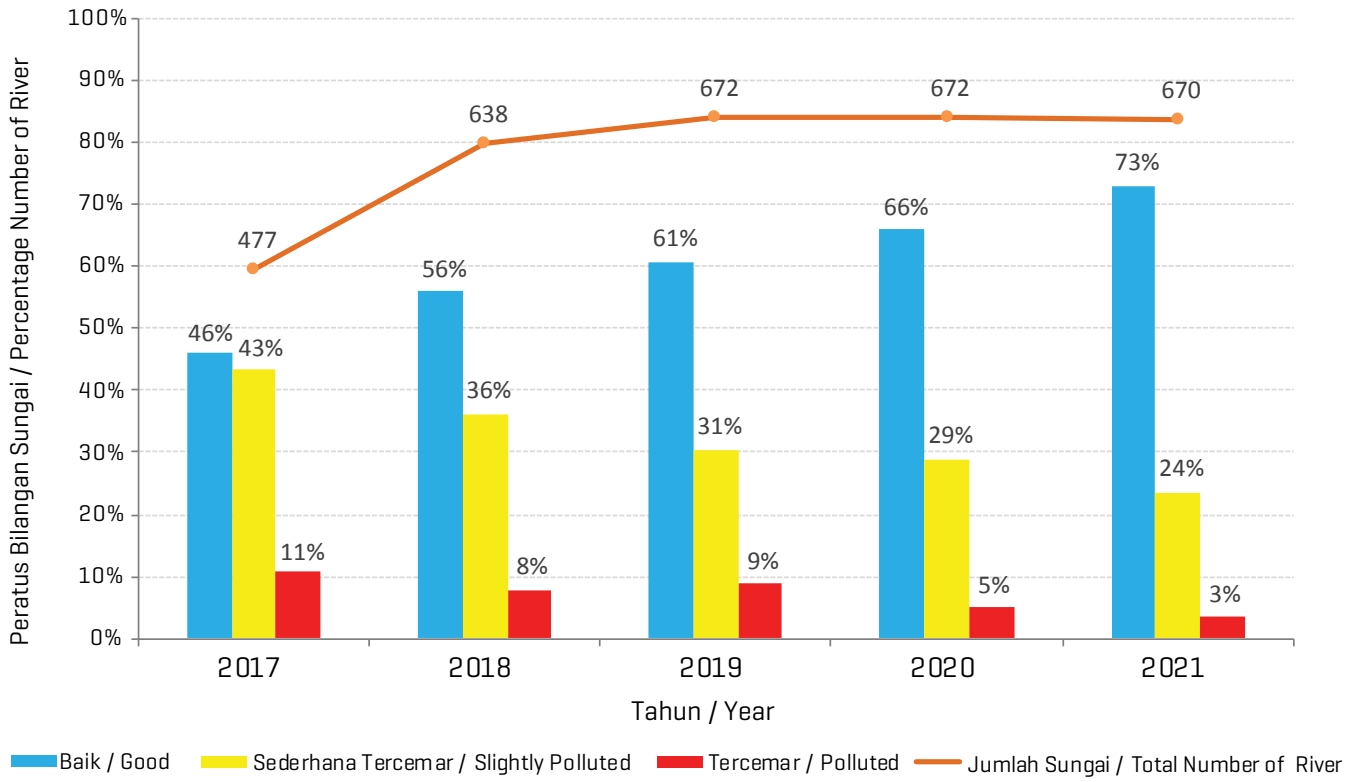
In 2021, river water quality was assessed based on 8,059 samples taken from a total 1,351 manual monitoring stations covering 670 rivers in Malaysia.

Out of the 670 rivers monitored, 489 (73%) showed clean WQI, 158 (24%) were slightly polluted, while 23 (3%) were polluted **(Figure 2.1).**

BOD, AN and SS parameters are the main indicators measured because they are closely related to pollution due to the discharge of pollutant loads either from point sources or non-point sources that can affect river water quality.

BOD is the amount of oxygen required by bacteria or other micro-organisms to decompose organic matter. High BOD concentrations are often associated with continuous discharge of effluents from industry. AN is associated with livestock farming activities and domestic sewage. While SS is caused by improper earthworks and uncontrollable land clearing activities.

Sungai Melaka, Melaka



Rajah 2.1: Tren Kualiti Air Sungai, 2017-2021

Figure 2.1: River Water Quality Trend, 2017-2021

Air Terjun Kota Kinabalu, Sabah

STATUS PENGAWASAN KUALITI AIR SUNGAI MANUAL MENGIKUT STESEN

Sebanyak 1,351 stesen pengawasan kualiti air sungai manual yang dipantau pada tahun 2021. Memandangkan pelaksanaan Perintah Kawalan Pergerakan (PKP), kerja-kerja pengawasan kualiti air sungai di dua (2) stesen iaitu di Sungai Tutuh dan Sungai Baloi, Sarawak tidak dapat dijalankan. **Jadual 2.1** menunjukkan senarai stesen pengawasan manual dan status kualiti air sungai mengikut negeri. Daripada 1,351 stesen, 1,012 (75%) adalah bersih, 293 (22%) sederhana tercemar dan 46 (3%) tercemar. **(Rajah 2.2)**

Status stesen pengawasan kualiti air sungai yang ditentukan berdasarkan IKA menunjukkan peningkatan pada tahun 2021. Peratus bilangan stesen sungai meningkat dengan ketara kepada 75% pada tahun 2021 berbanding 67% pada tahun sebelumnya. Peratus bilangan stesen sungai yang tercemar telah berlaku penurunan daripada 6% pada tahun 2020 kepada 3% pada tahun 2021.

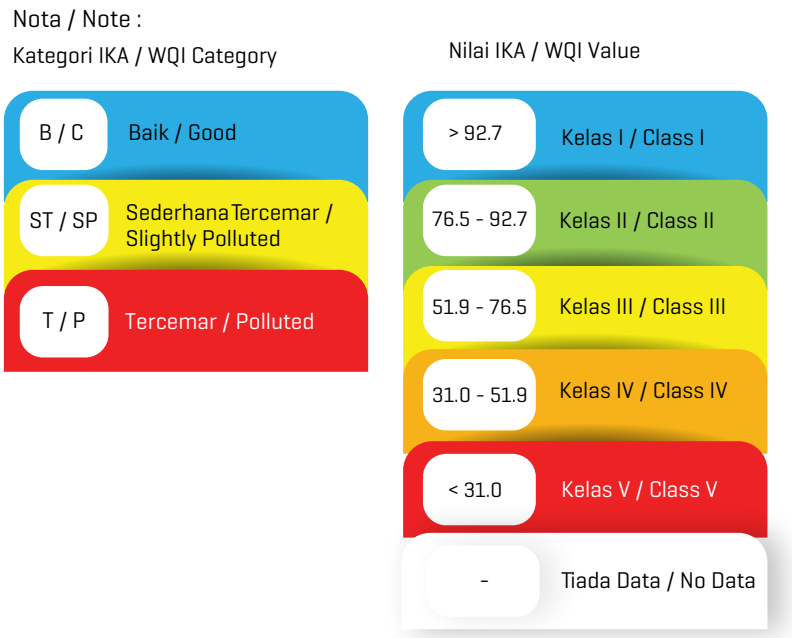
Bagi pengkelasan stesen pengawasan kualiti air sungai pula, sebanyak 328 (24.3%) adalah Kelas I, 760 (56.3%) Kelas II, 249 (18.4%) Kelas III, 12 (0.9%) Kelas IV dan 2 (0.1%) Kelas V.

STATUS OF MANUAL RIVER WATER QUALITY MONITORING STATION

A total of 1,351 river station were monitored for water quality in 2021. Due to Movement Control Order (MCO), monitoring work at two (2) stations; Sungai Tutuh and Sungai Baloi, Sarawak cannot be done. **Table 2.1** shows the list of manual monitoring stations and river water quality status by state. Out of the 1,351 stations, 1,012 (75%) were clean, 293 (22%) slightly polluted and 46 (3%) polluted. **(Figure 2.2)**

The status of river water quality monitoring stations determined based on WQI shows an increase in 2021. The percentage of river stations categorized as clean increased significantly to 75% in 2021 compared to 67% in the previous year. The percentage of polluted river stations has decreased from 6% in 2020 to 3% in 2021.

For water quality monitoring station, 328 (24.3%) were categorized as Class I, 760 (56.3%) Class II, 249 (18.4%) Class III, 12 (0.9%) Class IV and 2 (0.1) Class V.



Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perlis	Sg. Perlis	Sg. Arau	1RPLS012	76	79	80	79	88	B/C
		Sg. Arau	1RPLS014	85	88	87	91	92	B/C
		Sg. Empangan Timah Tasoh	1RPLS015	77	89	87	93	95	B/C
		Sg. Jarum	1RPLS006	79	85	83	88	91	B/C
		Sg. Jernih	1RPLS004	85	88	86	92	92	B/C
		Sg. Jernih	1RPLS005	87	89	86	90	95	B/C
		Sg. Kok Mak	1RPLS007	79	84	86	88	87	B/C
		Sg. Korok	1RPLS013	70	70	71	75	76	ST/SP
		Sg. Ngulang	1RPLS002	79	85	82	90	92	B/C
		Sg. Pelarit	1RPLS008	88	92	91	94	96	B/C
		Sg. Perlis	1RPLS001	64	72	72	76	77	ST/SP
		Sg. Serai	1RPLS003	68	82	76	82	86	B/C
		Sg. Terusan Mada	1RPLS010	82	84	84	88	91	B/C
		Sg. Terusan Mada	1RPLS011	82	87	87	89	92	B/C
		Sg. Wang Kelian	1RPLS009	90	93	94	95	97	B/C
Kedah	Sg. Kedah	Sg. Ahning	1KKDH011	86	88	88	92	96	B/C
		Sg. Changlun	1KKDH016	81	79	77	87	88	B/C
		Sg. Janing	1KKDH007	90	90	91	93	97	B/C
		Sg. Kedah	1KKDH001	63	65	64	70	77	ST/SP
		Sg. Napoh	1KKDH017	77	76	80	82	89	B/C
		Sg. Padang Terap	1KKDH002	84	86	87	87	91	B/C
		Sg. Padang Terap	1KKDH003	84	86	88	88	91	B/C
		Sg. Padang Terap	1KKDH004	82	86	89	85	96	B/C
		Sg. Padang Terap	1KKDH009	76	74	70	74	81	B/C
		Sg. Padang Terap	1KKDH012	89	89	91	92	97	B/C
		Sg. Pedu	1KKDH005	86	87	90	91	95	B/C
		Sg. Pendang	1KKDH008	81	78	77	81	82	B/C
		Sg. Sintok	1KKDH018	77	81	81	92	96	B/C
		Sg. Tekai	1KKDH006	82	82	80	88	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kedah	Sg. Kedah	Sg. Temin	1KKDH010	80	78	77	84	89	B/C
		Sg. Terusan Lengkuas	1KKDH014	83	88	89	86	92	B/C
		Sg. Terusan Mada Selatan	1KKDH013	83	86	88	89	92	B/C
		Sg. Terusan Tengah	1KKDH015	81	87	89	88	93	B/C
	Sg. Kerian	Sg. Kerian	1KKER001	92	93	93	94	95	B/C
	Sg. Kisap	Sg. Kisap	1KKSP001	92	91	90	95	97	B/C
	Sg. Kuah	Sg. Kuah	1KKUA001	78	66	74	81	79	ST/SP
	Sg. Merbok	Sg. Bakar Arang	1KMBK008	63	56	59	56	69	ST/SP
		Sg. Batu	1KMBK002	64	49	66	70	64	ST/SP
		Sg. Bongkok	1KMBK003	62	73	63	71	75	ST/SP
		Sg. Bukit Merah	1KMBK006	85	81	80	92	92	B/C
		Sg. Bukit Nanas	1KMBK011	91	93	93	95	97	B/C
		Sg. Korok	1KMBK009	70	69	69	65	71	ST/SP
		Sg. Merbok	1KMBK001	69	74	77	79	81	B/C
		Sg. Petani	1KMBK007	71	57	54	63	68	ST/SP
		Sg. Tok Pawang	1KMBK004	73	82	88	90	95	B/C
		Sg. Tok Pawang	1KMBK005	87	88	88	90	95	B/C
		Sg. Tupah	1KMBK010	90	93	93	94	97	B/C
	Sg. Muda	Sg. Chepir	1KMUD012	77	89	87	89	91	B/C
		Sg. Gunung Inas	1KMUD021	85	91	92	93	93	B/C
		Sg. Jerong	1KMUD002	74	65	61	66	75	ST/SP
		Sg. Jerong	1KMUD003	74	68	69	74	78	ST/SP
		Sg. Karangan	1KMUD009	81	81	81	85	91	B/C
		Sg. Ketil	1KMUD007	82	85	85	87	93	B/C
		Sg. Muda	1KMUD001	82	84	85	86	92	B/C
		Sg. Muda	1KMUD004	76	85	85	85	90	B/C
		Sg. Muda	1KMUD005	79	86	87	88	94	B/C
		Sg. Muda	1KMUD013	79	85	86	86	92	B/C
		Sg. Muda	1KMUD014	73	87	89	90	91	B/C
		Sg. Muda	1KMUD015	75	85	87	88	92	B/C
		Sg. Muda	1KMUD016	78	87	86	85	90	B/C
		Sg. Muda	1KMUD018	70	84	86	86	94	B/C
		Sg. Muda	1KMUD019	84	89	88	90	93	B/C
		Sg. Muda	1KMUD023	80	85	85	87	92	B/C
		Sg. Muda	1KMUD024	77	83	84	85	90	B/C
		Sg. Muda	1KMUD025	84	89	85	89	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kedah	Sg. Muda	Sg. Pegang	1KMUD011	88	92	93	95	97	B/C
		Sg. Sedim	1KMUD008	81	85	88	90	93	B/C
		Sg. Sedim	1KMUD017	84	85	87	89	91	B/C
		Sg. Tawar	1KMUD006	80	89	90	89	91	B/C
		Sg. Tawar	1KMUD010	85	83	88	88	89	B/C
		Sg. Tawar	1KMUD020	82	88	90	88	90	B/C
	Sg. Perai	Sg. Jarak	1KPRI018	70	68	74	74	77	ST/SP
		Sg. Jarak	1KPRI019	72	73	74	74	76	ST/SP
		Sg. Jarak	1KPRI024	70	70	73	72	70	ST/SP
		Sg. Keladi	1KPRI015	73	76	74	78	81	B/C
		Sg. Kulim	1KPRI014	75	77	75	77	82	B/C
		Sg. Kulim	1KPRI016	80	88	92	90	91	B/C
		Sg. Kulim	1KPRI017	88	89	92	91	93	B/C
		Sg. Kulim	1KPRI023	89	89	91	90	92	B/C
		Sg. Kulim	1KPRI025	87	89	92	88	94	B/C
		Sg. Seluang	1KPRI021	61	62	64	64	67	ST/SP
		Sg. Seluang Bawah	1KPRI020	63	65	67	67	71	ST/SP
	Sg. Ulu Melaka	Sg. Chenang	1KMLK006	75	53	69	78	84	B/C
		Sg. Melaka	1KMLK002	88	79	77	81	90	B/C
		Sg. Melaka	1KMLK003	82	85	81	87	91	B/C
		Sg. Melaka	1KMLK007	91	93	92	96	97	B/C
		Sg. Petang	1KMLK001	89	93	93	96	97	B/C
		Sg. Saga	1KMLK004	83	85	76	81	92	B/C
		Sg. Tuba	1KMLK005	84	90	88	94	96	B/C
P. Pinang	Sg. Bayan Lepas	Sg. Bayan Lepas	1PBLS003	69	70	76	64	74	ST/SP
		Sg. Tiram	1PBLS001	72	77	78	77	76	ST/SP
		Sg. Tiram	1PBLS002	74	71	65	67	67	ST/SP
	Sg. Jawi	Sg. Chempedak	1PJWI003	51	34	54	47	41	T/P
		Sg. Jawi	1PJWI001	51	47	49	55	52	T/P
		Sg. Junjong	1PJWI002	56	62	62	64	60	ST/SP
		Sg. Junjong	1PJWI004	56	55	47	57	52	T/P
		Sg. Junjong	1PJWI006	92	92	92	94	95	B/C
		Sg. Machang Bubok	1PJWI007	71	71	70	76	72	ST/SP
		Sg. Tengah	1PJWI005	50	48	61	49	58	T/P
	Sg. Juru	Sg. Ara	1PJRU006	72	70	66	67	77	ST/SP
		Sg. Juru	1PJRU001	52	55	60	68	69	ST/SP
		Sg. Juru	1PJRU012	52	59	53	64	65	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
P. Pinang	Sg. Juru	Sg. Kilang Ubi	1PJRU002	55	58	68	70	69	ST/SP
		Sg. Kilang Ubi	1PJRU003	60	66	71	75	70	ST/SP
		Sg. Kilang Ubi	1PJRU009	91	91	92	93	97	B/C
		Sg. Kilang Ubi	1PJRU010	53	55	58	63	60	ST/SP
		Sg. Kilang Ubi	1PJRU011	64	62	56	66	69	ST/SP
		Sg. Pasir	1PJRU004	72	58	61	65	75	ST/SP
		Sg. Permatang Rawa	1PJRU008	73	62	61	53	60	ST/SP
		Sg. Permatang Rawa	1PJRU013	78	77	69	66	90	B/C
		Sg. Rambai	1PJRU005	52	48	49	57	57	T/P
		Sg. Rambai	1PJRU007	67	60	54	56	62	ST/SP
	Sg. Kerian	Sg. Kechil	1PKER002	88	86	86	87	90	B/C
		Sg. Kechil	1PKER005	70	80	78	84	87	B/C
		Sg. Kerian	1PKER003	82	84	83	88	89	B/C
		Sg. Kerian	1PKER004	79	83	84	85	89	B/C
		Sg. Kerian	1PKER006	84	76	85	86	89	B/C
		Sg. Kerian	1PKER009	74	76	73	80	84	B/C
		Sg. Kerian	1PKER014	82	81	77	85	86	B/C
		Sg. Serdang	1PKER007	70	76	73	71	80	ST/SP
	Sg. Kluang	Sg. Ara	1PKLU002	89	93	91	95	97	B/C
		Sg. Ara	1PKLU003	63	74	65	68	69	ST/SP
		Sg. Dua Besar	1PKLU005	60	64	57	64	68	ST/SP
		Sg. Kluang	1PKLU001	70	72	63	65	68	ST/SP
		Sg. Relau	1PKLU004	80	82	66	66	68	ST/SP
	Sg. Perai	Sg. Air Melintas	1PPRI007	44	51	54	58	57	T/P
		Sg. Jarak	1PPRI009	74	73	69	74	79	ST/SP
		Sg. Jarak	1PPRI011	64	66	70	72	70	ST/SP
		Sg. Jarak	1PPRI012	58	66	68	71	71	ST/SP
		Sg. Kereh	1PPRI006	44	50	51	47	59	T/P
		Sg. Kereh	1PPRI008	53	55	57	55	60	ST/SP
		Sg. Kereh	1PPRI024	61	61	65	64	66	ST/SP
		Sg. Kubang Semang	1PPRI005	70	60	64	64	66	ST/SP
		Sg. Perai	1PPRI003	63	56	62	64	74	ST/SP
		Sg. Perai	1PPRI004	63	62	63	67	70	ST/SP
		Sg. Pertama	1PPRI022	54	54	59	65	69	ST/SP
		Sg. Seluang Bawah	1PPRI010	68	51	62	61	68	ST/SP
	Sg. Pinang	Sg. Air Itam	1PPNG006	67	69	72	70	74	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
P.Pinang	Sg. Pinang	Sg. Air Itam	1PPNG011	69	70	76	76	76	ST/SP
		Sg. Air Itam	1PPNG018	93	92	94	96	97	B/C
		Sg. Air Terjun	1PPNG019	93	94	93	95	97	B/C
		Sg. Batu Feringghi	1PPNG001	84	80	79	80	82	B/C
		Sg. Batu Feringghi	1PPNG002	92	92	92	95	96	B/C
		Sg. Dondang	1PPNG012	77	83	84	83	86	B/C
		Sg. Dondang	1PPNG013	76	83	84	84	87	B/C
		Sg. Dondang	1PPNG014	79	73	71	71	79	ST/SP
		Sg. Dondang	1PPNG015	67	69	72	73	75	ST/SP
		Sg. Dondang	1PPNG016	68	70	74	71	73	ST/SP
		Sg. Dondang	1PPNG017	73	68	72	67	63	ST/SP
		Sg. Jelutong	1PPNG010	72	69	64	63	65	ST/SP
		Sg. Pinang	1PPNG003	87	87	88	88	94	B/C
		Sg. Pinang	1PPNG008	75	68	62	69	67	ST/SP
		Sg. Pinang	1PPNG021	55	62	66	55	63	ST/SP
		Sg. Satu	1PPNG020	87	92	93	96	97	B/C
		Sg. Titi Kerawang	1PPNG004	70	65	63	68	75	ST/SP
Perak	Sg. Bernam	Sg. Bernam	1ABNM001	73	69	69	64	73	ST/SP
		Sg. Bernam	1ABNM002	70	64	67	72	66	ST/SP
		Sg. Bernam	1ABNM003	77	76	70	80	81	B/C
		Sg. Bernam	1ABNM004	83	84	86	86	93	B/C
		Sg. Bernam	1ABNM005	83	83	83	86	93	B/C
		Sg. Bernam	1ABNM006	85	87	87	90	97	B/C
		Sg. Gelinting	1ABNM015	83	89	87	92	96	B/C
		Sg. Inki	1ABNM012	89	93	93	94	97	B/C
		Sg. Slim	1ABNM007	85	86	86	87	94	B/C
		Sg. Slim	1ABNM008	87	87	87	88	94	B/C
		Sg. Slim	1ABNM011	83	85	79	89	94	B/C
		Sg. Trolak	1ABNM009	87	88	90	91	96	B/C
		Sg. Trolak	1ABNM010	85	88	91	92	97	B/C
		Sg. Trolak	1ABNM014	90	91	91	93	96	B/C
	Sg. Bruas	Sg. Bruas	1ABRU001	65	74	77	72	75	ST/SP
		Sg. Bruas	1ABRU004	90	90	90	91	94	B/C
		Sg. Bruas	1ABRU005	90	93	94	96	97	B/C
		Sg. Dandang	1ABRU006	87	90	86	91	94	B/C
		Sg. Licin	1ABRU007	94	94	95	96	97	B/C
		Sg. Rotan	1ABRU002	87	91	91	92	96	B/C

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NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Sg. Bruas	Sg. Rotan	1ABRU003	82	85	86	83	88	B/C
	Sg. Kerian	Sg. Selama	1AKER011	80	83	82	86	88	B/C
		Sg. Selama	1AKER012	80	83	85	87	88	B/C
		Sg. Selama	1AKER016	94	94	93	94	97	B/C
		Sg. Semang	1AKER013	77	83	76	81	80	ST/SP
		Sg. Terusan Bagan Serai	1AKER015	83	91	91	93	93	B/C
	Sg. Kurau	Sg. Air Hitam	1AKRU007	90	93	92	95	98	B/C
		Sg. Ara	1AKRU001	88	88	92	92	96	B/C
		Sg. Ara	1AKRU006	89	92	93	95	97	B/C
		Sg. Kurau	1AKRU002	72	72	77	77	76	ST/SP
		Sg. Kurau	1AKRU003	78	75	82	77	78	ST/SP
		Sg. Kurau	1AKRU004	90	89	89	91	94	B/C
		Sg. Kurau	1AKRU005	84	88	89	91	91	B/C
	Sg. Perak	Sg. Batang Padang	1APRK003	77	77	76	83	86	B/C
		Sg. Batang Padang	1APRK006	88	90	88	90	95	B/C
		Sg. Batang Padang	1APRK009	81	79	81	87	90	B/C
		Sg. Behrang	1APRK077	89	93	94	97	97	B/C
		Sg. Berok	1APRK068	93	93	92	96	97	B/C
		Sg. Bidor	1APRK002	80	73	76	71	84	B/C
		Sg. Bidor	1APRK004	81	78	81	88	89	B/C
		Sg. Bidor	1APRK005	86	85	86	91	88	B/C
		Sg. Chenderiang	1APRK012	91	91	91	94	95	B/C
		Sg. Chenderiang	1APRK013	82	84	91	92	93	B/C
		Sg. Chepor	1APRK056	90	94	94	96	97	B/C
		Sg. Cuar	1APRK046	87	84	83	87	96	B/C
		Sg. Ibol	1APRK066	92	93	93	94	97	B/C
		Sg. Kampar	1APRK031	87	90	89	93	95	B/C
		Sg. Kampar	1APRK032	85	84	82	90	94	B/C
		Sg. Kangsar	1APRK043	87	84	86	89	93	B/C
		Sg. Kangsar	1APRK044	89	87	85	90	91	B/C
		Sg. Kangsar	1APRK079	91	94	93	96	97	B/C
		Sg. Kepayang	1APRK037	80	75	71	79	86	B/C
		Sg. Kepayang	1APRK038	80	76	69	78	83	B/C
		Sg. Kerbau	1APRK064	91	94	93	94	96	B/C
		Sg. Kerbau	1APRK078	91	92	90	93	94	B/C
		Sg. Kerdah	1APRK041	65	69	67	74	73	ST/SP
		Sg. Kerdah	1APRK053	81	81	78	86	85	B/C

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NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI/ RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2021) / WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Sg. Perak	Sg. Kinjang	1APRK055	91	93	94	96	97	B/C
		Sg. Kinta	1APRK019	76	75	76	78	86	B/C
		Sg. Kinta	1APRK022	89	91	90	90	95	B/C
		Sg. Kinta	1APRK024	78	74	75	86	85	B/C
		Sg. Kinta	1APRK025	65	68	66	75	79	ST/SP
		Sg. Kinta	1APRK033	87	76	70	78	84	B/C
		Sg. Kinta	1APRK034	78	75	78	81	85	B/C
		Sg. Kinta	1APRK057	62	67	70	80	83	B/C
		Sg. Kinta	1APRK058	78	75	76	82	83	B/C
		Sg. Kinta	1APRK063	91	92	91	92	95	B/C
		Sg. Klah	1APRK014	87	88	88	91	95	B/C
		Sg. Klah	1APRK015	89	89	90	91	95	B/C
		Sg. Klian Baru	1APRK016	74	75	75	82	84	B/C
		Sg. Klian Baru	1APRK017	70	70	76	78	84	B/C
		Sg. Klian Gunong	1APRK081	91	94	93	96	97	B/C
		Sg. Kuang	1APRK042	86	84	80	81	88	B/C
		Sg. Manong	1APRK060	92	92	95	95	97	B/C
		Sg. Nyamok	1APRK052	55	73	68	76	77	ST/SP
		Sg. Pari	1APRK023	81	76	76	79	83	B/C
		Sg. Pari	1APRK028	68	67	68	80	79	ST/SP
		Sg. Pelus	1APRK039	88	87	85	82	86	B/C
		Sg. Pelus	1APRK040	86	86	86	89	91	B/C
		Sg. Perak	1APRK001	82	82	82	84	86	B/C
		Sg. Perak	1APRK018	83	86	85	87	90	B/C
		Sg. Perak	1APRK020	89	85	88	90	92	B/C
		Sg. Perak	1APRK045	88	90	88	88	94	B/C
		Sg. Perak	1APRK047	74	82	82	86	88	B/C
		Sg. Perak	1APRK048	90	89	91	90	94	B/C
		Sg. Perak	1APRK049	88	89	89	86	92	B/C
		Sg. Perak	1APRK051	88	88	89	87	94	B/C
		Sg. Perak	1APRK059	93	91	92	95	97	B/C
		Sg. Perak	1APRK065	87	87	87	88	95	B/C
		Sg. Perak	1APRK069	79	85	85	88	91	B/C
		Sg. Perak	1APRK070	87	85	87	89	92	B/C
		Sg. Perak	1APRK071	87	87	87	88	92	B/C
		Sg. Perak	1APRK072	87	86	88	86	93	B/C
		Sg. Perak	1APRK074	87	87	88	87	92	B/C

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NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Sg. Perak	Sg. Perak	1APRK080	90	92	93	95	97	B/C
		Sg. Perak	1APRK082	86	92	94	95	96	B/C
		Sg. Perak	1APRK086	86	91	93	96	94	B/C
		Sg. Pinji	1APRK021	64	67	69	75	75	ST/SP
		Sg. Pinji	1APRK036	62	67	64	72	78	ST/SP
		Sg. Pulau	1APRK067	92	92	94	95	97	B/C
		Sg. Raia	1APRK030	82	85	82	89	90	B/C
		Sg. Raia	1APRK035	82	85	83	86	89	B/C
		Sg. Rui	1APRK084	89	92	93	95	96	B/C
		Sg. Rui	1APRK085	83	84	84	86	91	B/C
		Sg. Seluang	1APRK050	51	66	58	72	62	ST/SP
		Sg. Serokai	1APRK026	66	60	65	71	71	ST/SP
		Sg. Serokai	1APRK027	62	77	74	77	86	B/C
		Sg. Sintang	1APRK054	63	66	65	72	72	ST/SP
		Sg. Sungkai	1APRK007	89	90	92	95	95	B/C
		Sg. Sungkai	1APRK008	79	78	84	90	91	B/C
		Sg. Sungkai	1APRK073	81	85	85	92	93	B/C
		Sg. Sungkai	1APRK075	84	86	90	91	93	B/C
		Sg. Sungkai Mati	1APRK010	82	73	71	57	65	ST/SP
		Sg. Sungkai Mati	1APRK011	81	85	82	92	87	B/C
		Sg. Tapah	1APRK076	91	95	95	96	97	B/C
		Sg. Teja	1APRK083	72	76	78	82	88	B/C
		Sg. Tesong	1APRK062	91	94	94	96	97	B/C
		Sg. Tumboh	1APRK029	63	69	71	73	73	ST/SP
		Sg. Woh	1APRK061	91	92	94	96	97	B/C
	Sg. Raja Hitam	Sg. Derhaka	1ARHT004	56	76	67	79	78	ST/SP
		Sg. Derhaka	1ARHT006	62	77	69	76	79	ST/SP
		Sg. Manjong	1ARHT001	87	83	85	85	88	B/C
		Sg. Manjong	1ARHT002	79	80	82	86	86	B/C
		Sg. Nyior	1ARHT007	93	93	95	96	97	B/C
		Sg. Raja Hitam	1ARHT003	62	71	73	76	81	B/C
		Sg. Raja Hitam	1ARHT005	57	66	68	72	84	B/C
		Sg. Raja Hitam	1ARHT008	24	30	20	52	39	T/P
	Sg. Sepetang	Sg. Batu Tegoh	1ASPT006	85	73	69	85	87	B/C
		Sg. Batu Tegoh	1ASPT007	81	83	79	87	92	B/C
		Sg. Batu Tegoh	1ASPT009	81	82	76	87	90	B/C
		Sg. Batu Tegoh	1ASPT012	91	93	94	96	97	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Sg. Sepetang	Sg. Batu Tegoh	1ASPT016	92	94	95	95	97	B/C
		Sg. Jana	1ASPT004	68	73	76	72	68	ST/SP
		Sg. Jana	1ASPT013	93	94	95	95	97	B/C
		Sg. Lidin	1ASPT008	76	78	75	84	86	B/C
		Sg. Limau	1ASPT014	88	89	90	91	96	B/C
		Sg. Malai	1ASPT002	72	70	76	77	82	B/C
		Sg. Malai	1ASPT019	70	70	73	73	77	ST/SP
		Sg. Nyior	1ASPT018	90	92	95	97	97	B/C
		Sg. Nyior	1ASPT020	85	86	87	88	94	B/C
		Sg. Sepetang	1ASPT001	74	71	72	76	75	ST/SP
		Sg. Sepetang	1ASPT003	83	82	81	83	84	B/C
		Sg. Temerloh	1ASPT010	91	88	89	90	96	B/C
		Sg. Temerloh	1ASPT011	88	77	83	86	92	B/C
		Sg. Trong	1ASPT015	89	90	90	92	96	B/C
		Sg. Trong	1ASPT017	94	93	95	96	97	B/C
	Sg. Wangi	Sg. Deralik	1AWGI001	63	71	73	71	70	ST/SP
		Sg. Deralik	1AWGI002	67	65	73	76	79	ST/SP
		Sg. Wangi	1AWGI003	58	74	70	82	82	B/C
		Sg. Wangi	1AWGI004	55	79	80	79	68	ST/SP
Selangor	Sg. Bernam	Sg. Bernam	2BBNM013	80	83	83	84	92	B/C
		Sg. Bernam	2BBNM016	78	84	83	84	91	B/C
		Sg. Dusun	2BBNM017	87	86	85	91	95	B/C
	Sg. Buloh	Sg. Buloh	2BBLH001	63	58	59	58	67	ST/SP
		Sg. Buloh	2BBLH002	59	56	49	54	61	ST/SP
		Sg. Buloh	2BBLH003	61	48	51	57	47	T/P
		Sg. Buloh	2BBLH004	59	45	52	59	43	T/P
		Sg. Buloh	2BBLH005	73	74	72	79	82	B/C
		Sg. Buloh	2BBLH006	-	47	47	57	55	T/P
	Sg. Klang	Sg. Ampang	2BKLG032	62	54	59	63	64	ST/SP
		Sg. Ampang	2BKLG042	74	63	67	70	76	ST/SP
		Sg. Anak Air Batu	2BKLG047	73	73	72	81	89	B/C
		Sg. Batu	2BKLG007	87	91	93	93	97	B/C
		Sg. Batu	2BKLG036	88	91	92	92	96	B/C
		Sg. Damansara	2BKLG008	56	57	60	62	71	ST/SP
		Sg. Damansara	2BKLG009	60	57	60	66	71	ST/SP
		Sg. Damansara	2BKLG017	56	52	54	64	64	ST/SP
		Sg. Damansara	2BKLG055	61	62	64	66	71	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Selangor	Sg. Klang	Sg. Damansara	2BKLG067	90	90	89	92	95	B/C
		Sg. Gombak	2BKLG020	92	92	90	93	97	B/C
		Sg. Gombak	2BKLG027	87	89	89	93	97	B/C
		Sg. Jinjang	2BKLG044	76	77	77	81	84	B/C
		Sg. Kerayong	2BKLG013	47	43	44	51	55	T/P
		Sg. Kerayong	2BKLG051	59	63	56	66	65	ST/SP
		Sg. Keroh	2BKLG030	91	91	90	95	97	B/C
		Sg. Klang	2BKLG005	91	88	88	93	97	B/C
		Sg. Klang	2BKLG006	79	75	75	84	84	B/C
		Sg. Klang	2BKLG016	57	64	57	58	64	ST/SP
		Sg. Klang	2BKLG022	50	55	52	58	60	ST/SP
		Sg. Klang	2BKLG023	57	56	50	56	61	ST/SP
		Sg. Klang	2BKLG024	58	56	57	55	60	ST/SP
		Sg. Klang	2BKLG034	50	56	55	61	67	ST/SP
		Sg. Klang	2BKLG050	47	52	49	52	56	T/P
		Sg. Kuyoh	2BKLG011	52	51	51	59	69	ST/SP
		Sg. Penchala	2BKLG019	-	42	56	53	72	ST/SP
		Sg. Penchala	2BKLG054	61	61	63	57	73	ST/SP
		Sg. Pusu	2BKLG021	-	71	67	71	80	ST/SP
		Sg. Rasau	2BKLG003	70	76	74	83	87	B/C
		Sg. Rumput	2BKLG033	89	91	91	92	97	B/C
		Sg. Semelah	2BKLG025	82	83	80	83	87	B/C
	Sg. Langat	Sg. Anak Chuau	2BCHU004	73	74	83	89	94	B/C
		Sg. Balak	2BLGT025	58	61	56	71	70	ST/SP
		Sg. Batang Labu	2BLGT028	71	74	72	79	75	ST/SP
		Sg. Batang Labu	2BLGT030	68	69	65	74	80	ST/SP
		Sg. Batang Labu	2BLGT031	70	62	61	69	71	ST/SP
		Sg. Batang Labu	2BLGT032	64	65	60	66	65	ST/SP
		Sg. Batang Labu	2BLGT033	68	79	76	86	91	B/C
		Sg. Batang Labu	2BLGT035	80	85	82	91	94	B/C
		Sg. Chuau	2BCHU001	88	87	89	91	94	B/C
		Sg. Chuau	2BCHU002	87	83	85	91	93	B/C
		Sg. Langat	2BLGT002	72	74	73	77	82	B/C
		Sg. Langat	2BLGT003	59	70	74	77	82	B/C
		Sg. Langat	2BLGT004	56	62	58	70	72	ST/SP
		Sg. Langat	2BLGT005	66	64	60	68	71	ST/SP
		Sg. Langat	2BLGT006	87	90	90	93	96	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Selangor	Sg. Langat	Sg. Langat	2BLGT007	70	75	72	83	84	B/C
		Sg. Langat	2BLGT008	86	89	90	95	95	B/C
		Sg. Langat	2BLGT026	73	70	72	73	78	ST/SP
		Sg. Langat	2BLGT027	62	61	60	72	72	ST/SP
		Sg. Limau Manis	2BCHU003	69	78	74	71	75	ST/SP
		Sg. Rinching	2BLGT014	77	75	76	81	84	B/C
		Sg. Rinching	2BLGT015	90	91	92	94	97	B/C
		Sg. Semenyih	2BLGT010	69	77	77	83	88	B/C
		Sg. Semenyih	2BLGT011	79	81	74	82	86	B/C
		Sg. Semenyih	2BLGT012	81	83	79	84	86	B/C
		Sg. Sering	2BLGT034	68	64	60	69	72	ST/SP
	Sg. Selangor	Sg. Air Hitam	2BSEL002	74	78	78	74	80	ST/SP
		Sg. Air Hitam	2BSEL024	69	78	82	76	80	ST/SP
		Sg. Batang Kali	2BSEL003	84	87	87	90	96	B/C
		Sg. Guntong	2BSEL021	71	77	73	80	81	B/C
		Sg. Kanching	2BSEL007	82	84	84	90	96	B/C
		Sg. Kerling	2BSEL006	82	91	93	94	97	B/C
		Sg. Kundang	2BSEL012	57	68	66	70	71	ST/SP
		Sg. Rangkap	2BSEL016	89	91	92	95	96	B/C
		Sg. Rawang	2BSEL013	73	73	70	77	81	B/C
		Sg. Selangor	2BSEL001	68	77	75	77	81	B/C
		Sg. Selangor	2BSEL004	87	89	90	92	96	B/C
		Sg. Selangor	2BSEL005	92	89	91	95	97	B/C
		Sg. Selangor	2BSEL010	78	77	78	79	83	B/C
		Sg. Selangor	2BSEL011	75	81	80	82	91	B/C
		Sg. Selangor	2BSEL014	72	78	81	80	84	B/C
		Sg. Selangor	2BSEL015	87	90	91	93	97	B/C
		Sg. Selangor	2BSEL017	87	89	89	92	95	B/C
		Sg. Selangor	2BSEL018	81	82	79	86	88	B/C
		Sg. Selangor	2BSEL023	79	77	77	80	83	B/C
		Sg. Sembah	2BSEL009	69	72	69	74	80	ST/SP
		Sg. Sembah	2BSEL019	70	77	77	76	83	B/C
		Sg. Serendah	2BSEL008	86	86	87	90	96	B/C
	Sg. Sepang	Sg. Sepang	2BSPG001	81	84	78	85	83	B/C
		Sg. Sepang	2BSPG002	73	77	77	73	78	ST/SP
		Sg. Sepang	2BSPG003	73	76	68	76	80	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Selangor	Sg. Tengi	Sg. Tengi	2BTGI001	71	75	74	76	80	ST/SP
		Sg. Tengi	2BTGI002	90	92	91	92	96	B/C
		Sg. Tengi	2BTGI003	82	81	81	79	84	B/C
		Sg. Tengi	2BTGI004	88	88	89	92	94	B/C
W.P. Kuala Lumpur	Sg. Klang	Sg. Air Busuk	2WKLG041	65	58	59	41	40	T/P
		Sg. Batu	2WKLG028	65	63	61	63	58	T/P
		Sg. Batu	2WKLG056	62	65	54	59	67	ST/SP
		Sg. Batu	2WKLG061	77	70	68	68	61	ST/SP
		Sg. Belongkong	2WKLG040	67	61	67	69	73	ST/SP
		Sg. Bunos	2WKLG006	51	47	49	71	63	ST/SP
		Sg. Bunos	2WKLG039	75	64	71	68	75	ST/SP
		Sg. Bunos	2WKLG043	76	74	73	73	85	B/C
		Sg. Gombak	2WKLG018	70	59	59	61	65	ST/SP
		Sg. Gombak	2WKLG026	67	59	60	73	74	ST/SP
		Sg. Gombak	2WKLG060	69	64	59	61	69	ST/SP
		Sg. Jinjang	2WKLG014	61	66	65	61	69	ST/SP
		Sg. Jinjang	2WKLG031	62	63	63	62	70	ST/SP
		Sg. Jinjang	2WKLG045	58	63	63	56	59	T/P
		Sg. Kerayong	2WKLG046	53	59	54	58	61	ST/SP
		Sg. Kerayong	2WKLG058	62	52	55	62	64	ST/SP
		Sg. Keroh	2WKLG015	60	63	56	62	65	ST/SP
		Sg. Keroh	2WKLG048	63	49	54	61	61	ST/SP
		Sg. Klang	2WKLG001	54	59	57	63	67	ST/SP
		Sg. Klang	2WKLG002	63	63	62	65	69	ST/SP
		Sg. Klang	2WKLG003	64	57	57	67	68	ST/SP
		Sg. Klang	2WKLG004	60	64	61	67	75	ST/SP
		Sg. Klang	2WKLG049	70	67	63	66	69	ST/SP
		Sg. Kuyoh	2WKLG052	55	52	55	64	70	ST/SP
		Sg. Penchala	2WKLG010	90	85	88	92	92	B/C
		Sg. Toba	2WKLG037	70	62	59	61	69	ST/SP
		Sg. Untut	2WKLG038	67	56	54	64	73	ST/SP
N. Sembilan	Sg. Sepang	Sg. Rambai	2BSPG004	48	28	21	25	25	T/P
	Sg. Langat	Sg. Batang Benar	3NLGT013	70	72	67	74	74	ST/SP
		Sg. Batang Labu	3NLGT009	65	71	71	81	87	B/C
		Sg. Batang Labu	3NLGT025	84	88	87	90	94	B/C
		Sg. Batang Nilai	3NLGT023	70	74	77	83	87	B/C
		Sg. Batang Nilai	3NLGT024	63	72	72	76	75	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
N. Sembilan	Sg. Langat	Sg. Beranang	3NLGT019	74	79	76	82	87	B/C
		Sg. Buan	3NLGT022	70	76	76	80	83	B/C
		Sg. Jijan	3NLGT026	79	82	78	85	82	B/C
		Sg. Pajam	3NLGT020	76	76	75	82	85	B/C
		Sg. Pajam	3NLGT021	63	54	54	60	56	T/P
	Sg. Linggi	Sg. Batang Penar	3NLGI009	78	75	77	81	89	B/C
		Sg. Batang Penar	3NLGI010	83	87	84	92	95	B/C
		Sg. Batang Penar	3NLGI020	75	77	78	84	92	B/C
		Sg. Batang Penar	3NLGI021	90	85	90	95	95	B/C
		Sg. Batang Penar	3NLGI027	91	92	92	94	96	B/C
		Sg. Batang Penar	3NLGI034	79	80	75	80	78	ST/SP
		Sg. Batu Hampar	3NLGI024	79	86	88	93	91	B/C
		Sg. Chembong	3NLGI012	85	84	83	93	88	B/C
		Sg. Empangan Terip	3NLGI022	75	73	72	80	82	B/C
		Sg. Jelai	3NLGI025	84	81	84	89	86	B/C
		Sg. Kayu Ara	3NLGI016	66	71	62	77	80	ST/SP
		Sg. Kenaboi	3NLGI032	84	80	80	83	87	B/C
		Sg. Kepayong	3NLGI007	72	69	73	78	80	ST/SP
		Sg. Kepayong	3NLGI023	88	91	91	94	97	B/C
		Sg. Kundur Besar	3NLGI013	87	90	86	91	92	B/C
		Sg. Linggi	3NLGI001	77	83	81	83	87	B/C
		Sg. Linggi	3NLGI002	77	77	79	82	86	B/C
		Sg. Linggi	3NLGI003	78	76	78	83	85	B/C
		Sg. Linggi	3NLGI004	74	77	77	77	85	B/C
		Sg. Linggi	3NLGI005	74	73	68	78	82	B/C
		Sg. Linggi	3NLGI006	72	71	74	77	82	B/C
		Sg. Muar	3NLGI026	86	87	90	88	93	B/C
		Sg. Ngoi Ngoi	3NLGI040	72	71	73	76	80	ST/SP
		Sg. Paroi	3NLGI018	71	75	76	78	80	ST/SP
		Sg. Pedas	3NLGI014	82	84	83	90	94	B/C
		Sg. Rembau	3NLGI011	81	86	82	91	92	B/C
		Sg. Senawang	3NLGI017	74	74	74	73	77	ST/SP
		Sg. Simin	3NLGI015	77	76	77	82	85	B/C
		Sg. Temiang	3NLGI019	77	73	76	83	85	B/C
		Sg. Temiang	3NLGI033	59	60	60	68	61	ST/SP
	Sg. Lukut	Sg. Lukut	3NLKT001	70	73	69	74	73	ST/SP
	Sg. Melaka	Sg. Dusun	3NMLK017	92	87	86	93	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
N. Sembilan	Sg. Melaka	Sg. Kemunting	3NMLK039	88	86	87	92	92	B/C
		Sg. Tampin	3NMLK038	89	90	92	95	96	B/C
		Sg. Tampin	3NMLK041	79	74	84	81	83	B/C
	Sg. Muar	Sg. Gemas	3NMUA041	72	68	68	70	71	ST/SP
		Sg. Gemencheh	3NMUA043	83	83	86	82	91	B/C
		Sg. Gemencheh	3NMUA045	78	78	80	82	90	B/C
		Sg. Jelai	3NMUA054	85	85	83	88	92	B/C
		Sg. Kelamah	3NMUA044	82	75	79	71	88	B/C
		Sg. Muar	3NMUA042	90	88	90	91	95	B/C
		Sg. Muar	3NMUA046	87	81	85	84	90	B/C
		Sg. Muar	3NMUA047	79	80	85	86	90	B/C
		Sg. Muar	3NMUA048	80	83	85	85	86	B/C
		Sg. Muar	3NMUA049	81	82	84	88	89	B/C
		Sg. Muar	3NMUA050	82	77	83	85	88	B/C
		Sg. Muar	3NMUA051	79	85	85	86	90	B/C
		Sg. Muar	3NMUA052	85	82	88	85	91	B/C
		Sg. Muar	3NMUA053	84	81	87	85	90	B/C
		Sg. Muar	3NMUA055	86	84	81	84	91	B/C
	Sg. Pahang	Sg. Pertang	3NPHG002	87	82	87	89	92	B/C
		Sg. Serting	3NPHG003	71	77	71	80	87	B/C
		Sg. Serting	3NPHG004	75	76	71	79	86	B/C
		Sg. Serting	3NPHG005	75	70	66	77	81	B/C
		Sg. Triang	3NPHG006	88	84	86	84	93	B/C
Melaka	Sg. Baru	Sg. Baru	3MBAR001	72	71	68	74	70	ST/SP
	Sg. Duyong	Sg. Duyong	3MDYG001	64	64	71	63	69	ST/SP
		Sg. Duyong	3MDYG002	67	59	55	58	65	ST/SP
		Sg. Duyong	3MDYG003	72	77	79	77	84	B/C
		Sg. Gapam	3MDYG004	82	86	87	88	92	B/C
		Sg. Punggur	3MPGR001	63	44	47	52	67	ST/SP
		Sg. Punggur	3MPGR002	72	48	53	49	58	T/P
	Sg. Kesang	Sg. Chin-Chin	3MKSG006	64	68	59	62	53	T/P
		Sg. Chin-Chin	3MKSG008	80	85	80	79	87	B/C
		Sg. Chin-Chin	3MKSG009	72	79	79	78	89	B/C
		Sg. Chohong	3MKSG004	76	82	80	86	91	B/C
		Sg. Chohong	3MKSG005	88	90	89	90	94	B/C
		Sg. Kesang	3MKSG001	75	66	63	72	82	B/C
		Sg. Kesang	3MKSG002	83	80	76	79	88	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Melaka	Sg. Kesang	Sg. Kesang	3MKSG003	76	78	72	77	88	B/C
		Sg. Tangkak	3MKSG007	69	67	64	67	77	ST/SP
	Sg. Linggi	Sg. Simpang Ampat	3MLGI029	80	82	79	83	87	B/C
		Sg. Siput	3MLGI030	80	86	84	87	90	B/C
		Sg. Siput	3MLGI031	77	84	85	86	92	B/C
		Sg. Tuang	3MTUG002	70	71	57	57	62	ST/SP
	Sg. Melaka	Sg. Batang Melaka	3MMLK008	84	78	82	90	91	B/C
		Sg. Batang Melaka	3MMLK027	89	88	80	87	91	B/C
		Sg. Batang Melaka	3MMLK028	83	76	80	86	89	B/C
		Sg. Durian Tunggal	3MMLK011	83	76	73	79	86	B/C
		Sg. Malim	3MMLK014	68	51	55	67	71	ST/SP
		Sg. Malim	3MMLK034	70	61	63	67	68	ST/SP
		Sg. Melaka	3MMLK007	78	64	65	72	71	ST/SP
		Sg. Melaka	3MMLK009	87	89	87	91	93	B/C
		Sg. Melaka	3MMLK010	88	90	93	93	96	B/C
		Sg. Melaka	3MMLK012	68	60	59	70	72	ST/SP
		Sg. Melaka	3MMLK013	69	66	66	63	68	ST/SP
		Sg. Melaka	3MMLK015	80	76	72	81	82	B/C
		Sg. Melaka	3MMLK021	82	75	73	81	85	B/C
		Sg. Melaka	3MMLK022	80	78	79	83	86	B/C
		Sg. Melaka	3MMLK023	75	68	66	72	72	ST/SP
		Sg. Melaka	3MMLK024	64	58	61	59	69	ST/SP
		Sg. Melaka	3MMLK025	81	77	77	79	84	B/C
		Sg. Melaka	3MMLK026	76	75	71	80	81	B/C
		Sg. Melaka	3MMLK030	80	80	73	82	84	B/C
		Sg. Melaka	3MMLK032	65	62	59	70	67	ST/SP
		Sg. Putat	3MMLK029	64	65	62	62	74	ST/SP
		Sg. Putat	3MMLK033	57	58	53	59	63	ST/SP
		Sg. Rembia	3MMLK035	68	68	68	73	82	B/C
		Sg. Rembia	3MMLK036	77	72	61	68	54	T/P
		Sg. Tampin	3MMLK031	88	87	85	91	94	B/C
	Sg. Merlimau	Sg. Merlimau	3MMLU001	53	50	47	60	55	T/P
		Sg. Merlimau	3MMLU002	60	52	46	52	56	T/P
		Sg. Merlimau	3MMLU003	56	57	49	40	58	T/P
		Sg. Merlimau	3MMLU004	52	52	54	58	58	T/P
		Sg. Merlimau	3MMLU005	56	52	49	67	68	ST/SP
	Sg. Seri Melaka	Sg. Air Salak	3MSMK001	73	69	65	62	79	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
	Sg. Seri Melaka	Sg. Seri Melaka	3MSMK002	59	59	65	65	66	ST/SP
		Sg. Sg.Udang	3MSUD001	85	87	81	87	86	B/C
	Sg. Tuang	Sg. Tuang	3MTUG001	71	67	58	59	63	ST/SP
Johor	Sg. Air Baloi	Sg. Air Baloi	3JABL001	65	59	52	60	56	T/P
		Sg. Air Baloi	3JABL002	69	49	48	59	52	T/P
		Sg. Air Baloi	3JABL003	64	58	49	60	57	T/P
	Sg. Batu Pahat	Sg. Amran	3JBPT018	60	70	74	75	81	B/C
		Sg. Bantang	3JBPT020	93	94	91	96	97	B/C
		Sg. Batu Pahat	3JBPT001	53	59	56	66	64	ST/SP
		Sg. Bekok	3JBPT005	74	74	63	79	84	B/C
		Sg. Bekok	3JBPT008	63	62	59	57	67	ST/SP
		Sg. Bekok	3JBPT016	85	88	82	85	91	B/C
		Sg. Bekok	3JBPT017	85	85	83	87	91	B/C
		Sg. Bekok	3JBPT019	87	89	90	92	94	B/C
		Sg. Bekok	3JBPT023	56	64	58	57	63	ST/SP
		Sg. Berlian	3JBPT007	74	78	79	78	77	ST/SP
		Sg. Chaah	3JBPT010	80	79	83	88	93	B/C
		Sg. Kahang	3JBPT022	84	84	86	90	92	B/C
		Sg. Lenik	3JBPT011	71	81	82	82	91	B/C
		Sg. Merek	3JBPT009	77	83	81	88	89	B/C
		Sg. Merpo	3JBPT006	84	84	81	91	90	B/C
		Sg. Panchor	3JBPT025	52	61	58	59	63	ST/SP
		Sg. Semberong	3JBPT003	55	66	53	57	64	ST/SP
		Sg. Semberong	3JBPT004	68	69	58	64	77	ST/SP
		Sg. Semberong Dam	3JBPT021	81	89	85	89	91	B/C
		Sg. Simpang Kanan	3JBPT002	53	62	60	58	62	ST/SP
		Sg. Simpang Kanan	3JBPT013	53	57	54	59	60	ST/SP
		Sg. Simpang Kiri	3JBPT012	63	69	73	81	82	B/C
		Sg. Simpang Kiri	3JBPT014	58	64	60	65	71	ST/SP
		Sg. Simpang Kiri	3JBPT015	45	58	55	60	64	ST/SP
		Sg. Temehel	3JBPT024	52	45	48	57	54	T/P
	Sg. Benut	Sg. Benut	3JBNT001	84	86	82	86	92	B/C
		Sg. Benut	3JBNT002	68	73	72	79	86	B/C
		Sg. Benut	3JBNT005	66	65	60	64	66	ST/SP
		Sg. Benut	3JBNT006	65	59	60	69	62	ST/SP
		Sg. Machap Dam	3JBNT008	80	85	91	92	94	B/C
		Sg. Parit Hj.Yassin	3JBNT004	82	81	77	85	81	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Benut	Sg. Pinggan	3JBNT007	66	59	61	60	59	T/P
		Sg. Ulu Benut	3JBNT003	85	77	79	89	90	B/C
	Sg. Danga	Sg. Danga	3JDGA001	40	48	47	58	62	ST/SP
		Sg. Danga	3JDGA002	48	48	45	55	59	T/P
	Sg. Endau	Sg. Anak Sg. Semberong	3JEND007	74	76	84	84	85	B/C
		Sg. Dengar	3JEND010	78	82	80	84	91	B/C
		Sg. Empangan Labong	3JEND027	84	92	92	89	91	B/C
		Sg. Endau	3JEND019	77	85	88	85	88	B/C
		Sg. Endau	3JEND022	82	86	87	87	90	B/C
		Sg. Endau	3JEND023	89	93	93	93	96	B/C
		Sg. Jasin	3JEND024	91	94	94	94	97	B/C
		Sg. Jebong	3JEND005	67	71	61	74	82	B/C
		Sg. Kahang	3JEND020	82	89	89	90	89	B/C
		Sg. Kahang	3JEND026	85	88	86	90	94	B/C
		Sg. Kahang	3JEND028	82	87	83	90	88	B/C
		Sg. Lenga	3JEND008	71	75	60	68	69	ST/SP
		Sg. Lenggor	3JEND009	80	84	87	82	89	B/C
		Sg. Lenggor	3JEND029	79	84	86	81	88	B/C
		Sg. Mamai	3JEND015	82	86	86	87	88	B/C
		Sg. Melatai	3JEND017	61	68	63	70	71	ST/SP
		Sg. Mengkibol	3JEND001	83	85	84	88	89	B/C
		Sg. Mengkibol	3JEND002	75	72	74	77	84	B/C
		Sg. Mengkibol	3JEND003	61	65	65	69	75	ST/SP
		Sg. Paloh	3JEND016	81	76	81	82	85	B/C
		Sg. Pamol	3JEND011	61	68	65	72	76	ST/SP
		Sg. Selai	3JEND025	83	90	92	92	94	B/C
		Sg. Semberong	3JEND004	83	84	86	89	90	B/C
		Sg. Semberong	3JEND006	71	81	83	84	84	B/C
		Sg. Semberong	3JEND012	69	68	63	76	80	ST/SP
		Sg. Semberong	3JEND018	83	82	84	85	88	B/C
		Sg. Semberong	3JEND021	78	75	83	84	88	B/C
		Sg. Singol	3JEND013	75	80	55	79	83	B/C
		Sg. Tamok	3JEND014	85	86	91	91	90	B/C
	Sg. Jemaluang	Sg. Jemaluang	3JJML001	79	86	88	81	90	B/C
		Sg. Jemaluang	3JJML002	70	78	78	81	86	B/C
	Sg. Johor	Sg. Anak Sg. Sayong	3JJHR023	77	76	79	86	92	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Johor	Sg. Anak Sg. Sayong	3JJHR032	61	67	69	75	84	B/C
		Sg. Belitong	3JJHR038	81	85	86	83	89	B/C
		Sg. Berangan	3JJHR013	55	63	67	71	82	B/C
		Sg. Bukit Besar	3JJHR007	57	59	57	61	60	ST/SP
		Sg. Bukit Besar	3JJHR009	84	83	93	90	95	B/C
		Sg. Chemangar	3JJHR019	61	72	72	70	73	ST/SP
		Sg. Johor	3JJHR011	81	81	83	83	89	B/C
		Sg. Johor	3JJHR014	81	81	82	85	89	B/C
		Sg. Johor	3JJHR015	84	80	84	86	91	B/C
		Sg. Johor	3JJHR040	75	82	78	84	87	B/C
		Sg. Johor	3JJHR041	82	82	85	82	89	B/C
		Sg. Johor	3JJHR042	80	82	83	85	90	B/C
		Sg. Layang	3JJHR001	88	87	89	93	93	B/C
		Sg. Layau Kiri	3JJHR017	78	87	84	87	92	B/C
		Sg. Lebam	3JJHR020	78	83	85	79	87	B/C
		Sg. Linggiu	3JJHR030	80	85	88	84	93	B/C
		Sg. Panti	3JJHR037	80	80	72	79	87	B/C
		Sg. Papan	3JJHR034	75	81	83	81	86	B/C
		Sg. Pelepah	3JJHR039	90	94	93	95	97	B/C
		Sg. Pelepah	3JJHR043	82	81	89	86	87	B/C
		Sg. Pelepah	3JJHR044	82	83	89	87	88	B/C
		Sg. Pelepah	3JJHR045	88	88	92	90	92	B/C
		Sg. Penggeli	3JJHR028	80	85	90	89	87	B/C
		Sg. Penggeli	3JJHR031	83	82	85	89	88	B/C
		Sg. Remis	3JJHR026	82	83	86	86	89	B/C
		Sg. Santi	3JJHR022	83	87	85	89	87	B/C
		Sg. Sayong	3JJHR024	82	81	81	82	85	B/C
		Sg. Sayong	3JJHR025	80	82	85	78	84	B/C
		Sg. Sayong	3JJHR027	86	78	88	82	84	B/C
		Sg. Sayong	3JJHR033	81	82	87	83	88	B/C
		Sg. Sebol	3JJHR029	66	76	69	73	80	ST/SP
		Sg. Seluyut	3JJHR035	75	76	77	83	87	B/C
		Sg. Semangar	3JJHR008	85	81	82	81	92	B/C
		Sg. Semenchu	3JJHR018	76	69	35	66	85	B/C
		Sg. Sening	3JJHR021	83	89	83	89	93	B/C
		Sg. Serai	3JJHR002	53	66	57	67	60	ST/SP
		Sg. Telor	3JJHR012	80	84	84	88	89	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Johor	Sg. Temoh	3JJHR016	67	63	64	74	84	B/C
		Sg. Tiram	3JJHR003	69	68	67	71	79	ST/SP
		Sg. Tiram	3JJHR004	84	85	87	86	91	B/C
		Sg. Tiram	3JJHR005	67	67	69	69	68	ST/SP
		Sg. Tiram	3JJHR006	87	87	90	88	93	B/C
	Sg. Kaw. Pasir Gudang	Sg. Buluh	3JPGD002	20	25	41	41	43	T/P
		Sg. Latoh	3JPGD004	45	64	58	62	68	ST/SP
		Sg. Masai	3JPGD005	56	55	50	63	60	ST/SP
		Sg. Perembi	3JPGD001	50	37	42	57	47	T/P
		Sg. Tukang Batu	3JPGD003	13	22	37	42	35	T/P
	Sg. Kempas	Sg. Kempas	3JKPS001	57	39	36	29	33	T/P
		Sg. Kempas	3JKPS002	57	55	44	37	42	T/P
	Sg. Kim-Kim	Sg. Kim-Kim	3JKIM001	45	36	43	51	66	ST/SP
		Sg. Kim-Kim	3JKIM002	75	83	83	85	90	B/C
	Sg. Mersing	Sg. Empangan Congok	3JMSG004	75	76	84	85	88	B/C
		Sg. Mersing	3JMSG001	86	91	90	87	95	B/C
		Sg. Mersing	3JMSG002	72	82	80	84	88	B/C
		Sg. Mersing	3JMSG003	83	89	85	83	92	B/C
	Sg. Muar	Sg. Air Panas	3JMUA035	91	90	92	94	97	B/C
		Sg. Belemang	3JMUA051	90	89	90	94	95	B/C
		Sg. Gemas	3JMUA036	83	71	65	80	85	B/C
		Sg. Jementah	3JMUA040	91	91	91	93	96	B/C
		Sg. Juasseh	3JMUA014	88	88	89	94	96	B/C
		Sg. Juasseh	3JMUA037	91	91	88	93	95	B/C
		Sg. Juasseh	3JMUA045	91	89	86	94	95	B/C
		Sg. Labis	3JMUA011	79	81	79	89	88	B/C
		Sg. Labis	3JMUA012	84	81	77	89	89	B/C
		Sg. Labis	3JMUA015	75	85	82	87	87	B/C
		Sg. Meda	3JMUA034	76	86	82	82	85	B/C
		Sg. Merbudu	3JMUA030	68	69	65	63	77	ST/SP
		Sg. Merlimau	3JMUA020	65	55	59	70	66	ST/SP
		Sg. Muar	3JMUA017	73	79	81	82	86	B/C
		Sg. Muar	3JMUA019	78	81	82	85	87	B/C
		Sg. Muar	3JMUA022	77	81	84	85	89	B/C
		Sg. Muar	3JMUA026	76	81	82	84	89	B/C
		Sg. Muar	3JMUA027	74	78	77	85	84	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Muar	Sg. Muar	3JMUA028	74	77	81	83	81	B/C
		Sg. Muar	3JMUA029	71	74	81	75	84	B/C
		Sg. Muar	3JMUA031	70	73	81	77	83	B/C
		Sg. Muar	3JMUA033	71	79	80	73	77	ST/SP
		Sg. Muar	3JMUA039	75	79	81	82	85	B/C
		Sg. Muar	3JMUA041	76	77	82	80	86	B/C
		Sg. Muar	3JMUA042	75	77	81	78	86	B/C
		Sg. Muar	3JMUA043	73	77	82	79	83	B/C
		Sg. Muar	3JMUA046	75	76	78	86	89	B/C
		Sg. Muar	3JMUA047	74	77	78	81	87	B/C
		Sg. P.Mengkuang	3JMUA018	82	80	67	89	92	B/C
		Sg. Pagoh	3JMUA049	62	70	67	66	74	ST/SP
		Sg. Palong	3JMUA024	75	83	82	88	89	B/C
		Sg. Palong	3JMUA025	75	78	81	84	85	B/C
		Sg. Pendol	3JMUA050	88	83	89	90	95	B/C
		Sg. Sarang Buaya	3JMUA038	48	64	70	58	60	ST/SP
		Sg. Segamat	3JMUA016	81	83	82	89	90	B/C
		Sg. Segamat	3JMUA044	87	87	88	91	94	B/C
		Sg. Segamat	3JMUA048	88	87	89	92	95	B/C
		Sg. Senarut	3JMUA021	70	74	66	75	77	ST/SP
		Sg. Serom	3JMUA032	46	54	55	63	63	ST/SP
		Sg. Simpang Loi	3JMUA023	82	76	78	77	84	B/C
		Sg. Tenang	3JMUA013	74	66	68	79	76	ST/SP
	Sg. Paloi	Sg. Paloi	3JPAL001	80	85	80	89	90	B/C
	Sg. Pontian Besar	Sg. Air Hitam	3JPBS001	61	67	76	71	74	ST/SP
		Sg. Ayer Merah	3JPBS005	33	53	46	43	54	T/P
		Sg. Pontian Besar	3JPBS002	55	63	63	65	65	ST/SP
		Sg. Pontian Besar	3JPBS003	66	87	77	80	85	B/C
		Sg. Pontian Besar	3JPBS004	83	81	77	86	84	B/C
		Sg. Pontian Besar	3JPBS006	53	57	60	64	63	ST/SP
		Sg. Pontian Besar	3JPBS007	59	70	70	73	73	ST/SP
	Sg. Pontian Kecil	Sg. Pontian Kecil	3JPKC001	84	85	84	86	84	B/C
		Sg. Pontian Kecil	3JPKC002	76	74	60	76	75	ST/SP
	Sg. Pulai	Sg. Pulai	3JPLI001	72	74	79	82	83	B/C
		Sg. Pulai	3JPLI002	72	72	71	72	77	ST/SP
		Sg. Pulai Dam	3JPLI004	89	92	93	95	95	B/C

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NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Pulai	Sg. Ulu Choh	3JPLI003	48	68	67	72	72	ST/SP
	Sg. Rambah	Sg. Rambah	3JRBH001	76	75	73	75	69	ST/SP
		Sg. Rambah	3JRBH002	58	66	55	65	63	ST/SP
	Sg. Sanglang	Sg. Sanglang	3JSLG001	63	63	60	59	57	T/P
	Sg. Sedili Besar	Sg. Ambat	3JSBE005	76	88	88	86	84	B/C
		Sg. Dohol	3JSBE001	82	85	88	89	90	B/C
		Sg. Mupur	3JSBE009	46	52	47	67	73	ST/SP
		Sg. Pasir Panjang	3JSBE010	74	85	87	88	87	B/C
		Sg. Sedili Besar	3JSBE002	82	82	82	86	86	B/C
		Sg. Sedili Besar	3JSBE004	85	86	89	91	93	B/C
		Sg. Sedili Besar	3JSBE006	76	79	76	82	87	B/C
		Sg. Sedili Besar	3JSBE007	61	73	65	74	72	ST/SP
		Sg. Sedili Besar	3JSBE008	81	82	85	87	89	B/C
		Sg. Sedili Besar	3JSBE011	82	85	88	90	88	B/C
		Sg. Temubor Kanan	3JSBE003	83	88	90	93	95	B/C
	Sg. Sedili Kecil	Sg. Anak Sedili Kecil	3JSKE005	21	29	30	25	24	T/P
		Sg. Anak Sedili Kecil	3JSKE006	70	78	76	79	85	B/C
		Sg. Bahan	3JSKE002	72	62	75	78	73	ST/SP
		Sg. Bahan	3JSKE004	70	57	76	74	78	ST/SP
		Sg. Sedili Kecil	3JSKE001	86	85	87	89	88	B/C
		Sg. Sedili Kecil	3JSKE003	71	77	77	80	76	ST/SP
	Sg. Segget	Sg. Segget	3JSGT001	63	68	55	81	71	ST/SP
		Sg. Segget	3JSGT002	60	68	55	77	68	ST/SP
		Sg. Segget	3JSGT003	45	51	50	59	67	ST/SP
		Sg. Segget	3JSGT004	44	57	54	63	78	ST/SP
		Sg. Segget	3JSGT005	54	51	50	54	65	ST/SP
	Sg. Skudai	Sg. Melana	3JSKU008	83	89	85	91	95	B/C
		Sg. Melana	3JSKU009	42	57	45	61	59	T/P
		Sg. Skudai	3JSKU001	50	52	44	55	63	ST/SP
		Sg. Skudai	3JSKU002	58	53	49	66	71	ST/SP
		Sg. Skudai	3JSKU003	62	61	58	61	74	ST/SP
		Sg. Skudai	3JSKU004	86	87	86	89	90	B/C
		Sg. Skudai	3JSKU005	63	73	65	72	79	ST/SP
		Sg. Skudai	3JSKU006	64	65	58	66	76	ST/SP
		Sg. Skudai	3JSKU007	49	43	44	43	54	T/P
		Sg. Skudai	3JSKU010	51	56	52	55	62	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Sg. Skudai	Sg. Skudai	3JSKU011	89	89	91	92	92	B/C
	Sg. Tebrau	Sg. Bala	3JTRU008	53	46	42	55	47	T/P
		Sg. Pandan	3JTRU007	54	44	43	46	43	T/P
		Sg. Plentong	3JTRU004	60	53	52	56	66	ST/SP
		Sg. Sebulung	3JTRU009	58	47	38	53	58	T/P
		Sg. Sengkuang	3JTRU011	57	29	35	52	53	T/P
		Sg. Tampoi	3JTRU010	57	48	44	52	60	ST/SP
		Sg. Tebrau	3JTRU001	61	38	40	44	65	ST/SP
		Sg. Tebrau	3JTRU002	59	60	61	55	72	ST/SP
		Sg. Tebrau	3JTRU003	72	58	61	65	72	ST/SP
		Sg. Tebrau	3JTRU005	55	49	49	57	65	ST/SP
		Sg. Tebrau	3JTRU006	66	58	58	64	69	ST/SP
Pahang	Sg. Anak Endau	Sg. Anak Endau	4CAED001	83	88	92	94	95	B/C
		Sg. Anak Endau	4CAED002	77	78	81	84	87	B/C
	Sg. Balok	Sg. Balok	4CBLK001	79	68	68	66	82	B/C
		Sg. Balok	4CBLK002	71	69	69	70	77	ST/SP
		Sg. Panjang	4CBLK004	63	79	86	76	78	ST/SP
		Sg. Yior	4CBLK003	58	64	64	62	75	ST/SP
	Sg. Bebar	Sg. Bebar	4CBBR001	64	76	79	76	86	B/C
		Sg. Bebar	4CBBR002	78	84	85	82	92	B/C
		Sg. Merba	4CBBR005	80	75	86	85	91	B/C
		Sg. Serai	4CBBR003	71	80	80	75	85	B/C
		Sg. Serai	4CBBR004	79	82	83	85	88	B/C
	Sg. Cherating	Sg. Cherating	4CCHE001	82	83	79	81	86	B/C
	Sg. Kuantan	Sg. Belat	4CKTN001	79	83	79	80	86	B/C
		Sg. Charu	4CKTN006	85	86	92	93	96	B/C
		Sg. Galing Besar	4CKTN003	58	67	64	63	70	ST/SP
		Sg. Galing Besar	4CKTN004	67	68	61	64	62	ST/SP
		Sg. Kenau	4CKTN010	85	89	90	94	97	B/C
		Sg. Kuantan	4CKTN002	75	82	85	88	93	B/C
		Sg. Kuantan	4CKTN015	83	83	84	87	93	B/C
		Sg. Kuantan	4CKTN016	87	85	88	90	93	B/C
		Sg. Kuantan	4CKTN017	84	87	91	93	96	B/C
		Sg. Kuantan	4CKTN018	90	91	92	94	96	B/C
		Sg. Kuantan	4CKTN019	75	81	81	80	85	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	NILAI IKA / WQI VALUE					KATEGORI IKA (2021) / WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Sg. Kuantan	Sg. Kuantan	4CKTN020	82	84	87	86	93	B/C
		Sg. Kuantan	4CKTN021	81	83	83	85	88	B/C
		Sg. Pandan	4CKTN012	82	86	83	87	93	B/C
		Sg. Pinang	4CKTN005	73	85	89	80	88	B/C
		Sg. Reman	4CKTN014	85	82	86	87	91	B/C
		Sg. Riau	4CKTN007	80	83	84	84	88	B/C
		Sg. Talam	4CKTN013	82	80	69	72	70	ST/SP
	Sg. Merchong	Sg. Merchong	4CMC0002	65	77	85	82	92	B/C
		Sg. Merchong	4CMC0003	78	80	87	89	93	B/C
	Sg. Pahang	Sg. Anak Sg. Lepar	4CPHG136	66	84	84	85	93	B/C
		Sg. Batu	4CPHG056	77	82	79	84	92	B/C
		Sg. Belayar	4CPHG135	90	91	89	94	94	B/C
		Sg. Bentong	4CPHG040	83	89	92	92	95	B/C
		Sg. Bentong	4CPHG045	85	81	82	87	91	B/C
		Sg. Bentong	4CPHG092	85	82	84	92	95	B/C
		Sg. Bentong	4CPHG133	88	85	79	86	93	B/C
		Sg. Bentong	4CPHG134	91	91	86	92	96	B/C
		Sg. Bentong	4CPHG144	83	81	82	86	89	B/C
		Sg. Benus	4CPHG047	87	82	82	91	91	B/C
		Sg. Benus	4CPHG118	88	90	85	94	94	B/C
		Sg. Benus	4CPHG152	91	89	87	93	96	B/C
		Sg. Bera	4CPHG019	80	79	82	83	86	B/C
		Sg. Bera	4CPHG020	78	80	82	84	86	B/C
		Sg. Bera	4CPHG058	80	80	85	85	86	B/C
		Sg. Bera	4CPHG059	78	83	88	85	91	B/C
		Sg. Bera	4CPHG063	78	86	85	85	86	B/C
		Sg. Berkelah	4CPHG098	83	92	92	93	97	B/C
		Sg. Bertam	4CBTM002	85	86	88	91	94	B/C
		Sg. Bertam	4CBTM010	76	76	81	74	79	ST/SP
		Sg. Bertam	4CBTM011	93	93	94	96	96	B/C
		Sg. Bertam	4CBTM013	94	92	94	97	97	B/C
		Sg. Bilut	4CPHG119	85	84	82	83	88	B/C
		Sg. Bilut	4CPHG129	82	85	87	85	92	B/C
		Sg. Burung	4CBTM005	88	91	92	96	96	B/C
		Sg. Chini	4CPHG004	81	80	86	82	84	B/C
		Sg. Gapoi	4CPHG086	89	92	94	94	97	B/C
		Sg. Habu	4CBTM004	89	88	88	90	96	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Sg. Pahang	Sg. Jelai	4CPHG0130	85	88	88	90	93	B/C
		Sg. Jelai	4CPHG096	84	83	86	86	91	B/C
		Sg. Jelai	4CPHG125	83	82	87	88	90	B/C
		Sg. Jempol	4CPHG049	80	84	86	83	91	B/C
		Sg. Jempol	4CPHG050	89	86	90	93	97	B/C
		Sg. Jempol	4CPHG087	87	87	89	93	95	B/C
		Sg. Jempol	4CPHG088	82	83	89	90	95	B/C
		Sg. Jempol	4CPHG121	79	86	79	85	95	B/C
		Sg. Jengka	4CPHG041	84	86	88	92	95	B/C
		Sg. Jengka	4CPHG051	79	84	85	86	89	B/C
		Sg. Kecau	4CPHG091	78	82	74	83	87	B/C
		Sg. Kecau	4CPHG116	78	81	80	84	87	B/C
		Sg. Kecau	4CPHG151	89	85	84	89	89	B/C
		Sg. Kelau	4CPHG117	88	86	86	88	91	B/C
		Sg. Kelau	4CPHG145	84	82	82	82	86	B/C
		Sg. Kelau	4CPHG146	90	88	85	91	93	B/C
		Sg. Kelau	4CPHG153	82	81	83	84	89	B/C
		Sg. Kertam	4CPHG014	80	83	90	91	91	B/C
		Sg. Koyan	4CPHG033	90	89	88	89	94	B/C
		Sg. Krau	4CPHG003	85	89	90	92	94	B/C
		Sg. Kundang	4CPHG018	75	86	86	79	82	B/C
		Sg. Lenggok	4CBTM003	88	90	91	93	96	B/C
		Sg. Lepar	4CPHG006	87	87	91	92	91	B/C
		Sg. Lipis	4CPHG029	88	81	85	85	90	B/C
		Sg. Lipis	4CPHG030	86	86	86	88	91	B/C
		Sg. Lipis	4CPHG035	87	89	91	93	96	B/C
		Sg. Luit	4CPHG015	75	85	89	91	93	B/C
		Sg. Maran	4CPHG016	86	85	90	93	96	B/C
		Sg. Mentiga	4CPHG005	76	80	85	80	77	ST / SP
		Sg. Mentiga	4CPHG042	79	83	87	85	86	B/C
		Sg. Mentiga	4CPHG089	82	85	82	85	87	B/C
		Sg. Pahang	4CPHG007	82	82	83	82	90	B/C
		Sg. Pahang	4CPHG008	86	87	86	93	93	B/C
		Sg. Pahang	4CPHG010	82	84	86	87	90	B/C
		Sg. Pahang	4CPHG011	82	83	85	88	93	B/C
		Sg. Pahang	4CPHG012	79	85	90	89	93	B/C
		Sg. Pahang	4CPHG013	83	79	86	89	91	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Sg. Pahang	Sg. Pahang	4CPHG021	78	85	83	87	92	B/C
		Sg. Pahang	4CPHG022	84	78	88	87	91	B/C
		Sg. Pahang	4CPHG023	91	91	91	91	94	B/C
		Sg. Pahang	4CPHG027	87	87	83	88	94	B/C
		Sg. Pahang	4CPHG054	76	85	87	87	90	B/C
		Sg. Pahang	4CPHG055	80	80	83	86	91	B/C
		Sg. Pahang	4CPHG097	84	83	84	88	93	B/C
		Sg. Pahang	4CPHG100	79	85	83	84	89	B/C
		Sg. Pahang	4CPHG104	87	87	87	87	91	B/C
		Sg. Pahang	4CPHG111	83	80	83	89	92	B/C
		Sg. Pahang	4CPHG113	80	85	84	87	92	B/C
		Sg. Pahang	4CPHG124	84	88	87	89	91	B/C
		Sg. Pahang	4CPHG126	85	81	89	88	92	B/C
		Sg. Pahang	4CPHG127	82	85	84	89	88	B/C
		Sg. Pahang	4CPHG131	78	81	84	88	88	B/C
		Sg. Pahang	4CPHG137	81	82	85	86	93	B/C
		Sg. Pahang	4CPHG138	78	83	84	85	90	B/C
		Sg. Pahang	4CPHG139	82	84	82	83	90	B/C
		Sg. Pahang	4CPHG141	84	79	83	87	91	B/C
		Sg. Pahang	4CPHG148	86	82	85	88	92	B/C
		Sg. Pahang	4CPHG150	86	83	86	87	89	B/C
		Sg. Penjuring	4CPHG044	91	91	87	94	97	B/C
		Sg. Pertang	4CPHG132	86	83	79	91	90	B/C
		Sg. Perting	4CPHG120	89	90	91	94	96	B/C
		Sg. Raub	4CPHG123	87	89	89	93	95	B/C
		Sg. Retang	4CPHG105	86	87	87	92	93	B/C
		Sg. Ringlet	4CBTM001	85	83	82	83	91	B/C
		Sg. Salak	4CPHG122	80	86	89	87	91	B/C
		Sg. Semantan	4CPHG025	80	83	83	87	92	B/C
		Sg. Semantan	4CPHG036	84	89	90	91	92	B/C
		Sg. Semantan	4CPHG061	82	85	84	87	90	B/C
		Sg. Semantan	4CPHG084	71	84	86	88	93	B/C
		Sg. Serting	4CPHG101	79	80	80	84	85	B/C
		Sg. Serting	4CPHG102	74	83	83	85	84	B/C
		Sg. T. Paya Bungor	4CPHG002	91	84	85	91	91	B/C
		Sg. Tahan	4CPHG109	85	87	88	91	92	B/C
		Sg. Tanglir	4CPHG048	85	86	87	88	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Sg. Pahang	Sg. Tanglir	4CPHG053	81	83	87	89	87	B/C
		Sg. Tanglir	4CPHG057	80	83	84	87	84	B/C
		Sg. Tanglir	4CPHG106	79	80	86	88	86	B/C
		Sg. Tanglir	4CPHG107	87	84	86	88	88	B/C
		Sg. Tasik Bera	4CPHG140	81	84	86	91	88	B/C
		Sg. Tasik Chini	4CPHG043	87	88	89	92	88	B/C
		Sg. Tasik Chini	4CPHG060	82	90	90	93	90	B/C
		Sg. Tasik Chini	4CPHG071	87	89	90	91	92	B/C
		Sg. Tasik Chini	4CPHG108	87	88	90	92	93	B/C
		Sg. Tasik Chini	4CPHG110	89	89	90	91	87	B/C
		Sg. Tasik Chini	4CPHG112	88	89	90	93	89	B/C
		Sg. Tasik Chini	4CPHG114	85	90	89	92	92	B/C
		Sg. Tasik Chini	4CPHG115	88	90	91	92	90	B/C
		Sg. Tasik Chini	4CPHG130	89	92	89	92	90	B/C
		Sg. Tasik Chini	4CPHG143	86	89	89	92	87	B/C
		Sg. Teh	4CPHG090	78	80	90	93	94	B/C
		Sg. Tekal	4CPHG062	83	83	81	85	89	B/C
		Sg. Telang	4CPHG032	87	89	90	91	94	B/C
		Sg. Telemong	4CPHG046	91	89	86	94	96	B/C
		Sg. Telemong	4CPHG093	78	85	91	93	93	B/C
		Sg. Telemong	4CPHG094	90	91	89	91	97	B/C
		Sg. Telom	4CBTM008	82	86	86	86	95	B/C
		Sg. Telom	4CBTM009	74	83	83	86	93	B/C
		Sg. Tembeling	4CPHG142	87	84	88	91	90	B/C
		Sg. Teranum	4CPHG038	90	88	87	95	96	B/C
		Sg. Teras	4CPHG037	91	90	87	93	96	B/C
		Sg. Teras	4CPHG147	92	88	88	91	96	B/C
		Sg. Teris	4CPHG081	80	89	87	91	94	B/C
		Sg. Teris	4CPHG082	85	87	87	92	95	B/C
		Sg. Teris	4CPHG083	84	88	88	92	94	B/C
		Sg. Terla	4CBTM007	90	91	91	92	95	B/C
		Sg. Terla	4CBTM012	86	92	88	95	97	B/C
		Sg. Triang	4CPHG024	79	84	85	88	91	B/C
		Sg. Triang	4CPHG074	77	83	86	88	91	B/C
		Sg. Tringkap	4CBTM006	86	85	82	89	94	B/C
		Sg. Ulong	4CBTM014	92	93	94	96	97	B/C
	Sg. Rompin	Sg. Aur	4CRPN005	86	84	86	86	91	B/C
		Sg. Bakar	4CRPN016	88	80	71	75	69	ST/SP
		Sg. Jekatih	4CRPN012	81	83	86	87	91	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Sg. Rompin	Sg. Jekatih	4CRPN013	85	84	84	87	90	B/C
		Sg. Jeram	4CRPN006	84	84	88	88	93	B/C
		Sg. Kepasing	4CRPN010	87	79	81	88	90	B/C
		Sg. Keratong	4CRPN011	81	83	82	84	87	B/C
		Sg. Keratong	4CRPN018	75	83	86	84	91	B/C
		Sg. Keratong	4CRPN021	76	82	85	86	93	B/C
		Sg. Keratong	4CRPN022	77	81	83	88	93	B/C
		Sg. Pontian	4CRPN003	85	86	87	85	90	B/C
		Sg. Pukin	4CRPN014	83	80	83	87	90	B/C
		Sg. Pukin	4CRPN015	86	79	83	84	90	B/C
		Sg. Pukin	4CRPN017	83	84	83	87	89	B/C
		Sg. Rompin	4CRPN004	81	82	86	78	88	B/C
		Sg. Rompin	4CRPN007	80	84	88	79	92	B/C
		Sg. Rompin	4CRPN008	83	83	86	85	93	B/C
		Sg. Rompin	4CRPN020	84	82	87	83	93	B/C
		Sg. Rompin	4CRPN030	82	84	86	86	90	B/C
		Sg. Sepayang	4CRPN002	73	82	84	77	84	B/C
	Sg. Tonggok	Sg. Tonggok	4CTGK001	72	69	73	80	82	B/C
		Sg. Tonggok	4CTGK002	82	66	63	65	80	ST/SP
Terengganu	Sg. Besut	Sg. Besut	4TBST002	78	88	89	91	93	B/C
		Sg. Besut	4TBST003	88	89	91	92	94	B/C
		Sg. Besut	4TBST004	85	90	91	93	96	B/C
		Sg. Besut	4TBST005	90	87	91	92	93	B/C
		Sg. Besut	4TBST006	86	84	89	92	94	B/C
		Sg. Jertih	4TBST001	80	85	84	88	92	B/C
	Sg. Chukai	Sg. Bungkus	4TCKI006	75	80	82	80	83	B/C
		Sg. Chukai	4TCKI003	82	79	80	80	87	B/C
		Sg. Ibok	4TCKI001	79	80	79	81	87	B/C
		Sg. Ibok	4TCKI002	81	84	86	91	91	B/C
		Sg. Ruang	4TCKI004	79	76	74	74	80	ST/SP
		Sg. Ruang	4TCKI005	74	74	73	65	80	ST/SP
	Sg. Dungun	Sg. Dungun	4TDGN002	83	88	90	92	96	B/C
		Sg. Dungun	4TDGN003	89	90	88	91	95	B/C
		Sg. Dungun	4TDGN004	82	88	88	90	94	B/C
		Sg. Dungun	4TDGN005	80	91	90	90	94	B/C
		Sg. Dungun	4TDGN006	83	90	85	91	94	B/C
		Sg. Telemboh	4TDGN001	77	83	86	86	89	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Terengganu	Sg. Ibai	Sg. Ibai	4TIBI001	71	72	77	81	75	ST/SP
		Sg. Ibai	4TIBI002	70	76	81	79	84	B/C
		Sg. Ibai	4TIBI003	75	81	79	85	82	B/C
	Sg. Kemaman	Sg. Cherul	4TKMM003	82	87	84	90	92	B/C
		Sg. Cherul	4TKMM004	81	85	85	91	91	B/C
		Sg. Cherul	4TKMM010	80	87	81	89	90	B/C
		Sg. Kemaman	4TKMM007	87	90	90	92	95	B/C
		Sg. Kemaman	4TKMM008	74	83	85	87	94	B/C
		Sg. Kemaman	4TKMM009	82	81	82	86	90	B/C
		Sg. Neram	4TKMM005	73	73	31	75	86	B/C
		Sg. Perasing	4TKMM006	85	85	82	82	92	B/C
		Sg. Ransan	4TKMM001	74	70	64	65	78	ST/SP
		Sg. Ransan	4TKMM002	84	88	87	91	95	B/C
	Sg. Kertih	Sg. Kertih	4TKTH001	80	84	84	82	88	B/C
		Sg. Kertih	4TKTH002	80	85	83	87	83	B/C
	Sg. Kluang	Sg. Kluang	4TKLU005	74	82	83	88	84	B/C
	Sg. Marang	Sg. Kerak	4TMRG001	45	70	81	79	82	B/C
		Sg. Marang	4TMRG002	78	85	83	88	89	B/C
		Sg. Temala	4TMRG003	85	85	87	91	92	B/C
	Sg. Merang	Sg. Merang	4TMER001	62	81	77	82	77	ST/SP
	Sg. Merchang	Sg. Landas	4TMCA001	78	69	65	71	87	B/C
		Sg. Merchang	4TMCA002	69	70	72	71	80	ST/SP
	Sg. Paka	Sg. Besul	4TPKA001	80	87	86	92	96	B/C
		Sg. Paka	4TPKA005	80	84	84	87	88	B/C
		Sg. Paka	4TPKA006	83	85	84	88	92	B/C
		Sg. Paka	4TPKA007	76	89	87	88	90	B/C
		Sg. Rasau	4TPKA003	83	83	79	83	85	B/C
		Sg. Rasau	4TPKA004	76	75	79	77	83	B/C
		Sg. Rengat	4TPKA002	88	87	85	84	91	B/C
	Sg. Setiu	Sg. Bari	4TSTU002	86	90	91	92	95	B/C
		Sg. Chalok	4TSTU001	87	90	86	85	94	B/C
		Sg. Chalok	4TSTU005	89	89	89	90	92	B/C
		Sg. Chalok	4TSTU006	75	82	84	83	83	B/C
		Sg. Setiu	4TSTU004	79	86	84	87	93	B/C
		Sg. Setiu	4TSTU007	83	90	86	90	94	B/C
		Sg. Tarom	4TSTU003	85	89	88	89	94	B/C
	Sg. Terengganu	Sg. Berang	4TTGG002	83	88	91	89	92	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Terengganu	Sg. Terengganu	Sg. Berang	4TTGG011	87	92	90	92	97	B/C
		Sg. Nerus	4TTGG004	86	88	84	85	91	B/C
		Sg. Nerus	4TTGG005	84	89	91	92	95	B/C
		Sg. Nerus	4TTGG006	83	89	91	89	93	B/C
		Sg. Nerus	4TTGG010	63	68	60	66	68	ST/SP
		Sg. Nerus	4TTGG014	88	85	87	90	94	B/C
		Sg. Nerus	4TTGG015	83	88	90	91	94	B/C
		Sg. Pueh	4TTGG007	88	63	65	70	82	B/C
		Sg. Pueh	4TTGG008	86	75	72	77	89	B/C
		Sg. Telemong	4TTGG012	87	84	89	88	93	B/C
		Sg. Terengganu	4TTGG001	80	85	86	87	91	B/C
		Sg. Terengganu	4TTGG003	84	90	91	90	95	B/C
		Sg. Terengganu	4TTGG009	85	84	87	87	88	B/C
		Sg. Terengganu	4TTGG013	81	88	89	89	92	B/C
Kelantan	Sg. Golok	Sg. Golok	4DGLK002	87	83	87	86	93	B/C
		Sg. Golok	4DGLK003	90	90	90	94	97	B/C
		Sg. Golok	4DGLK004	90	86	82	87	93	B/C
		Sg. Golok	4DGLK005	87	80	86	89	93	B/C
		Sg. Golok	4DGLK006	87	83	84	86	91	B/C
		Sg. Jedok	4DGLK008	92	86	88	90	95	B/C
		Sg. Lanas	4DGLK007	91	85	86	84	94	B/C
		Sg. Tasik Garu	4DGLK001	85	78	76	80	85	B/C
	Sg. Kelantan	Sg. Aring	4DKLT013	80	76	76	79	80	ST/SP
		Sg. Belatop	4DKLT020	83	79	80	83	89	B/C
		Sg. Belatop	4DKLT021	89	86	86	87	96	B/C
		Sg. Belatop	4DKLT046	77	77	74	78	82	B/C
		Sg. Ber	4DKLT018	79	79	84	87	91	B/C
		Sg. Berok	4DKLT016	87	75	79	81	83	B/C
		Sg. Berok	4DKLT019	83	80	82	88	90	B/C
		Sg. Berok	4DKLT022	84	79	81	81	84	B/C
		Sg. Betis	4DKLT017	87	83	84	86	93	B/C
		Sg. Chiku	4DKLT037	83	84	83	88	88	B/C
		Sg. Chiku	4DKLT043	88	86	87	89	90	B/C
		Sg. Galas	4DKLT014	80	84	83	89	89	B/C
		Sg. Galas	4DKLT031	85	88	86	89	90	B/C
		Sg. Galas	4DKLT032	80	85	87	87	92	B/C
		Sg. Galas	4DKLT033	82	83	79	84	81	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kelantan	Sg. Kelantan	Sg. Galas	4DKLT034	79	82	81	82	79	ST/SP
		Sg. Isos	4DKLT049	71	68	73	73	73	ST/SP
		Sg. Kelantan	4DKLT001	78	79	82	82	83	B/C
		Sg. Kelantan	4DKLT006	77	81	78	78	87	B/C
		Sg. Kelantan	4DKLT010	77	82	81	84	83	B/C
		Sg. Kelantan	4DKLT045	73	81	78	80	84	B/C
		Sg. Kelantan	4DKLT054	87	84	87	88	89	B/C
		Sg. Kelantan	4DKLT055	90	85	85	85	93	B/C
		Sg. Kelantan	4DKLT056	81	79	78	81	83	B/C
		Sg. Kelesa	4DKLT015	80	80	84	87	94	B/C
		Sg. Kenkren	4DKLT047	87	89	88	92	93	B/C
		Sg. Kerilla	4DKLT002	88	89	87	92	94	B/C
		Sg. Kerilla	4DKLT003	88	89	90	91	94	B/C
		Sg. Ketil	4DKLT036	89	86	86	90	97	B/C
		Sg. Ketil	4DKLT053	89	86	84	90	96	B/C
		Sg. Lebir	4DKLT026	86	85	89	92	94	B/C
		Sg. Lebir	4DKLT027	84	80	78	85	87	B/C
		Sg. Lebir	4DKLT028	88	84	85	88	94	B/C
		Sg. Lebir	4DKLT029	84	82	82	84	87	B/C
		Sg. Lebir	4DKLT058	85	88	85	88	95	B/C
		Sg. Muring	4DKLT059	88	88	84	85	92	B/C
		Sg. Nal	4DKLT007	87	87	89	89	93	B/C
		Sg. Nal	4DKLT008	84	81	85	88	91	B/C
		Sg. Nal	4DKLT009	84	83	85	87	91	B/C
		Sg. Nenggiri	4DKLT023	87	77	82	82	83	B/C
		Sg. Nenggiri	4DKLT024	79	80	80	83	86	B/C
		Sg. Nenggiri	4DKLT025	82	79	80	80	78	ST/SP
		Sg. Pehi	4DKLT011	79	89	87	88	92	B/C
		Sg. Pehi	4DKLT044	86	84	88	86	90	B/C
		Sg. Pelaur	4DKLT048	91	90	88	90	96	B/C
		Sg. Penangau	4DKLT050	87	81	82	78	87	B/C
		Sg. Pergau	4DKLT004	89	91	93	91	96	B/C
		Sg. Pergau	4DKLT005	87	90	89	90	95	B/C
		Sg. Pergau	4DKLT038	90	89	92	94	96	B/C
		Sg. Pergau	4DKLT039	89	91	92	94	97	B/C
		Sg. Pergau	4DKLT040	89	92	93	94	97	B/C
		Sg. Pergau	4DKLT041	86	86	87	90	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kelantan	Sg. Kelantan	Sg. Pergau	4DKLT051	86	92	92	91	96	B/C
		Sg. Pergau	4DKLT052	88	90	88	92	94	B/C
		Sg. Rasau	4DKLT061	74	78	81	80	80	ST/SP
		Sg. Relai	4DKLT012	84	80	83	90	91	B/C
		Sg. Relai	4DKLT030	85	86	86	88	91	B/C
		Sg. Sokor	4DKLT042	86	87	83	86	89	B/C
		Sg. Tuang	4DKLT035	86	89	87	90	94	B/C
	Sg. Kemasin	Sg. Gali	4DKMS006	71	76	76	79	75	ST/SP
		Sg. Kemasin	4DKMS001	82	83	83	84	90	B/C
		Sg. Kemasin	4DKMS003	70	77	73	75	76	ST/SP
		Sg. Semerak	4DKMS002	82	86	84	85	91	B/C
		Sg. Semerak	4DKMS004	85	88	83	86	89	B/C
		Sg. Semerak	4DKMS005	84	85	88	80	77	ST/SP
	Sg. Pengkalan Chepa	Sg. Alor B	4DPCH003	63	57	48	65	63	ST/SP
		Sg. Alor Lintah	4DPCH004	65	62	61	76	68	ST/SP
		Sg. Keladi	4DPCH002	77	79	78	76	84	B/C
		Sg. Pengkalan Chepa	4DPCH005	56	62	50	68	70	ST/SP
		Sg. Pengkalan Chepa	4DPCH006	71	71	69	75	82	B/C
		Sg. Raja Gali	4DPCH001	78	72	73	79	87	B/C
	Sg. Pengkalan Datu	Sg. Pasir Hor	4DPDT004	78	78	67	73	77	ST/SP
		Sg. Pengkalan Datu	4DPDT001	79	75	76	83	86	B/C
		Sg. Pengkalan Datu	4DPDT002	71	80	73	83	87	B/C
		Sg. Pengkalan Datu	4DPDT003	77	80	77	86	86	B/C
Sarawak	Sg. Balingian	Sg. Balingian	6QBLG001	68	75	83	90	87	B/C
		Sg. Balingian	6QBLG002	89	88	88	88	86	B/C
	Sg. Baram	Sg. Baram	6QBRM001	78	83	86	79	81	B/C
		Sg. Baram	6QBRM002	78	80	85	81	83	B/C
		Sg. Baram	6QBRM003	87	86	90	89	89	B/C
		Sg. Baram	6QBRM004	86	85	92	90	88	B/C
		Sg. Tutuh	6QBRM005	86	85	92	90	-	-
	Sg. Kayan	Sg. Kayan	6QKYN001	70	75	77	77	76	ST/SP
		Sg. Kayan	6QKYN002	78	76	79	82	83	B/C
		Sg. Kayan	6QKYN003	86	87	85	87	88	B/C
	Sg. Kemena	Sg. Kemena	6QKMN001	76	83	82	82	82	B/C
		Sg. Kemena	6QKMN002	81	83	84	89	83	B/C
		Sg. Kemena	6QKMN003	80	89	86	81	80	ST/SP

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Sg. Kemena	Sg. Kemena	6QKMN004	84	88	89	91	83	B/C
		Sg. Sibiu	6QKMN005	75	87	83	81	79	ST/SP
	Sg. Kerian	Sg. Kerian	6QKRN014	73	77	80	82	81	B/C
		Sg. Kerian	6QKRN015	87	89	86	89	84	B/C
		Sg. Seblak	6QKRN016	80	85	82	84	88	B/C
		Sg. Selalang	6QKRN017	90	93	91	92	92	B/C
	Sg. Lawas	Sg. Lawas	6QLWS001	89	88	91	89	87	B/C
		Sg. Lawas	6QLWS002	85	86	90	87	88	B/C
		Sg. Lawas	6QLWS003	87	86	91	89	90	B/C
	Sg. Limbang	Sg. Limbang	6QLBG001	84	84	90	88	86	B/C
		Sg. Limbang	6QLBG002	83	84	91	87	86	B/C
		Sg. Limbang	6QLBG003	87	87	91	88	90	B/C
		Sg. Limbang	6QLBG004	88	88	92	90	91	B/C
		Sg. Limbang	6QLBG005	90	90	92	92	88	B/C
	Sg. Lupar	Sg. Ai	6QLPR001	88	91	92	89	91	B/C
		Sg. Ai	6QLPR002	90	92	92	91	91	B/C
		Sg. Lupar	6QLPR003	59	82	81	77	83	B/C
		Sg. Lupar	6QLPR004	65	80	81	82	85	B/C
		Sg. Lupar	6QLPR005	89	90	91	89	85	B/C
		Sg. Sekerang	6QLPR006	83	90	91	92	88	B/C
		Sg. Seterap	6QLPR007	79	86	86	82	86	B/C
		Sg. Undup	6QLPR008	88	91	88	91	85	B/C
	Sg. Miri	Sg. Adong	6QMRI001	52	54	70	83	78	ST/SP
		Sg. Dalam	6QMRI002	71	71	74	84	83	B/C
		Sg. Lutong	6QMRI003	67	72	86	80	82	B/C
		Sg. Lutong	6QMRI004	62	72	86	77	80	ST/SP
		Sg. Miri	6QMRI005	59	56	75	87	88	B/C
		Sg. Miri	6QMRI006	52	60	76	88	88	B/C
		Sg. Padang Liku	6QMRI007	80	80	90	89	88	B/C
	Sg. Mukah	Sg. Mukah	6QMKH001	74	78	81	85	80	ST/SP
		Sg. Mukah	6QMKH002	60	71	83	89	82	B/C
		Sg. Mukah	6QMKH003	70	77	85	89	81	B/C
		Sg. Mukah	6QMKH004	85	87	88	89	87	B/C
		Sg. Mukah	6QMKH005	82	85	83	89	84	B/C
	Sg. Niah	Sg. Niah	6QNIA001	83	89	90	86	87	B/C
		Sg. Niah	6QNIA002	78	88	90	86	86	B/C
		Sg. Sekaloh	6QNIA003	73	71	69	68	64	ST/SP
		Sg. Sekaloh	6QNIA004	77	85	83	87	86	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Sg. Oya	Sg. Oya	6QOYA001	68	81	82	79	76	ST/SP
		Sg. Oya	6QOYA002	68	72	84	89	81	B/C
		Sg. Oya	6QOYA003	84	86	91	89	89	B/C
	Sg. Rajang	Sg. Baloi	6QRJG019	81	84	89	89	-	-
		Sg. Binatang	6QRJG004	86	89	89	89	89	B/C
		Sg. Daro	6QRJG021	51	63	76	80	62	ST/SP
		Sg. Jemoreng	6QRJG022	55	61	78	80	63	ST/SP
		Sg. Julau	6QRJG005	89	91	90	88	86	B/C
		Sg. Kanowit	6QRJG006	86	87	88	89	87	B/C
		Sg. Meradong	6QRJG003	73	84	86	80	82	B/C
		Sg. Pakan	6QRJG020	85	91	89	88	89	B/C
		Sg. Pila Parit	6QRJG023	63	69	81	62	77	ST/SP
		Sg. Rajang	6QRJG008	69	86	82	83	86	B/C
		Sg. Rajang	6QRJG009	71	86	80	84	86	B/C
		Sg. Rajang	6QRJG010	70	86	85	82	86	B/C
		Sg. Rajang	6QRJG011	77	84	86	80	85	B/C
		Sg. Rajang	6QRJG012	62	73	78	85	84	B/C
		Sg. Rajang	6QRJG013	81	85	85	87	86	B/C
		Sg. Rajang	6QRJG014	82	84	85	85	84	B/C
		Sg. Rajang	6QRJG015	80	85	88	85	83	B/C
		Sg. Rajang	6QRJG016	83	83	88	85	86	B/C
		Sg. Rajang	6QRJG017	84	85	88	90	86	B/C
		Sg. Rajang	6QRJG018	84	86	87	90	84	B/C
		Sg. Salim	6QRJG007	62	77	80	83	81	B/C
		Sg. Sarikei	6QRJG001	65	84	83	80	86	B/C
		Sg. Sarikei	6QRJG002	82	88	90	89	90	B/C
	Sg. Sadong	Sg. Karangan	6QSDG001	71	66	71	68	69	ST/SP
		Sg. Karangan	6QSDG002	66	81	83	87	87	B/C
		Sg. Sadong	6QSDG003	67	75	75	73	81	B/C
		Sg. Sadong	6QSDG004	87	65	71	72	66	ST/SP
		Sg. Sadong	6QSDG005	87	90	87	88	90	B/C
		Sg. Sadong	6QSDG006	60	91	89	90	91	B/C
		Sg. Tarat	6QSDG007	91	92	90	91	90	B/C
	Sg. Sarawak	Sg. Kelantan	6QSWK017	84	86	84	74	59	T/P
		Sg. Kuap	6QSWK009	77	84	83	79	88	B/C
		Sg. Kuap	6QSWK010	80	89	87	87	88	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Sg. Sarawak	Sg. Maong Kiri	6QSWK011	65	68	76	72	73	ST/SP
		Sg. Samarahan	6QSWK013	75	66	68	65	63	ST/SP
		Sg. Samarahan	6QSWK014	86	83	79	80	85	B/C
		Sg. Sarawak	6QSWK001	83	85	83	81	84	B/C
		Sg. Sarawak	6QSWK003	83	86	85	83	85	B/C
		Sg. Sarawak	6QSWK004	86	91	86	88	87	B/C
		Sg. Sarawak	6QSWK006	83	85	82	84	80	ST/SP
		Sg. Sarawak	6QSWK007	88	92	89	90	88	B/C
		Sg. Sarawak	6QSWK008	89	91	90	91	89	B/C
		Sg. Sarawak Kanan	6QSWK002	87	86	85	82	84	B/C
		Sg. Sarawak Kiri	6QSWK005	88	92	87	88	87	B/C
		Sg. Semadang	6QSWK016	90	93	90	89	90	B/C
		Sg. Semenggoh	6QSWK012	78	67	77	71	78	ST/SP
		Sg. Tabuan	6QSWK015	72	80	73	77	76	ST/SP
		Sg. Tapah	6QSWK018	89	89	89	89	91	B/C
	Sg. Saribas	Sg. Layar	6QSRB002	86	79	86	85	88	B/C
		Sg. Layar	6QSRB003	69	91	90	87	90	B/C
		Sg. Saribas	6QSRB001	67	78	80	74	79	ST/SP
	Sg. Semunsam	Sg. Semunsam	6QSMS001	86	89	85	87	80	ST/SP
	Sg. Sibuti	Sg. Kabuloh	6QSBT001	51	56	64	76	61	ST/SP
		Sg. Kabuloh	6QSBT002	84	88	72	69	64	ST/SP
		Sg. Kejapil	6QSBT003	81	85	90	88	89	B/C
		Sg. Satap	6QSBT004	72	79	86	88	84	B/C
		Sg. Sibuti	6QSBT005	83	82	88	82	84	B/C
		Sg. Sibuti	6QSBT006	79	85	86	87	88	B/C
	Sg. Similajau	Sg. Similajau	6QSML001	83	90	89	90	86	B/C
		Sg. Similajau	6QSML002	86	88	88	89	84	B/C
	Sg. Suai	Sg. Suai	6QSUA001	76	84	89	88	87	B/C
	Sg. Tatau	Sg. Tatau	6QTTU001	82	86	87	88	85	B/C
	Sg. Trusan	Sg. Trusan	6QTSN001	88	90	92	88	88	B/C
Sabah	Sg. Apas	Sg. Apas	5SAPS001	78	89	91	89	90	B/C
	Sg. Balung	Sg. Balung	5SBLU001	88	89	93	87	91	B/C
	Sg. Bengkoka	Sg. Bengkoka	5SBKK001	91	88	88	90	91	B/C
		Sg. Bengkoka	5SBKK002	90	87	85	86	86	B/C
	Sg. Bingkongan	Sg. Bandau	5SBKG001	94	91	90	91	92	B/C
		Sg. Bingkongan	5SBKG005	93	92	92	92	94	B/C
		Sg. Bingkongan	5SBKG006	92	92	93	91	94	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Sg. Bingkongan	Sg. Menggaris	5SBKG002	92	93	91	93	93	B/C
		Sg. Menggaris	5SBKG003	92	91	92	92	92	B/C
		Sg. Tandek	5SBKG004	92	90	90	91	91	B/C
	Sg. Bongawan	Sg. Bongawan	5SBGW001	88	90	88	87	87	B/C
	Sg. Brantian	Sg. Brantian	5SBTN001	88	86	91	86	84	B/C
	Sg. Kalabakan	Sg. Kalabakan	5SKBK001	83	86	89	85	85	B/C
		Sg. Kalabakan	5SKBK002	83	85	85	84	84	B/C
		Sg. Kalabakan	5SKBK003	86	84	85	82	83	B/C
	Sg. Kalumpang	Sg. Kalumpang	5SKLP001	77	85	90	86	86	B/C
		Sg. Kalumpang	5SKLP002	79	84	92	86	90	B/C
		Sg. Kalumpang	5SKLP003	88	86	87	84	85	B/C
		Sg. Pang Burong 1	5SKLP004	86	87	89	83	86	B/C
		Sg. Pang Burong 2	5SKLP005	87	74	76	69	85	B/C
	Sg. Kedamaian	Sg. Kedamaian	5SKDI004	91	92	93	90	93	B/C
		Sg. Tempasuk	5SKDI001	88	91	91	87	93	B/C
		Sg. Tempasuk	5SKDI002	90	92	93	91	92	B/C
		Sg. Wariu	5SKDI003	89	92	91	91	93	B/C
	Sg. Kimanis	Sg. Kimanis	5SKMA001	85	92	89	87	90	B/C
	Sg. Kinabatangan	Sg. Karamuak	5SKBT006	93	91	92	91	92	B/C
		Sg. Kinabatangan	5SKBT001	87	83	87	85	86	B/C
		Sg. Kinabatangan	5SKBT002	80	82	88	82	84	B/C
		Sg. Kinabatangan	5SKBT004	84	83	88	84	87	B/C
		Sg. Kinabatangan	5SKBT005	81	84	90	86	85	B/C
		Sg. Koyah	5SKBT003	87	85	88	87	89	B/C
		Sg. Leepang	5SKBT009	81	84	88	84	85	B/C
		Sg. Menanggul	5SKBT008	77	86	87	81	86	B/C
		Sg. Pin	5SKBT010	79	86	85	86	87	B/C
		Sg. Takala	5SKBT007	81	86	88	85	88	B/C
	Sg. Labok	Sg. Kinipir	5SLBK001	90	90	91	90	91	B/C
		Sg. Kinipir	5SLBK002	88	92	91	86	91	B/C
		Sg. Labok	5SLBK006	87	90	89	87	86	B/C
		Sg. Liwagu	5SLBK003	87	92	91	88	89	B/C
		Sg. Liwagu	5SLBK004	90	90	91	88	88	B/C
		Sg. Maliau	5SLBK005	92	91	93	92	94	B/C
		Sg. Tungud	5SLBK007	90	91	90	88	91	B/C
	Sg. Lakutan	Sg. Lakutan	5SLKT001	90	91	90	89	93	B/C
	Sg. Likas	Sg. Darau	5SLKS008	78	85	76	80	83	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

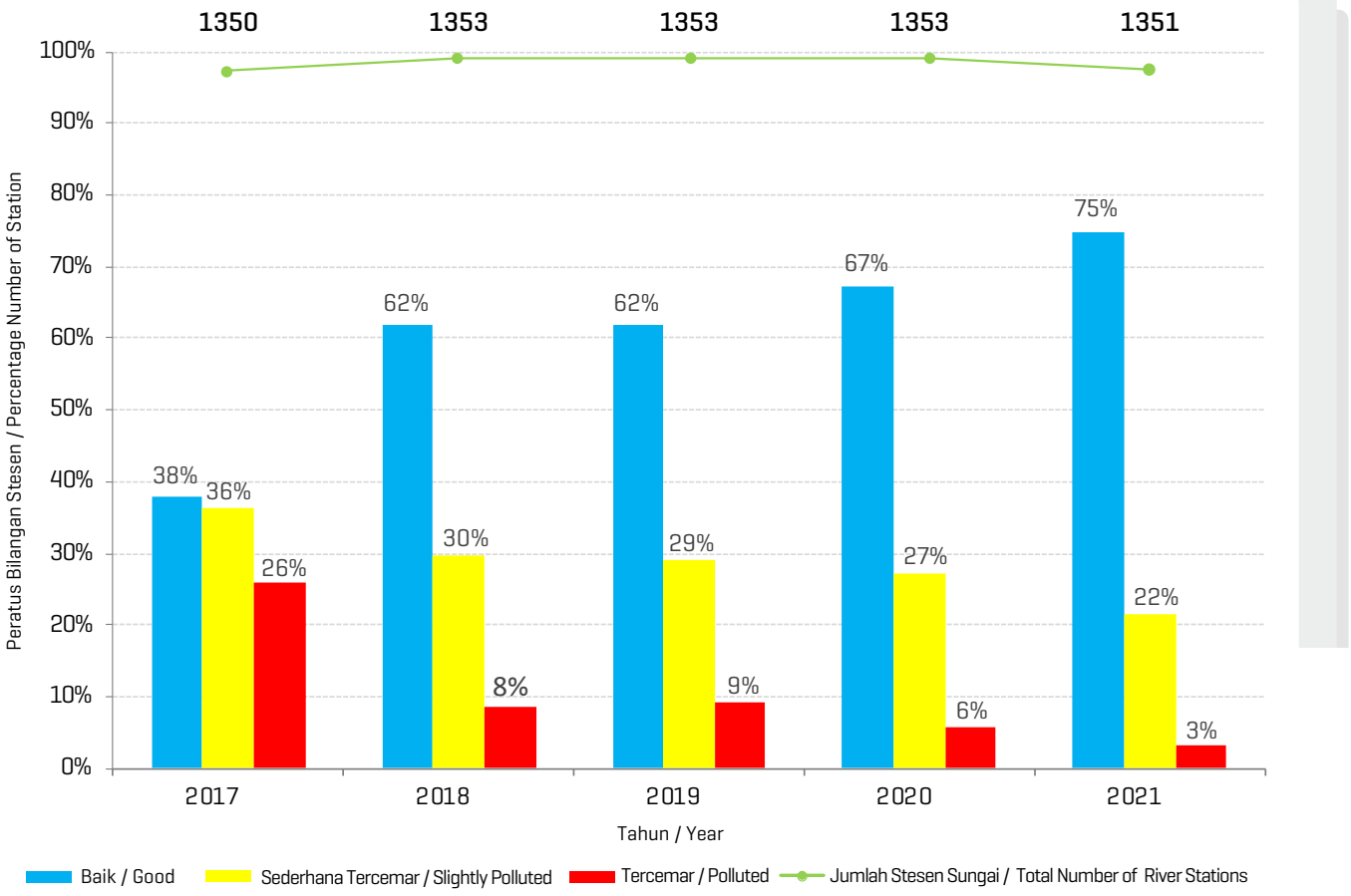
Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Sg. Likas	Sg. Inanam	5SLKS001	85	83	77	79	81	B/C
		Sg. Inanam	5SLKS002	78	85	82	84	87	B/C
		Sg. Inanam	5SLKS003	92	92	93	92	93	B/C
		Sg. Likas	5SLKS004	81	75	70	77	73	ST/SP
		Sg. Likas	5SLKS005	76	77	85	78	77	ST/SP
		Sg. Menggatal	5SLKS006	89	86	85	81	87	B/C
		Sg. Menggatal	5SLKS007	89	93	91	87	91	B/C
	Sg. Lingkungan	Sg. Bukau	5SLKG002	92	91	90	88	92	B/C
		Sg. Lingkungan	5SLKG001	93	92	89	91	93	B/C
	Sg. Membakut	Sg. Membakut	5SMBT001	83	90	87	85	87	B/C
	Sg. Menggalong	Sg. Menggalong	5SMGL001	89	86	86	86	91	B/C
		Sg. Menggalong	5SMGL002	90	91	93	92	93	B/C
	Sg. Merotai	Sg. Merotai	5SMRT001	87	91	87	88	90	B/C
		Sg. Merotai	5SMRT002	92	91	89	92	94	B/C
		Sg. Merotai	5SMRT003	89	89	84	87	90	B/C
	Sg. Mounad	Sg. Mounad	5SMND001	85	87	86	85	89	B/C
		Sg. Mounad	5SMND002	86	87	88	86	86	B/C
	Sg. Moyog	Sg. Moyog	5SMYG001	92	91	90	86	88	B/C
		Sg. Moyog	5SMYG002	92	92	92	89	92	B/C
		Sg. Moyog	5SMYG003	91	93	92	92	94	B/C
		Sg. Moyog	5SMYG004	91	92	93	92	94	B/C
	Sg. Padas	Sg. Bunsit	5SPDS001	94	91	92	91	93	B/C
		Sg. Liawan	5SPDS002	92	92	91	91	91	B/C
		Sg. Padas	5SPDS003	89	89	86	86	87	B/C
		Sg. Padas	5SPDS004	86	89	88	88	90	B/C
		Sg. Padas	5SPDS005	88	87	89	86	88	B/C
		Sg. Padas	5SPDS011	86	88	86	85	88	B/C
		Sg. Pangatan	5SPDS006	85	88	86	87	88	B/C
		Sg. Pegalan	5SPDS008	88	89	90	89	91	B/C
		Sg. Pegalan	5SPDS009	90	90	88	87	86	B/C
		Sg. Pegalan	5SPDS010	84	89	86	86	87	B/C
		Sg. Tandulu	5SPDS007	92	92	90	91	92	B/C
	Sg. Paitan	Sg. Paitan	5SPTN001	91	88	88	85	91	B/C
	Sg. Papar	Sg. Papar	5SPPR001	91	92	91	89	91	B/C
		Sg. Papar	5SPPR002	91	89	91	90	91	B/C
		Sg. Papar	5SPPR003	88	91	91	89	90	B/C
		Sg. Papar	5SPPR004	92	92	92	90	91	B/C

Jadual 2.1 : Status Kualiti Air Sungai mengikut Stesen, 2021

Table 2.1 : Water Quality Status by Stations, 2021

NEGERI/ STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	NILAI IKA/ WQI VALUE					KATEGORI IKA (2021)/ WQI CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Sg. Papar	Sg. Papar	5SPPR005	92	93	93	92	91	B/C
	Sg. Sapi	Sg. Sapi	5SSAP002	84	84	87	85	85	B/C
		Sg. Sapi	5SSAP003	84	84	86	86	86	B/C
		Sg. Sapi	5SSAP004	86	88	89	87	88	B/C
		Sg. Sualong	5SSAP001	94	89	91	92	92	B/C
	Sg. Segaliud	Sg. Segaliud	5SSLD001	82	82	87	86	85	B/C
		Sg. Segaliud	5SSLD002	80	82	87	87	86	B/C
	Sg. Segama	Sg. Segama	5SSGM001	86	86	91	86	87	B/C
		Sg. Segama	5SSGM002	85	84	91	85	88	B/C
		Sg. Segama	5SSGM003	78	86	91	85	88	B/C
	Sg. Sembulan	Sg. Sembulan	5SSBL001	69	73	81	84	81	B/C
		Sg. Sembulan	5SSBL002	78	74	73	74	80	ST/SP
	Sg. Silabukan	Sg. Silabukan	5SSBK001	85	87	89	86	87	B/C
		Sg. Silabukan	5SSBK002	87	91	90	89	91	B/C
	Sg. Sugut	Sg. Bongkud	5SSUG001	93	91	92	91	92	B/C
		Sg. Lohan	5SSUG002	92	91	92	91	92	B/C
		Sg. Merali	5SSUG003	92	88	92	88	91	B/C
		Sg. Sugut	5SSUG004	92	89	91	91	91	B/C
		Sg. Sugut	5SSUG005	87	91	91	88	92	B/C
		Sg. Sugut	5SSUG006	92	91	90	85	89	B/C
	Sg. Tawau	Sg. Tawau	5STWU001	82	78	83	77	83	B/C
		Sg. Tawau	5STWU002	86	87	85	83	88	B/C
		Sg. Tawau	5STWU003	90	91	92	91	93	B/C
		Sg. Tawau	5STWU004	92	93	92	91	93	B/C
	Sg. Telipok	Sg. Telipok	5STLP001	72	71	66	70	70	ST/SP
		Sg. Telipok	5STLP002	89	88	88	90	90	B/C
	Sg. Tenghilan	Sg. Tenghilan	5STHL001	93	92	91	92	92	B/C
	Sg. Tingkayu	Sg. Tingkayu	5STKY001	84	85	89	84	85	B/C
		Sg. Tingkayu	5STKY002	80	84	89	86	86	B/C
	Sg. Tuaran	Sg. Damit	5STUA001	87	87	88	89	87	B/C
		Sg. Damit	5STUA002	90	89	89	87	87	B/C
		Sg. Song Sai	5STUA003	91	90	91	90	92	B/C
		Sg. Tuaran	5STUA004	92	93	92	92	93	B/C
		Sg. Tuaran	5STUA005	91	94	93	92	93	B/C
	Sg. Tungku	Sg. Tungku	5STKU001	91	89	87	89	90	B/C
		Sg. Tungku	5STKU002	92	89	90	90	89	B/C
	Sg. Umas-Umas	Sg. Umas-Umas	5SUSM001	87	81	90	83	84	B/C



Rajah 2.2 : Tren Stesen Kualiti Air Sungai, 2017 – 2021
Figure 2.2 : River Water Quality Stations Trend, 2017 – 2021

Ulu Yam, Hulu Selangor

STESEN PENGAWASAN KUALITI AIR SUNGAI KATEGORI TERCEMAR

Jadual 2.2 menunjukkan sebanyak 46 stesen pengawasan kualiti air sungai tercemar pada tahun 2021. Dari segi IKA, 32 dalam Kelas III, 12 Kelas IV dan dua (2) adalah Kelas V.

Berdasarkan sub-indeks BOD, empat (4) stesen sungai dikategorikan sebagai Kelas II, enam (6) Kelas III, 16 Kelas IV, manakala 20 Kelas V.

Dari segi sub-indeks AN pula, dua (2) stesen sungai dikategorikan sebagai Kelas I, empat (4) Kelas II, dua (2) Kelas III, tiga (3) Kelas IV, manakala 35 Kelas V.

Dari segi sub-indeks SS, 41 stesen sungai dikategorikan sebagai Kelas I, 21 Kelas II, lima (5) Kelas III dan satu (1) Kelas IV.

Kesimpulannya, daripada 46 stesen sungai yang tercemar ini, penyumbang terbesar kemerosotan stesen pengawasan kualiti air sungai kepada Kelas V adalah berpunca daripada parameter AN iaitu sebanyak 76% dan diikuti parameter BOD iaitu sebanyak 43%.

WATER QUALITY MONITORING STATIONS CATEGORIZED AS POLLUTED

Table 2.2 shows a total of 46 river water quality monitoring stations categorized as polluted in 2021. In terms of WQI, 32 stations in Class III, 12 in Class IV and two (2) in Class V.

Based on the BOD sub-index, four (4) river stations are classified as Class II, six (6) in Class III, 16 in Class IV, while 20 in Class V.

In terms of AN sub-index, two (2) river stations are classified as Class I, four (4) in Class II, two (2) in Class III, three (3) in Class IV, while 35 in Class V.

In terms of SS sub-index, 41 river stations are classified as Class I, 21 in Class II, five (5) in Class III and one (1) in Class IV.

In conclusion, of the 46 polluted river stations, the largest contributor to the deterioration of river water quality monitoring stations to Class V is due to the parameter AN of 76% and followed by the BOD of 43%.

Tasik Kenyir, Terengganu

Jadual 2.2 : Stesen Sungai Tercemar dan Kelas Kualiti Air Berdasarkan Sub-Indeks BOD, AN dan SS, 2021

Table 2.2 : Polluted River Stations and Classes Based on BOD, AN and SS Sub-Index, 2021

NEGERI / STATE	LEMBANGAN / BASIN	SUNGAI / RIVER	NOMBOR STESEN / STATION NUMBER	2021			KELAS BERDASARKAN / CLASS BASED ON		
				IKA / WQI	KATEGORI / CATEGORY	KELAS / CLASS	BOD	AN	SS
Pulau Pinang	Sg. Jawi	Sg. Chempedak	1PJWI003	41	T/P	IV	V	V	III
		Sg. Jawi	1PJWI001	52	T/P	III	IV	V	II
		Sg. Junjong	1PJWI004	52	T/P	III	IV	V	II
		Sg. Tengah	1PJWI005	58	T/P	III	IV	V	II
	Sg. Juru	Sg. Rambai	1PJRU005	57	T/P	III	IV	V	I
	Sg. Perai	Sg. Air Melintas	1PPRI007	57	T/P	III	IV	V	II
		Sg. Kereh	1PPRI006	59	T/P	III	IV	V	II
Perak	Sg. Raja Hitam	Sg. Raja Hitam	1ARHT008	39	T/P	IV	V	V	II
Selangor	Sg. Buloh	Sg. Buloh	2BBLH003	47	T/P	IV	V	IV	II
		Sg. Buloh	2BBLH004	43	T/P	IV	V	IV	II
		Sg. Buloh	2BBLH006	55	T/P	III	IV	V	II
	Sg. Klang	Sg. Kerayong	2BKLG013	55	T/P	III	V	V	I
		Sg. Klang	2BKLG050	56	T/P	III	IV	V	II
	Sg. Sepang	Sg. Rambai	2BSPG004	25	T/P	V	V	V	III
W.P. Kuala Lumpur	Sg. Klang	Sg. Air Busuk	2WKLG041	40	T/P	IV	V	V	II
		Sg. Batu	2WKLG028	58	T/P	III	IV	V	II
		Sg. Jinjang	2WKLG045	59	T/P	III	IV	V	II
N. Sembilan	Sg. Langat	Sg. Pajam	3NLGT021	56	T/P	III	V	V	II
Melaka	Sg. Duyong	Sg. Punggur	3MPGR002	58	T/P	III	III	V	I
	Sg. Kesang	Sg. Chin-Chin	3MKSG006	53	T/P	III	V	IV	II
	Sg. Melaka	Sg. Rembia	3MMLK036	54	T/P	III	IV	V	I
	Sg. Merlimau	Sg. Merlimau	3MMLU001	55	T/P	III	IV	V	I
		Sg. Merlimau	3MMLU002	56	T/P	III	III	V	I
		Sg. Merlimau	3MMLU003	58	T/P	III	IV	III	I
		Sg. Merlimau	3MMLU004	58	T/P	III	III	V	I
Johor	Sg. Air Baloi	Sg. Air Baloi	3JABL001	56	T/P	III	II	II	III
		Sg. Air Baloi	3JABL002	52	T/P	III	II	I	I
		Sg. Air Baloi	3JABL003	57	T/P	III	III	II	II
	Sg. Batu Pahat	Sg. Temehel	3JBPT024	54	T/P	III	IV	V	I
	Sg. Benut	Sg. Pinggan	3JBNT007	59	T/P	III	II	II	III
	Sg. Danga	Sg. Danga	3JDGA002	59	T/P	III	III	V	II

Jadual 2.2 : Stesen Sungai Tercemar dan Kelas Kualiti Air Berdasarkan Sub-Indeks BOD, AN dan SS, 2021

Table 2.2 : Polluted River Stations and Classes Based on BOD, AN and SS Sub-Index, 2021

NEGERI / STATE	LEMBANGAN/ BASIN	SUNGAI/ RIVER	NOMBOR STESEN/ STATION NUMBER	2021			KELAS BERDASARKAN/ CLASS BASED ON		
				IKA/ WQI	KATEGORI / CATEGORY	KELAS/ CLASS	BOD	AN	SS
Johor	Sg. Kaw. Pasir Gudang	Sg. Buluh	3JPGD 002	43	T/P	IV	V	I	II
		Sg. Perembi	3JPGD 001	47	T/P	IV	V	V	I
		Sg. Tukang Batu	3JPGD 003	35	T/P	IV	V	V	I
	Sg. Kempas	Sg. Kempas	3JKPS 001	33	T/P	IV	V	V	II
		Sg. Kempas	3JKPS 002	42	T/P	IV	V	V	II
	Sg. Pontian Besar	Sg. Ayer Merah	3JPBS 005	54	T/P	III	III	III	I
	Sg. Sanglang	Sg. Sanglang	3JSLG 001	57	T/P	III	II	II	IV
	Sg. Sedili Kecil	Sg. Anak Sedili Kecil	3JSKE 005	24	T/P	V	V	V	III
	Sg. Skudai	Sg. Melana	3JSKU 009	59	T/P	III	IV	V	II
		Sg. Skudai	3JSKU 007	54	T/P	III	IV	V	I
	Sg. Tebrau	Sg. Bala	3JTRU 008	47	T/P	IV	V	V	I
		Sg. Pandan	3JTRU 007	43	T/P	IV	V	V	I
		Sg. Sebulung	3JTRU 009	58	T/P	III	V	V	I
		Sg. Sengkuang	3JTRU 011	53	T/P	III	V	V	I
Sarawak	Sg. Sarawak	Sg. Kelantan	6QSWK017	59	T/P	III	V	V	I

Sungai Pandan, Kuantan

TREN PENCEMARAN STESEN PENGAWASAN KUALITI AIR SUNGAI

Berdasarkan sub-indeks BOD, 1,049 (78%) stesen sungai dikategorikan sebagai bersih telah meningkat pada tahun 2021 berbanding 718 (53%) pada tahun sebelumnya **(Rajah 2.3)**. Bilangan stesen sungai yang tercemar dari segi sub-indeks BOD telah menurun daripada 173 (13%) pada tahun 2020 kepada 127 (9%) pada tahun 2021.

Dari segi sub-indeks AN, bilangan stesen sungai bersih telah meningkat daripada 514 (38%) pada tahun 2020 kepada 685 (51%) pada tahun 2021 **(Rajah 2.4)**. Bilangan sungai yang tercemar telah menurun daripada 410 (30%) pada tahun 2020 kepada 398 (29%) pada tahun 2021.

Dari segi sub-indeks SS pula, bilangan stesen sungai yang dikategorikan bersih telah meningkat daripada 850 (63%) pada tahun 2020 kepada 1,037 (77%) pada tahun 2021 **(Rajah 2.5)**. Bilangan stesen sungai yang dikategorikan sebagai tercemar menurun daripada 353 (26%) pada 2020 kepada 191 (14%) pada tahun 2021.

Kesimpulannya, didapati kebanyakan stesen pengawasan kualiti air sungai mengalami peningkatan kualiti air bagi tahun 2021 berbanding 2020. Sekatan PKP pada tahun 2021 boleh menjadi salah satu faktor penyumbang dalam mengurangkan pelepasan jumlah beban pencemar seterusnya meningkatkan kualiti air di stesen sungai khususnya di kawasan yang berdekatan dengan industri.

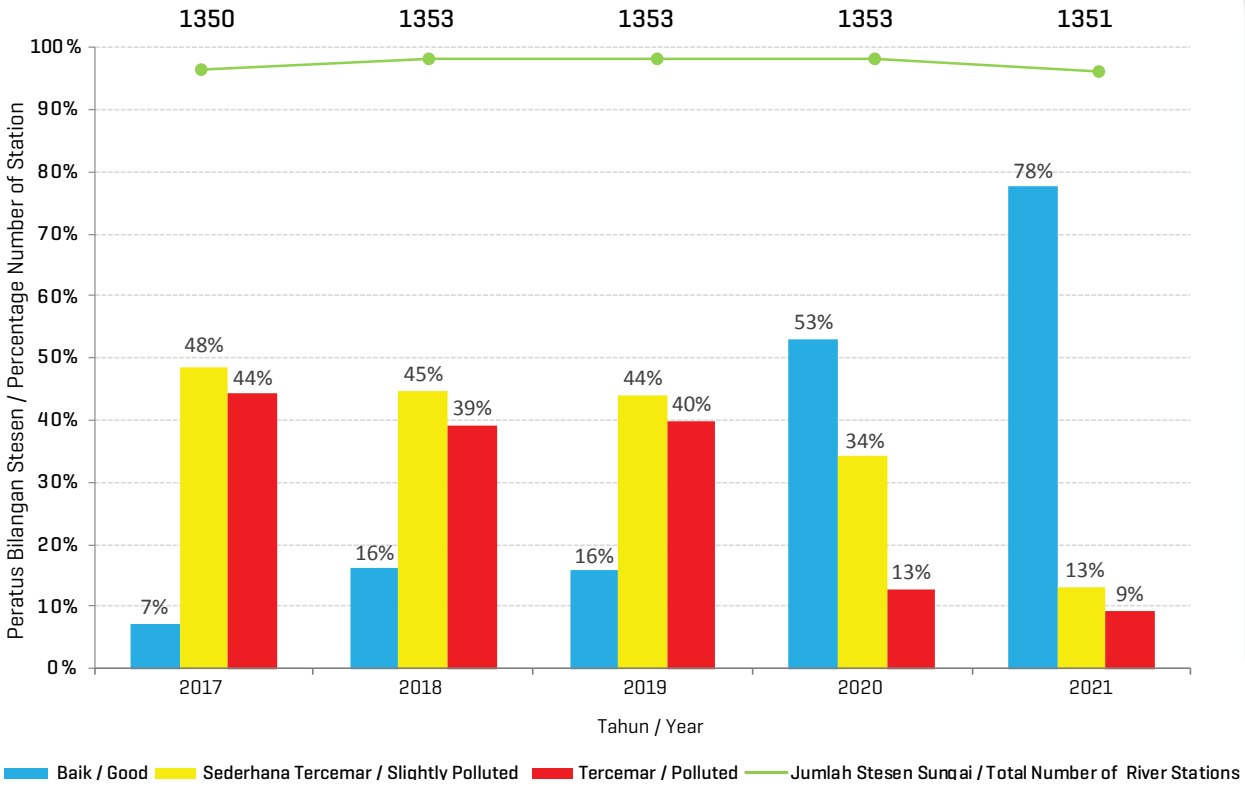
POLLUTION TRENDS OF RIVER WATER QUALITY MONITORING STATIONS

In terms of BOD sub-index, 1,049 (78%) river stations categorized as clean have increased in the year 2021 compared 718 (53%) river stations in year before **(Figure 2.3)**. The number of polluted river station in terms of BOD sub-index decreased well from 173 (13%) in 2020 down to 127 (9%) in 2021.

In terms of AN sub-index, the number of clean river stations significantly increased from 514 (38%) in 2020 up to 685 (51%) in 2021. **(Figure 2.4)** The number of polluted rivers has decreased from 410 (30%) in 2020 down to 398 (29%) in 2021.

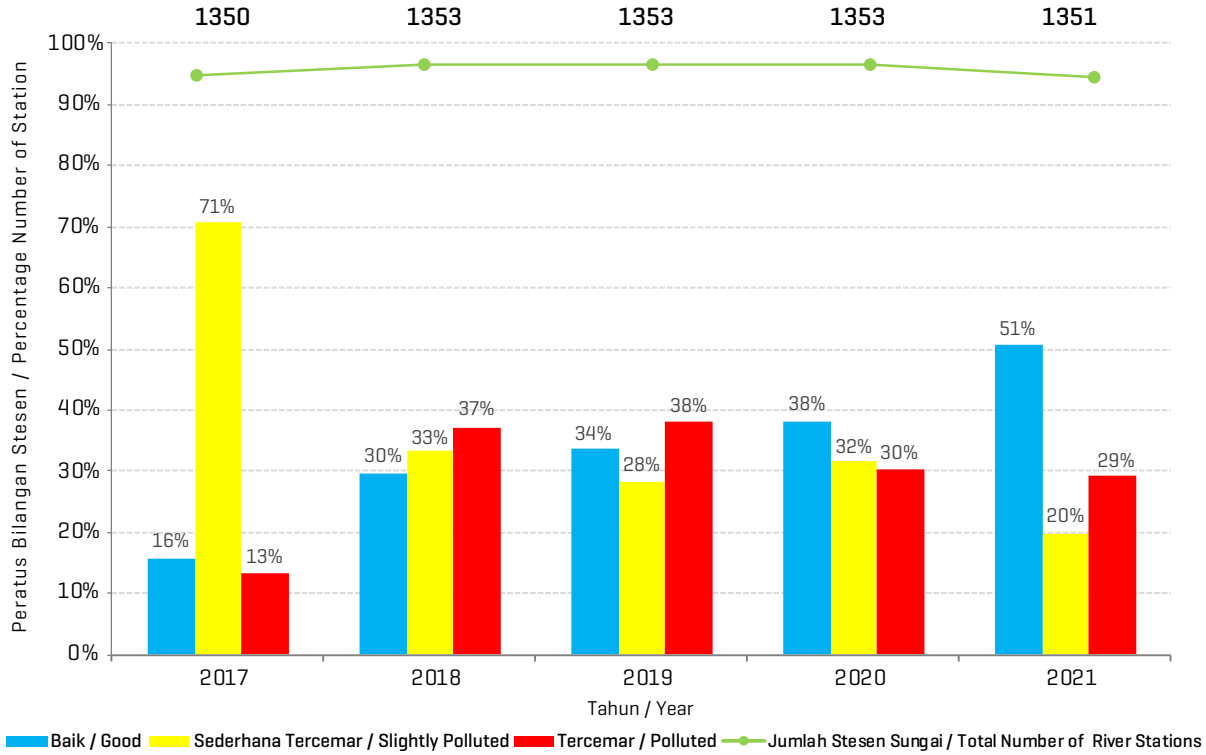
In terms of SS sub-index, the number of clean river stations increased from 850 (63%) in 2020 up to 1,037 (77%) in 2021 **(Figure 2.5).** The number of polluted river stations has decreased from 353 (26%) in 2020 down to 191 (14%) in 2021.

In conclusion, most of river water quality monitoring stations showed a significant improvement in water quality in 2021 compare to 2020. The MCO imposed in 2021 can be one of the contributing factors in reducing pollutant load and thus improving water quality at river stations located in areas close to industry.



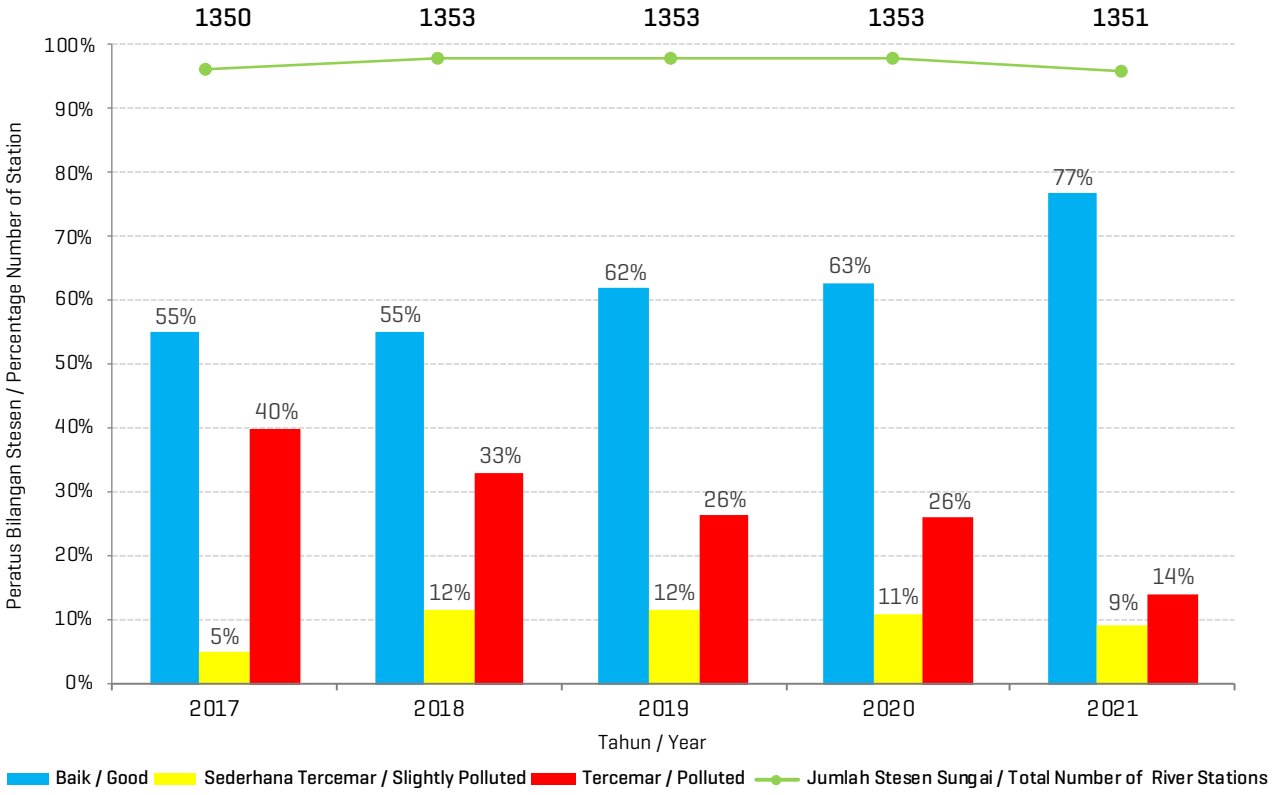
Rajah 2.3 : Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks BOD, 2017 – 2021

Figure 2.3 : River Water Quality Stations Trend on BOD Sub-Index, 2017 – 2021



Rajah 2.4 : Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks AN, 2017 – 2021

Figure 2.4 : River Water Quality Stations Trend on AN Sub-Index, 2017 – 2021



Rajah 2.5 : Tren Stesen Kualiti Air Sungai Berdasarkan Sub-Indeks SS, 2017 – 2021

Figure 2.5 : River Water Quality Stations Trend on SS Sub-Index, 2017 – 2021

ANALISIS LOGAM BERAT DI STESEN PENGAWASAN KUALITI AIR SUNGAI

Pada tahun 2021, sebanyak 8,059 sampel kualiti air mewakili 1,351 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). **(Jadual 2.3)** Pematuhan dipantau dengan merujuk Standard Kualiti Air Kebangsaan (NWQS).

Bagi parameter raksa, semua stesen sungai di seluruh negara telah menunjukkan pematuhan penuh. Parameter Cd, Cr, Pb dan Zn menunjukkan julat pematuhan 99.2% hingga 100%. Walau bagaimanapun, bagi parameter arsenik menunjukkan stesen sungai di W.P Kuala Lumpur tidak mencapai pematuhan 90%, berbanding stesen sungai di negeri lain yang julat pematuhannya antara 96% hingga 100%.

ANALYSIS OF HEAVY METAL AT RIVER WATER QUALITY MONITORNG STATIONS

In 2021, a total of 8,059 water quality sample represent 1,351 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). **(Tabel 2.3)** Compliance monitored with reference to the National Water Quality Standards (NWQS).

For mercury parameters, all river stations in country showed full compliance. Parameters of Cd, Cr, Pb and Zn showed a compliance in the range of 99.2% to 100%. However, arsenic parameter for river stations in W.P Kuala Lumpur achieved compliance of less then 90%, compared to river stations in other states whose compliance range is 96% to 100%.

Jadual 2.3 : Peratusan Pematuhan Parameter Logam Berat mengikut Negeri
Table 2.3: Percentage of Heavy Metal Parameter Compliance by State

NEGERI / STATE	BIL. STESEN / NO OF STATIONS	BIL. PERSAMPELAN / NO OF SAMPLING	PEMATUHAN KELAS II (%) / COMPLIANCE OF CLASS II (%)					
			RAKSA / MERCURY (Hg)	ARSENIK / ARSENIC (As)	KADMIUM / 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	99.8	100	99.8
P.Pinang	66	396	100	100	99.7	99.7	100	100
Perak	150	900	100	97.6	100	100	100	100
Selangor	95	570	100	96.0	100	99.8	99.8	100
W.P. Kuala Lumpur	27	162	100	87.7	100	100	100	100
N. Sembilan	66	396	100	100	100	99.7	99.7	100
Melaka	54	324	100	100	100	100	99.4	99.4
Johor	227	1362	100	100	100	99.9	100	99.9
Pahang	192	1141	100	99.8	100	100	99.9	100
Terengganu	69	414	100	100	100	100	100	100
Kelantan	83	491	100	100	100	100	99.2	100
Sarawak	115	673	100	100	100	100	100	100
Sabah	118	696	100	100	100	100	100	100

KUALITI AIR SUNGAI BAGI STESEN DI HULU MUKA SAUK

Pada tahun 2021, 51 (92.7%) daripada 55 stesen pengawasan kualiti air di hulu muka sauk telah menunjukkan indeks kualiti air bersih, sementara empat (4) (7.3%) sederhana tercemar. Berdasarkan IKA, 25 (45.5%) Kelas I dan 27 (49.1%) Kelas II, manakala tiga (3) (5.5%) adalah Kelas III. **Jadual 2.4** menunjukkan status kualiti air di stesen hulu muka sauk terpilih berdasarkan IKA.

Bagi sub-indeks BOD, 54 (98.2%) stesen telah menunjukkan kualiti air pada Kelas II dan satu (1) (1.8%) Kelas III. Berdasarkan sub-indeks AN, sebanyak 46 (83.6%) stesen menunjukkan kualiti air pada Kelas I, enam (6) (10.9%) Kelas II, dua (2) (3.6%) Kelas III dan satu (1) (1.8%) pada Kelas IV. Dari segi sub-indeks SS, 37 (67.3%) stesen telah dikategorikan sebagai Kelas I, 10 (18.2%) Kelas II, enam (6) (10.9%) Kelas III, manakala Kelas IV dan V masing-masing satu (1) (1.8%) stesen. **(Rajah 2.6)**

RIVER WATER QUALITY OF STATIONS UPSTREAM OF WATER INTAKES

In 2021, 51 (92.7%) of the 55 water quality monitoring stations upstream have shown a clean water quality index, while four (4) (7.3%) were slightly polluted. Based on WQI, 25 (45.5%) were in Class I and 27 (49.1%) Class II, while three (3) (5.5%) Class III. **Table 2.4** shows the water quality status at selected upstream stations based on WQI.

In terms of the BOD sub-index, 54 (98.2%) stations showed water quality at Class II and one (1) (1.8%) station was at Class III. Based on the AN sub-index, a total of 46 (83.6%) stations showed water quality in Class I, six (6) (10.9%) in Class II, two (2) (3.6%) in Class III and one (1) (1.8 %) in Class IV. In terms of the SS sub-index, 37 (67.3%) stations were categorized as Class I, 10 (18.2%) in Class II, six (6) (10.9%) in Class III, while Class IV and V were one (1) (1.8%) station respectively. **(Figure 2.6)**

Jadual 2.4 : Status Kualiti Air di Hulu Muka Sauk, 2021

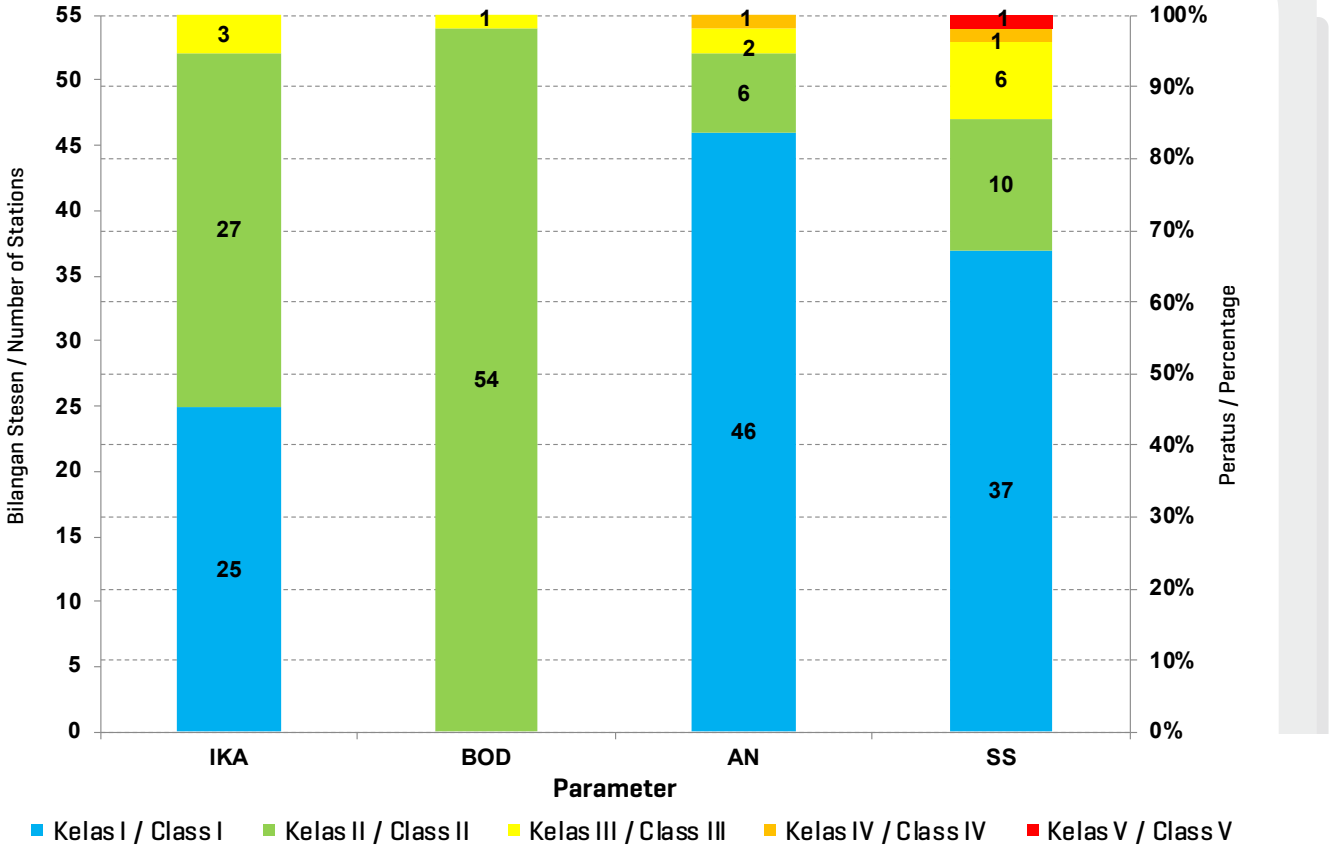
Table 2.4 : Water Quality Status of Upstream Water Intake, 2021

NEGERI / STATE	LEMBANGAN SUNGAI / RIVER BASIN	SUNGAI / RIVER	STATION ID BARU / NEW ID STATION	MUKA SAUK / WATER INTAKE	NILAI IKA / WQI VALUE	SUB-INDEKS 2021 (%) / SUB-INDEX 2021 (%)		
						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	91	96	96	81
		Sg. Terusan Mada	1RPLS011	Loji Rawatan Air TTPC, Sg. Baru	92	96	98	87
Kedah	Sg. Ulu Melaka	Sg. Melaka	1KMLK003	Ulu Melaka	91	96	94	91
		Sg. Saga	1KMLK004	Padang Saga	92	96	93	92
	Sg. Kedah	Sg. Ahning	1KKDH011	Padang Sanai	96	96	98	93
		Sg. Padang Terap	1KKDH012	Kuala Nerang	97	96	97	96
	Sg. Muda	Sg. Temin	1KKDH010	Changloon	89	96	95	85
		Sg. Muda	1KMUD014	Jeneri	91	96	99	68
		Sg. Muda	1KMUD015	Jeniang	92	96	99	75
		Sg. Muda	1KMUD016	Bukit Selambau	90	96	99	69
		Sg. Muda	1KMUD018	Pinang Tunggal	94	96	93	83
		Sg. Muda	1KMUD019	Nami	93	96	99	83
		Sg. Sedim	1KMUD017	Bikan	91	96	99	79
P.Pinang	Sg. Pinang	Sg. Satu	1PPNG020	Batu Feringgi	97	96	99	96
Perak	Sg. Bernam	Sg. Gelinting	1ABNM015	Loji Rawatan Air Ulu Slim	96	96	99	92
		Sg. Trolak	1ABNM014	Loji Rawatan Air Trolak Timur	96	96	99	97
	Sg. Kurau	Sg. Air Hitam	1AKRU007	Loji Rawatan Air Jelai	98	96	99	97
	Sg. Perak	Sg. Manong	1APRK060	Loji Rawatan Air Manong	97	96	99	96
		Sg. Perak	1APRK059	Loji Rawatan Air Sauk	97	96	99	96
		Sg. Tesong	1APRK062	Loji Rawatan Air Sg. Klah	97	96	99	97
		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
Selangor	Sg. Klang	Sg. Gombak	2BKLG020	Loji Rawatan Air Gombak	97	96	99	97
	Sg. Langat	Sg. Batang Labu	2BLGT028	Loji Rawatan Air Salak Tinggi	75	86	49	67
		Sg. Semenyih	2BLGT010	Loji Rawatan Air Semenyih	88	92	75	78
Johor	Sg. Batu Pahat	Sg. Semberong Dam	3JBPT021	Semberong Dam	91	92	98	92
	Sg. Benut	Sg. Machap Dam	3JBNT008	Machap Dam	94	94	99	92
	Sg. Endau	Sg. Kahang	3JEND026	Jalan Felda Kahang Timur, Kluang	94	96	87	93

Jadual 2.4 : Status Kualiti Air di Hulu Muka Sauk, 2021

Table 2.4 : Water Quality Status of Upstream Water Intake, 2021

NEGERI / STATE	LEMBANGAN SUNGAI / RIVER BASIN	SUNGAI / RIVER	STATION ID BARU / NEW ID STATION	MUKA SAUK / WATER INTAKE	NILAI IKA / WQI VALUE	SUB-INDEKS 2021 (%) / SUB-INDEX 2021 (%)		
						SUB-INDEKS BOD / BOD SUB-INDEX	SUB-INDEKS AN / AN SUB-INDEX	SUB-INDEKS SS / SS SUB-INDEX
Johor	Sg. Muar	Sg. Jelai	3NMUA054	Loji Rawatan Air Dangi	92	96	99	83
		Sg. Jementah	3JMUA040	Loji Rawatan Air Jementah	96	96	99	94
		Sg. Muar	3JMUA039	Loji Rawatan Air Gombang	85	96	96	93
	Sg. Pulai	Sg. Pulai Dam	3JPLI004	Pulai Dam	95	96	98	97
Melaka	Sg. Kesang	Sg. Chin-Chin	3MKSG008	Muka sauk Loji Rawatan Air Chin-chin	87	96	99	73
Pahang	Sg. Pahang	Sg. Bertam	4CBTM013	Loji Rawatan Air Habu	97	96	99	97
		Sg. Gapoi	4CPHG086	Muka sauk Loji Rawatan Air Gapoi	97	96	99	97
		Sg. Jempol	4CPHG087	Loji Air Sg Jerik	95	96	96	93
		Sg. Jempol	4CPHG088	Loji Air Jengka 3	95	96	99	85
		Sg. Mentiga	4CPHG089	Loji Air Chini	87	96	91	74
		Sg. Terla	4CBTM012	Loji Rawatan Air Kuala Terla	97	96	99	97
		Sg. Triang	4CPHG074	Loji Rawatan Air Sg. Triang	91	96	99	61
		Sg. Ulong	4CBTM014	Brinchang Dam	97	96	99	97
Terengganu	Sg. Terengganu	Sg. Terengganu	4TTGG013	Loji Air Serada	92	96	91	95
Kelantan	Sg. Golok	Sg. Golok	4DGLK003	Syarikat Air Kelantan	97	96	99	97
	Sg. Kelantan	Sg. Chiku	4DKLT043	Felda Ciku 2	90	96	99	63
		Sg. Kelantan	4DKLT045	Loji Air Kelar, Pasir Mas	84	96	95	33
		Sg. Pehi	4DKLT044	Loji Air Pahi	90	96	96	59
Sabah	Sg. Padas	Sg. Padas	5SPDS011	Water Intake Jabatan Air Beaufort	88	94	94	53
	Sg. Papar	Sg. Papar	5SPPR004	Sekolah Kebangsaan Man - dalipau	91	96	96	90
		Sg. Papar	5SPPR005	Water Intake Kogopon	91	96	93	90
Sarawak	Sg. Kerian	Sg. Selalang	6QKRN017	Selalang Water Intake	92	96	74	95
	Sg. Mukah	Sg. Mukah	6QMKH005	Mukah Water Intake	84	94	71	83
	Sg. Rajang	Sg. Daro	6QRJG021	Daro Water Intake	62	96	68	96
		Sg. Jemoreng	6QRJG022	Jemoreng Water Intake	63	96	68	94
		Sg. Pakan	6QRJG020	Pakan Water Intake	89	96	72	86
		Sg. Pila Parit	6QRJG023	Igan Water Intake	77	94	69	92



Rajah 2.6 : Kualiti Air Sungai di Stesen Hulu Muka Sauk, 2021
Figure 2.6 : River Water Quality at Upstream Water Intake Stations, 2021

STATUS PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

Rajah 2.7(a) dan **Rajah 2.7(b)** menunjukkan lokasi 30 stesen pengawasan sungai automatik serta takat pengambilan air yang disenaraikan seperti dalam **Jadual 2.5.**

Pada tahun 2021, status kualiti air sungai bagi 29 stesen pengawasan sungai automatik telah dinilai berdasarkan peratusan pematuhan kepada Kelas II. Parameter yang diukur adalah pH, DO, BOD, COD, AN dan jumlah pepejal terampai (TSS). Pematuhan ini ditunjukkan seperti pada **Jadual 2.6.**

Dari segi pematuhan Kelas II, pematuhan 90% atau lebih kepada kualiti air Kelas II pada tahun 2021 adalah di dapati di 17 (58.6%) stesen iaitu CR01K, CR02K, CR03K, CR05A, CR06A, CR14N, CR15N, CR18J, CR20J, CR22C, CR24T, CR25T, 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 14 (48.3%) stesen iaitu CR01K, CR04P, CR08B, CR09B, CR10B, CR12W, CR13N, CR16M, CR17M, CR19J, CR20J, CR21J, CR23C dan CR24T.

Ammonium (NH_4) adalah satu bentuk ammonia (NH_3) yang telah terion. Pengukuran NH_4 memberi petunjuk kepada potensi kehadiran pencemar NH_3 atau AN dalam air sungai apabila pH dan suhu air berubah. Julat pematuhan yang rendah bagi AN didapati di 19 (65.5%) stesen iaitu CR01K, CR02K, CR03K, CR04P, CR05A, CR08B, CR04P, CR05A, CR08B, CR09B, CR10B, CR11B, CR12W, CR13N, CR14N, CR15N, CR16M, CR17M, CR18J, CR20J, CR21J dan CR22C.

CONTINUOUS RIVER WATER QUALITY MONITORING STATUS

Figure 2.7(a) and **Figure 2.7(b)** shows the location of the 30 continuous river monitoring stations and subsequent water intakes as listed in **Table 2.5.**

In 2021, river water quality status of the 29 continuous river water quality monitoring stations are assessed based on percentage of compliance to Class II. The measured parameter is pH, DO, BOD, COD, AN and total suspended solid (TSS). The compliance is shown in **Table 2.6.**

In terms of Class II compliance, 90% compliance or more to Class II water quality in 2021 was observed at 17 (58.6%) stations which CR01K, CR02K, CR03K, CR05A, CR06A, CR14N, CR15N, CR18J, CR20J, CR22C, CR24T, CR25T, CR27S, CR29Q, CR30Q dan CR31S stations.

DO is one of the indicators of the presence of BOD which is exerted by organic pollutants. Low range compliance of DO was observed at 14 (48.3%) stations CR01K, CR04P, CR08B, CR09B, CR10B, CR12W, CR13N, CR16M, CR17M, CR19J, CR20J, CR21J, CR23C and CR24T.

Ammonium (NH_4) is an ionized form of ammonia (NH_3). The measurement of NH_4 indicates the potential presence of NH_3 or AN pollutant in rivers which is also improved pH and temperature changes. Low range compliance of AN were observed at 19 (65.5%) stations CR01K, CR02K, CR03K, CR04P, CR05A, CR08B, CR09B, CR10B, CR11B, CR12W, CR13N, CR14N, CR15N, CR16M, CR17M, CR18J, CR20J, CR21J and CR22C.

pH adalah ukuran bagi keasidan dan kealkalian mengikut skala pH. Julat pematuhan yang rendah bagi pH diperhatikan di enam (6) (20.7%) stesen iaitu CR01K, CR04P, CR05A, CR20J, CR23C dan CR24T.

Kekeruhan digunakan sebagai penunjuk kehadiran SS di dalam sungai. Bagi julat pematuhan TSS yang direkodkan adalah rendah adalah hampir kepada semua stesen kecuali CR27S.

Rajah 2.8 hingga **Rajah 2.19** menunjukkan peratus pematuhan Kelas II mengikut zon.

pH is a measurement of acidity and alkalinity based on pH scale. Relatively low compliance of pH ranges were observed at six (6) (20.7%) stations CR01K, CR04P, CR05A, CR20J, CR23C and CR24T.

Turbidity is used as an indicator of SS presence in a river. Low range compliance of TSS were recorded mostly at all stations except CR27S.

Figure 2.8 to **Figure 2.19** showed of percentage of Class II compliance by regional.

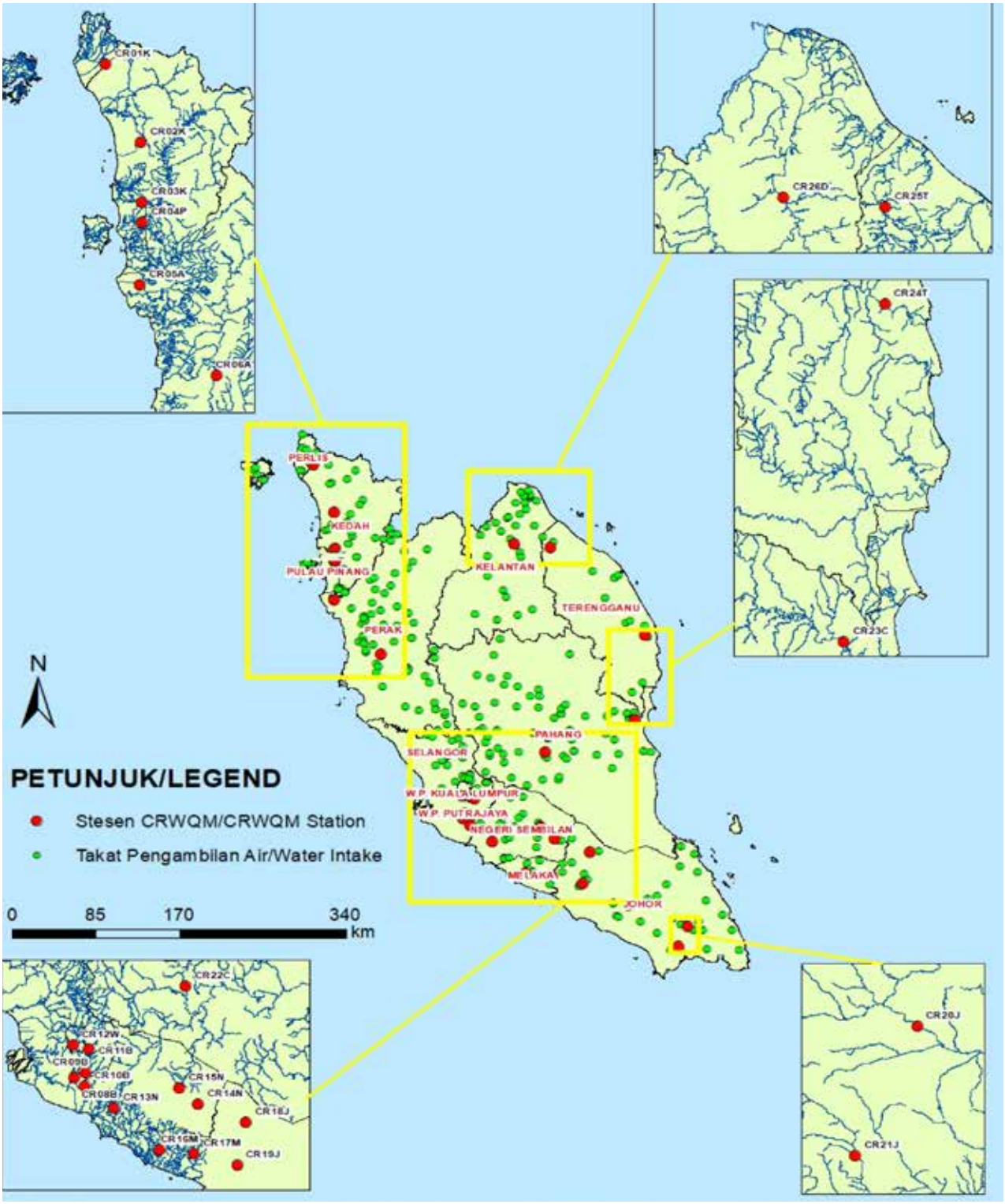
Jadual 2.5: Lokasi CRWQMS: ID Stesen, Sungai bagi Stesen dan Takat Pengambilan Air
Table 2.5: CRWQMS Location: Station ID, River of the Station and Water Intake

NEGERI / STATE	ID STESEN / ID STATION	SUNGAI / RIVER	TAKAT PENGAMBILAN AIR / WATER INTAKE
Kedah	CR 01K CR 02K CR 03K	Terusan MADA Terusan MADA Sungai Muda	Arau Fasa IV Bukit Jenun Kulim Hi -Tech
P. Pinang	CR 04P	Sungai Kulim	Toh Along
Perak	CR 05A CR 06A	Sungai Bogak Sungai Perak	Parit Buntar Sultan Idris
Selangor	CR07B * CR 08B CR 09B CR 10B CR1 1B	Sungai Selangor Sungai Langat Sungai Semenyih Sungai Labu Sungai Langat	Sg. Selangor Fasa 1,2,3 Bukit Tampoi Jenderam Labu Lanjut Cheras Batu 11
W.P. Kuala Lumpur	CR 12W	Sungai Klang	Tiada Berkenaan / Not Applicable
N. Sembilan	CR 13N CR 14N CR 15N	Sungai Linggi Sungai Muar Sungai Muar	Linggi Pasir Besar Jelai Jempol
Melaka	CR 16M CR 17M	Sungai Melaka Sungai Kesang	Durian Tunggal Chin Chin
Johor	CR 18J CR 19J CR 20J CR 21J	Sungai Segamat Sungai Muar Sungai Johor Sungai Sekudai	Segamat Panchor Semanggar Skudai
Pahang	CR 22C CR 23C	Sungai Pahang Sungai Kuantan	Lubuk Kawah Semambu
Terengganu	CR 24T CR 25T	Sungai Paka Sungai Besut	Bulit Bauk Bukit Bunga
Kelantan	CR 26D	Sungai Kelantan	Sokor
Sabah	CR 27S CR 31S	Sungai Tuaran Sungai Moyog	Telibong Kasigui
Sarawak	CR 29Q CR 30Q	Sungai Sarawak Sungai Batang Sadong	Sarawak Kiri Tebekang

* CR07B : Stesen tidak beroperasi / The station is not in operations

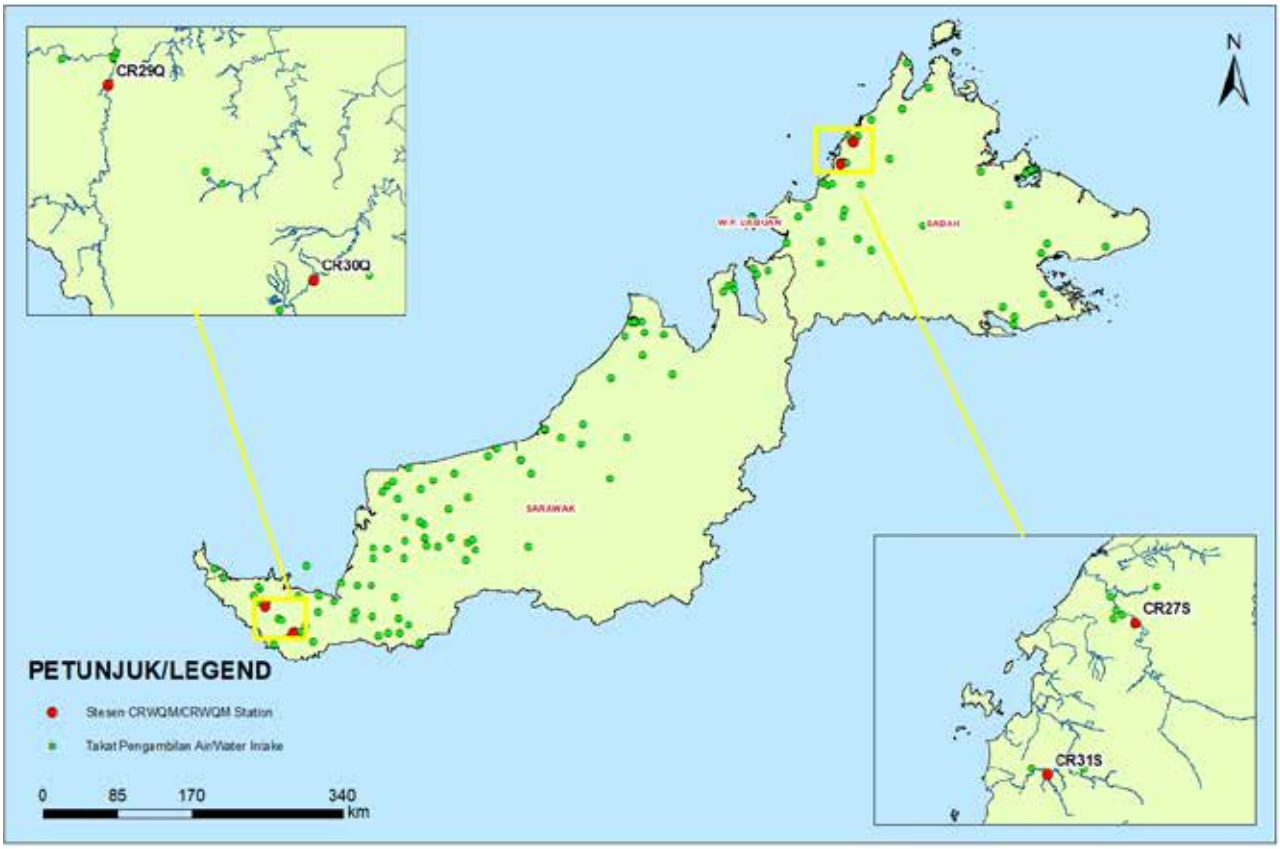
Jadual 2.6: Peratus Pematuhan Kelas II mengikut Stesen
Table 2.6: Percentage of Compliance to Class II by Station

NEGERI / STATE	ID STESEN / STATION ID	PEMATUHAN KELAS II (%) / COMPLIANCE TO CLASS II (%)					
		DO sat (%)	BOD	COD	TSS	AN	pH
Kedah	CR01K	56	100	100	45	82	88
	CR02K	97	100	100	45	88	92
	CR03K	97	100	100	28	81	97
P. Pinang	CR04P	46	29	97	26	24	70
Perak	CR05A	92	100	100	84	84	66
	CR06A	100	100	100	55	94	100
Selangor	CR08B	43	22	100	44	8	100
	CR09B	52	74	100	40	13	99
	CR10B	32	13	93	61	7	100
	CR11B	97	36	100	33	23	100
W.P. Kuala Lumpur	CR12W	6	5	100	67	4	100
N. Sembilan	CR13N	74	73	100	58	42	100
	CR14N	100	88	98	15	60	99
	CR15N	100	100	100	21	77	97
Melaka	CR16M	67	62	100	9	38	99
	CR17M	81	96	100	39	74	98
Johor	CR18J	99	91	100	70	81	100
	CR19J	4	88	100	40	92	90
	CR20J	83	90	95	62	78	49
	CR21J	38	65	100	47	29	96
Pahang	CR22C	93	99	100	25	82	97
	CR23C	64	80	98	60	92	83
Terengganu	CR24T	71	100	100	74	97	23
	CR25T	94	100	100	72	99	93
Kelantan	CR26D	99	96	100	9	100	100
Sabah	CR27S	100	99	100	99	100	100
	CR31S	100	100	100	74	99	99
Sarawak	CR29Q	98	100	96	66	100	100
	CR30Q	94	70	95	78	97	99



Rajah 2.7(a): Stesen Pengawasan Kualiti Air Sungai Automatik Dan Takat Pengambilan Air

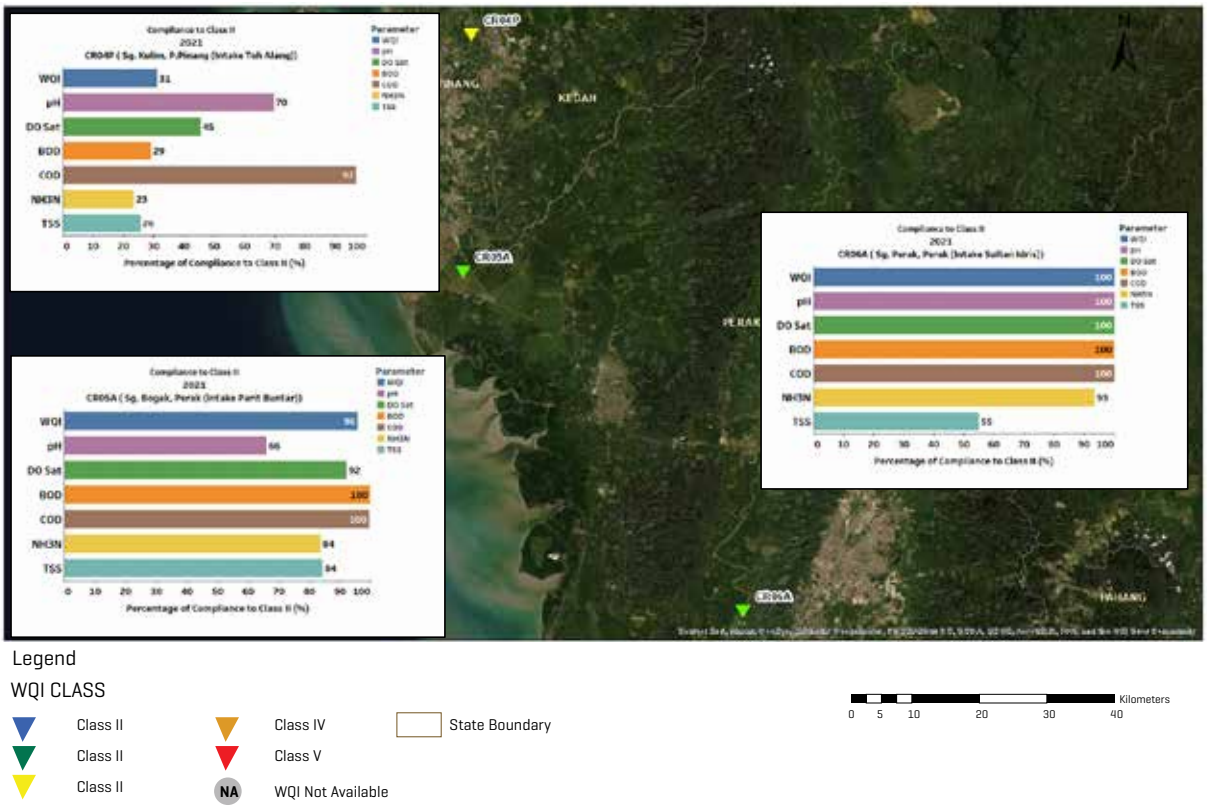
Figure 2.7(a): Continuous Water Quality Stations and Water Intakes



Rajah 2.7(b): Stesen Pengawasan Kualiti Air Sungai Automatik dan Takat Pengambilan Air
Figure 2.7(b): Continuous Water Quality Stations and Water Intakes

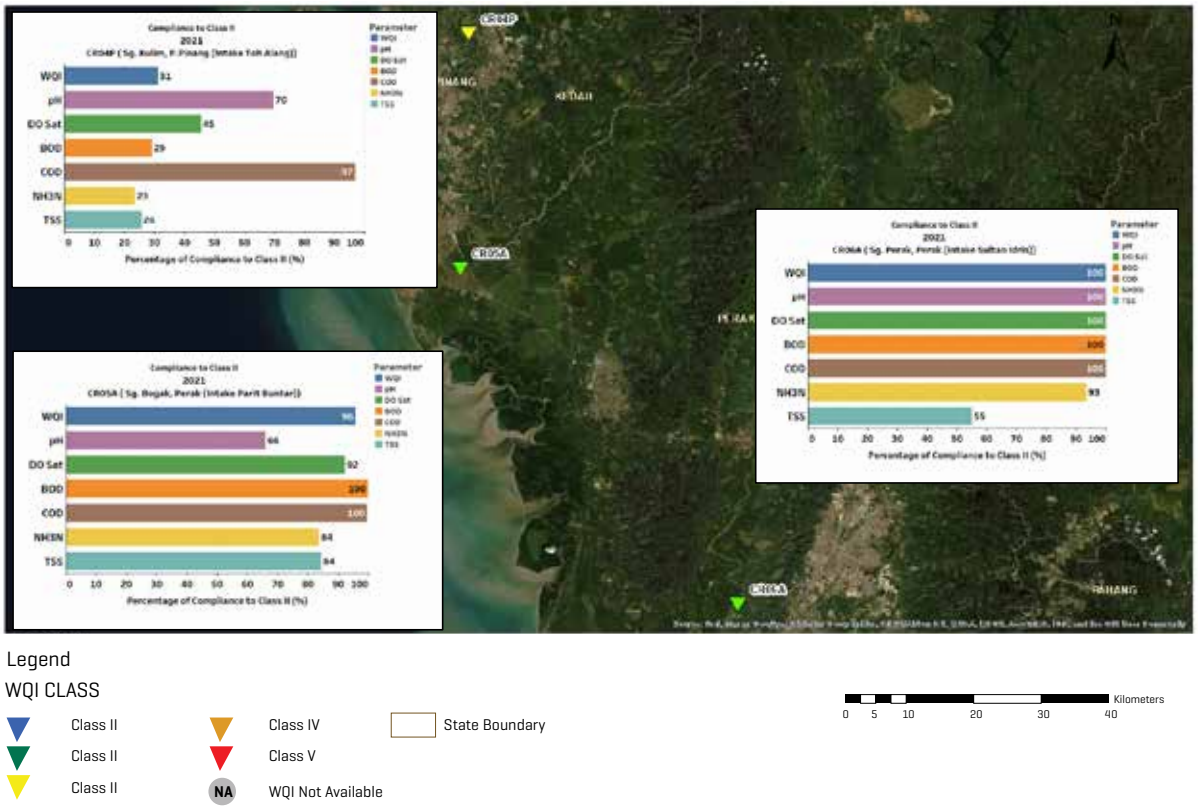
Sungai Petani , Kedah

CRWQM 2021 - Wilayah Utara / Northern Region



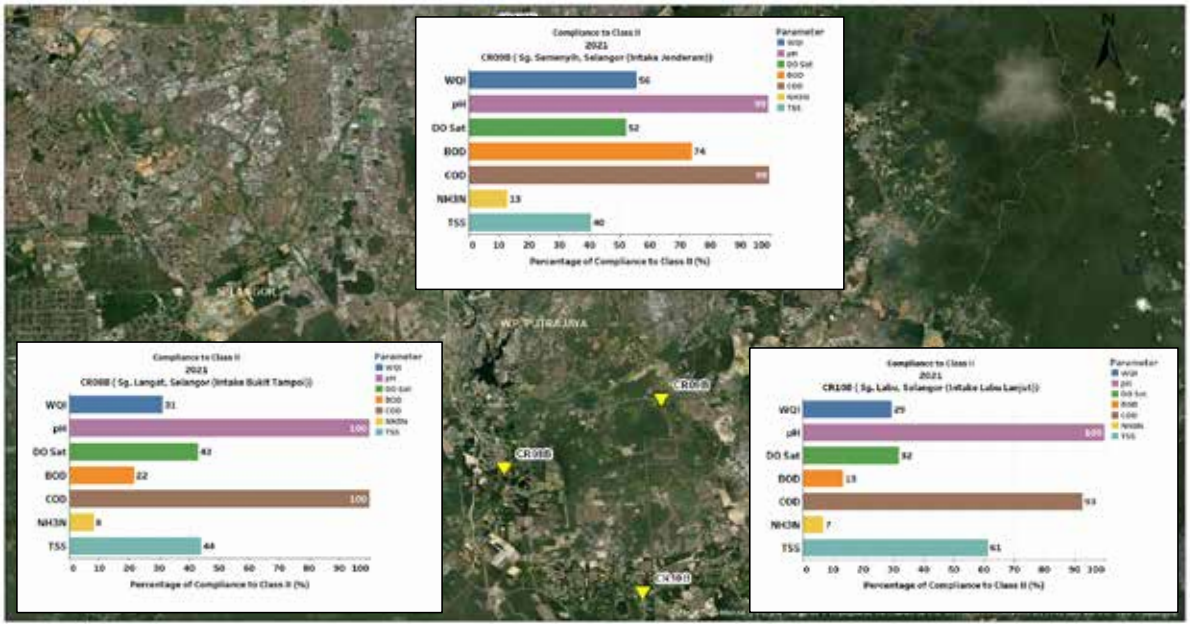
Rajah 2.8: Peratus Pematuhan Kelas II (Wilayah Utara)
Figure 2.8: Percentage of Compliance to Class II (Northern Region)

CRWQM 2021 - Wilayah Utara / Northern Region



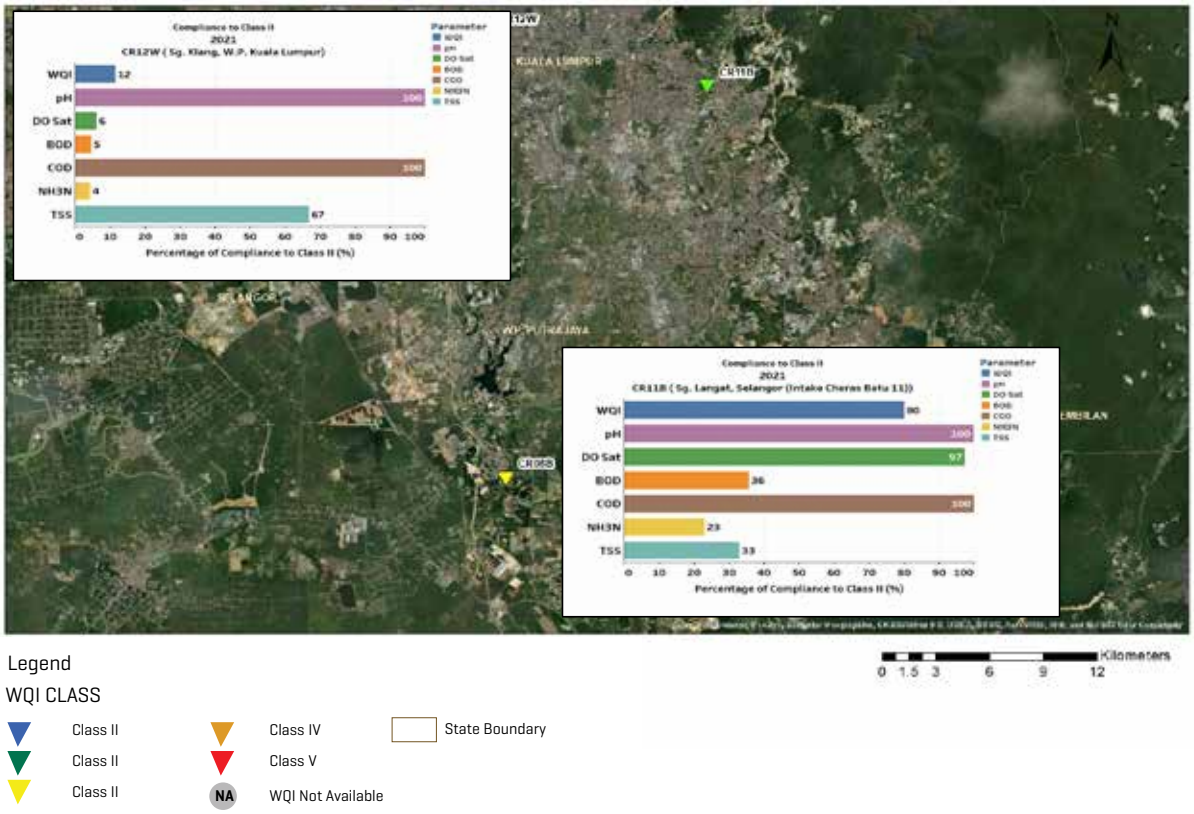
Rajah 2.9: Peratus Pematuhan Kelas II (Wilayah Utara)
Figure 2.9: Percentage of Compliance to Class II (Northern Region)

CRWQM 2021 - Wilayah Tengah / Central Region



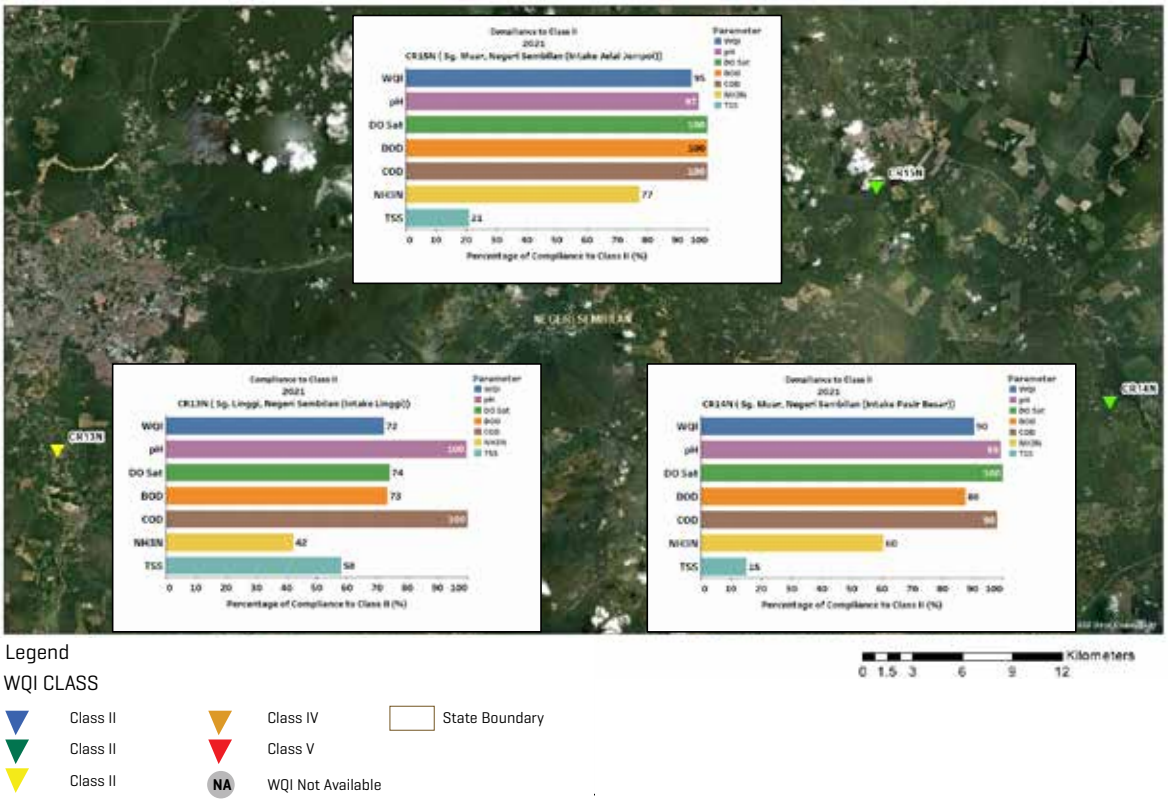
Rajah 2.10: Peratus Pematuhan Kelas II (Wilayah Tengah)
Figure 2.10: Percentage of Compliance to Class II (Central Region)

CRWQM 2021 - Wilayah Tengah / Central Region



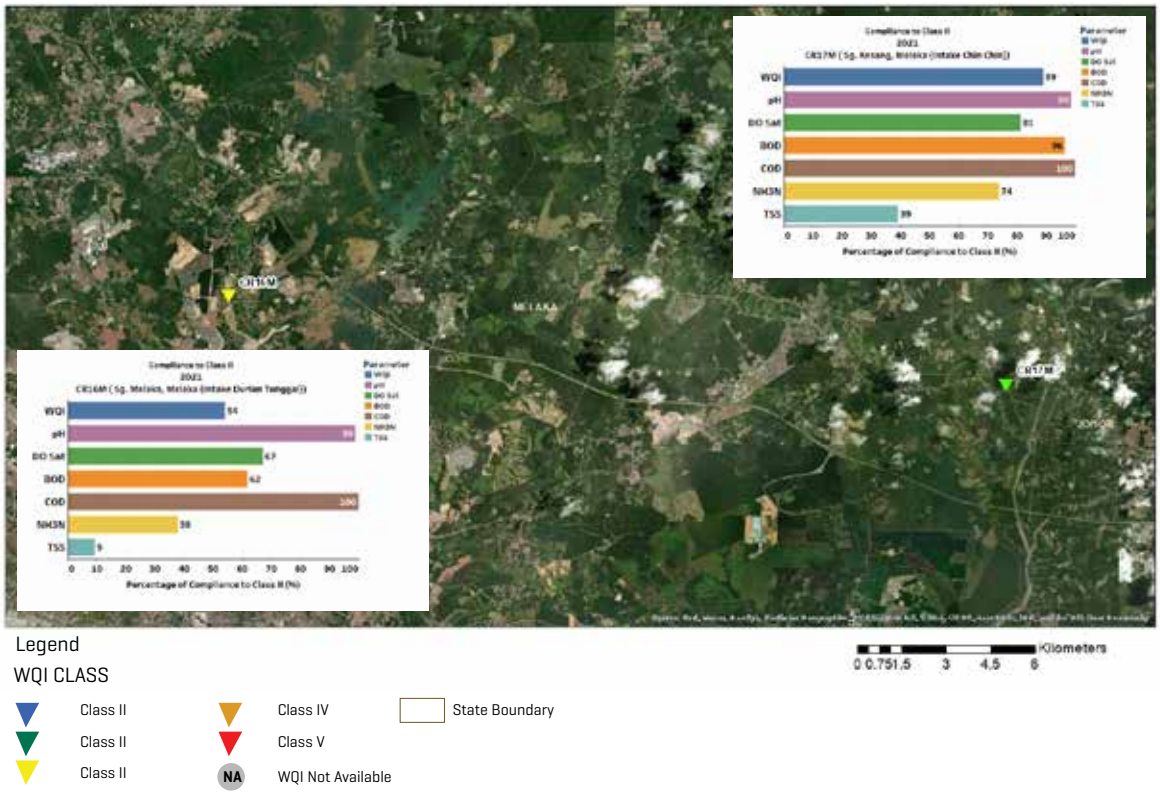
Rajah 2.11: Peratus Pematuhan Kelas II (Wilayah Tengah)
Figure 2.11: Percentage of Compliance to Class II (Central Region)

CRWQM 2021 - Wilayah Tengah / Centre Region



Rajah 2.12: Peratus Pematuhan Kelas II (Wilayah Tengah)
Figure 2.12: Percentage of Compliance to Class II (Central Region)

CRWQM 2021 - Wilayah Tengah / Central Region

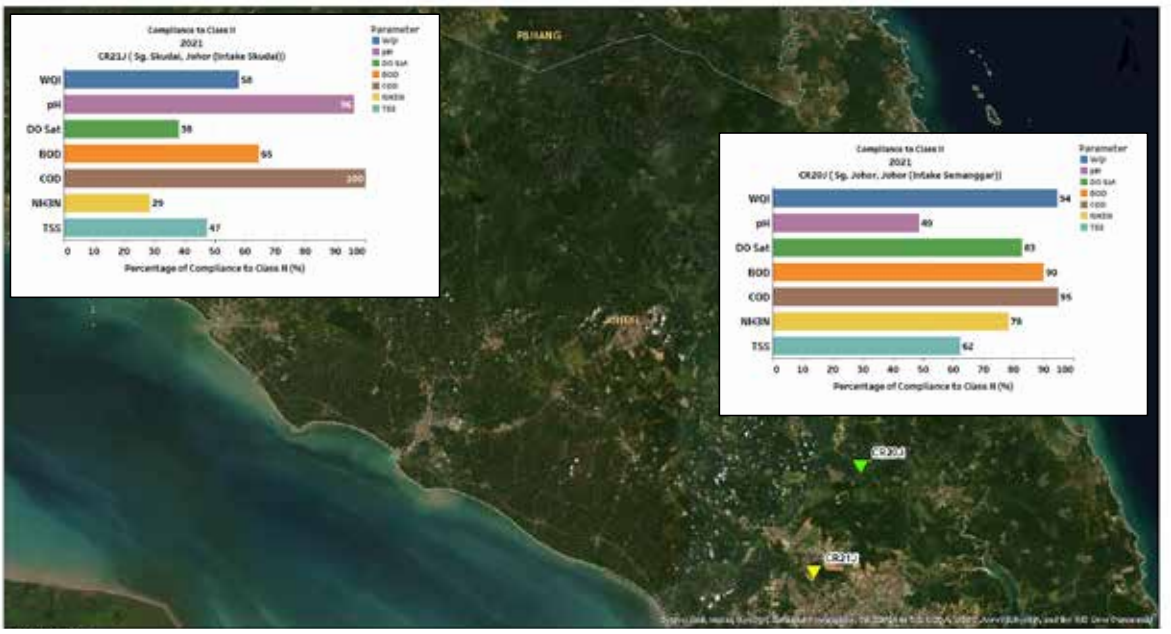


Rajah 2.13: Peratus Pematuhan Kelas II (Wilayah Tengah)
Figure 2.13: Percentage of Compliance to Class II (Central Region)

CRWQM 2021 - Wilayah Selatan / Southernt Region

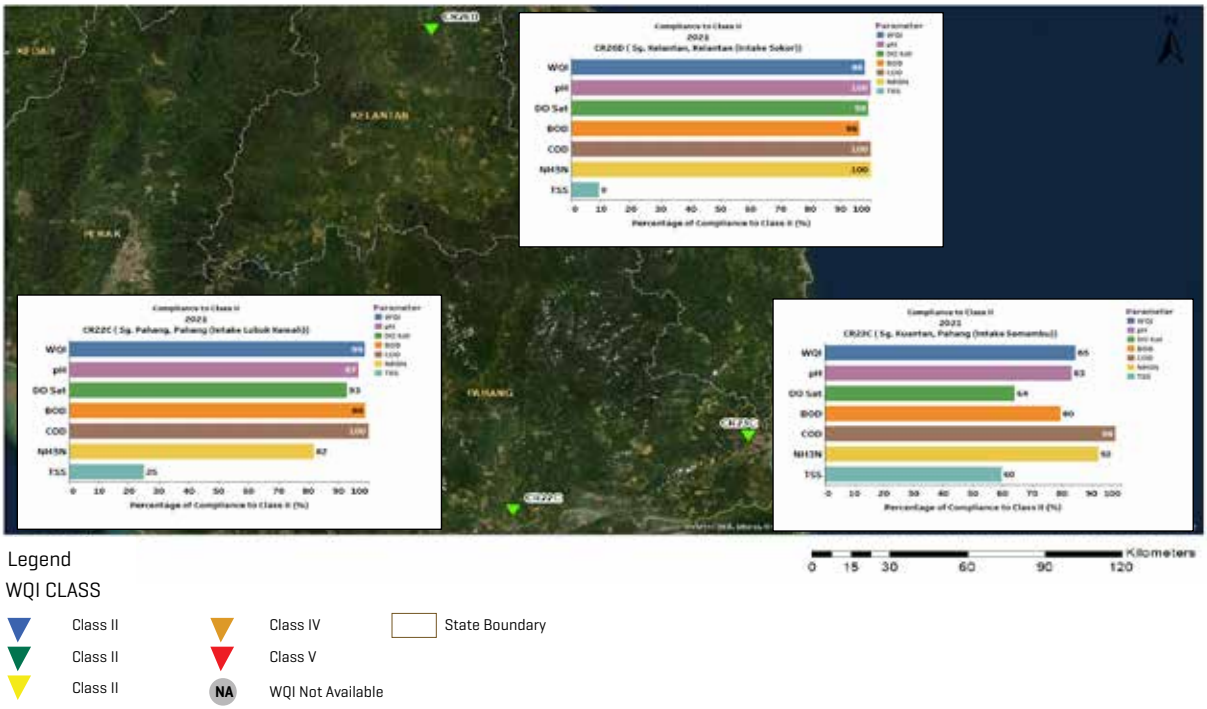
Rajah 2.14: Peratus Pematuhan Kelas II (Wilayah Selatan)
Figure 2.14: Percentage of Compliance to Class II (Southern Region)

CRWQM 2021 - Wilayah Selatan / Southern Region



Rajah 2.15: Peratus Pematuhan Kelas II (Wilayah Selatan)
Figure 2.15: Percentage of Compliance to Class II (Southern Region)

CRWQM 2021 - Wilayah Timur / Eastern Region

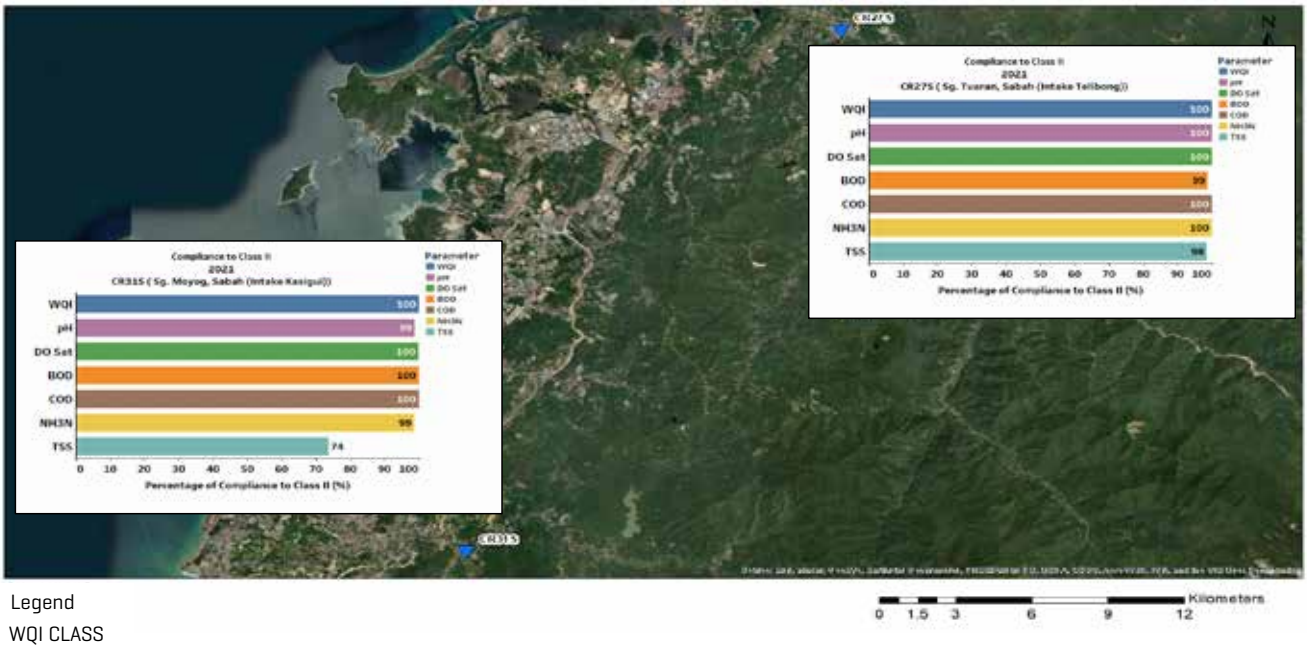


Rajah 2.16: Peratus Pematuhan Kelas II (Wilayah Timur)
Figure 2.16: Percentage of Compliance to Class II (Eastern Region)

CRWQM 2021 - Wilayah Timur / Eastern Region

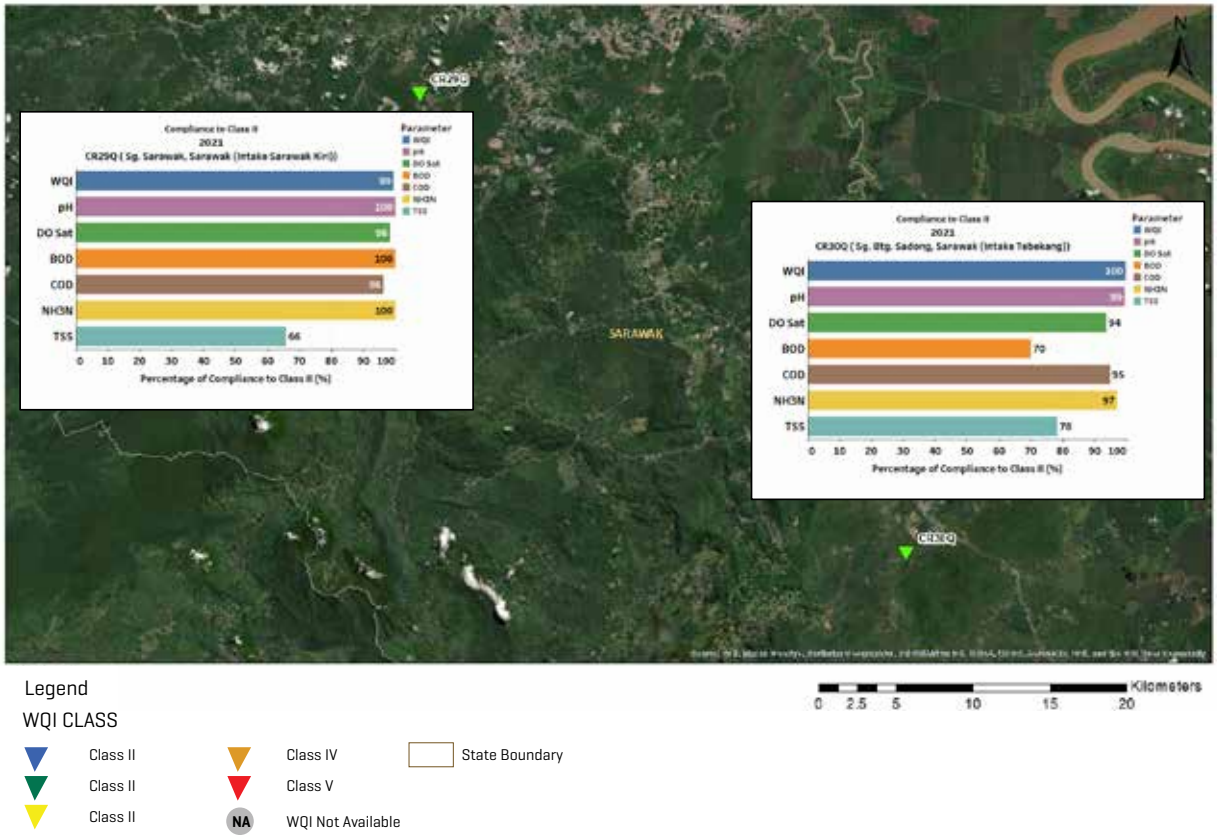
Rajah 2.17: Peratus Pematuhan Kelas II (Wilayah Timur)
Figure 2.17: Percentage of Compliance to Class II (Eastern Region)

CRWQM 2021 - Wilayah Sabah / Sabah Region



Rajah 2.18: Peratus Pematuhan Kelas II (Wilayah Sabah)
Figure 2.18: Percentage of Compliance to Class II (Sabah Region)

CRWQM 2021 - Wilayah Sarawak / Sarawak Region



Rajah 2.19: Peratus Pematuhan Kelas II (Wilayah Sarawak)
Figure 2.19: Percentage of Compliance to Class II (Sarawak Region)

BAB 3
CHAPTER 3

3

KUALITI AIR TANAH
GROUNDWATER QUALITY

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 2021 hanya 114 stesen telah dijalankan persampelan kualiti air tanah. Ini memandangkan terdapat stesen pengawasan kualiti air tanah yang tiada luahan air akibat faktor pembangunan yang mengakibatkan rekahan batuan di dalam stesen tersebut (telaga air tanah). **Jadual 3.1** menunjukkan taburan stesen pengawasan kualiti air tanah seluruh Malaysia mengikut jenis kategori guna tanah.

Pada tahun 2021, sebanyak 346 sampel telah dianalisa untuk bahan kimia organik meruap (VOCs), racun perosak, logam berat, anion, bakteria (koliform), sebatian berfenol, jumlah keliatan, jumlah pepejal terlarut (TDS), pH, suhu, konduktiviti dan oksigen terlarut (DO).

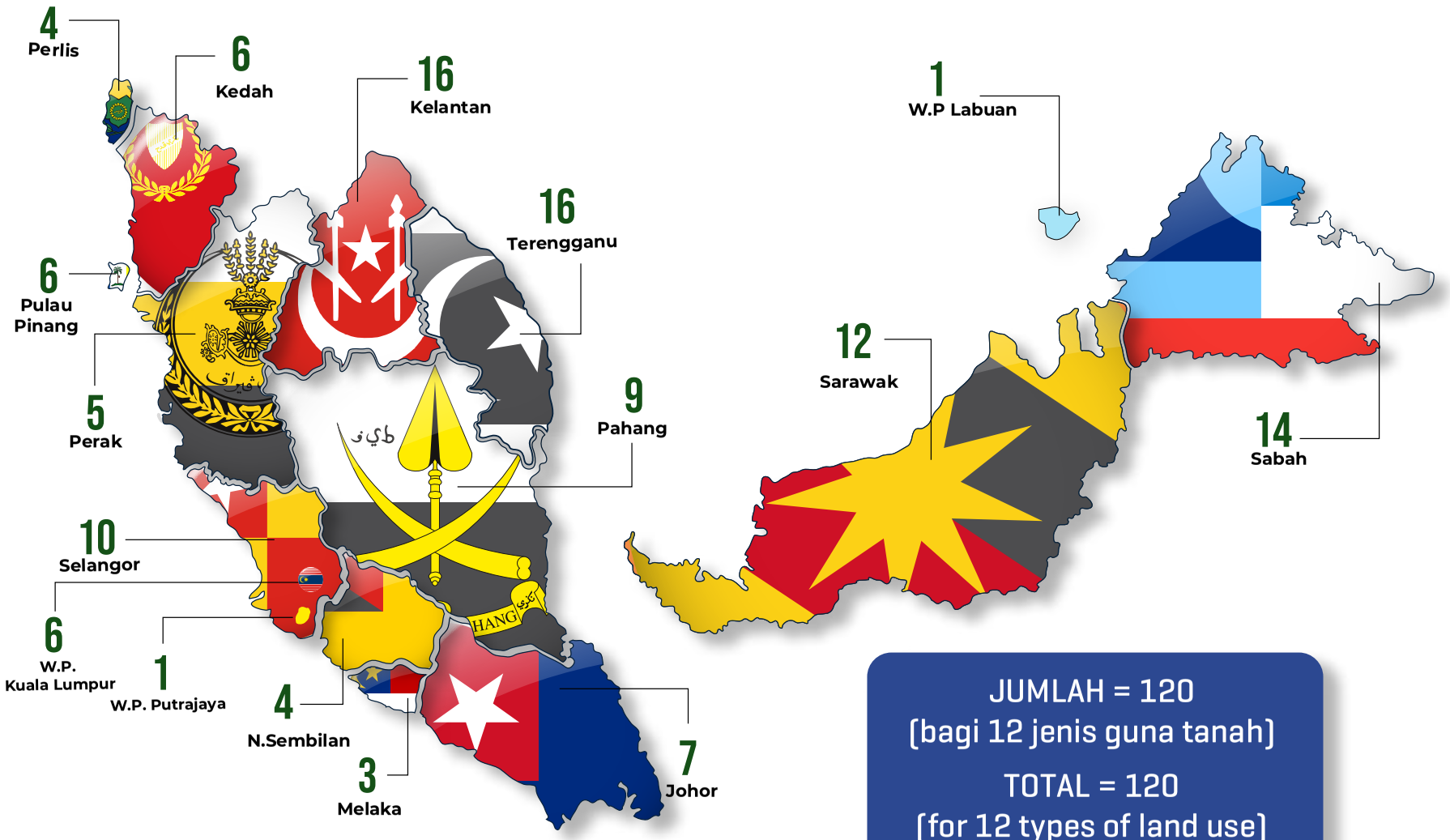
Indeks Kualiti Air Tanah (IKAT) digunakan sebagai satu kaedah menentukan kategori dan status kualiti air tanah. IKAT dibangunkan berdasarkan tujuh (7) parameter utama iaitu pH, besi, jumlah pepejal terlarut, nitrat, E-coli, fenol dan sulfat. IKAT yang berskala 0 hingga 100 akan menentukan kategori kualiti air tanah dari sangat baik hingga sangat tercemar **(Jadual 3.2).**

GROUNDWATER QUALITY MONITORING

The National Groundwater Quality Monitoring Program has been started since 1997. The monitoring station sites that have been selected are representative of specific land use types where there are 120 groundwater quality monitoring stations (wells) throughout the country. In 2021, for 114 stations groundwater conducted quality sampling have only been. This is for the reasons of no discharge of groundwater due to development factors and rocks cracking in the groundwater quality monitoring stations. **Table 3.1** shows the distribution of groundwater quality monitoring stations (wells) throughout the state in Malaysia by land use category.

In 2021, 346 samples were analyzed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO).

The Malaysia Groundwater Quality Index (GWQI) is used as a method to determine the groundwater quality status and its category. MGQI was developed based on seven (7) main parameters, namely pH, iron, total dissolved solids, nitrate, E-coli, phenol and sulphate. MGQI with a scale quality ranging from 0 to 100 that will identify quality of the groundwater from excellent to very poor **(Table 3.2).**



Jumlah Stesen Pengawasan Kualiti Air Tanah bagi Setiap Negeri Seluruh Malaysia, 2021

Total Station Monitoring Well Groundwater Quality for Each States of Malaysia, 2021

Jadual 3. 1: Taburan Stesen Pengawasan Kualiti Air Tanah di Seluruh Negeri di Malaysia mengikut Jenis Kategori Guna Tanah, 2021
Table 3.1: Distribution of Groundwater Quality Monitoring Stations (Wells) Throughout the States in Malaysia by Land Use Category, 2021

KATEGORI / CATEGORY	BILANGAN TELAGA / NUMBER OF WELLS	NEGERI / STATE	BILANGAN TELAGA / NUMBER OF WELLS
Kawasan Pertanian / Agriculture	15	Sabah	2
		Terengganu	5
		Pahang	1
		Kedah	3
		Perlis	1
		Kelantan	2
		Selangor	1
Bandar dan Pinggir Bandar / Urban and Suburban Area	12	Sabah	1
		Terengganu	2
		Pahang	1
		Kedah	1
		Perlis	2
		Kelantan	2
		Selangor	2
		W.P. Putrajaya	1
Tapak Perindustrian / Industrial Sites	22	Sabah	1
		Terengganu	5
		Johor	2
		Kedah	1
		Kelantan	2
		Melaka	1
		Selangor	3
		Pulau Pinang	3
		N. Sembilan	1
		Perak	1
		Pahang	1
		Perlis	1
Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	26	Sabah	7
		Sarawak	2
		Terengganu	2
		Johor	2
		Kelantan	3
		Perak	1
		Kuala Lumpur	5
		N. Sembilan	3
		Melaka	1

Jadual 3. 1: Taburan Stesen Pengawasan Kualiti Air Tanah di Seluruh Negeri di Malaysia mengikut Jenis Kategori Guna Tanah, 2021

Table 3.1: Distribution of Groundwater Quality Monitoring Stations (Wells) Throughout the States in Malaysia by Land Use Category, 2021

KATEGORI / CATEGORY	BILANGAN TELAGA / NUMBER OF WELLS	NEGERI / STATE	BILANGAN TELAGA / NUMBER OF WELLS
Padang Golf / Golf Course	7	Sabah	2
		Kelantan	4
		Kuala Lumpur	1
Luar Bandar / Rural	6	Terengganu	1
		Kelantan	3
		Melaka	1
		Selangor	1
Bekas Lombong Emas / Used Mining (Gold Mines)	3	Sarawak	3
Bekalan Air / Water Supply	5	Sabah	1
		Sarawak	4
Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	14	Sarawak	2
		Johor	3
		Perak	3
		Selangor	3
		Pulau Pinang	3
Akuakultur / Aquaculture	7	Pahang	6
		Terengganu	1
Tapak Pelupusan Radioaktif / Radioactive Landfills	1	Perak	1
Peranginan / Resorts	2	Sabah	1
		Kedah	1
Jumlah / Total			120

Mata Air Panas Poring, Ranau. Sabah

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 / Pertanian / Irrigation
Sederhana / Fair	40-69	Penggunaan Industri / Industrial Use
Baik / Good	70-89	Berpotensi sebagai air minuman / Potential use as drinking water
Sangat Baik / Excellent	≥ 90	Air berkualiti untuk semua kegunaan / High quality water for all purpose

Hutan Paya Bakau, Malaysia

STATUS KUALITI AIR TANAH BAGI KAWASAN PERTANIAN

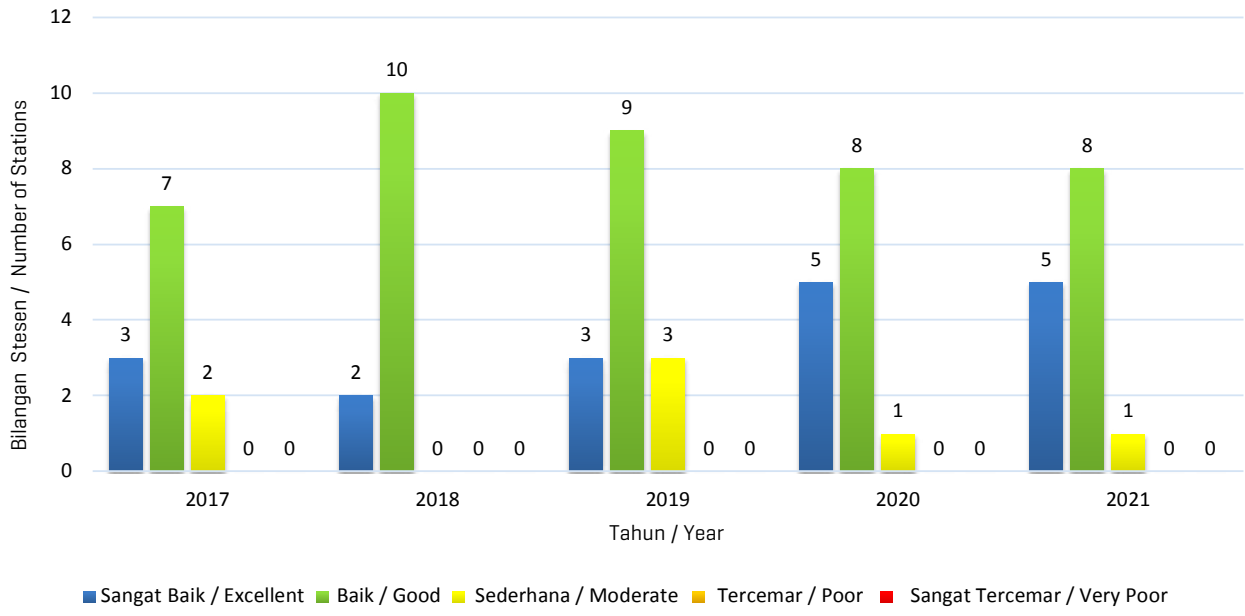
Tren IKAT mulai tahun 2017 hingga 2021 bagi kawasan pertanian adalah seperti yang ditunjukkan dalam **Rajah 3.1.** Berdasarkan **Rajah 3.1,** didapati bilangan stesen sangat baik, baik dan sederhana sama seperti tahun sebelumnya, Tiada stesen tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak 14 stesen kawasan pertanian telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan lima (5) stesen (36%) sangat baik, lapan (8) stesen (57%) baik dan satu (1) stesen (7%) sederhana **(Jadual 3.3).**

STATUS OF GROUNDWATER QUALITY INDEX FOR AGRICULTURE

GWQI trend for agriculture from the year 2017 until 2021 is shown in **Figure 3.1**. Based on **Figure 3.1,** the number of excellent, good and moderate stations remain the same as previous year. No station was categorized under poor and very poor in the year 2021.

In 2021, a total of 14 stations under agriculture were monitored. The monitoring result indicated that five (5) stations were excellent (36%), eight (8) stations were good (57%) and one (1) station was moderate (7%). **(Table 3.3).**



Rajah 3.1: Tren Indeks Kualiti Air Tanah Kawasan Pertanian, 2017 - 2021
Figure 3.1: Trend of Groundwater Quality Index for Agriculture, 2017 - 2021

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 (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perlis	Pertanian / Agriculture	Rimba Mas, Padang Besar	MW(7) -R3 -1 -15.72	90	83	92	96	86	Baik / Good
Kedah	Pertanian / Agriculture	Padang Mat Sirat, Langkawi	MW(7) - KV - 1 - 5.80	82	81	89	97	97	Sangat baik / Excellent
		Padang Mat Sirat, Langkawi	MW(7) - KV - 1 - 12.09	80	79	79	95	95	Sangat baik / Excellent
		*SK. Kepala Batas	MW(7) - R610014 - 2 - 9.34	–	–	81	73	91	Sangat baik / Excellent
Selangor	Pertanian / Agriculture	*Masjid Jameul Huda, Parit 7, Sekinchan	MW(7) - S310105 - 1 - 13.70	–	–	60	60	63	Sederhana / Moderate
Pahang	Pertanian / Agriculture	Sek. Keb. Lepar	MW(7) - C7 - 1 - 6.64	81	95	88	88	90	Sangat baik / Excellent
Kelantan	Pertanian / Agriculture	Kampong Jembal Kota Bharu.	MW(7) - D6 - 1 - 7.58	96	80	97	82	79	Baik / Good
		Sek. Keb. Beris Lalang Bachok	MW(7) - D15 - 1 - 4.05	76	75	80	–	–	Tiada Data / No Data
Terengganu	Pertanian / Agriculture	Kg.Merang, Setiu	MW(7) - T8 - 1 - 8.56	81	82	79	79	78	Baik / Good
		Sek. Keb. Alor PeroiKg, Gajah Mati	T21 - 1 - 45.82	66	82	60	78	77	Baik / Good
		Sek. Keb. Alor PeroiKg, Gajah Mati	T21 - 1 - 22.13	66	83	63	72	80	Baik / Good
		Sek. Keb. Alor PeroiKg, Gajah Mati	T21 - 1 - 6.16	80	82	80	91	97	Sangat baik / Excellent
		*Sk. Telaga Hulu Terengganu	MW(7) - T510216 - 1 - 9.06	–	–	78	82	72	Baik / Good
Sabah	Pertanian / Agriculture	Limbawang Agriculture Stesen, Beaufort	MW(7) - H511511 -1 - 7.50	86	81	82	76	81	Baik / Good
		Yongs Farm, Tawau	MW(7) - H411712 -1 - 16.2	93	93	97	97	79	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station


Pulau Langkawi

STATUS KUALITI AIR TANAH BAGI BANDAR DAN PINGGIR BANDAR

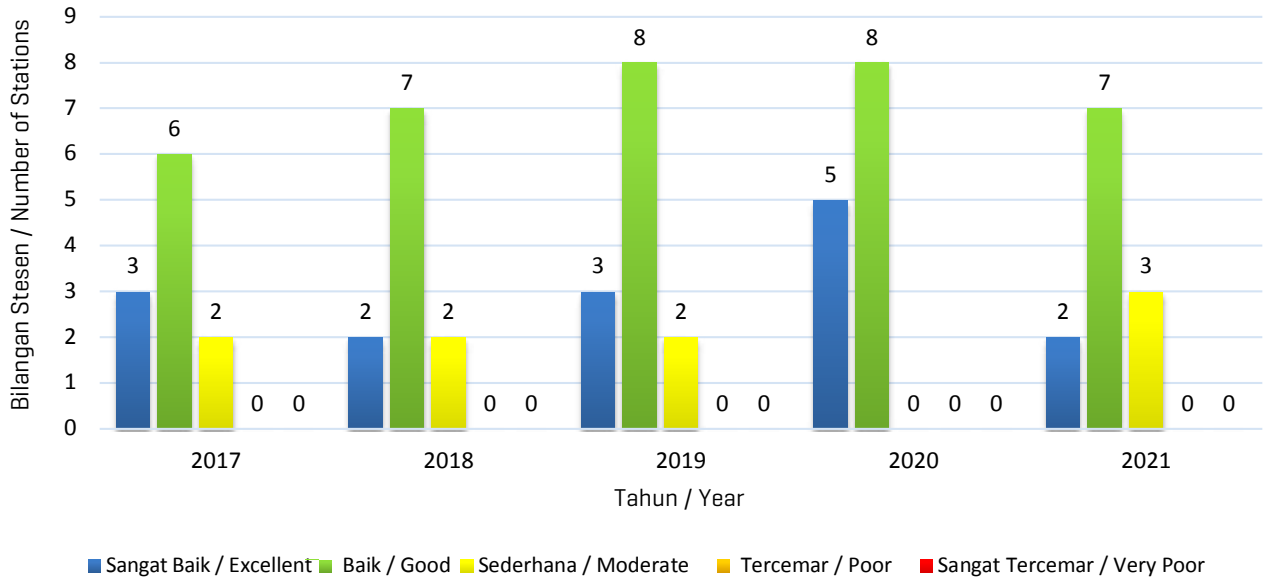
Tren IKAT mulai tahun 2017 hingga 2021 bagi bandar dan pinggir bandar adalah seperti yang ditunjukkan dalam **Rajah 3.2.** Berdasarkan **Rajah 3.2** didapati bilangan stesen sangat baik dan baik telah menurun manakala bilangan stesen sederhana meningkat dibandingkan tahun sebelumnya. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak 12 stesen guna tanah bandar dan pinggir bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan dua (2) stesen (17%) sangat baik, tujuh (7) stesen (58%) baik dan tiga (3) stesen (25%) sederhana **(Jadual 3.4).**

STATUS OF GROUNDWATER QUALITY INDEX FOR URBAN AND SUBURBAN

GWQI trend for urban and suburban from year 2017 until 2021 is shown in **Figure 3.2.** Based on **Figure 3.2.** The number of excellent and good stations has decreased while the number of moderate stations has increased compared to the previous year. No station was categorized as poor and very poor in the year 2021.

In 2021, a total of 12 stations under urban and suburban land use were monitored. The monitoring result indicated that two (2) stations (17%) were excellent, seven (7) stations (58%) were good and three (3) stations were moderate (25%) **(Table 3.4).**



Rajah 3.2: Tren Indeks Kualiti Air Tanah bagi Bandar dan Pinggir Bandar, 2017 - 2021
Figure 3.2: Trends of Groundwater Quality Index for Urban and Suburban, 2017 - 2021

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 (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perlis	Bandar dan Pinggir Bandar / Urban and Suburban	Arau Perlis	MW(7) -R4 -1 -5.41	80	77	76	75	68	Sederhana / Moderate
		Arau Perlis	MW(7) -R4 -1 -19.80	95	93	87	93	88	Baik / Good
Kedah	Bandar dan Pinggir Bandar / Urban and Suburban	SK Darul Uloom Kepala Batas	MW(7) -K2 -1 -6.22	59	55	75	74	82	Baik / Good
Selangor	Bandar dan Pinggir Bandar / Urban and Suburban	Saujana Golf Resort, Subang	MW(7) -S13 -1 -5.45	82	69	79	78	80	Baik / Good
		Saujana Golf Resort, Subang	MW(7) -S13 -1 -12.67	88	78	97	97	89	Baik / Good
W.P. Putrajaya	Bandar dan Pinggir Bandar / Urban and Suburban	*Taman Wetland	MW(7) -W210103-1 -10.0	–	–	72	80	–	Tiada Data
Pahang	Bandar dan Pinggir Bandar / Urban and Suburban	Nenasi	MW(7) -C13 -1 -45.97	85	90	88	93	85	Baik / Good
Kelantan	Bandar dan Pinggir Bandar / Urban and Suburban	Sek.Men.Keb. Rantau Panjang	MW(7) -D7 -1 -5.50	91	82	96	97	80	Baik / Good
		Sek.Men.Keb. Rantau Panjang	MW(7) -D7 -1 -20.23	92	81	86	82	79	Baik / Good
		*Sek.Men.Keb. Cherang Ruku, Pasir Puteh	MW(7) -D510202-1 -7.96	–	–	67	88	68	Sederhana / Moderate
Terengganu	Bandar dan Pinggir Bandar / Urban and Suburban	Kg. Raja, Besut	MW(7) -T1 -1 -7.25	83	84	79	88	96	Sangat baik / Excellent
		Kg. Raja, Besut	MW(7) -T1 -1 -31.79	67	85	64	73	64	Sederhana / Moderate
Sabah	Bandar dan Pinggir Bandar / Urban and Suburban	SK Inanam	MW(7) -H511601-9 -7.50	78	80	93	91	92	Sangat baik / Excellent

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

Gunung Santubong, Sarawak

STATUS KUALITI AIR TANAH BAGI TAPAK PERINDUSTRIAN

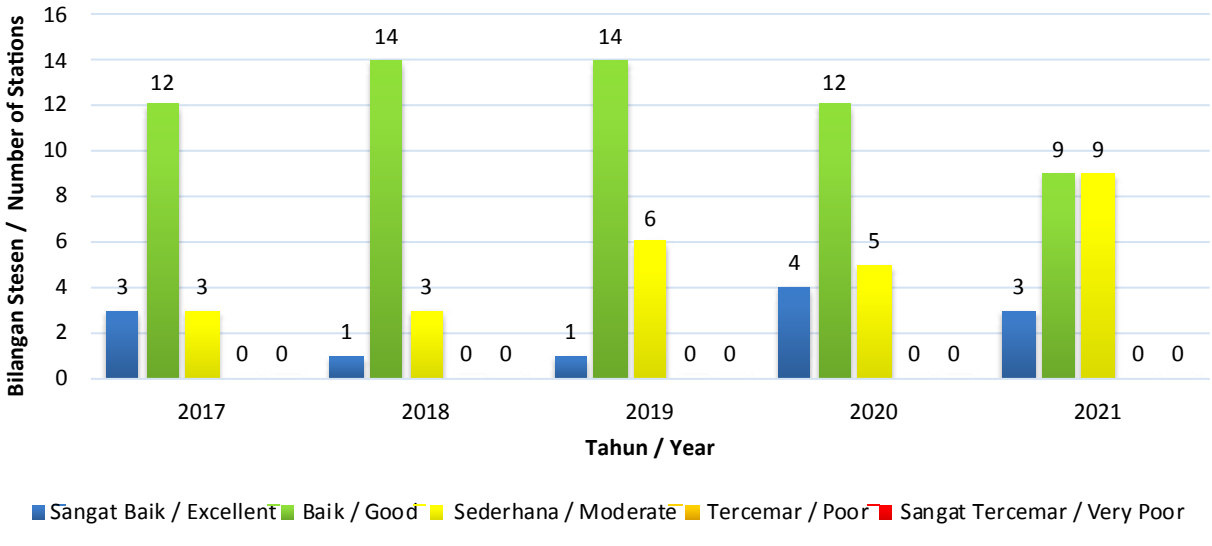
Tren IKAT mulai tahun 2017 hingga 2021 bagi tapak perindustrian adalah seperti yang ditunjukkan dalam **Rajah 3.3.** Berdasarkan **Rajah 3.3**, didapati bilangan stesen sangat baik dan baik telah menurun. Bilangan stesen sederhana meningkat. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak 21 stesen tapak perindustrian telah dipantau sama seperti tahun 2020. Hasil program pengawasan yang telah dijalankan menunjukkan tiga (3) stesen (14%) sangat baik, sembilan (9) stesen (43%) baik dan sembilan (9) stesen (43%) sederhana **(Jadual 3.5).**

STATUS OF GROUNDWATER QUALITY INDEX FOR INDUSTRIAL SITES

GWQI trend for industrial sites from year 2017 until 2021 is shown in **Figure 3.3.** Based on **Figure 3.3**, the number of excellent and good stations has decreased, and moderate category has increased compared to the previous year. No station was categorized as poor and very poor in the year 2021.

In 2021, a total of 21 stations for industrial sites were monitored. The monitoring result indicated that three (3) stations (14%) were excellent, nine (9) stations (43%) were good and nine (9) stations (43%) were moderate **(Table 3.5)**.



Rajah 3.3 : Tren Indeks Kualiti Air Tanah bagi Tapak Perindustrian, 2017 - 2021
Figure 3.3 : Trends of Groundwater Quality Index for Industrial Sites, 2017 - 2021

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 (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perlis	Tapak Perindustrian / Industrial Sites	*Felda Chuping	MW(7)-R610006-2-6.55	–	–	71	90	76	Baik / Good
Kedah	Tapak Perindustrian / Industrial Sites	Kulim Hi-Tech	MW(7)-K3-1-8.45	68	70	82	72	82	Baik / Good
Pulau Pinang	Tapak Perindustrian / Industrial Sites	Mak Mandin (MAGRI)	MW(7)-P1-2-4.50	86	76	69	78	78	Baik / Good
		Mak Mandin (KASTAM)	MW(7)-P1-1-6.50	91	77	74	79	84	Baik / Good
		Bayan Lepas	MW(7)-P2-1-4.34	89	87	78	98	95	Sangat baik / Excellent
Selangor	Tapak Perindustrian / Industrial Sites	SK Seksy. 20, Shah Alam	MW(7)-S9A-1-8.20	74	67	82	73	62	Sederhana / Moderate
		CIAST, Seksy. 19, Shah Alam	MW(7)-S9-1-20.21	77	67	81	81	66	Sederhana / Moderate
		CIAST, Seksy. 19, Shah Alam	MW(7)-S9-1-5.97	72	66	54	78	53	Sederhana / Moderate
N. Sembilan	Tapak Perindustrian / Industrial Sites	Senawang Edible Oil	MW(7)-N4-1-6.44	71	71	81	65	72	Baik / Good
Melaka	Tapak Perindustrian / Industrial Sites	Petronas Oil Refinery, Melaka	MW(7)-M1-1-8.10	75	71	64	64	82	Baik / Good
Johor	Tapak Perindustrian / Industrial Sites	Tg. Puteri, Pasir Gudang	MW(7)-J5-1-7.34	92	99	73	85	90	Sangat baik / Excellent
		Tg. Puteri, Pasir Gudang	MW(7)-J5-2-7.49	74	72	70	60	48	Sederhana / Moderate
Pahang	Tapak Perindustrian / Industrial Sites	*LYNAS, Gebeng	MW(7)-C310302-1-6.50	–	–	66	62	77	Baik / Good
Kelantan	Tapak Perindustrian / Industrial Sites	Eastern Garment MFG. Pkln.Chepa	MW(7)-D6-2-51.38	81	70	87	71	57	Sederhana / Moderate
		Eastern Garment MFG. Pkln.Chepa	MW(7)-D6-2-4.24	90	80	79	71	68	Sederhana / Moderate
Terengganu	Tapak Perindustrian / Industrial Sites	TCOT Kerteh, Kemaman	MW(7)-T15-1-5.68	81	82	88	97	80	Baik / Good
		TCOT Kerteh, Kemaman	MW(7)-T15-1-24.89	68	85	82	82	65	Sederhana / Moderate
		KSB Telok Kalong, Kemaman	MW(7)-T16-1-5.57	70	87	64	82	64	Sederhana / Moderate
		KSB Telok Kalong, Kemaman	MW(7)-T16-1-18.76	66	83	61	69	60	Sederhana / Moderate
		*Sk. Bari, Setiu	MW(7)-T510208-1-7.97	–	–	74	78	78	Baik / Good
W.P. Labuan	Tapak Perindustrian / Industrial Sites	Asian Supply Base W. P. Labuan	MW(7)-H511509-1-6.80	83	81	91	94	91	Sangat baik / Excellent

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

Tanjung Piai Mangrove Swamp Forest, Johor

STATUS KUALITI AIR TANAH BAGI BEKAS TAPAK PELUPUSAN SAMPAH

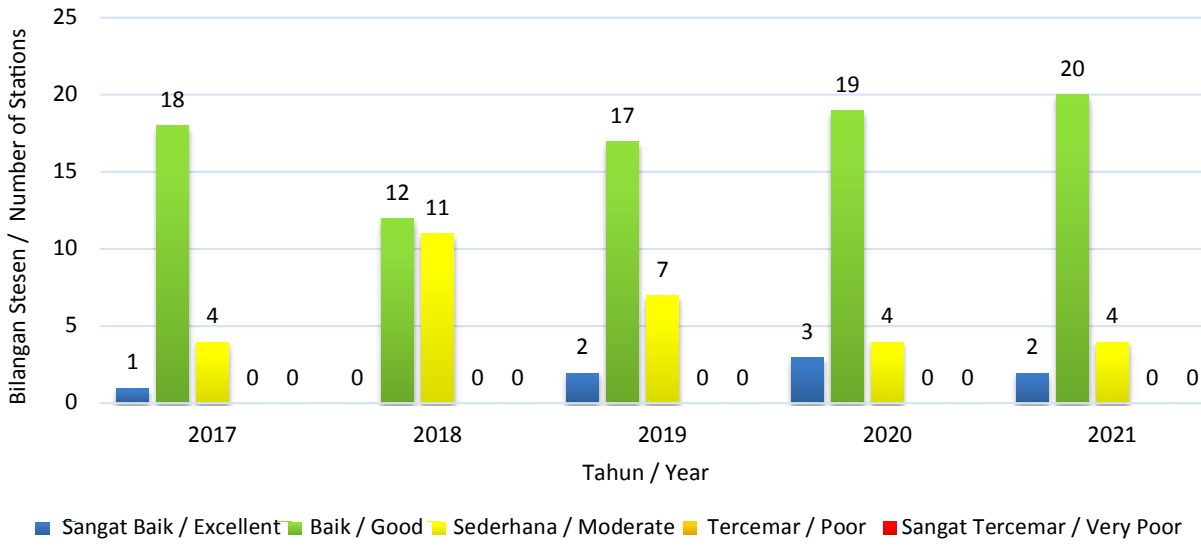
Tren IKAT mulai tahun 2017 hingga 2021 bagi bekas tapak pelupusan sampah adalah seperti yang ditunjukkan dalam **Rajah 3.4**. Berdasarkan **Rajah 3.4** didapati bilangan stesen sangat baik telah menurun berbanding tahun sebelumnya. Bilangan stesen baik meningkat manakala bilangan stesen sederhana sama seperti tahun sebelumnya. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak 26 stesen bekas tapak pelupusan sampah telah dipantau sama seperti tahun 2020. Hasil program pengawasan yang telah dijalankan menunjukkan dua (2) stesen (8%) sangat baik, 20 stesen (77%) baik dan empat (4) stesen (15%) sederhana.

STATUS OF GROUNDWATER QUALITY INDEX FOR USED SOLID WASTE LANDFILLS

GWQI trend from 2017 to 2021 for used solid waste landfills is as shown in **Figure 3.4.** Based on **Figure 3.4,** it is found that the number of excellent stations has decreased compared to the previous year. The number of good stations increased while the number of moderate stations was the same as the previous year. There are no stations in the polluted and highly polluted category in 2021.

In 2021, a total of 26 stations for used solid waste landfills were monitored the same as in 2020. The results of the monitoring program that was conducted showed that two (2) stations (8%) were excellent, 20 stations (77%) were good and four (4) (15%) were moderate.



Rajah 3.4: Tren Indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Sampah, 2017 - 2021
Figure 3.4: Trends of Groundwater Quality Index for Used Solid Waste Landfills, 2017 - 2021

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

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

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Pusing, Batu Gajah	MW(7)-A11-1-6.05	70	70	59	73	79	Baik / Good
W.P . Kuala Lumpur	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Jln Sg. Besi	MW(7)-S11-1-5.50	70	51	86	79	64	Sederhana / Moderate
		Jln Sg. Besi	MW(7)-S11-1-5.54	68	59	82	74	73	Baik / Good
		Jln Sg. Besi	MW(7)-S11-1-5.57	72	65	93	74	82	Baik / Good
		Tmn Beringin, Kepong	MW(7)-S13-1-7.26	72	58	95	84	73	Baik / Good
		Tmn Beringin, Kepong	MW(7)-S13-2-6.10	64	56	87	75	77	Baik / Good
N. Sembilan	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kualiti Alam	MW(7)-N5-1-8.00	82	64	84	79	83	Baik / Good
		Kualiti Alam	MW(7)-N5-1-7.55	70	64	64	64	82	Baik / Good
		*TPS Tanah Merah (CYPARK), Port Dickson	MW(7)-N210108-2-10.03	–	–	69	70	71	Baik / Good
Melaka	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	*Tapak Pelupusan Sampah, Sungai Udang	MW(7)-M210209-1-7.68	–	–	62	75	56	Sederhana / Moderate
Johor	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kg. Batu 4, Kota Tinggi	MW(7)-J4-1-6.94	76	82	65	89	61	Sederhana / Moderate
		*Tapak Pelupusan Sisa Pepejal, Ladang CEP, Simpang Renggam	MW(7)-J110302-1-7.02	–	–	64	63	64	Sederhana / Moderate
Kelantan	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-13.43	88	83	89	82	73	Baik / Good
		Panji Landfill, Panji Kota Bharu	MW(7)-D6-3-5.34	88	80	89	82	73	Baik / Good
		P.Mas Landfill, Kg.Pusu 40, P.Mas	MW(7)-D8-1-5.22	90	76	89	94	72	Baik / Good
Terengganu	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-5.45	80	67	78	98	75	Baik / Good
		Kg. Kubang Badak, K.Terengganu	MW(7)-T10-1-22.89	81	81	78	97	76	Baik / Good
Sabah	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-1-8.80	70	70	82	82	82	Baik / Good
		ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-2-14.0	74	82	82	82	82	Baik / Good
		ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-3-8.00	78	85	86	85	85	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 for Used Solid Waste Landfills

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-4-17.3	78	84	85	85	84	Baik / Good
		ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-5-19.0	74	76	73	80	80	Baik / Good
		ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-6-10.2	72	69	80	80	96	Sangat baik / Excellent
		ITAC, Kg. Duvanson, Penampang	MW(7)-H511601-7-10.3	80	73	82	82	97	Sangat baik / Excellent
Sarawak	Bekas Tapak Pelupusan Sampah / Used Solid Waste Landfills	Kemuyang, No.1	MW(7)-QS-K1-11.10	56	58	53	53	84	Baik / Good
		Kemuyang, No.2	MW(7)-QS-K2-10.78	62	51	72	69	83	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI PADANG GOLF

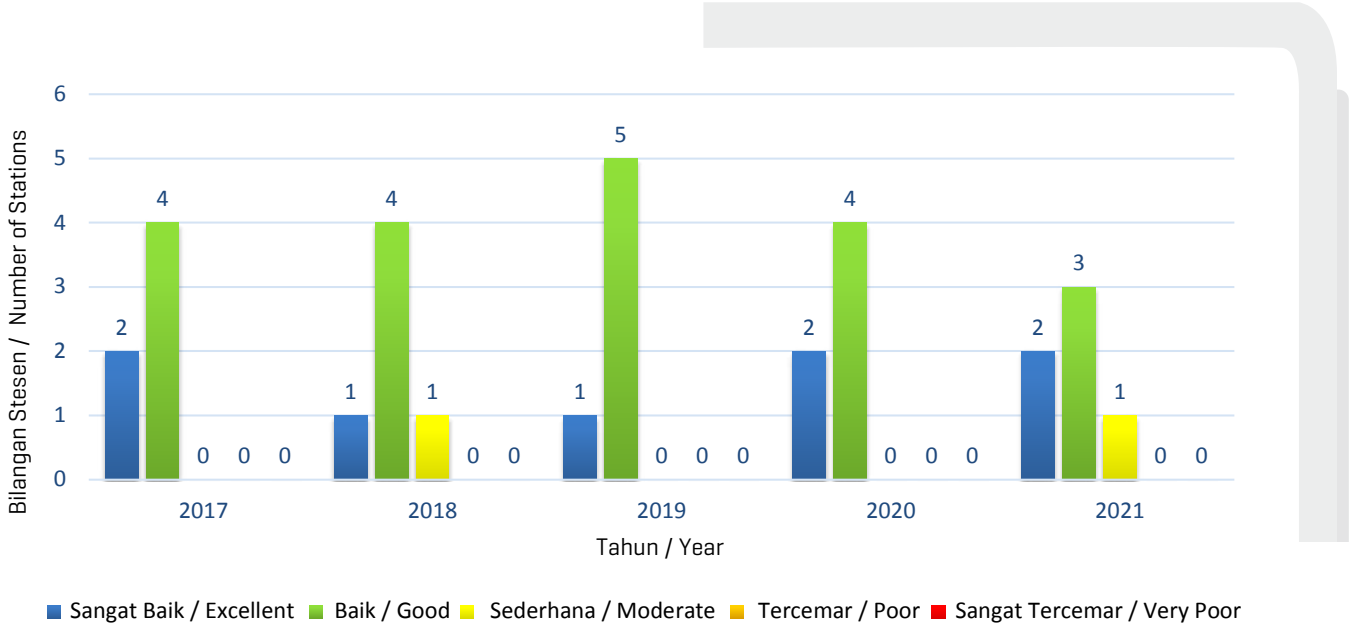
Tren IKAT mulai tahun 2017 hingga 2021 bagi padang golf adalah seperti yang ditunjukkan dalam **Rajah 3.5.** Berdasarkan **Rajah 3.5,** didapati bilangan stesen sangat baik sama seperti tahun sebelumnya. Bilangan stesen dalam kategori baik menurun berbanding tahun sebelumnya manakala bilangan stesen yang berada dalam kategori sederhana meningkat. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak enam (6) stesen yang dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan dua (2) stesen (33%) sangat baik dan tiga (3) stesen (50%) baik dan satu (1) stesen sederhana (17%) **(Jadual 3.7).**

STATUS OF GROUNDWATER QUALITY INDEX FOR GOLF COURSES

The GWQI trend from 2017 to 2021 for golf courses is as shown in **Figure 3.5**. Based on **Figure 3.5**, it was found that the number of stations categorized as very good remained the same as previous year. The number of stations in the good category decreased compared to the previous year while the number of stations in moderate category increased. No station was categorized as poor and very poor in 2021.

In 2021, six (6) stations were monitored. The monitoring results indicated that two (2) station (33%) were excellent and three (3) stations (50%) were good and one (1) station was moderate (17%) **(Table 3.7)**.



Rajah 3.5 : Tren Indeks Kualiti Air Tanah bagi Padang Golf, 2017 - 2021
Figure 3.5 : Trends of Groundwater Quality Index for Golf Courses, 2017 - 2021

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 (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
W.P. Kuala Lumpur	Padang Golf / Golf Courses	Royal Selangor Golf Club	MW[7]-S12-1-5.37	–	–	–	–	–	Tiada Air / No Water
Kelantan	Padang Golf / Golf Courses	Kelab Golf & Desa Pkln.Chepa	MW[7]-D3-1-6.90	84	82	89	82	79	Baik / Good
		Kelab Golf & Desa Pkln.Chepa	MW[7]-D3-1-6.37	90	71	84	71	62	Sederhana / Moderate
		Kelab Golf D'Raja Kubang Kerian	MW[7]-D6-4-31.29	82	65	82	82	75	Baik / Good
		Kelab Golf D'Raja Kubang Kerian	MW[7]-D6-4-9.05	89	75	85	81	90	Sangat baik / Excellent
Sabah	Padang Golf / Golf Courses	Sandakan Golf Club, Sandakan	MW[7]-H511801-1-8.82	86	79	81	96	81	Baik / Good
		Sandakan Golf Club, Sandakan	MW[7]-H511801-2-8.60	96	96	96	95	95	Sangat baik / Excellent

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI LUAR BANDAR

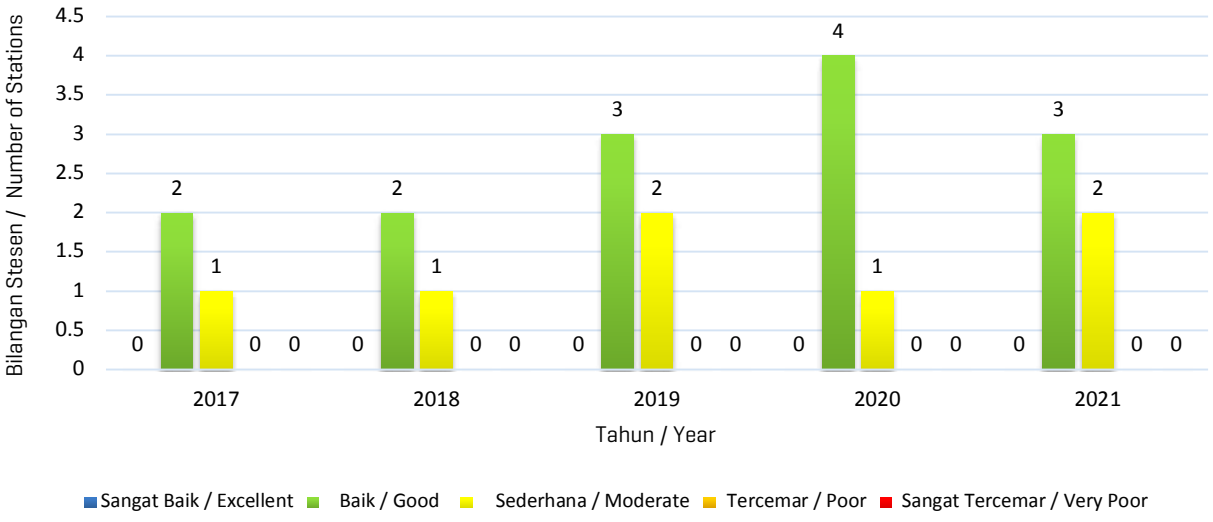
Tren IKAT mulai tahun 2017 hingga 2021 bagi kawasan luar bandar adalah seperti yang ditunjukkan dalam **Rajah 3.6**. Bilangan stesen baik menunjukkan penurunan berbanding tahun sebelumnya. dan bilangan stesen sederhana meningkat berbanding tahun lepas. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak lima (5) stesen kawasan luar bandar telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan tiga (3) stesen (60%) baik dan dua (2) stesen (40%) sederhana **(Jadual 3.8).**

STATUS OF GROUNDWATER QUALITY INDEX FOR RURAL

GWQI trend for rural area from the year 2017 until 2021 is shown in **Figure 3.6.** Number of stations categorized as good has decreased compared to the previous year and the number of stations categorized as moderate has increased compared to the previous year. No station was categorized as poor and very poor in the year 2021.

In 2021, a total of five (5) stations under rural area were monitored. The monitoring result indicated that three (3) stations (60%) were good and two (2) stations (40%) were moderate **(Table 3.8)**.



Rajah 3.6: Tren Indeks Kualiti Air Tanah bagi Luar Bandar, 2017 - 2021
Figure 3.6: Trends of Groundwater Quality Index for Rural, 2017 - 2021

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 [2021] / CATEGORY [2021]
				2017	2018	2019	2020	2021	
Kelantan	Luar Bandar / Rural	Sek. Keb. Jelawat Bachok	MW[7]-D11-1-6.10	81	81	80	79	73	Baik / Good
		Sek. Men. Keb. Jelawat Bachok	MW[7]-D11-2-5.09	74	65	65	81	58	Sederhana / Moderate
Selangor	Luar Bandar / Rural	*Institut Alam Sekitar, EIMAS, UKM Bangi	MW[7]-S210104-1-20.30	–	–	72	85	76	Baik / Good
Melaka	Luar Bandar / Rural	*Pusat Kecemerlangan Buangan Terjadual, JAS Tabuh Naning	MW[7]-M210209-2-21.10	–	–	49	42	63	Sederhana / Moderate
Terengganu	Luar Bandar / Rural	Kg.Padang Pak Wan, Bkt. Payung, Marang	MW[7]-T14-1-6.99	80	81	80	88	79	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI BEKAS LOMBONG EMAS

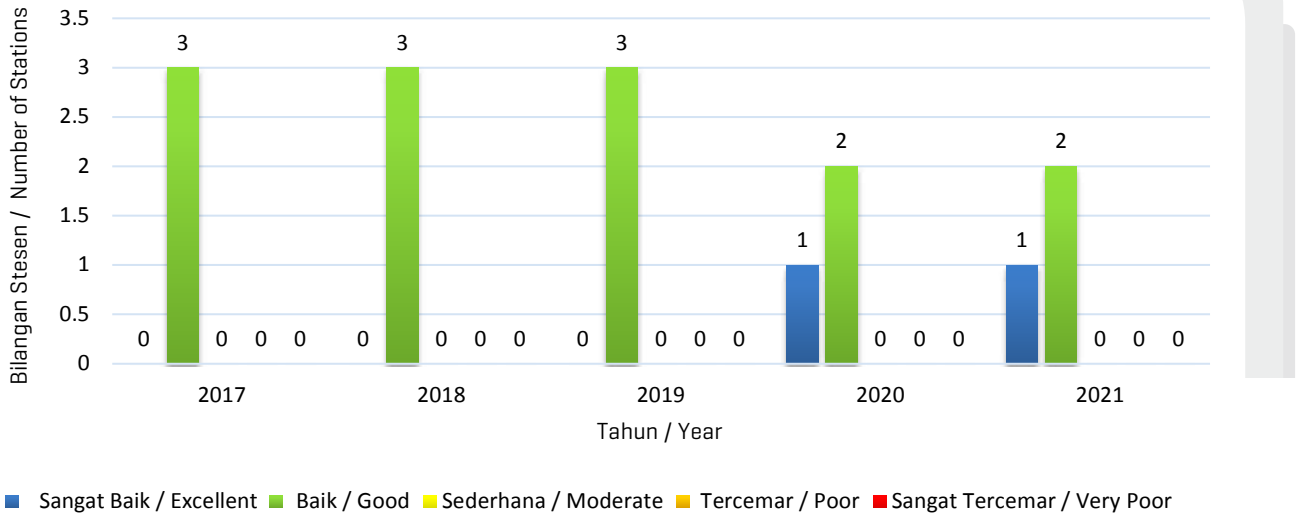
Tren IKAT mulai tahun 2017 hingga 2021 bagi bekas lombong emas adalah seperti yang ditunjukkan dalam **Rajah 3.7.** Berdasarkan **Rajah 3.7** didapati stesen bagi kategori sangat baik dan baik sama seperti tahun sebelumnya. Tiada stesen dalam kategori sederhana, tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak tiga (3) stesen bekas lombong emas telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan satu (1) stesen (33%) sangat baik dan dua (2) stesen (67%) baik **(Jadual 3.9).**

STATUS OF GROUNDWATER QUALITY INDEX FOR USED MINING (GOLD MINE)

GWQI trend for used mining (gold mine) from the year 2017 until 2021 is shown in **Figure 3.7.** Based on **Figure 3.7** it is found that stations categorized as excellent and good remained the same as previous year. No station was categorized as moderate, poor and very poor in the year 2021.

In 2021, a total of three (3) stations for used mining (gold mine) were monitored. The monitoring result indicated that one (1) station (33%) was excellent and two (2) stations (67%) were good **(Table 3.9).**



Rajah 3.7: Tren Indeks Kualiti Air Tanah bagi Bekas Lombong Emas, 2017 - 2021
Figure 3.7: Trends of Groundwater Quality Index for Used Mining (Gold Mine), 2017 - 2021

Jadual 3.9: Status Indeks Kualiti Air Tanah bagi Bekas Lombong Emas
Jadual 3.9: Status of Groundwater Quality Index For Used Mining (Gold Mine)

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Bekas Lombong Emas / Used Mining (Gold Mine)	Bau, No. 1	MW(7)-QK-B1-27.27	82	82	85	88	92	Sangat Baik / Excellent
		Bau, No. 2	MW(7)-QK-B2-29.50	85	82	84	93	87	Baik / Good
		Bau	MW(7)-QK-B3-29.00	82	73	82	82	82	Baik / Good

STATUS KUALITI AIR TANAH BAGI BEKALAN AIR

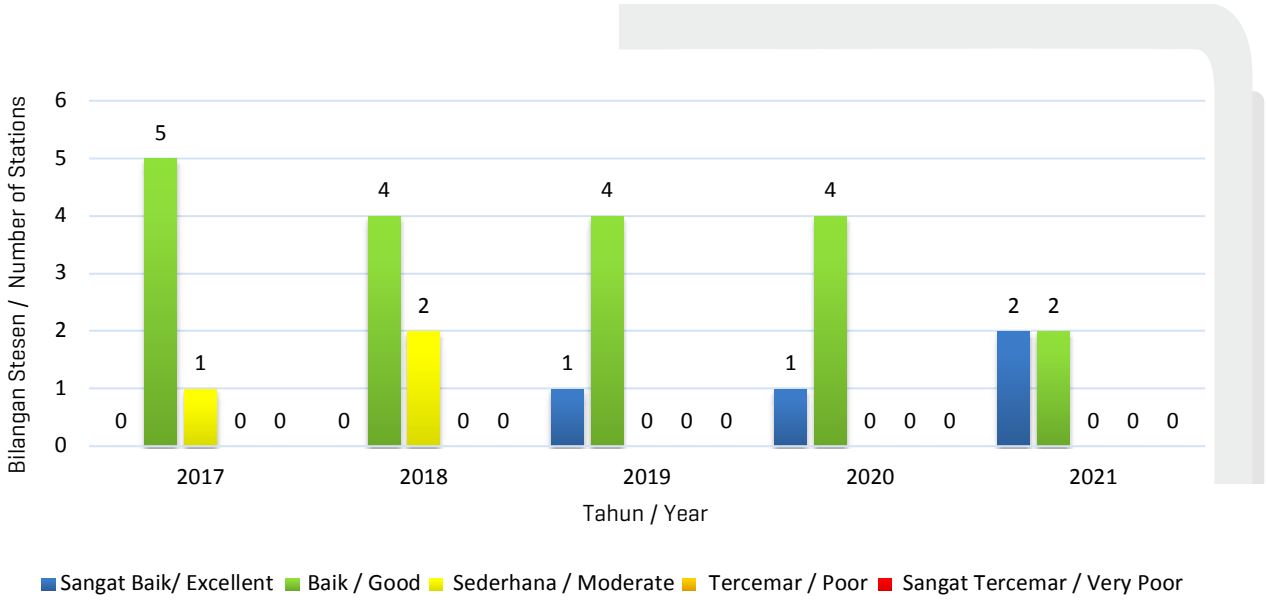
Tren IKAT mulai tahun 2017 hingga 2021 bagi bekalan air adalah seperti yang ditunjukkan dalam **Rajah 3.8.** Berdasarkan **Rajah 3.8** didapati stesen bagi kategori sangat baik meningkat berbanding tahun sebelumnya manakala stesen bagi kategori baik menurun berbanding tahun sebelumnya. Tiada stesen dalam kategori sederhana, tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak empat (4) stesen bekalan air telah dipantau. Hasil program pengawasan yang telah dijalankan menunjukkan dua (2) stesen (50%) sangat baik dan dua (2) stesen (50%) baik **(Jadual 3.10).**

STATUS OF GROUNDWATER QUALITY INDEX FOR WATER SUPPLY

GWQI trend for water supply from the year 2017 until 2021 is shown in **Figure 3.8.** Based on **Figure 3.8,** station categorized as excellent has increased compared to the previous year. Stations categorized as good has decreased compared to the previous year. No station was categorized as moderate, poor and very poor in the year 2021.

In 2021, a total of four (4) stations for water supply were monitored. The monitoring results indicated that two (2) stations (50%) were excellent and two (2) stations (50%) were good **(Table 3.10).**



Rajah 3.8: Tren Indeks Kualiti Air Tanah bagi Bekalan Air, 2017 - 2021

Figure 3.8: Trends of Groundwater Quality Index for Water Supply, 2017 - 2021

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	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Bekalan Air / Water Supply	Kg. Tajau Laut, Kudat	MW[7]-H511604-1-4.5	80	75	87	88	97	Sangat baik / Excellent
Sarawak	Bekalan Air / Water Supply	Kabong, No. 1	MW[7]-QB-K1-6.70	81	79	84	70	79	Baik / Good
		Pusat Rawatan Air.JKR, No. 1, Miri	MW[7]-QL-L1-7.53	72	56	92	99	–	Tiada Data / No Data
		Pusat Rawatan Air.JKR, No. 2, Miri	MW[7]-QL-L2-7.90	72	70	–	–	–	Tiada Data / No Data
		LAKU [Lambir], No. 1, Miri	MW[7]-QM-L1-30.50	62	59	75	83	93	Sangat baik / Excellent
		Kg. Lusut Kiri, No. 3, Miri	MW[7]-QM-L3-28.30	72	82	77	87	76	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI BEKAS TAPAK PELUPUSAN BANGKAI HAIWAN

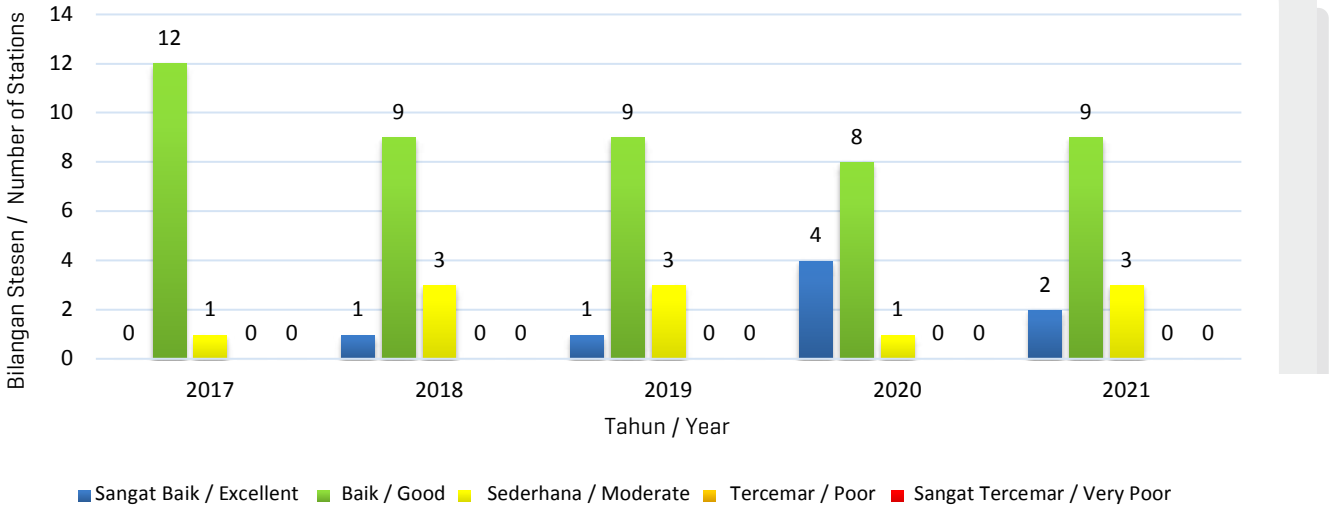
Tren IKAT mulai tahun 2017 hingga 2021 bagi bekas tapak pelupusan bangkai haiwan adalah seperti yang ditunjukkan dalam **Rajah 3.9.** Berdasarkan **Rajah 3.9** didapati jumlah stesen dalam kategori sangat baik menurun daripada tahun sebelumnya. Bilangan stesen baik dan sederhana meningkat pada tahun ini. Tiada stesen dalam kategori tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021 sebanyak 14 stesen yang dipantau. Berdasarkan **Jadual 3.11,** yang telah dijalankan menunjukkan dua (2) stesen (14%) sangat baik, sembilan (9) stesen (64%) baik dan tiga (3) stesen (22%) sederhana **(Jadual 3.11).**

STATUS OF GROUNDWATER QUALITY INDEX FOR USED ANIMAL BURIAL SITES

GWQI trend for used animal burial sites from the year 2017 until 2021 is shown in **Figure 3.9.** Based on **Figure 3.9**, station in the excellent category, decreased from the previous year while the number of good and moderate stations has increased compared to 2020. No station was categorized as poor and very poor in the year 2021.

In the year 2021, 14 stations were monitored. Based on **Table 3.11,** it indicated that two (2) stations (14%) were excellent, nine (9) stations (64%) were good and three (3) stations (22%) were moderate **(Table 3.11).**



Rajah 3.9: Tren Indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Bangkai Haiwan, 2017 - 2021
Figure 3.9: Trends of Groundwater Quality Index for Used Animal Burial Sites, 2017 - 2021

Jadual 3.11 : Status indeks Kualiti Air Tanah bagi Bekas Tapak Pelupusan Bangkai Haiwan

Table 3.11 : Status of Grondwater Quality Index for Used Animal Burial Sites

NEGERI / STATE	KLASSIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Tapak Bazar Seramik Tambun	MW[7]-A(IP)-1-5.92	70	69	69	78	73	Baik / Good
		Tapak Bekas Wabak JE Jalong	MW[7]-A(SS)-2-3.14	–	–	–	–	88	Baik / Good
		Tapak Bekas Wabak JE Jalong	MW[7]-A(SS)-1-7.65	85	85	83	87	84	Baik / Good
Pulau Pinang	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Perkampungan Ldg Valdor (Kelapa)	MW[7]-P(LV)-1-7.45	73	89	96	96	93	Sangat baik / Excellent
		Perkampungan Ldg Valdor (Tengah)	MW[7]-P(LV)-2-6.78	73	88	74	90	92	Sangat baik / Excellent
		Perkampungan Ldg Valdor (Jalan)	MW[7]-P(LV)-3-7.30	80	91	72	90	81	Baik / Good
Johor	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Ulu Choh (Pintu)	MW[7]-JPN-1-6.90	74	82	62	73	81	Baik / Good
		Ulu Choh (kolam)	MW[7]-JPN-2-6.10	74	81	70	70	62	Sederhana / Moderate
		Ulu Choh (sungai)	MW[7]-JPN-3-6.71	78	82	78	83	82	Baik / Good
Selangor	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	stesen kg. sg. keroh, sepang	MW[7]-S(SE)-1-5.67	72	63	59	52	62	Sederhana / Moderate
		TNB Sepang	MW[7]-S(SE)-2-6.95	87	71	79	96	68	Sederhana / Moderate
		Ladang Sepang	MW[7]-S(SE)-3-5.60	82	78	78	87	72	Baik / Good
Sarawak	Bekas Tapak Pelupusan Bangkai Haiwan / Used Animal Burial Sites	Oya Road, No. 1, Sibu	MW[7]-QS-Y1-10.00	64	55	79	79	89	Baik / Good
		Oya Road, No. 2, Sibu	MW[7]-QS-Y2-9.17	72	71	78	83	82	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI AKUAKULTUR

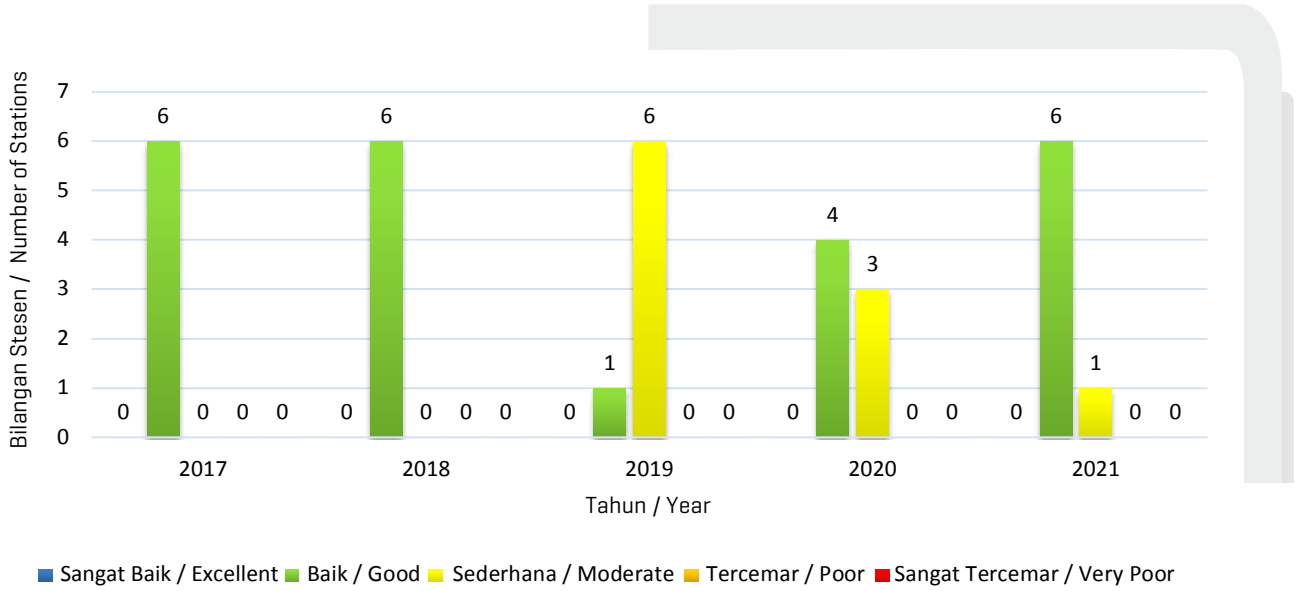
Tren IKAT mulai tahun 2017 hingga 2021 bagi akuakultur adalah seperti yang ditunjukkan dalam **Rajah 3.10.** Berdasarkan **Rajah 3.10** didapati bahawa kualiti air tanah di dua (2) stesen menunjukkan peningkatan iaitu daripada kelas sederhana kepada baik. Untuk kategori ini tiada stesen dalam kategori sangat baik, tercemar dan sangat tercemar pada tahun 2021.

Pada tahun 2021, sebanyak tujuh (7) stesen bagi akuakultur telah dipantau. Hasil program pengawasan yang telah dijalankan, enam (6) stesen (86%) baik, manakala satu (1) stesen (14%) sederhana **(Jadual 3.12).**

STATUS GROUNDWATER QUALITY FOR AQUACULTURE

GWQI trend for aquaculture from the year 2017 until 2021 is shown in **Figure 3.10.** Based on **Figure 3.10** it is found that groundwater quality in two (2) stations showed an improvement from moderate to good. No stations was categorized as excellent, poor and very poor in the year 2021.

In 2021, a total of seven (7) stations for aquaculture were monitored. The monitoring results indicated that six (6) stations (86%) were good and one (1) station (14%) was moderate **(Table 3.12).**



Rajah 3.10: Tren Indeks Kualiti Air Tanah bagi Akuakultur, 2017 - 2021
Figure 3.10: Trends of Groundwater Quality Index for Aquaculture, 2017 - 2021

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

NEGERI / STATE	KLASSIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Akuakultur / Aquaculture	Nenasi [Agrobest]	MW[7]-C16-2-10.5	80	81	62	61	79	Baik / Good
		Nenasi [Agrobest]	MW[7]-C16-3-43	79	80	68	74	79	Baik / Good
		Nenasi [Agrobest]	MW[7]-C16-4-38	82	83	72	76	82	Baik / Good
		Nenasi [Agrobest]	MW[7]-C16-5-10	84	79	60	58	76	Baik / Good
		Nenasi [Agrobest]	MW[7]-C16-6-10	73	82	64	82	82	Baik / Good
		Nenasi [Agrobest]	MW[7]-C16-7-29	87	88	69	80	86	Baik / Good
Terengganu	Akuakultur / Aquaculture	*Blue Archipelago	MW[7]-T510208-2-14.00	–	–	66	68	59	Sederhana / Moderate

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

STATUS KUALITI AIR TANAH BAGI PERANGINAN

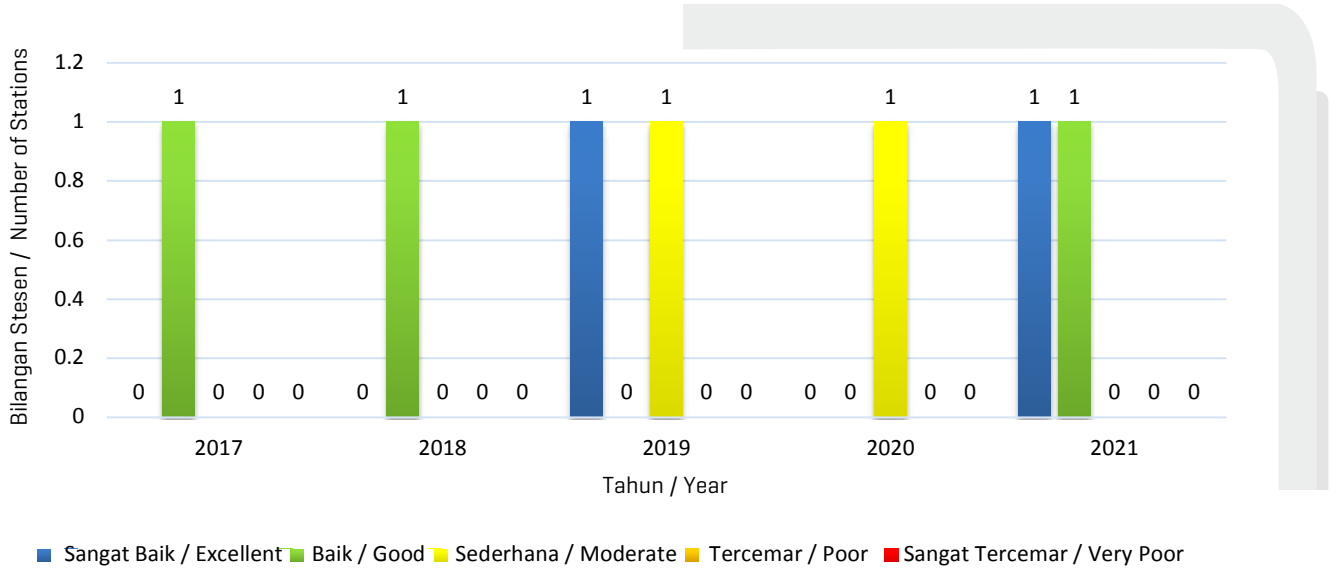
Tren IKAT mulai tahun 2017 hingga 2021 bagi kawasan peranginan adalah seperti yang ditunjukkan dalam **Rajah 3.11.** Berdasarkan **Rajah 3.11,** daripada dua (2) stesen yang dipantau satu (1) stesen dalam kategori sangat baik serta satu lagi dalam kategori baik. Tiada stesen dalam kategori sederhana, tercemar dan sangat tercemar.

Pada tahun 2021, sebanyak dua (2) stesen bagi kawasan peranginan telah dipantau berbanding satu (1) stesen pada tahun 2020. Hasil program pengawasan yang telah dijalankan, satu (1) stesen sangat baik, manakala satu (1) stesen baik. **(Jadual 3.13).**

STATUS OF GROUNDWATER QUALITY INDEX FOR RESORTS

GWQI trend from 2017 to 2021 for resorts is shown in **Figure 3.11.** Based on **Figure 3.11,** out of the two (2) stations monitored, one (1) station was in the excellent category while another one (1) is in the good category. No stations was categorized as moderate, poor and very poor in 2021.

In 2021, a total of two (2) stations for resorts were monitored compared to one (1) station in 2020. As a result of the monitoring program conducted, one (1) station was excellent, while one (1) station was good. **(Table3.13).**



Rajah 3.11: Tren Indeks Kualiti Air Tanah bagi Peranginan, 2017 - 2021
Figure 3.11: Trend of Groundwater Quality Index for Resorts, 2017 - 2021

Jadual 3.13: Status Indeks Kualiti Air Tanah bagi Peranginan
Table 3.13: Status of Groundwater Quality Index for Resorts

NEGERI / STATE	KLASSIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAT / GWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Peranginan / Resort	Pulau Manukan	MW(7)-H511601-8-6.50	83	85	93	–	95	Sangat baik / Excellent
Kedah	Peranginan / Resort	*Kuarters Imigresen Tanjung Rhu, Langkawi	MW(7)-KV 69912-1-10.10	–	–	68	57	79	Baik / Good

Nota / Note :
* Stesen Baru / New Station
- Tiada Data / No Data :
(i) Tiada Air / No Water
(ii) Stesen Rosak / Damaged Station

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) seperti di **ANNEX**.

Nilai peratusan tersebut adalah sebagaimana di dalam **Jadual 3.14.**

GROUNDWATER QUALITY STATUS

The assessment of groundwater quality was 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) as shown in **ANNEX**.

The percentage value is as shown in **Table 3.14.**

Jadual 3.14: Peratusan Julat Nilai Pematuhan, 2021
Table 3.14: Percentage of Compliance, 2021

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

Pada tahun 2021, keputusan yang diperoleh daripada pengawasan kualiti air tanah yang dijalankan menunjukkan bahawa semua stesen berada dalam peratusan julat nilai pematuhan Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) kecuali bagi beberapa guna tanah tertentu yang mana parameter seperti Mangan (Mn), Jumlah Kolifom, Besi (Fe) dan Sebatian Fenol mempunyai peratusan julat nilai pematuhan Standard Kualiti Air Tanah Bagi Rawatan Air Mentah Secara Konvensional (Air Minuman) yang rendah seperti yang ditunjukkan dalam **Rajah 3.12.** Merujuk **Rajah 3.12**, analisis status pematuhan kualiti air tanah adalah seperti berikut:

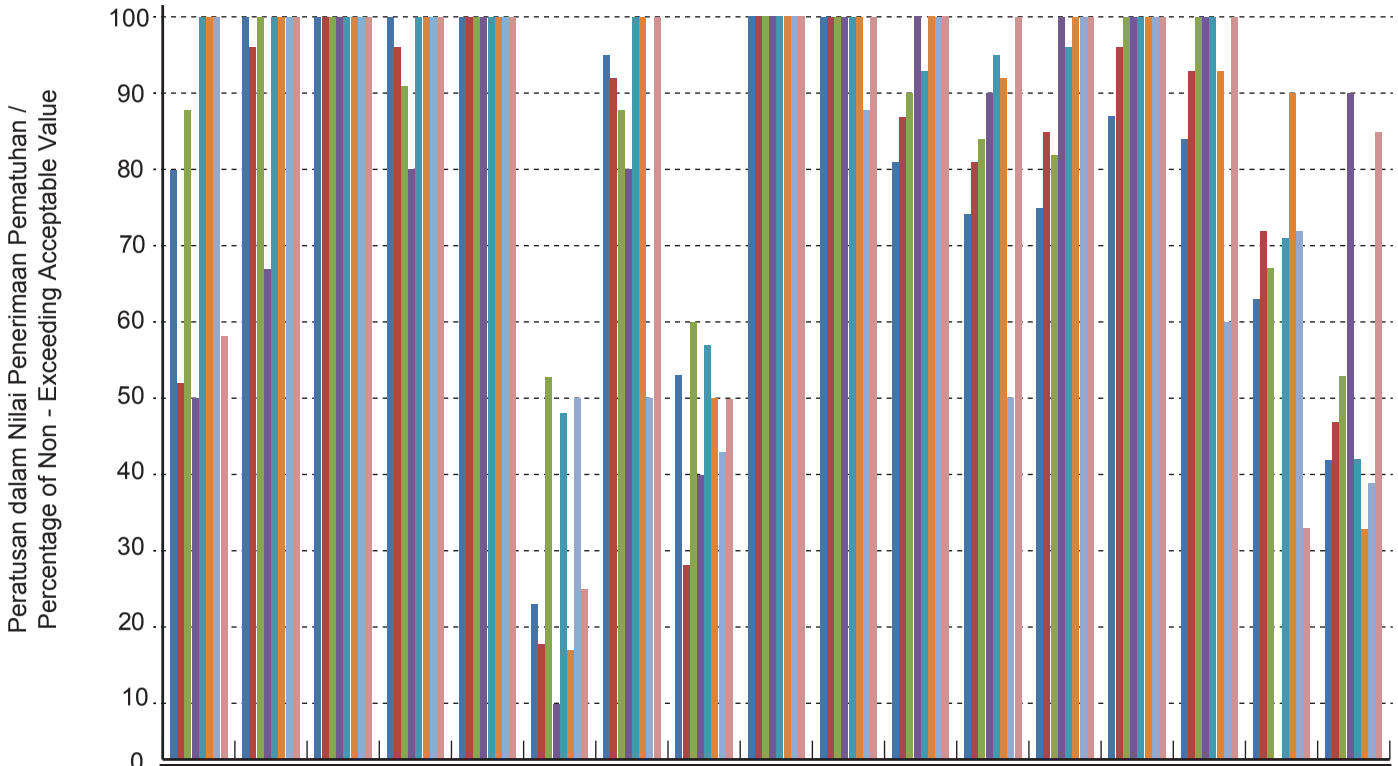
In 2021, the results derived from monitoring showed that all stations were within the Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water) values except for iron (Fe), manganese (Mn), total coliform and phenolics which had a low range of Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water) value as shown in **Figure 3.12**. Analysis of the compliance status of ground water quality is as shown in **Figure 3.12**.

(i) Peratus % pematuhan terendah bagi gunatanah industri adalah parameter fenol.
(ii) Peratus % pematuhan terendah bagi gunatanah tapak pelupusan sampah adalah parameter fenol.
(iii) Peratus % pematuhan terendah bagi gunatanah pertanian adalah parameter fenol.
(iv) Peratus % pematuhan terendah bagi gunatanah bekalan air tempatan adalah parameter Jumlah Kolifom.
(v) Peratus % pematuhan terendah bagi gunatanah bandar / pinggir bandar adalah parameter Fenol.
(vi) Peratus % pematuhan terendah bagi gunatanah Padang golf adalah parameter fenol.
(vii) Peratus % pematuhan terendah bagi gunatanah luar bandar adalah parameter fenol.
(viii) Peratus % pematuhan terendah bagi gunatanah bekas lombong adalah parameter mangan dan Jumlah Kolifom.

Jadual 3.15 menunjukkan nilai peratusan yang melebihi Standard Kualiti Air Tanah mengikut negeri.

(i) The lowest compliance percentage for industrial land use is the phenol parameter.
(ii) The lowest % compliance for landfill land use is the phenol parameter.
(iii) The lowest compliance percentage for agricultural land use is the phenol parameter.
(iv) The lowest % compliance for the local water supply land use is the Total Coliform parameter.
(v) The lowest % compliance for urban / suburban land use is the phenol parameter.
(vi) The lowest % compliance for the golf course land use is the phenol parameter.
(vii) The lowest percentage of compliance for rural land use is the phenol parameter.
(viii) The lowest percentage of compliance for ex-mining land use is manganese and Total Coliform parameters.

Table 3.15 shows the percentage value exceeding Groundwater Quality Standards by state.



	As	Hg	Cd	Cr	Cu	Fe	Pb	Mn	Zn	Se	$CaCO_3$	TDS	Cl	NO_3	SO_4	T - Coliform	Phenol
Industri / Industrial	81	100	100	100	100	19	85	48	100	95	86	74	75	97	85	68	16
Tapak Pelupusan Sampah / Used Solid Waste Landfills	65	100	100	100	100	27	98	33	100	98	91	85	89	95	95	51	19
Pertanian / Agriculture	87	100	100	91	100	46	83	54	100	87	86	80	77	100	100	50	39
Bekalan Air / Water Supply	47	67	100	93	100	20	73	53	100	100	100	100	100	100	100	6	62
Bandar / Pinggir Bandar / Urban / Suburban	90	100	100	100	100	48	100	79	100	100	93	97	94	100	100	50	45
Padang Golf / Golf Course	72	100	100	100	100	33	100	56	100	100	100	100	100	100	100	67	31
Luar Bandar / Rural	71	100	100	100	100	43	93	31	100	93	100	93	93	100	86	54	14
Bekas Lombong / Used Mining	33	89	100	100	100	44	67	22	100	100	100	100	100	100	100	22	78

Rajah 3.12: Peratusan Pematuhan oleh Pencemar Terpilih mengikut Guna Tanah, 2021

Figure 3.12: Percentage of Compliance of Selected Contaminants by Land Use, 2021

Jadual 3.15 : Nilai Peratusan yang Melebihi Standard Kualiti Air Tanah mengikut Negeri, 2021

Table 3.15 : Percentage Value Exceeding Groundwater Quality Standards by State, 2021

NEGERI / STATE	BILANGAN STESEN / NO. OF STATION	MAKLUMAT STESEN / STATION DESCRIPTION	NILAI PERATUSAN YANG MELEBIHI GWQI (%) / THE PERCENTAGE OF EXCEEDANCE GWQI (%)				
			AS	FE	MN	T-COLIFORM	PHENOL
Sabah	14	1] ITAC, Penampang 1	50	50	50	33	75
		2] ITAC, Penampang 2	50	25	75	100	100
		3] ITAC, Penampang 3	0	0	50	50	100
		4] ITAC, Penampang 4	0	0	50	50	50
		5] ITAC, Penampang 5	75	50	50	50	50
		6] ITAC, Penampang 6	0	0	50	100	100
		7] ITAC, Penampang 7	0	50	50	100	100
		8] Limbawang	50	50	100	100	100
		9] Tawau	25	25	50	100	100
		10] Kg. Tajau Laut	0	75	75	100	100
		11] Sandakan Golf Club No.1	25	0	0	50	75
		12] Sandakan Golf Club No.2	25	25	25	100	75
		13] Inanam	0	75	75	75	75
		14] Pulau Manukan	0	0	0	75	0
W.P Labuan	1	1] Asian Supply Base	0	25	50	75	100
Sarawak	12	1] Kemuyang No.1	0	75	100	75	75
		2] Kemuyang No.2	0	75	100	100	100
		3] Kabong	75	100	100	100	100
		4] Kuala Lawas No.1	-	-	-	-	-
		5] Kuala Lawas No.2	-	-	-	-	-
		6] Laku	0	75	0	75	75
		7] Kg. Lusut Kiri	50	100	100	100	100
		8] Bau No.1	100	100	100	100	100
		9] Bau No.2	75	75	100	100	100
		10] Bau	25	75	25	75	75
		11] Oya No.1	100	100	75	75	100
		12] Oya No.2	100	100	75	75	100
Terengganu	16	1] Kerteh No.1	0	0	0	75	75
		2] Kerteh No.2	0	25	0	100	100
		3] Telok Kalong No.1	0	100	0	75	75
		4] Telok Kalong No.2	25	25	100	75	75
		5] Kg. Kubang Badak No.1, K.Treg	0	0	0	75	75
		6] Kg. Kubang Badak No.2, K.Treg	0	100	0	75	100
		7] Kg. Merang,Setiu	0	0	0	75	75
		8] Kg. Raja No.1, Besut	0	0	0	0	75
		9] Kg. Raja No.2, Besut	0	100	100	75	75
		10] Bukit Payung, Marang	0	0	50	100	75
		11] Kg. Alor Peroi No.1	50	50	100	100	100
		12] Kg. Alor Peroi No.2	25	100	100	100	100
		13] Kg. Alor Peroi No.3	25	100	100	100	100
		14] Sk Bari, Setiu	0	0	0	75	75
		15]Blue Archipelago	75	75	75	100	100
		16]Sk Telaga, Hulu Terengganu	0	0	0	75	100

Jadual 3.15 : Nilai Peratusan yang Melebihi Standard Kualiti Air Tanah mengikut Negeri, 2021

Table 3.15 : Percentage Value Exceeding Groundwater Quality Standards by State, 2021

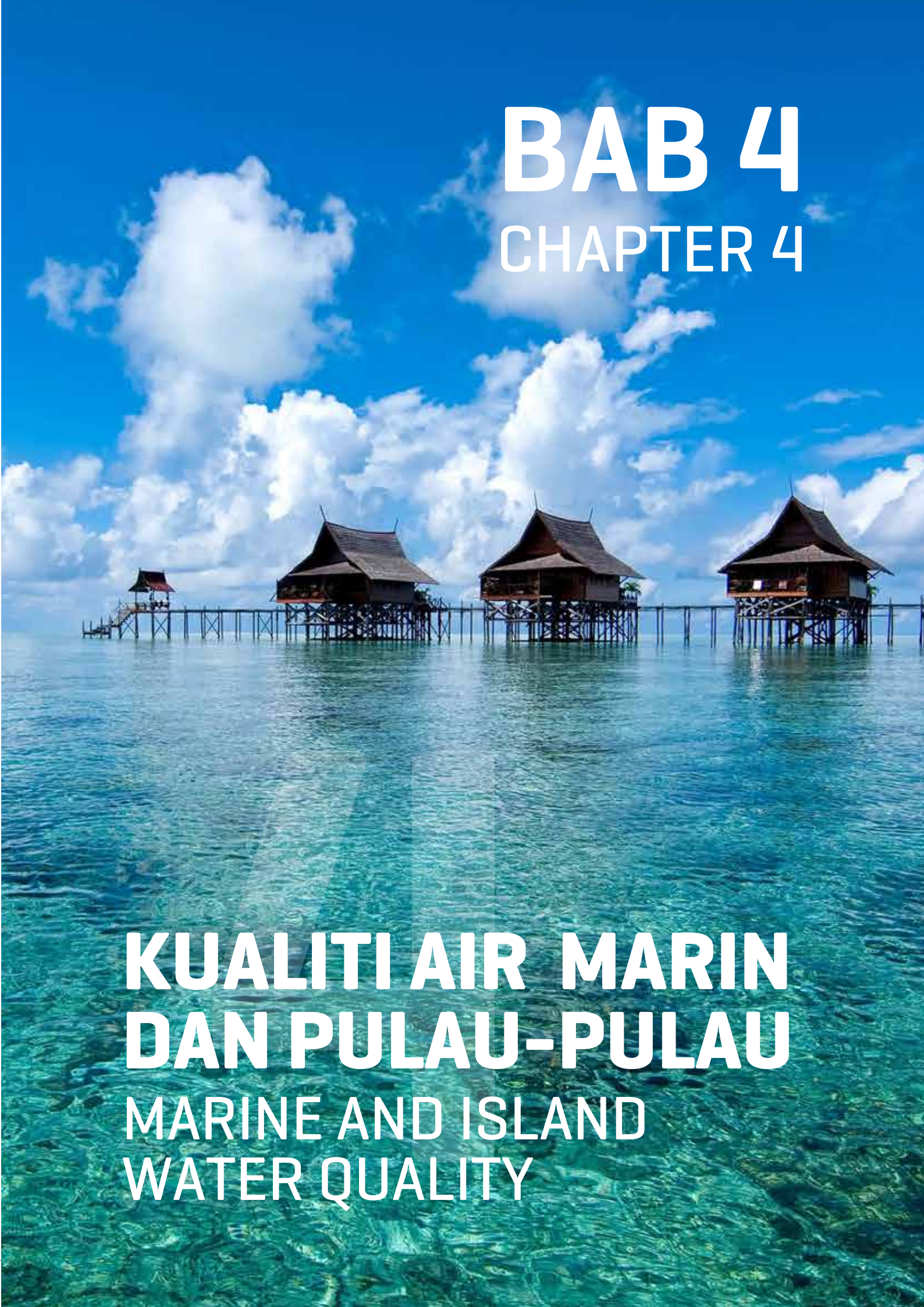
NEGERI / STATE	BILANGAN STESEN / NO. OF STATION	MAKLUMAT STESEN / STATION DESCRIPTION	NILAI PERATUSAN YANG MELEBIHI GWQI (%) / THE PERCENTAGE OF EXCEEDANCE GWQI (%)				
			AS	FE	MN	T-COLIFORM	PHENOL
Pahang	9	1) Nenasi	0	50	75	100	100
		2) Lepar	0	75	0	75	100
		3) Agrobest No.2, Nenasi	25	0	0	100	100
		4) Agrobest No.3, Nenasi	25	100	100	100	100
		5) Agrobest No.4, Nenasi	0	75	75	100	100
		6) Agrobest No.5, Nenasi	25	0	25	75	75
		7) Agrobest No.6, Nenasi	25	100	100	100	100
		8) Agrobest No.7, Nenasi	0	0	75	100	100
		9) Lynas	25	75	100	100	100
Johor	7	1) Tg. Puteri, Pasir Gudang (MUCC)	0	50	0	75	100
		2) Tg. Puteri, Pasir Gudang	100	100	100	100	100
		3) Kota Tinggi	25	75	100	100	100
		4) Ulu Choh (Pintu)	75	75	100	100	75
		5) Ulu Choh (Kolam)	75	75	100	100	100
		6) Ulu Choh (Sungai)	100	100	100	100	100
		7) Tapak Pelupusan Sisa Pepejal, Ladang CEP, Lot 2075, Mukim Renggam	100	100	100	100	100
Kedah	6	1) Kulim Hi -Tech	0	0	0	75	100
		2) Pulau Langkawi No.1	0	50	0	25	100
		3) Pulau Langkawi No.2	100	0	0	25	100
		4) SK Darul Uloom Kepala Batas	100	100	100	100	100
		5) SK Kepala Batas	0	0	0	50	100
		6) Kuarters Imigresen, Tg. Rhu, Langkawi	0	0	0	50	100
Perlis	4	1) Arau No.1	0	100	0	50	50
		2) Arau No.2	0	0	50	33	33
		3) Rimba Mas	0	0	0	0	75
		4) Felda Chuping	0	0	0	50	50
Kelantan	16	1) Eastern Garment MFG No.1	0	75	75	75	75
		2) Eastern Garment MFG No.2	75	0	0	75	75
		3) Panji No.1	0	50	0	75	75
		4) Panji No.2	0	75	75	100	100
		5) Pasir Mas	0	75	75	100	100
		6) Kampong Jembal	0	0	50	50	75
		7) Beris Lalang	-	-	-	-	-
		8) Rantau Panjang No.1	0	75	0	50	50
		9) Rantau Panjang No.2	0	0	0	75	50
		12) Kelab Golf & Desa No.1	0	100	25	75	75
		13) Kelab Golf & Desa No.2	0	50	25	75	75
		10) Kelab Golf Diraja Kubang Kerian No.1	50	100	75	100	100
		11) Kelab Golf Diraja Kubang Kerian No.2	25	100	0	100	100
		14) Bachok No.1	25	25	50	75	75
		15) Bachok No.2	50	50	75	75	100
		16) Smk Cherang Ruku, Pasir Puteh	0	0	0	100	100
Melaka	3	1) Petronas Sungai Udang	100	100	100	100	100
		2) Pusat Kecemerlangan Buangan Terjadual, Jabatan Alam Sekitar	0	75	33	100	100
		3) Tapak Pelupusan Sampah, Sungai Udang	100	100	100	100	100
Perak	5	1) Tambun	100	100	100	75	100
		2) Jalong No.2	-	-	-	-	-
		3) Batu Gajah	100	100	100	75	75
		4)Pusat Kecermelangan Kenderaan Bermotor, JAS Gopeng, Perak	-	-	-	-	-
		5) Jalong No.1	0	75	75	75	75

Jadual 3.15 : Nilai Peratusan yang Melebihi Standard Kualiti Air Tanah mengikut Negeri, 2021

Table 3.15 : Percentage Value Exceeding Groundwater Quality Standards by State, 2021

NEGERI / STATE	BILANGAN STESEN / NO. OF STATION	MAKLUMAT STESEN / STATION DESCRIPTION	NILAI PERATUSAN YANG MELEBIHI GWQI (%) / THE PERCENTAGE OF EXCEEDANCE GWQI (%)				
			AS	FE	MN	T-COLIFORM	PHENOL
W.P. Kuala Lumpur	7	1] Jln. Sungai Besi No.1	100	67	100	100	100
		2] Jln. Sungai Besi No.2	0	0	0	75	75
		3] Jln. Sungai Besi No.3	0	0	0	75	75
		4] Taman Beringin No.1	50	75	50	33	50
		5] Taman Beringin No.2	75	75	75	100	100
		6] Royal Selangor Golf Club	-	-	-	-	-
		7] Taman Wetland, W.P. Putrajaya	-	-	-	-	-
Selangor	10	1] Sek Keb Seksyen 20, Shah Alam	0	25	0	75	75
		2] CIAST No.1, Shah Alam	0	75	67	75	75
		3] CIAST No.2, Shah Alam	0	75	75	75	75
		4] Saujana Golf Resort No.1, Subang	50	75	75	75	75
		5] Saujana Golf Resort No.2, Subang	50	75	50	75	75
		6] Stesen Kampung Sungai Keroh, Sepang	75	50	75	100	100
		7] TNB Sepang	25	100	100	100	100
		8] Ladang Sepang	75	75	75	100	100
		9] Masjid Jameul Huda,Parit 7,Sekinchan	75	0	0	50	50
		10] Institut Alam Sekitar (EIMAS)	0	0	0	50	50
Pulau Pinang	6	1] Mak Mandin No.1	75	0	75	75	75
		2] Mak Mandin No.2	75	50	50	75	75
		3] Bayan Lepas	0	0	0	75	75
		4] Valdor (Kelapa)	0	75	75	50	75
		5] Valdor (Tengah)	0	0	0	50	50
		6] Valdor (Jalan)	0	0	75	75	75
N. Sembilan	4	1] Senawang	75	50	0	75	75
		2] Kualiti Alam Sdn. Bhd No.1	75	100	100	100	100
		3] Kualiti Alam Sdn. Bhd No.2	100	100	75	100	100
		4] TPS Tanah Merah (Cypark) Port Dickson	100	100	100	100	100

Gua Niah, Sarawak



BAB 4
CHAPTER 4

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

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

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 kemampanan 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

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 program 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 Program are classified into three (3) categories as followed:

1. Coastal Station
2. Estuary Station
3. Island Station

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.

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

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.

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

Stesen pulau pula dibahagikan kepada empat (4) kategori iaitu Pulau (Kawasan Dilindungi), Pulau (Taman Laut), Pulau (Pembangunan) dan Pulau (Resort).

The island station is divided into four (4) categories namely Island (Protected Area), Island (Marine Park), Island (Development) and Island (Resort).

1. Stesen Pulau (Kawasan Dilindungi) adalah stesen yang dibangunkan di dalam Kawasan Perlindungan Perikanan di bawah Peraturan-Peraturan Perikanan (Kawasan Larangan) 1994.

1. Island Stations (Protected Area) are those stations established within the Fisheries Protected Area under the Fisheries (Prohibited Area) Regulation, 1994.

2. Stesen Pulau (Taman Laut) adalah stesen pengawasan yang dibangunkan di kawasan Taman Laut yang ditetapkan di bawah Perintah Taman Laut Malaysia 1994.

2. Island Stations (Marine Park) are those established within the designated Marine Park area under the Marine Park Malaysia Order, 1994.

3. Stesen Pulau (Pembangunan) adalah stesen pengawasan yang dibangunkan di sekitar pulau yang sekurang-kurangnya 90 km^2 dengan jumlah penduduk lebih daripada 20,000 orang; atau/ dan pulau-pulau yang ada kepentingan ekonomi.

3. Island Stations (Development) are monitoring stations established around Islands that are at least 90 km^2 with a total population more than 20,000 people; or/ and islands of economical importance.

4. Stesen Pulau (Resort) adalah stesen pengawasan di sekitar pulau yang dibangunkan untuk pelancongan, yang mempunyai pusat peranginan dan chalet sebagai pemacu ekonomi setempat bagi pulau tersebut.

4. Island Stations (Resort) are those stations that have been established surrounding islands that developed for tourism; with resorts and chalets developed on the islands as the key economical driver for the islands.

Standard Kualiti Air Marin Malaysia (SKAMM) merupakan standard ambien, memberi fokus pada perlindungan dan kelestarian ekosistem akuatik serta perkhidmatan ekosistem tersebut kepada masyarakat dan mengambilkira faktor ekonomi, praktikal dan sosial.

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

1. 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, rumpai laut, tapak pendaratan penyu dan perairan yang terdapat habitat tertentu seperti habitat sensitif kawasan sumber makanan organisma marin.

2. Kelas 2 merangkumi air yang ada aktiviti perikanan dan marikultur yang berdasarkan pada zon 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.

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.

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 categorized in MMWQS :

1. Class 1 water comprises of the gazetted and statutory protected waters; and non-gazetted area with the presence of sensitive ecosystem including coral reefs, sea grass, turtle landing sites and water specific to habitats and feeding grounds of sensitive marine organisms.

2. Class 2 water encompasses both fisheries and mariculture activities, based on fishing zone 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 and cockle culture; but excluding on land aquaculture activities.

3. 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.

3. 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 area.

4. 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 terhasil 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.

4. Class E (Interim) is the standard for estuarine water subject to both seasonal and diurnal variation. In addition, the geological characteristics and water circulation patterns also contributed 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 plain, Class E2 represents the lagoon type estuary while Class E3 is to be referred to when assessing estuaries with large and complex distributary network.

5. 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.

5. Class R is the standards 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.

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.

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 solid.

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**).

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

Jadual 4.2 menunjukkan Standard Kualiti Air Marin Malaysia.

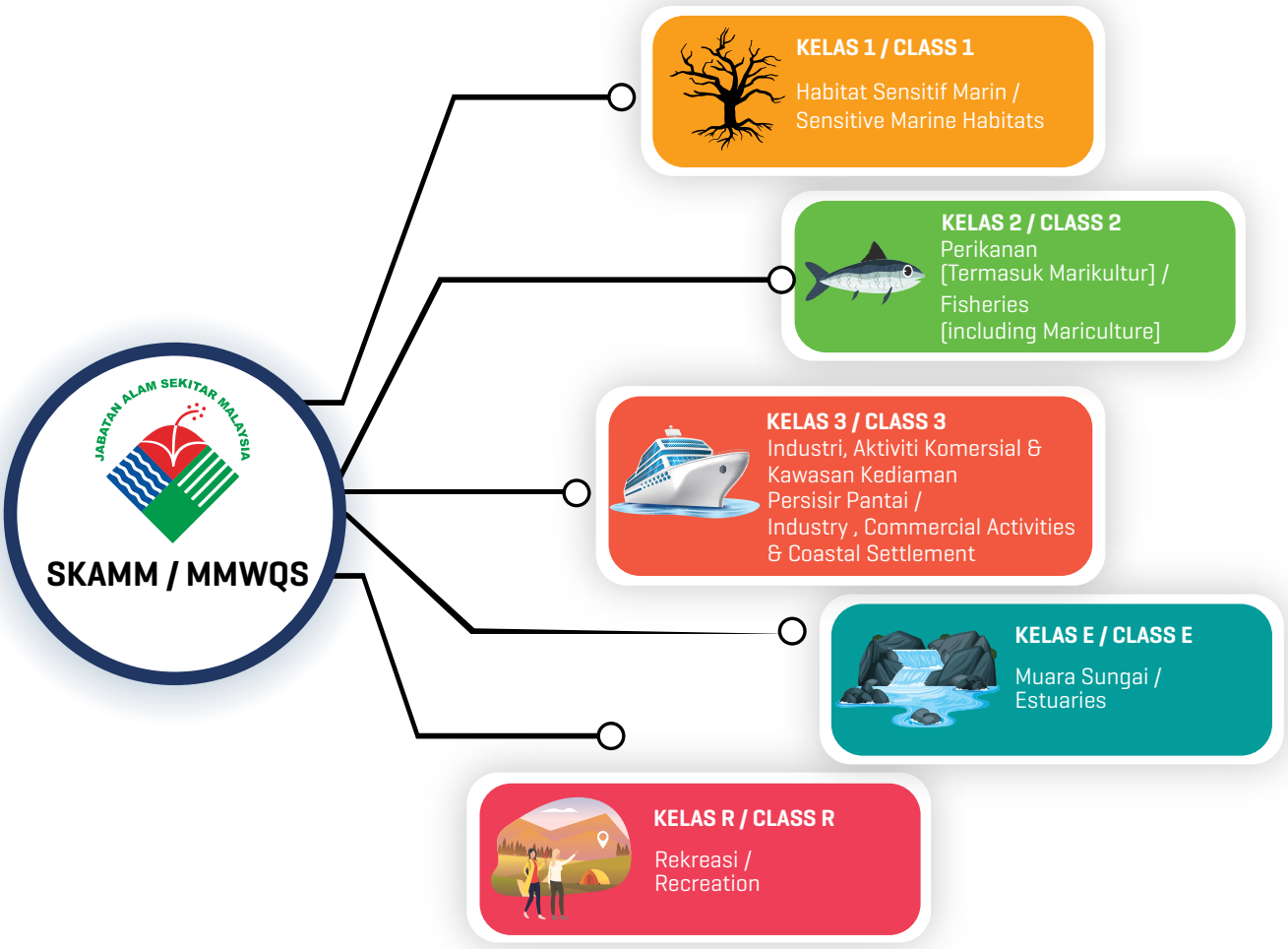
Table 4.2 shows Malaysian Marine Water Quality Standards.

Sebanyak 188 stesen pantai, 85 stesen muara sungai dan 95 stesen pulau telah dipantau pada tahun 2021. 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.

A total of 188 coastal stations, 85 estuary stations and 95 island stations were monitored in the year 2021. 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 MMWQI of the six (6) frequencies.

Rajah 4.2 menunjukkan lokasi Stesen Pengawasan Kualiti Air Marin Manual di Malaysia.

Figure 4.2 shows location of Manual Marine Water Quality Station in Malaysia.



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 of 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

Jadual 4.2: Standard Kualiti Air Marin Malaysia (SKAMM)

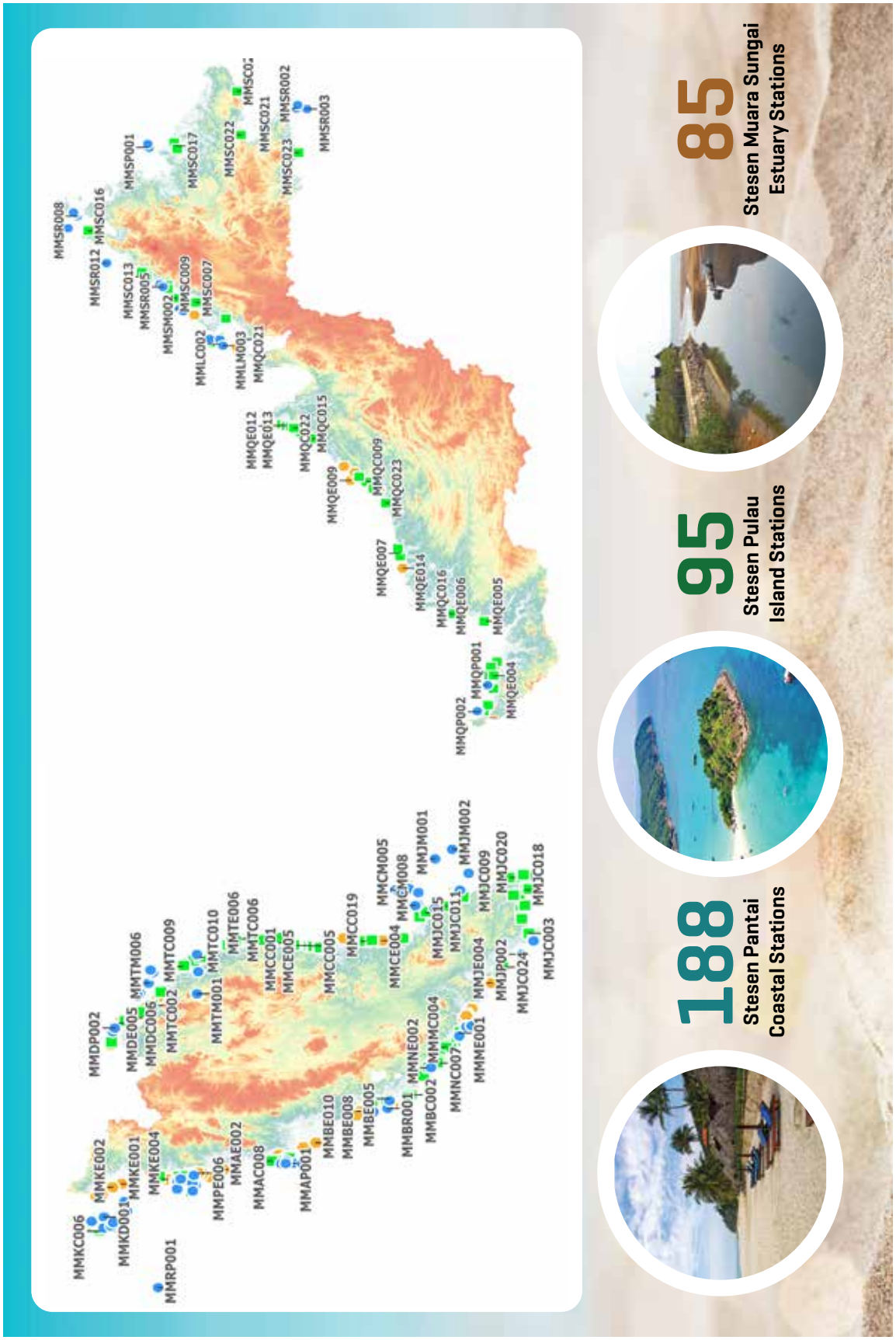
Table 4.2: Malaysian Marine Water Quality Standards (MMWQS)

PARAMETER (µg/l) melainkan dinyatakan sebaliknya / PARAMETER (µg/l) unless otherwise stated	KLASIFIKASI/ CLASSIFICATION					
	KELAS 1 / CLASS 1	KELAS 2 / CLASS 2	KELAS 3 / CLASS 3	INTERIM KELAS E1 / INTERIM CLASS E1	INTERIM KELAS E2 / INTERIM CLASS E2	INTERIM KELAS E3 / INTERIM CLASS E3
	Habitat Marin Sensitif / Sensitive Marine Habitats	Perikanan (Termasuk Marikultur) / Fisheries (including Mariculture)	Industri, Aktiviti Komersial & Kawasan Kediaman Pesisir Pantai / Industry, Commercial Activities & Coastal Settlements	Muara Sungai / Estuaries		
				Dataran Pantai / Coastal Plain	Lagun / Lagoon	Rangkaian Kompleks / Complex Distributary Network
Oksigen Terlarut / Dissolved Oxygen (mg/l)	>6.0	>5.0	>3.0	>5.0	>5.0	>5.0
Jumlah Pepejal Terampai / Total Suspended Solids (mg/l)	25.0	50.0	100.0	30.0	30.0	30.0
Fosfat/ Phosphate	5.0	75.0	670.0	100.0	180.0	180.0
Nitrat / 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
Merkuri / Mercury	0.04	0.04	0.04	0.04	0.04	0.04
Kadmium / Cadmium	0.50	2.00	3.00	1.00	1.00	1.00
Kromium (VI) / Chromium (VI)	0.14	10.00	20.00	10.00	10.00	10.00
Kuprum / Copper	1.30	2.90	8.00	1.00	1.00	1.00
Sianida / Cyanide	2.00	7.00	14.00	5.00	5.00	5.00
Plumbum / Lead	2.20	8.50	12.00	1.30	2.00	2.00

Jadual 4.2: Standard Kualiti Air Marin Malaysia (SKAMM)

Table 4.2: Malaysian Marine Water Quality Standards (MMWQS)

PARAMETER (µg/l) melainkan dinyatakan sebaliknya / PARAMETER (µg/l) unless otherwise stated	KLASIFIKASI/ CLASSIFICATION					
	KELAS 1 / CLASS 1	KELAS 2 / CLASS 2	KELAS 3 / CLASS 3	INTERIM KELAS E1 / INTERIM CLASS E1	INTERIM KELAS E2 / INTERIM CLASS E2	INTERIM KELAS E3 / INTERIM CLASS E3
	Habitat Marin Sensitif / Sensitive Marine Habitats	Perikanan (Termasuk Marikultur) / Fisheries (including Mariculture)	Industri, Aktiviti Komersial & Kawasan Kediaman Pesisir Pantai / Industry, Commercial Activities & Coastal Settlements	Muara Sungai / Estuaries		
				Dataran Pantai / Coastal Plain	Lagun / Lagoon	Rangkaian Kompleks / Complex Distributary Network
Zink / Zinc	7.00	50.00	100.00	16.00	5.00	5.00
Arsenik (III) / Arsenic (III)	1.00	3.00	3.00	3.00	1.00	1.00
Aluminium	27.0	27.0	55.0	27.0	27.0	27.0
Tributyltin (TBT)	0.001	0.010	0.050	0.002	0.002	0.002
Polycyclic Aromatic Hydrocarbons (PAHs)	100.0	200.0	1000.0	5.0	5.0	5.0
Jumlah Fenol / Total Phenol	1.0	10.0	100.0	10.0	10.0	10.0
Minyak & Gris / 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
Suhu / Temperature (°C)	≤ 2 °C bertambah melebihi ambien maksimum / ≤ 2 °C increase over maximum ambient					
pH	6.5 - 9.0					
Marine Litter	Bebas dari marine litter / Free from marine litter					



Rajah 4.2: Lokasi Stesen Pengawasan Kualiti Air Marin Manual di Malaysia 2021
Figure 4.2: Location of Manual Marine Water Quality Station on Malaysia, 2021

STATUS STESEN - STESEN PENGAWASAN KUALITI AIR MARIN

Dalam tahun 2021, daripada 368 stesen pengawasan kualiti air marin bagi pantai, muara sungai dan pulau di negara ini, sebanyak 145 stesen adalah terbaik, 60 stesen baik, sementara 158 stesen adalah sederhana manakala lima (5) stesen tercemar. Bilangan stesen yang tercemar bagi tahun 2021 menunjukkan penurunan berbanding tahun sebelumnya iaitu daripada 18 stesen tercemar kepada lima (5) stesen tercemar bagi tahun ini.

Semua stesen tercemar berada di kawasan muara sungai iaitu dua (2) stesen masing-masing di Pulau Pinang dan Selangor manakala satu (1) stesen di Perak.

Faecal coliform, jumlah pepejal terampai dan kandungan nutrien yang tinggi adalah parameter utama yang menyebabkan kemerosotan kualiti air marin di muara sungai yang berpunca daripada aktiviti di daratan di hulu sungai tersebut yang kemudiannya menjejaskan kualiti air marin di muara sungai.

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

Jadual 4.3, **Jadual 4.4** dan **Jadual 4.5** menunjukkan senarai stesen pantai, muara sungai dan pulau yang mencapai kategori terbaik berdasarkan IKAMM bagi tahun 2021.

Rajah 4.3 - **4.8** menunjukkan status kualiti air marin berdasarkan IKAMM mengikut lokasi stesen pengawasan bagi pantai, muara sungai dan pulau-pulau tahun 2021.

STATUS OF MARINE WATER QUALITY MONITORING STATIONS

In 2021, out of 368 marine water quality monitoring stations at coastal, estuary and islands in the country, 145 stations coastal were categorized as excellent, 60 stations are good while 158 stations were categorized as moderate and remaining five (5) stations were categorized as poor. The number of poor stations showed a remarkable reduction from 18 stations in the previous year, down to five (5) stations this year.

All of poor water quality stations were located at the estuary. Two (2) stations in Penang and Selangor were categorized as poor and one (1) station in Perak.

High faecal coliform, total suspended solid and nutrient concentration level are the main parameters that cause deterioration of marine water quality in river estuaries due to land-based activities flowing into rivers in turn affecting the quality in river estuaries.

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

Table 4.3, **Table 4.4** and **Table 4.5** show the list of coastal, estuary and island stations that achieved the excellent category based on MMWQI in 2021.

Figures 4.3 - **4.8** shows the marine water quality status based on MMWQI according to coastal, estuary and island monitoring station, 2021.

Jadual 4.3: Senarai Stesen Pengawasan Kualiti Air Marin bagi Pantai dengan Status Kategori Terbaik, 2021

Table 4.3: List of Marine Water Quality Monitoring Stations for Coastal with Status of Excellent, 2021

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Terengganu	Rhu 10
2	Pahang	Pantai Cherating (Club Med) B
3	Johor	Pantai Tanjung Leman
4	Terengganu	Pantai Kemasek
5	Kedah	Pantai Pasir Tengkorak
6	Terengganu	Pantai Bukit Keluang
7	Terengganu	Pantai Rantau Abang
8	Terengganu	Teluk Ketapang
9	Terengganu	Kelului
10	Perak	Pantai Pasir Bogak

Nota / Notes:

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

Jadual 4.4: Senarai Stesen Pengawasan Kualiti Air Marin bagi Muara Sungai dengan Status Kategori Terbaik, 2021

Table 4.4: List of Marine Water Quality Monitoring Stations for Estuary with Status of Excellent, 2021

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Terengganu	Tioxide Utara (Kg. Bukit Kuang, Kijal)
2	Terengganu	Tioxide Tengah (Pupuk Semangat, Kijal)
3	Terengganu	Kuala Sungai Setiu
4	Johor	Kuala Sungai Johor
5	Sarawak	Kuala Sungai Semantan
6	Sarawak	Kuala Sungai Santubong
7	Terengganu	Kuala Sungai Ibai

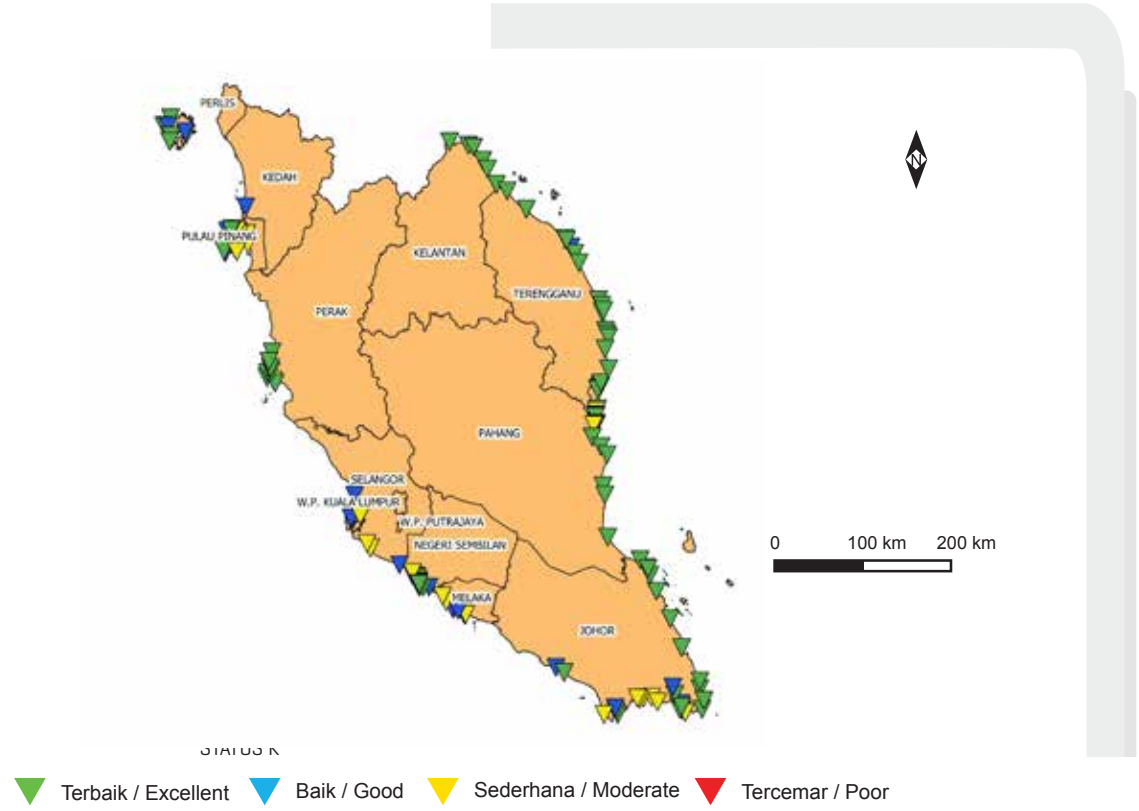
Jadual 4.5: Senarai Stesen Pengawasan Kualiti Air Marin bagi Pulau dengan Status Kategori Terbaik, 2021

Table 4.5: List of Marine Water Quality Monitoring Stations for Island with Status of Excellent, 2021

BIL. / NO.	NEGERI / STATE	LOKASI / LOCATION
1	Pahang	Tulai
2	Pahang	Labas
3	Pahang	Sepui
4	Pahang	Seri Buat
5	Johor	Setindan
6	Terengganu	Perhentian Besar (Selatan)
7	Terengganu	Perhentian Kecil
8	Terengganu	Lang Tengah
9	Pahang	Sembilang
10	Terengganu	Ekor Tebu

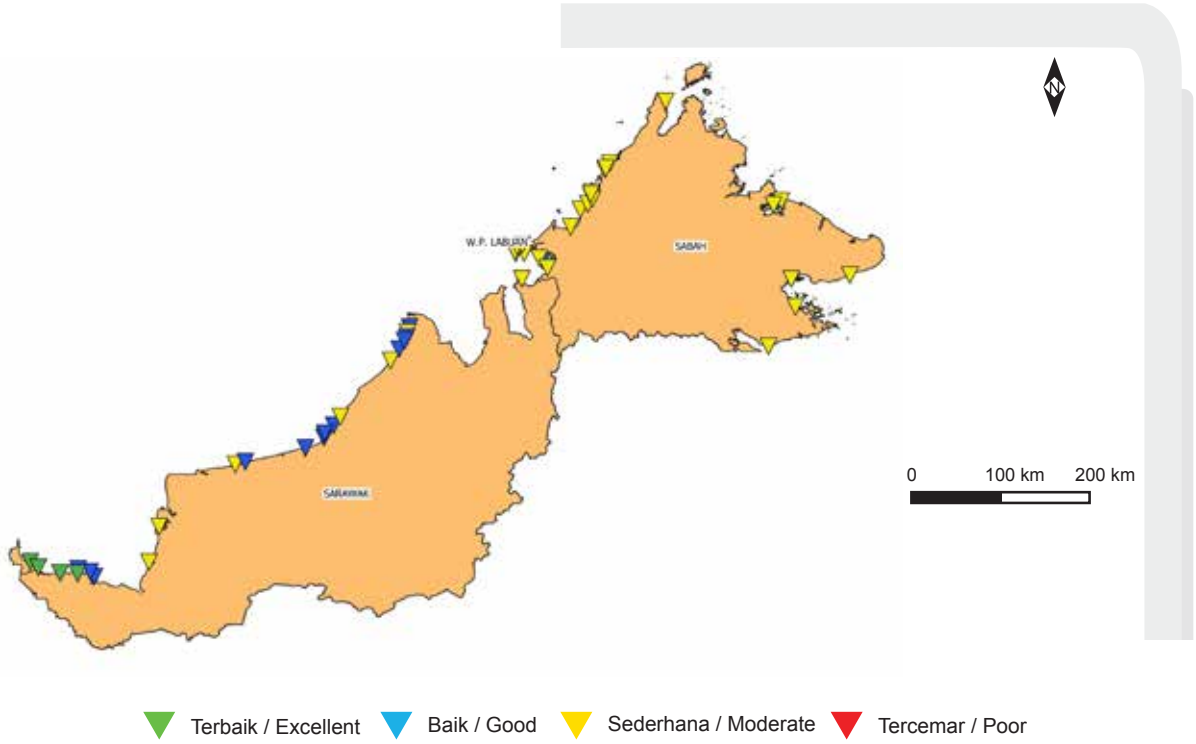
Nota/ Notes:

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



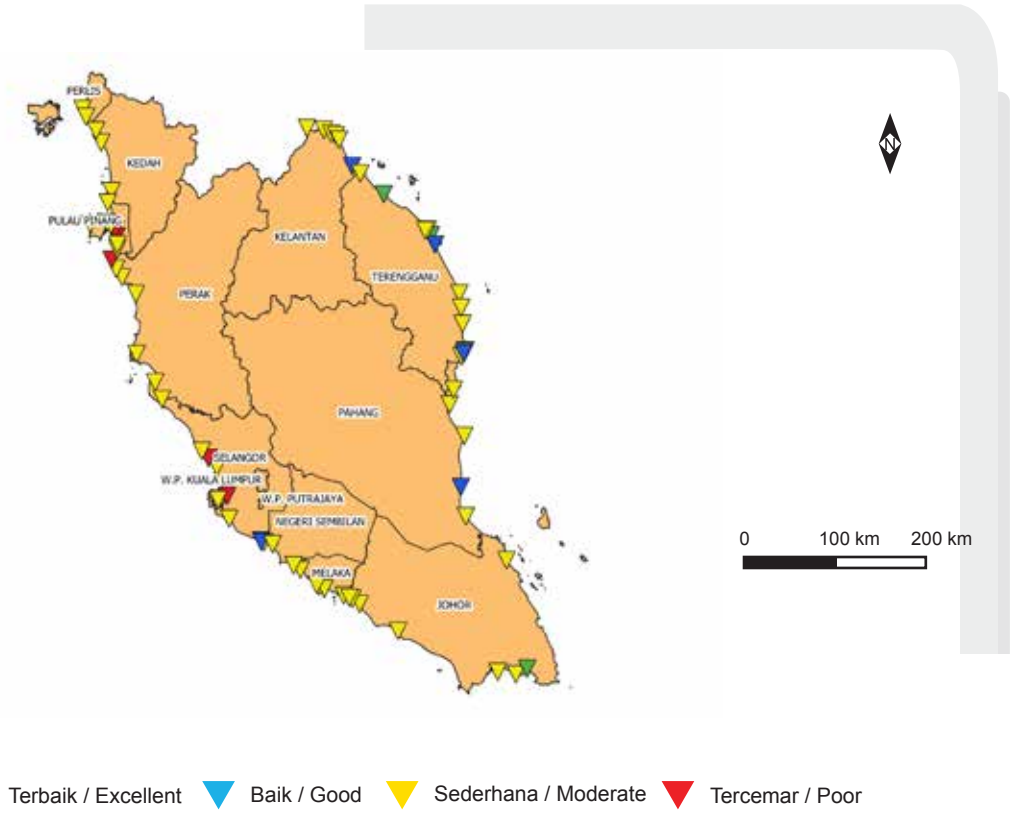
Rajah 4.3: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pantai di Semenanjung Malaysia

Figure 4.3: Marine Water Quality Status based on the Location Monitoring Stations for Coastal at Peninsular Malaysia



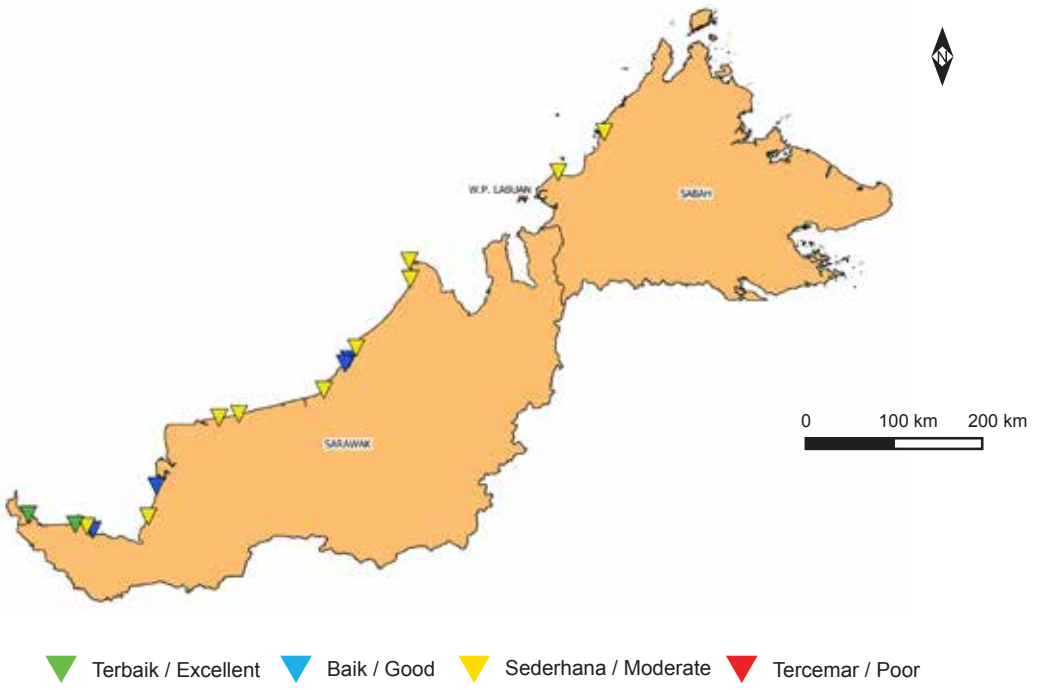
Rajah 4.4: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pantai di Sabah, Sarawak dan W.P. Labuan

Figure 4.4: Marine Water Quality Status based on the Location Monitoring Stations for Coastal at Sabah, Sarawak and Labuan



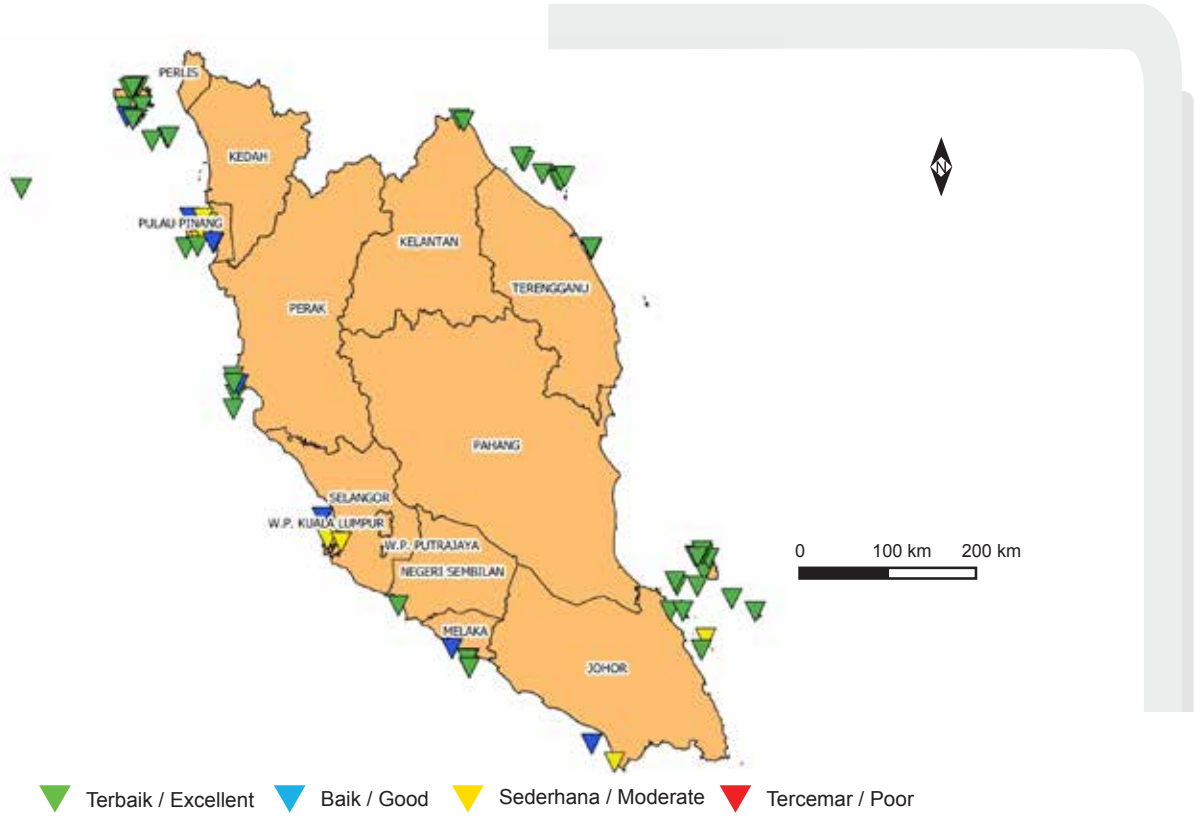
Rajah 4.5: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Muara Sungai di Semenanjung Malaysia

Figure 4.5: Marine Water Quality Status based on the Location Monitoring Stations for Estuary at Peninsular Malaysia



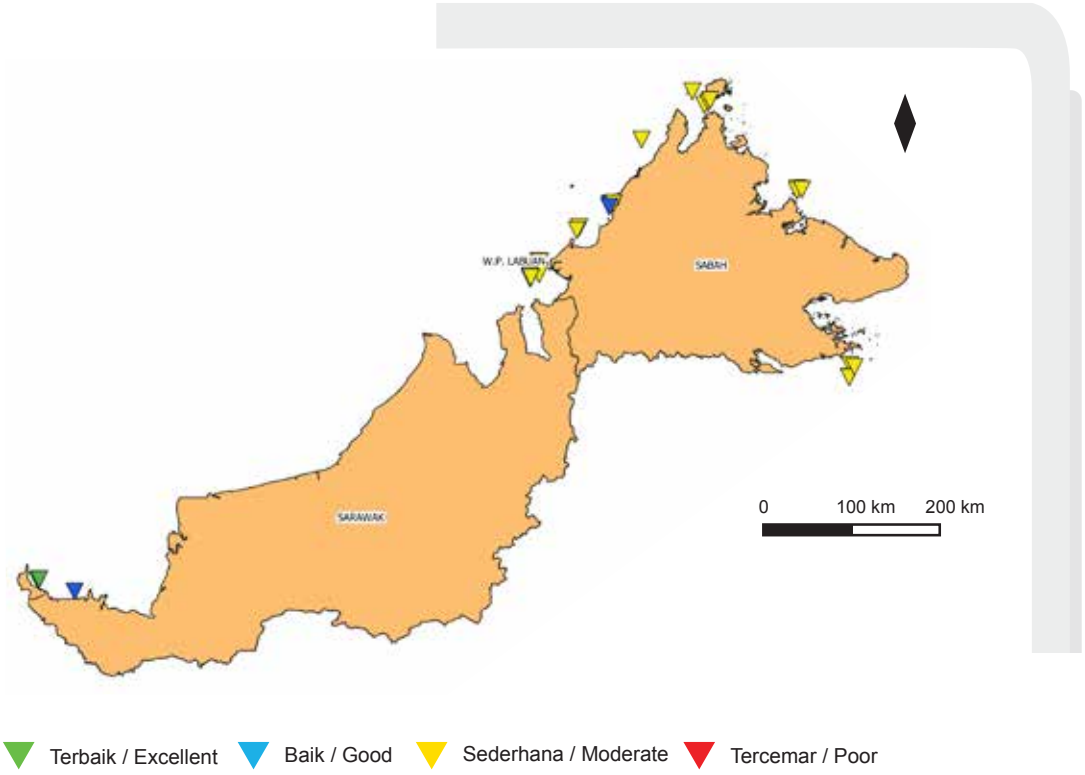
Rajah 4.6: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Muara Sungai di Sabah, Sarawak dan W.P. Labuan

Figure 4.6: Marine Water Quality Status based on the Location Monitoring Stations for Estuary at Sabah, Sarawak and Labuan



Rajah 4.7: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pulau di Semenanjung Malaysia

Figure 4.7: Marine Water Quality Status based on the Location Monitoring Stations for Island at Peninsular Malaysia



Rajah 4.8: Status Kualiti Air Marin mengikut Lokasi Stesen Pengawasan bagi Pulau di Sabah, Sarawak dan W.P. Labuan

Figure 4.8: Marine Water Quality Status based on the Location Monitoring Stations for Island at Sabah, Sarawak and Labuan

STATUS KUALITI AIR MARIN BAGI PANTAI

Sebanyak 188 stesen pantai dipantau pada tahun 2021. Daripada 188 stesen pantai, 85 stesen (45%) terbaik, 40 stesen (21%) baik, 63 stesen (34%) sederhana manakala tiada stesen dikategorikan sebagai tercemar **(Jadual 4.6)**.

MARINE WATER QUALITY STATUS FOR COASTAL

A total of 188 coastal stations were monitored for water quality in 2021. Of this number, 85 stations (45%) ranked excellent, 40 stations (21%) ranked good, 63 stations (34%) ranked moderate and no station was ranked poor **(Table 4.6)**.

Pulau Semporna, Sabah

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021

Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kedah	Pantai / Coastal	Pantai Merdeka	MMKC001	79	91	79	71	85	Baik / Good
		Langkawi Island Resort	MMKC002	90	94	90	93	94	Terbaik / Excellent
		Pantai Kok	MMKC003	83	94	92	95	90	Terbaik / Excellent
		Pantai Kuah	MMKC004	91	94	84	89	88	Baik / Good
		Pantai Pasir Tengkorak	MMKC005	93	94	68	93	96	Terbaik / Excellent
		Pantai Teluk Burau	MMKC006	85	94	83	89	94	Terbaik / Excellent
		Pantai Teluk Nibong	MMKC007	91	84	91	94	86	Baik / Good
		Pantai Tengah	MMKC008	87	94	92	96	92	Terbaik / Excellent
		Pantai Beras Basah	MMKC009	93	94	92	95	92	Terbaik / Excellent
Pulau Pinang	Pantai / Coastal	Gertak Sanggul	MMPC001	71	81	58	84	81	Baik / Good
		Kawasan Perindustrian Bayan Lepas 1	MMPC002	67	59	56	56	72	Sederhana / Moderate
		Pantai Bersih	MMPC003	50	66	58	58	75	Sederhana / Moderate
		Pantai Miami	MMPC004	68	93	69	81	70	Sederhana / Moderate
		Pantai Pasir Panjang	MMPC005	86	93	81	81	93	Terbaik / Excellent
		Batu Feringgi (Casuarina)	MMPC006	67	67	60	58	83	Baik / Good
		Luar Pantai Teluk Bahang	MMPC007	85	93	57	83	81	Baik / Good
		Persiaran Gurney	MMPC008	62	66	58	59	60	Sederhana / Moderate
		Rumah Pam Baru Perai	MMPC009	59	64	56	61	68	Sederhana / Moderate
		Rumah Pam Lama Perai	MMPC010	64	65	57	60	65	Sederhana / Moderate
		Selat PP Selatan (Jelutong)	MMPC011	49	59	57	55	59	Sederhana / Moderate
		Tanjung Bungah	MMPC012	84	67	57	70	67	Sederhana / Moderate
		Teluk Tempoyak	MMPC013	61	75	57	69	70	Sederhana / Moderate
		Batu Maung	MMPC014	59	62	57	56	69	Sederhana / Moderate
		Pantai Sungai Batu Ferringhi 3	MMPC015	62	93	83	84	86	Baik / Good
		Pantai Sungai Batu Ferringhi 2	MMPC016	61	93	70	74	90	Terbaik / Excellent
		Pantai Sungai Batu Ferringhi 1	MMPC017	51	85	71	85	91	Terbaik / Excellent

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021

Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Pantai / Coastal	Pantai Pasir Bogak	MMAC001	91	92	80	93	95	Terbaik / Excellent
		Pantai Teluk Dalam	MMAC002	91	93	88	89	94	Terbaik / Excellent
		Pantai Teluk Batik	MMAC003	89	92	62	84	78	Sederhana / Moderate
		Pantai Tanjung Batu	MMAC004	92	94	61	83	93	Terbaik / Excellent
		Pantai Teluk Rubiah	MMAC005	93	92	62	92	90	Terbaik / Excellent
		Pantai Damai Laut	MMAC006	91	92	70	93	94	Terbaik / Excellent
		Pantai Teluk Senangin	MMAC007	92	93	67	90	90	Terbaik / Excellent
		Pantai Pasir Panjang	MMAC008	93	93	70	94	91	Terbaik / Excellent
Selangor	Pantai / Coastal	Pantai Bagan Lalang	MMBC001	92	88	81	91	84	Baik / Good
		Pantai Morib	MMBC002	89	87	61	68	68	Sederhana / Moderate
		Selat Pulau Babi	MMBC003	72	90	73	73	87	Baik / Good
		Selat Klang Utara	MMBC004	64	62	56	55	62	Sederhana / Moderate
		Pantai Remis	MMBC005	67	90	58	63	83	Baik / Good
		Pantai Klanang	MMBC006	91	82	58	71	74	Sederhana / Moderate
N. Sembilan	Pantai / Coastal	Bagan Pinang	MMNC001	68	91	82	85	91	Terbaik / Excellent
		Telok Sinting	MMNC002	87	88	71	86	87	Baik / Good
		Port Dickson Bandar	MMNC003	68	68	60	74	88	Baik / Good
		Port Dickson Batu 4	MMNC004	67	90	81	86	88	Baik / Good
		Port Dickson Batu 5	MMNC005	79	68	63	67	73	Sederhana / Moderate
		Port Dickson Batu 6	MMNC006	68	92	77	90	90	Terbaik / Excellent
		Port Dickson Batu 7	MMNC007	67	88	86	92	93	Terbaik / Excellent
		Port Dickson Batu 8	MMNC008	75	87	86	85	93	Terbaik / Excellent
		Port Dickson Batu 10	MMNC009	68	89	84	92	92	Terbaik / Excellent
		Port Dickson Janakuasa TNB	MMNC010	68	68	59	89	70	Sederhana / Moderate
		Telok Pelanduk	MMNC011	81	90	87	83	91	Terbaik / Excellent
		Pantai Cermin	MMNC012	68	92	70	83	94	Terbaik / Excellent
		Pantai Teluk Kemang	MMNC013	68	67	83	94	91	Terbaik / Excellent
		Pantai Seri Purnama	MMNC014	85	93	80	90	92	Terbaik / Excellent

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021
Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Melaka	Pantai / Coastal	Pantai Rombang	MMMC001	85	85	68	89	88	Baik / Good
		Pantai Kundur	MMMC002	84	82	77	90	89	Baik / Good
		Pantai Tanjung Bidara	MMMC003	82	93	78	90	69	Sederhana / Moderate
		Teluk Gong	MMMC004	88	93	76	83	60	Sederhana / Moderate
		Pulau Melaka Point A1	MMMC005	64	67	60	91	89	Baik / Good
		Pulau Melaka Point A2	MMMC006	72	81	60	79	80	Baik / Good
		Pulau Melaka Point B1	MMMC007	63	62	57	58	58	Sederhana / Moderate
		Pulau Melaka Point B2	MMMC008	66	58	57	57	57	Sederhana / Moderate
		Pantai Klebang	MMMC009	67	81	58	78	87	Baik / Good
Johor	Pantai / Coastal	Tanjung Bin	MMJC001	92	92	81	90	90	Terbaik / Excellent
		Pelabuhan Tanjung Pelepas	MMJC002	90	92	67	92	91	Terbaik / Excellent
		Hadapan Jabatan Laut	MMJC003	80	88	77	87	82	Baik / Good
		Pantai Stulang Laut	MMJC004	61	63	49	48	56	Sederhana / Moderate
		Jeti Teluk Jawa	MMJC005	62	62	52	62	70	Sederhana / Moderate
		Pelabuhan Pasir Gudang	MMJC006	64	65	54	57	59	Sederhana / Moderate
		Hadapan HSAJB	MMJC007	59	59	36	49	58	Sederhana / Moderate
		Pantai Lido	MMJC008	55	52	37	44	54	Sederhana / Moderate
		Pantai Teluk Mahkota	MMJC009	92	94	72	90	93	Terbaik / Excellent
		Pantai Tanjung Leman	MMJC010	94	93	87	83	97	Terbaik / Excellent
		Pantai Sri Pantai	MMJC011	94	94	87	87	91	Terbaik / Excellent
		Tanjung Merak	MMJC012	93	73	60	89	85	Baik / Good
		Tanjung Pengelih	MMJC013	93	93	77	90	92	Terbaik / Excellent
		Pantai Tanjong Stapa	MMJC014	93	93	86	91	72	Sederhana / Moderate
		Pantai Teluk Gorek	MMJC015	93	94	92	83	93	Terbaik / Excellent
		Pantai Air Papan	MMJC016	93	94	92	95	92	Terbaik / Excellent
		Jeti Kukup	MMJC017	88	89	58	59	62	Sederhana / Moderate
		Pasir Gogok	MMJC018	94	93	74	92	89	Baik / Good
		Tanjung Buai	MMJC019	92	92	63	75	91	Terbaik / Excellent
		Pantai Desaru	MMJC020	94	94	81	95	94	Terbaik / Excellent
		Tanjung Sepang	MMJC021	94	93	87	92	90	Terbaik / Excellent

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021
Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Johor	Pantai / Coastal	Tanjung Penyusup	MMJC022	92	93	62	83	93	Terbaik / Excellent
		Pantai Sungai Lurus	MMJC023	90	91	59	74	88	Baik / Good
		Punggur	MMJC024	84	87	59	69	90	Terbaik / Excellent
		Pantai Penyabung	MMJC025	93	93	80	82	95	Terbaik / Excellent
		Tanjung Resang	MMJC026	94	94	93	90	92	Terbaik / Excellent
		Tanjung Balau	MMJC027	93	93	84	93	94	Terbaik / Excellent
		Batu Layar	MMJC028	93	94	62	90	92	Terbaik / Excellent
		Tanjung Sengat	MMJC029	92	91	60	72	85	Baik / Good
Pahang	Pantai / Coastal	Pantai Cherating (Club Med A)	MMCC001	92	94	88	91	95	Terbaik / Excellent
		Pantai Cherating (Club Med B)	MMCC002	93	94	85	94	97	Terbaik / Excellent
		Pantai Cherating (Legend A)	MMCC003	92	94	88	96	93	Terbaik / Excellent
		Pantai Cherating (Legend B)	MMCC004	89	94	94	96	95	Terbaik / Excellent
		Pantai Muhibbah Balok A	MMCC005	68	89	59	73	90	Terbaik / Excellent
		Pantai Muhibbah Balok B	MMCC006	65	83	59	67	74	Sederhana / Moderate
		Pantai Batu Hitam A	MMCC007	68	87	75	76	92	Terbaik / Excellent
		Pantai Batu Hitam B	MMCC008	81	91	62	73	84	Baik / Good
		Pantai Berserah A	MMCC009	80	90	74	76	93	Terbaik / Excellent
		Pantai Berserah B	MMCC010	67	90	80	60	90	Terbaik / Excellent
		Pantai Teluk Cempedak A	MMCC011	67	88	83	84	94	Terbaik / Excellent
		Pantai Teluk Cempedak B	MMCC012	88	91	90	95	93	Terbaik / Excellent
		Pantai Teluk Gelora A	MMCC013	67	77	75	60	72	Sederhana / Moderate
		Pantai Teluk Gelora B	MMCC014	66	76	62	59	59	Sederhana / Moderate
		Pantai Sepat A	MMCC015	91	93	81	92	94	Terbaik / Excellent
		Pantai Sepat B	MMCC016	91	93	88	92	95	Terbaik / Excellent
		Pantai Legenda A	MMCC017	93	94	93	97	92	Terbaik / Excellent
		Pantai Legenda B	MMCC018	93	94	92	96	92	Terbaik / Excellent

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021

Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Pantai / Coastal	Pantai Kuala Api-Api	MMCC019	90	93	58	85	94	Terbaik / Excellent
		Pantai Tanjung Batu	MMCC020	90	94	72	85	94	Terbaik / Excellent
		Pantai Chendor	MMCC021	86	94	84	87	92	Terbaik / Excellent
		Pantai Lanjut	MMCC022	93	92	86	85	94	Terbaik / Excellent
Terengganu	Pantai / Coastal	Pantai Batu Buruk	MMTC001	94	93	59	93	88	Baik / Good
		Pantai Bukit Keluang	MMTC002	94	94	86	95	96	Terbaik / Excellent
		Pantai Chen dering	MMTC003	89	94	69	93	95	Terbaik / Excellent
		Pantai Rantau Abang	MMTC004	90	94	85	95	96	Terbaik / Excellent
		KIPC Utara	MMTC005	91	94	92	78	95	Terbaik / Excellent
		KIPC Tengah	MMTC006	89	94	90	88	94	Terbaik / Excellent
		KIPC Selatan	MMTC007	89	94	94	88	95	Terbaik / Excellent
		Pantai Rhu 10	MMTC008	94	94	89	95	97	Terbaik / Excellent
		Pantai Tok Jembal	MMTC009	94	94	95	96	95	Terbaik / Excellent
		Pantai Kelulut	MMTC010	94	94	95	93	96	Terbaik / Excellent
		Pantai Teluk Ketapang	MMTC011	94	94	80	95	96	Terbaik / Excellent
		Pantai Kuala Abang	MMTC012	94	94	88	94	95	Terbaik / Excellent
		Pantai Teluk Kalong	MMTC013	94	94	94	94	95	Terbaik / Excellent
		Pantai Sura	MMTC014	94	94	89	94	94	Terbaik / Excellent
		Pantai Tanjung Bidara	MMTC015	94	94	93	93	94	Terbaik / Excellent
		Pantai Kemasik	MMTC016	93	88	86	90	97	Terbaik / Excellent
Kelantan	Pantai / Coastal	Pantai Seri Tujuh	MMDC001	88	93	88	84	93	Terbaik / Excellent
		Pantai Cahaya Bulan	MMDC002	87	93	87	92	95	Terbaik / Excellent
		Pantai Sabak	MMDC003	81	93	88	89	95	Terbaik / Excellent
		Pantai Irama Bachok	MMDC004	86	93	89	66	95	Terbaik / Excellent
		Pantai Bisikan Bayu	MMDC005	89	94	95	83	95	Terbaik / Excellent
		Pantai Melawi	MMDC006	93	94	85	83	95	Terbaik / Excellent

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021
Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Pantai / Coastal	Pantai Sematan	MMQC001	88	90	91	72	93	Terbaik / Excellent
		Pantai Pandan	MMQC002	87	91	91	75	92	Terbaik / Excellent
		Pantai Pasir Putih	MMQC003	80	87	91	80	84	Baik / Good
		Pantai Bako	MMQC004	88	89	91	85	89	Baik / Good
		Pantai Bako	MMQC005	88	91	91	68	86	Baik / Good
		Pantai Tanjung Kembang	MMQC006	69	85	91	86	77	Sederhana / Moderate
		Pantai Harmoni Mukah	MMQC007	72	86	88	60	67	Sederhana / Moderate
		Pantai Tanjung Batu	MMQC008	84	89	89	56	81	Baik / Good
		Pantai Likau	MMQC009	85	89	87	62	88	Baik / Good
		Pantai Emas	MMQC010	87	90	90	62	75	Sederhana / Moderate
		Pantai Piasau	MMQC011	86	89	87	70	85	Baik / Good
		Pantai Brighton	MMQC012	81	88	80	79	75	Sederhana / Moderate
		Pantai Esplaned	MMQC013	86	82	88	70	83	Baik / Good
		Pantai Beraya	MMQC014	87	88	90	65	83	Baik / Good
		Pantai Bungai	MMQC015	88	87	88	68	75	Sederhana / Moderate
		Pantai Belawai	MMQC016	84	88	90	66	67	Sederhana / Moderate
		Pantai Mukah	MMQC017	84	88	87	49	89	Baik / Good
		Tanjung Kidurong	MMQC018	85	90	87	63	80	Baik / Good
		Pasir Pandak	MMQC019	86	90	90	74	91	Terbaik / Excellent
		Rambungan	MMQC020	89	90	89	69	93	Terbaik / Excellent
		Sri Tanjung Lawas	MMQC021	92	86	78	71	68	Sederhana / Moderate
		Pantai Luak	MMQC022	88	78	88	77	84	Baik / Good
		Pasir Panjang	MMQC023	87	88	91	55	86	Baik / Good
Sabah	Pantai / Coastal	Pantai Teluk Brunei 1	MMSC001	70	92	85	67	73	Sederhana / Moderate
		Pantai Teluk Brunei 2	MMSC002	65	93	94	69	84	Baik / Good
		Pantai Teluk Brunei 3	MMSC003	65	92	81	62	75	Sederhana / Moderate
		Pantai Teluk Brunei 4	MMSC004	69	93	78	72	84	Baik / Good

Jadual 4.6: Status Kualiti Air Marin bagi Pantai, 2021

Table 4.6: Marine Water Quality Status for Coastal Areas, 2021

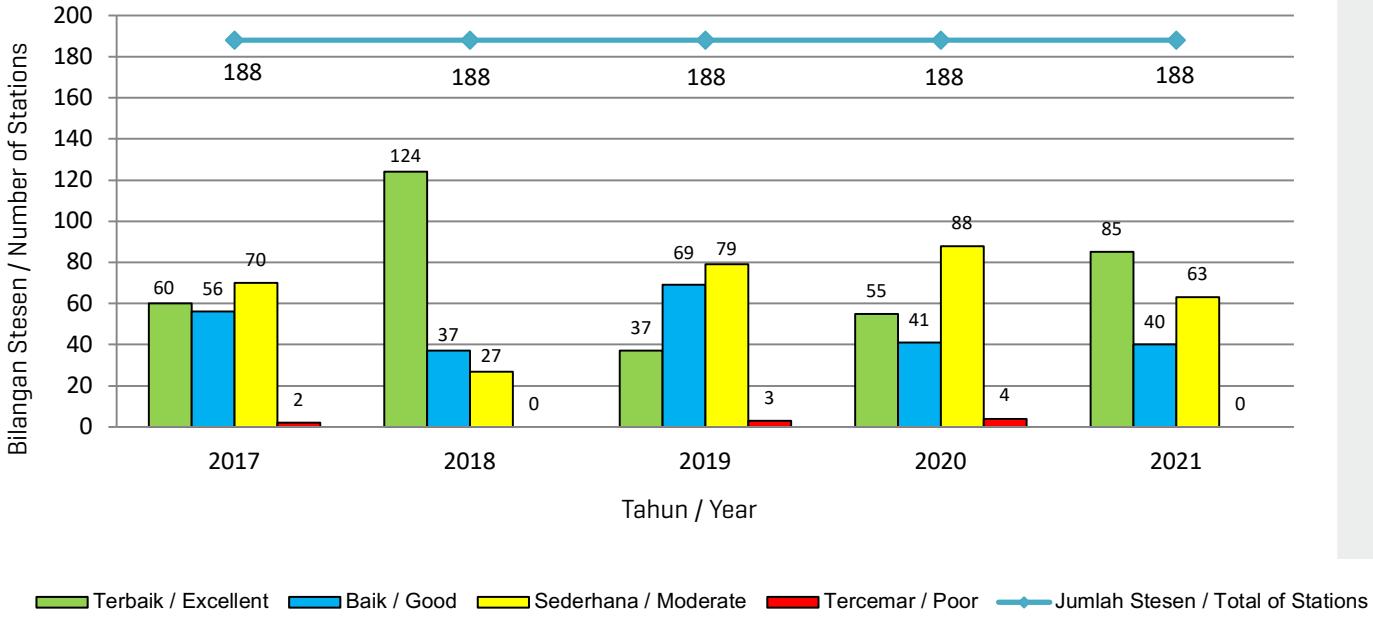
NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Pantai / Coastal	Pantai Teluk Brunei 5	MMSC005	69	93	88	64	64	Sederhana / Moderate
		Pantai Teluk B runei 6	MMSC006	70	93	94	67	67	Sederhana / Moderate
		Borneo Golf Seawater	MMSC007	68	92	88	72	72	Sederhana / Moderate
		Pantai Manis Papar	MMSC008	69	91	92	60	60	Sederhana / Moderate
		Pantai Melinsung	MMSC009	73	93	90	67	67	Sederhana / Moderate
		Pantai Tanjung Aru (Roll Skating)	MMSC010	86	93	92	67	67	Sederhana / Moderate
		Pantai Tanjung Aru (No. 3)	MMSC0 11	82	93	88	64	64	Sederhana / Moderate
		Pantai Lok Kawi	MMSC012	85	93	87	72	72	Sederhana / Moderate
		Pantai Dalit Tuaran	MMSC013	74	93	88	78	78	Sederhana / Moderate
		Mangrove Paradise	MMSC014	86	93	87	73	73	Sederhana / Moderate
		Pantai Sabandar	MMSC015	71	93	95	75	75	Sederhana / Moderate
		Pantai Bak-Bak Kudat	MMSC016	70	93	85	62	62	Sederhana / Moderate
		Pasir Putih Sandakan	MMSC017	66	92	84	63	63	Sederhana / Moderate
		Pantai TLDM	MMSC018	69	92	67	72	72	Sederhana / Moderate
		Pantai Batu Sapi	MMSC019	51	93	93	61	61	Sederhana / Moderate
		Pantai Ulu Tungku	MMSC020	69	92	70	66	57	Sederhana / Moderate
		Pantai Sarina Kunak	MMSC021	68	93	84	74	58	Sederhana / Moderate
		Pantai Kg. Lamak	MMSC022	49	91	79	64	57	Sederhana / Moderate
		Pantai Tinagat	MMSC023	70	93	78	58	58	Sederhana / Moderate
		Pantai Tanjung Aru (Rest Lido)	MMSC024	86	93	79	63	69	Sederhana / Moderate
W.P. Labuan	Pantai / Coastal	Pulau Papan	MMLC001	73	92	68	62	59	Sederhana / Moderate
		Kiamsam	MMLC002	73	93	64	68	58	Sederhana / Moderate
		Sungai Pagar	MMLC003	71	92	83	61	58	Sederhana / Moderate
		Layang - Layangan	MMLC004	73	92	82	69	57	Sederhana / Moderate
		Tanjung Aru	MMLC005	73	91	59	58	59	Sederhana / Moderate

Nota / Notes:

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

Rajah 4.9 menunjukkan status kualiti air marin bagi pantai berdasarkan IKAMM dan bilangan stesen pengawasan pantai. Bilangan stesen terbaik meningkat daripada 55 stesen pada tahun 2020 kepada 85 stesen pada tahun 2021. Walau bagaimanapun, stesen dengan status kualiti air baik menurun daripada 41 stesen pada tahun 2020 kepada 40 stesen pada tahun 2021. Tiada stesen tercemar yang direkodkan pada tahun 2021 berbanding empat (4) stesen tercemar pada tahun 2020.

Figure 4.9 depicts the trend of marine water quality status for coastal based on MMWQI and the number of monitoring stations. The number of excellent stations increased from 55 stations in 2020 to 85 stations in 2021. Nevertheless, the number of good water quality stations decreased from 41 stations in 2020 to 40 stations in 2021. No poor station was recorded in 2021 compared to four (4) poor stations in 2020.



Rajah 4.9: Tren Status Kualiti Air Marin bagi Kawasan Pantai, 2017 - 2021
Figure 4.9: The Trend of Marine Water Quality Status for Coastal Area, 2017 - 2021

STATUS KUALITI AIR MARIN BAGI MUARA SUNGAI

Sebanyak 85 stesen muara sungai dipantau pada tahun 2021. Daripada 85 stesen pengawasan bagi muara sungai, tujuh (7) stesen (8%) terbaik, 10 stesen (12%) baik, 63 stesen (74%) sederhana manakala lima (5) stesen (6%) tercemar (**Jadual 4.7**).

MARINE WATER QUALITY STATUS FOR ESTUARY

A total of 85 estuary stations were monitored in the year 2021 and of this number, seven (7) stations (8%) were ranked excellent, 10 stations (12%) were ranked good, 63 stations (74%) were moderate, while the remaining five (5) stations were ranked poor (**Table 4.7**).

Jadual 4.7: Status Kualiti Air Marin bagi Muara Sungai
Table 4.7: Marine Water Quality Status for Estuaries

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perlis	Muara Sungai / Estuary	Kuala Sungai Baru	MMRE001	64	70	50	56	57	Sederhana / Moderate
		Kuala Sungai Perlis	MMRE002	64	66	58	54	57	Sederhana / Moderate
Kedah	Muara Sungai / Estuary	Kuala Kedah	MMKE001	62	61	53	53	57	Sederhana / Moderate
		Kuala Jerlun	MMKE002	62	82	50	57	55	Sederhana / Moderate
		Kuala Segantang Garam	MMKE003	83	88	57	70	69	Sederhana / Moderate
		Kuala Sungai Muda	MMKE004	64	62	62	58	56	Sederhana / Moderate
Pulau Pinang	Muara Sungai / Estuary	Kuala Sungai Jawi	MMPE001	49	54	46	38	43	Tercemar / Poor
		Kuala Sungai Juru	MMPE002	49	47	51	30	42	Tercemar / Poor
		Kuala Sungai Kerian	MMPE003	56	60	52	54	56	Sederhana / Moderate
		Kuala Sungai Pinang	MMPE004	52	61	52	53	52	Sederhana / Moderate
		Kuala Sungai Perai	MMPE005	52	59	53	43	55	Sederhana / Moderate
		Kuala Sungai Tengah	MMPE006	58	37	52	52	57	Sederhana / Moderate
		Kuala Sungai Pinang (Balik Pulau)	MMPE007	55	64	50	48	56	Sederhana / Moderate
Perak	Muara Sungai / Estuary	Kuala Sungai Manjung	MMAE001	88	91	71	75	73	Sederhana / Moderate
		Kuala Sungai Gula	MMAE002	82	84	55	53	54	Sederhana / Moderate
		Kuala Sungai Kurau	MMAE003	61	64	54	53	54	Sederhana / Moderate
		Kuala Sungai Tanjung Piandang	MMAE004	59	61	51	38	45	Tercemar / Poor
		Kuala Sungai Sepetang	MMAE005	60	58	46	48	55	Sederhana / Moderate
		Kuala Sungai Perak	MMAE006	61	81	53	58	55	Sederhana / Moderate
Selangor	Muara Sungai / Estuary	Kuala Sungai Sepang	MMBE001	92	89	60	57	66	Sederhana / Moderate
		Kuala Sungai Sepang (Kecil)	MMBE002	93	89	61	88	80	Baik / Good
		Kuala Sungai Sepang (Kawalan)	MMBE003	93	92	70	88	81	Baik / Good
		Kuala Sungai Langat (Jugra)	MMBE004	82	62	50	44	54	Sederhana / Moderate
		Kuala Sungai Klang	MMBE005	60	37	38	35	40	Tercemar / Poor

Jadual 4.7: Status Kualiti Air Marin bagi Muara Sungai
Table 4.7: Marine Water Quality Status for Estuaries

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	NOMBOR STESEN / STATION NUMBER	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Selangor	Muara Sungai / Estuary	Kuala Sungai Langat (Lumut)	MMBE006	60	39	49	45	54	Sederhana / Moderate
		Kuala Sungai Buloh	MMBE007	64	62	44	58	57	Sederhana / Moderate
		Kuala Sungai Selangor	MMBE008	85	69	45	45	43	Tercemar / Poor
		Kuala Sungai Tengi	MMBE009	74	64	49	43	51	Sederhana / Moderate
		Kuala Sungai Bernam	MMBE010	56	86	52	55	55	Sederhana / Moderate
N.Sembilan	Muara Sungai / Estuary	Kuala Sungai Linggi	MMNE001	75	65	52	64	68	Sederhana / Moderate
		Kuala Sungai Lukut	MMNE002	66	66	52	52	56	Sederhana / Moderate
Melaka	Muara Sungai / Estuary	Kuala Sungai Melaka	MMME001	63	65	55	56	60	Sederhana / Moderate
		Kuala Sungai Sri Melaka	MMME002	57	59	45	53	50	Sederhana / Moderate
		Kuala Sungai Merlimau	MMME003	81	75	52	55	58	Sederhana / Moderate
		Kuala Sungai Kesang	MMME004	83	82	54	85	74	Sederhana / Moderate
		Kuala Sungai Sebatu	MMME005	86	87	56	63	63	Sederhana / Moderate
		Kuala Sungai Melaka 2	MMME006	64	64	52	54	56	Sederhana / Moderate
		Kuala Sungai Baru	MMME007	84	83	55	56	57	Sederhana / Moderate
		Kuala Sungai Lereh	MMME008	63	64	55	57	55	Sederhana / Moderate
Johor	Muara Sungai / Estuary	Kuala Sungai Segget	MMJE001	53	32	33	41	51	Sederhana / Moderate
		Kuala Sungai Laloh	MMJE002	61	61	39	42	55	Sederhana / Moderate
		Kuala Sungai Johor	MMJE003	92	92	72	88	92	Terbaik / Excellent
		Kuala Sungai Batu Pahat	MMJE004	90	80	57	67	58	Sederhana / Moderate
		Kuala Sungai Muar	MMJE005	92	66	55	57	57	Sederhana / Moderate
		Kuala Sungai Mersing	MMJE006	67	67	59	62	59	Sederhana / Moderate
Pahang	Muara Sungai / Estuary	Kuala Kuantan	MMCE001	66	67	56	59	58	Sederhana / Moderate
		Kuala Rompin Kecil	MMCE002	89	93	69	79	72	Sederhana / Moderate
		Kuala Pahang	MMCE003	92	73	59	59	57	Sederhana / Moderate
		Kuala Nenasi	MMCE004	93	94	63	93	85	Baik / Good
		Kuala Sungai Balok	MMCE005	65	66	57	59	55	Sederhana / Moderate
Terengganu	Muara Sungai / Estuary	Kuala Sungai Besut	MMTE001	73	67	58	59	74	Sederhana / Moderate

Jadual 4.7: Status Kualiti Air Marin bagi Muara Sungai
Table 4.7: Marine Water Quality Status for Estuaries

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Terengganu	Muara Sungai / Estuary	Kuala Sungai Dungun	MMTE002	65	86	59	60	69	Sederhana / Moderate
		Kuala Sungai Ibai	MMTE003	90	93	85	77	90	Terbaik / Excellent
		Kuala Sungai Kerteh	MMTE004	91	92	59	73	58	Sederhana / Moderate
		Kuala Sungai Marang	MMTE005	90	91	67	71	84	Baik / Good
		Kuala Sungai Paka	MMTE006	80	94	58	73	65	Sederhana / Moderate
		Kuala Sungai Setiu	MMTE007	92	93	86	64	92	Terbaik / Excellent
		Kuala Sungai Terengganu	MMTE008	66	67	59	59	66	Sederhana / Moderate
		Kuala Sungai Kemaman/ Chukai	MMTE009	90	94	59	60	58	Sederhana / Moderate
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	MMTE010	89	94	95	94	94	Terbaik / Excellent
		Tioxide Tengah (Pupuk Semangat, Kijal)	MMTE011	90	94	94	87	93	Terbaik / Excellent
		Tioxide Selatan (KSB, T. Kalong)	MMTE012	94	94	85	94	86	Baik / Good
		Pulau Duyung	MMTE013	66	66	58	59	59	Sederhana / Moderate
Kelantan	Muara Sungai / Estuary	Kuala Sungai Golok	MMDE001	75	67	58	59	79	Sederhana / Moderate
		Kuala Sungai Kelantan	MMDE002	79	65	55	58	70	Sederhana / Moderate
		Kuala Sungai Pengkalan Chepa	MMDE003	89	67	53	56	64	Sederhana / Moderate
		Kuala Sungai Pengkalan Datu	MMDE004	86	81	68	59	59	Sederhana / Moderate
		Kuala Sungai Kemasin	MMDE005	63	67	39	56	59	Sederhana / Moderate
		Kuala Sungai Semerak	MMDE006	87	67	69	59	85	Baik / Good
Sarawak	Muara Sungai / Estuary	Kuala Sungai Semantan	MMQE001	86	90	91	65	90	Terbaik / Excellent
		Kuala Sungai Sarawak	MMQE002	85	86	86	64	85	Baik / Good
		Kuala Sungai Bako	MMQE003	55	90	63	56	79	Sederhana / Moderate
		Kuala Sungai Santubong	MMQE004	87	88	87	76	90	Terbaik / Excellent
		Kuala Batang Krian (Kabong)	MMQE005	64	76	80	83	71	Sederhana / Moderate
		Kuala Batang Rejang	MMQE006	83	85	89	66	85	Baik / Good

Jadual 4.7: Status Kualiti Air Marin bagi Muara Sungai

Table 4.7: Marine Water Quality Status for Estuaries

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sarawak	Muara Sungai / Estuary	Kuala Mukah	MMQE007	72	83	76	50	62	Sederhana / Moderate
		Kuala Batang Kemena	MMQE008	68	87	83	53	58	Sederhana / Moderate
		Kuala Tanjung Similajau	MMQE009	84	89	84	55	85	Baik / Good
		Kuala Sungai Panipah	MMQE010	86	89	87	55	83	Baik / Good
		Kuala Pantai Nyalau	MMQE011	84	79	83	58	71	Sederhana / Moderate
		Kuala Sungai Baram	MMQE012	72	76	74	57	76	Sederhana / Moderate
		Kuala Sungai Miri	MMQE013	61	78	74	68	63	Sederhana / Moderate
		Kuala Sungai Trusan	MMQE014	70	87	80	54	64	Sederhana / Moderate
Sabah	Muara Sungai / Estuary	Kuala Penyu	MMSE001	71	92	83	63	58	Sederhana / Moderate
		Muara Sungai Inanam	MMSE002	86	91	75	57	59	Sederhana / Moderate

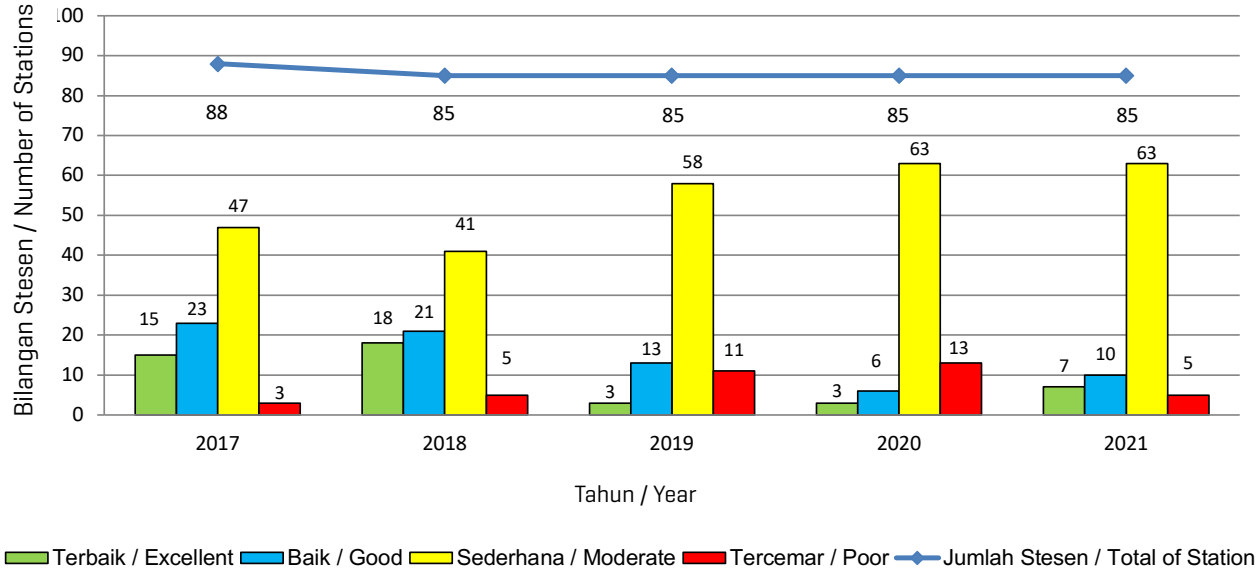
Nota / Notes:

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

Pantai Cenang, Langkawi

Rajah 4.10 menunjukkan tren status kualiti air marin bagi muara sungai berdasarkan IKAMM dan bilangan stesen pengawasan muara sungai. Bilangan stesen terbaik meningkat daripada tiga (3) stesen pada tahun 2020 kepada tujuh (7) stesen pada tahun 2021 manakala bilangan stesen baik meningkat daripada enam (6) stesen pada tahun 2020 kepada 10 stesen pada tahun 2021.

Figure 4.10 shows the trend of marine water quality status for estuaries based on MMWQI and the number of monitoring stations. The number of station ranked excellent increased from three (3) stations in 2020 to seven (7) stations in 2021, while the number of stations ranked good increased from six (6) stations in 2020 to 10 stations in 2021.



Rajah 4.10: Tren Status Kualiti Air Marin bagi Muara Sungai, 2017 - 2021
Figure 4.10: The Trend of Marine Water Quality Status for Estuaries, 2017 - 2021

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 2021. **Jadual 4.8** menunjukkan senarai stesen pengawasan kualiti air marin bagi pulau. Daripada 95 stesen pengawasan, 53 stesen (56%) terbaik, 10 stesen (10%) baik, manakala 32 stesen (34%) sederhana. Tiada stesen sebagai tercemar pada tahun 2021 (**Jadual 4.9**).

MARINE WATER QUALITY STATUS FOR ISLAND

A total of 95 island water quality monitoring stations were established for the surrounding 79 islands that were monitored in the year 2021. **Table 4.8** shows the list of marine water quality monitoring stations for island. Out of the 95 monitoring stations, 53 stations (56%) ranked excellent, 10 stations (10%) ranked good, while the remaining 32 stations (34%) ranked moderate. There was no station ranked poor in 2021 (**Table 4.9**).

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

NEGERI / STATE	BIL. PULAU / NO. OF ISLAND	BIL. STESEN / NO. OF STATION	PULAU / ISLAND	ID STESEN LAMA / OLD STATION ID	ID STESEN BARU / NEW STATION ID	KATEGORI / CATEGORY
Kedah	10	1	Singa Besar	7KR01	MMKR001	Peranginan / Resort
		2	Dayang Bunting	7KR02	MMKR002	Peranginan / Resort
			Dayang Bunting 2	NA	MMKR003	Peranginan / Resort
		1	Pulau Perak	7KP01	MMRP001	Dilindungi / Protected
		1	Payar	7KM03	MMKM001	Taman Laut / Marine Park
		1	Kaca	7KM04	MMKM002	Taman Laut / Marine Park
		1	Segantang	7KM06	MMKM003	Taman Laut / Marine Park
		4	Pantai Kuah	7KD07	MMKD001	Pembangunan / Development
			Pantai Chenang	7KD09	MMKD002	Pembangunan / Development
			Tanjung Rhu	7KD010	MMKD003	Pembangunan / Development
			Teluk Ewa	7KD08	MMKD004	Pembangunan / Development
		1	Pasir	NA	MMKP001	Dilindungi / Protected
		1	Gasing	NA	MMKP002	Dilindungi / Protected
		1	Dangli	NA	MMKP003	Dilindungi / Protected
Pulau 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

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

NEGERI / STATE	BIL. PULAU / NO. OF ISLAND	BIL. STESEN / NO. OF STATION	PULAU / ISLAND	ID STESEN LAMA / OLD STATION ID	ID STESEN BARU / NEW STATION ID	KATEGORI / CATEGORY
Pulau Pinang	7	1	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
Melaka	3	2	Upeh (Point A)	7MR02	MMMR001	Peranginan / Resort
			Upeh (Point B)	7MR02	MMMR002	Peranginan / Resort
		2	Besar (Point A)	7MR01	MMMR003	Peranginan / Resort
			Besar (Point B)	7MR01	MMMR004	Peranginan / Resort

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

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	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	Tioman (Teluk Salang)	7CM02	MMCM001	Taman Laut / Marine Park
		1	Tioman (Kg. Nipah)	7CM01	MMCM002	Taman Laut / Marine Park
		1	Tulai	7CM05	MMCM003	Taman Laut / Marine Park
		1	Labas	7CM07	MMCM004	Taman Laut / Marine Park
		1	Cebeh	7CM04	MMCM005	Taman Laut / Marine Park
		1	Sepui	7CM06	MMCM006	Taman Laut / Marine Park
		1	Sembilang	7CM08	MMCM007	Taman Laut / Marine Park
		1	Seri Buat	7CM03	MMCM008	Taman Laut / Marine Park
		1	Tokong Bahara	7CM09	MMCM009	Taman Laut / Marine Park

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

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
Terengganu	9	1	Gemia	7TR01	MMTR001	Peranginan / Resort
		1	Perhentian Besar (South)	7TM04	MMTM001	Taman Laut / Marine Park
		2	Perhentian Besar (West)	7TM05	MMTM002	Taman Laut / Marine Park
			Perhentian Kecil	7TM06	MMTM003	Taman Laut / Marine Park
		2	Redang (North)	7TM07	MMTM004	Taman Laut / Marine Park
			Redang (South)	7TM08	MMTM005	Taman Laut / Marine Park
		1	Lang Tengah	7TM11	MMTM006	Taman Laut / Marine Park
		1	Pinang	7TM12	MMTM007	Taman Laut / Marine Park
		1	Ekor Tebu	7TM13	MMTM008	Taman Laut / Marine Park
		1	Lima	7TM14	MMTM009	Taman Laut / Marine Park
		1	Kapas	7TM09	MMTM010	Taman Laut / Marine Park
Kelantan	2	1	Panjang	7DP01	MMDP001	Dilindungi / Protected
		1	Kundur	7DP02	MMDP002	Dilindungi / Protected
Sarawak	3	1	Satang	7QP01	MMQP001	Dilindungi / Protected
		1	Talang-Talang Kecil	7QP02	MMQP002	Dilindungi / Protected
		1	Talang-Talang Besar	7QP03	MMQP003	Dilindungi / Protected

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

NEGERI / STATE	BIL. PULAU / NO. OF ISLAND	BIL. STESEN / NO. OF STATION	PULAU / ISLAND	ID STESEN LAMA /OLD STATION ID	ID STESEN BARU / NEW STATION ID	KATEGORI / CATEGORY
Sabah	16	1	Gaya	7SR01	MMSR001	Peranginan / Resort
		1	Mabul	7SR03	MMSR002	Peranginan / Resort
		2	Sipadan (N)	7SR04	MMSR003	Peranginan / Resort
			Sipadan (W)	7SR05	MMSR004	Peranginan / Resort
		1	Manukan	7SM09	MMSR005	Peranginan / Resort
		1	Tiga	7SR10	MMSR006	Peranginan / Resort
		1	Kapalai	7SR12	MMSR007	Peranginan / Resort
		1	Molleangan Besar	7SR14	MMSR008	Peranginan / Resort
		1	Banggi (South)	7SR15	MMSR009	Peranginan / Resort
		1	Banggi (East)	7SR20	MMSR010	Peranginan / Resort
		1	Balambangan	7SR16	MMSR011	Peranginan / Resort
		1	Mantanani Besar	7SR21	MMSR012	Peranginan / Resort
		1	Sapi	7SM08	MMSM001	Taman Laut / Marine Park
		1	Kalampunian Besar	7SM11	MMSM002	Taman Laut / Marine Park
		1	Selingan	7SP17	MMSP001	Dilindungi / Protected
		1	Gulisan	7SP18	MMSP002	Dilindungi / Protected
		1	Bakungan Kecil	7SP19	MMSP003	Dilindungi / Protected

Jadual 4.8: Stesen-Stesen Pengawasan Kualiti Air Marin bagi Pulau, 2021

Table 4.8: Marine Water Quality Monitoring Stations for Island, 2021

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
W.P Labuan	4	1	Kuraman	7LM05	MMLM001	Taman Laut / Marine Park
		1	Rusukan Besar	7LM07	MMLM002	Taman Laut / Marine Park
		1	Rusukan Kecil	7LM06	MMLM003	Taman Laut / Marine Park
		4	Pohon Batu	7LD01	MMLD001	Pembangunan / Development
			Water Front	7LD02	MMLD002	Pembangunan / Development
			LubukTemiang	7LD03	MMLD003	Pembangunan / Development
			Ranca-Ranca	7LD04	MMLD004	Pembangunan / Development

Nota / Note :
NA - (Tidak berkenaan/ Not applicable)

Pantai Teluk Kemang, Port Dickson

Jadual 4.9: Status Kualiti Air Marin bagi Pulau, 2021

Table 4.9: Marine Water Quality Status for Island, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Kedah	Pulau / Island	Pantai Kuah	MMKD001	92	94	85	92	93	Terbaik / Excellent
		Pantai Chenang	MMKD002	74	82	73	93	91	Terbaik / Excellent
		Tanjung Rhu	MMKD003	92	94	91	93	91	Terbaik / Excellent
		Teluk Ewa	MMKD004	92	94	95	94	92	Terbaik / Excellent
		Payar	MMKM001	91	94	92	96	95	Terbaik / Excellent
		Kaca	MMKM002	93	94	86	95	95	Terbaik / Excellent
		Segantang	MMKM003	91	94	83	95	96	Terbaik / Excellent
		Pasir	MMKP001	93	94	94	96	96	Terbaik / Excellent
		Gasing	MMKP002	94	94	94	95	92	Terbaik / Excellent
		Dangli	MMKP003	92	94	95	95	91	Terbaik / Excellent
		Singa Besar	MMKR001	90	93	84	92	88	Baik / Good
		Dayang Bunting	MMKR002	91	93	90	87	95	Terbaik / Excellent
		Dayang Bunting 2	MMKR003	93	93	84	94	92	Terbaik / Excellent
		Pulau Perak	MMRP001	94	94	93	89	92	Terbaik / Excellent
Pulau Pinang	Pulau / Island	Batu Maung	MMPD001	64	62	55	57	57	Sederhana / Moderate
		Padang Kota	MMPD002	52	65	58	67	60	Sederhana / Moderate
		Teluk Bahang	MMPD003	61	82	59	85	83	Baik / Good
		Tanjung Tokong	MMPP001	63	66	57	71	68	Sederhana / Moderate
		Aman	MMPR001	72	88	60	72	72	Sederhana / Moderate
		Jerejak	MMPR002	57	65	57	58	76	Sederhana / Moderate
		Kendi	MMPR003	83	93	77	93	92	Terbaik / Excellent
		Rimau	MMPR004	85	93	85	90	92	Terbaik / Excellent
		Gedong	MMPR005	63	86	56	84	82	Baik / Good

Jadual 4.9: Status Kualiti Air Marin bagi Pulau, 2021

Table 4.9: Marine Water Quality Status for Island, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Perak	Pulau / Island	Tukun Perak	MMAP001	93	93	88	93	96	Terbaik / Excellent
		Pantai Teluk Gedong	MMAR001	85	92	69	79	88	Baik / Good
		Pantai Puteri Dewi	MMAR002	92	94	90	95	95	Terbaik / Excellent
		Pangkor Laut	MMAR003	89	92	86	93	96	Terbaik / Excellent
		Sembilan	MMAR004	93	94	82	91	94	Terbaik / Excellent
Selangor	Pulau / Island	Ketam	MMBR001	88	89	57	68	72	Sederhana / Moderate
		Angsa	MMBR002	85	92	71	59	89	Baik / Good
		Lumut	MMBR003	61	54	47	46	50	Sederhana / Moderate
N. Sembilan	Pulau / Island	Arang	MMNP001	68	92	81	92	94	Terbaik / Excellent
Melaka	Pulau / Island	Upeh (Point A)	MMMR001	65	85	59	87	77	Sederhana / Moderate
		Upeh (Point B)	MMMR002	82	84	70	80	87	Baik / Good
		Besar (Point A)	MMMR003	89	94	84	95	96	Terbaik / Excellent
		Besar (Point B)	MMMR004	90	93	71	95	94	Terbaik / Excellent
		Undan (Point A)	MMMR005	90	94	83	96	96	Terbaik / Excellent
		Undan (Point B)	MMMR006	90	94	91	96	95	Terbaik / Excellent
Johor	Pulau / Island	Dayang	MMJM001	94	94	88	94	95	Terbaik / Excellent
		Nanga Besar	MMJM002	94	94	70	78	78	Sederhana / Moderate
		Sibu Tengah	MMJM003	94	94	86	86	96	Terbaik / Excellent
		Pemanggil	MMJM004	94	94	91	95	94	Terbaik / Excellent
		Kukup	MMJP001	91	87	58	62	70	Sederhana / Moderate
		Pisang	MMJP002	93	93	58	94	86	Baik / Good
		Setindan	MMJR001	94	94	91	95	97	Terbaik / Excellent
		Babi Tengah	MMJR002	94	94	94	94	93	Terbaik / Excellent
Pahang	Pulau / Island	Tioman (Teluk Salang)	MMCM001	92	94	94	89	96	Terbaik / Excellent
		Tioman (Kg. Nipah)	MMCM002	93	94	83	95	96	Terbaik / Excellent

Jadual 4.9: Status Kualiti Air Marin bagi Pulau, 2021

Table 4.9: Marine Water Quality Status for Island, 2021

NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Pahang	Pulau / Island	Tulai	MMCM003	93	94	94	95	97	Terbaik / Excellent
		Labas	MMCM004	93	94	91	95	97	Terbaik / Excellent
		Cebeh	MMCM005	94	94	95	96	96	Terbaik / Excellent
		Sepui	MMCM006	93	94	95	96	97	Terbaik / Excellent
		Sembilang	MMCM007	93	94	96	94	97	Terbaik / Excellent
		Seri Buat	MMCM008	94	94	94	93	97	Terbaik / Excellent
		Tokong Bahara	MMCM009	93	94	69	69	95	Terbaik / Excellent
Terengganu	Pulau / Island	Perhentian Besar (South)	MMTM001	89	94	86	95	97	Terbaik / Excellent
		Perhentian Besar (West)	MMTM002	90	94	92	96	96	Terbaik / Excellent
		Perhentian Kecil	MMTM003	90	94	91	96	97	Terbaik / Excellent
		Redang (North)	MMTM004	90	94	88	96	96	Terbaik / Excellent
		Redang (South)	MMTM005	89	94	85	95	96	Terbaik / Excellent
		Lang Tengah	MMTM006	90	94	75	96	97	Terbaik / Excellent
		Pinang	MMTM007	90	94	94	95	96	Terbaik / Excellent
		Ekor Tebu	MMTM008	90	94	87	97	97	Terbaik / Excellent
		Lima	MMTM009	90	94	97	96	97	Terbaik / Excellent
		Kapas	MMTM010	90	93	90	94	96	Terbaik / Excellent
		Gemia	MMTR001	89	94	96	90	94	Terbaik / Excellent
Kelantan	Pulau / Island	Panjang	MMDP001	88	93	82	77	92	Terbaik / Excellent
		Kundur	MMDP002	89	93	84	84	92	Terbaik / Excellent
Sarawak	Pulau / Island	Satang	MMQP001	87	90	91	76	86	Baik / Good
		Talang-Talang Kecil	MMQP002	87	91	92	69	93	Terbaik / Excellent
		Talang-Talang Besar	MMQP003	87	90	90	79	93	Terbaik / Excellent
Sabah	Pulau / Island	Sapi	MMSM001	72	93	85	65	81	Baik / Good

Jadual 4.9: Status Kualiti Air Marin bagi Pulau, 2021

Table 4.9: Marine Water Quality Status for Island, 2021

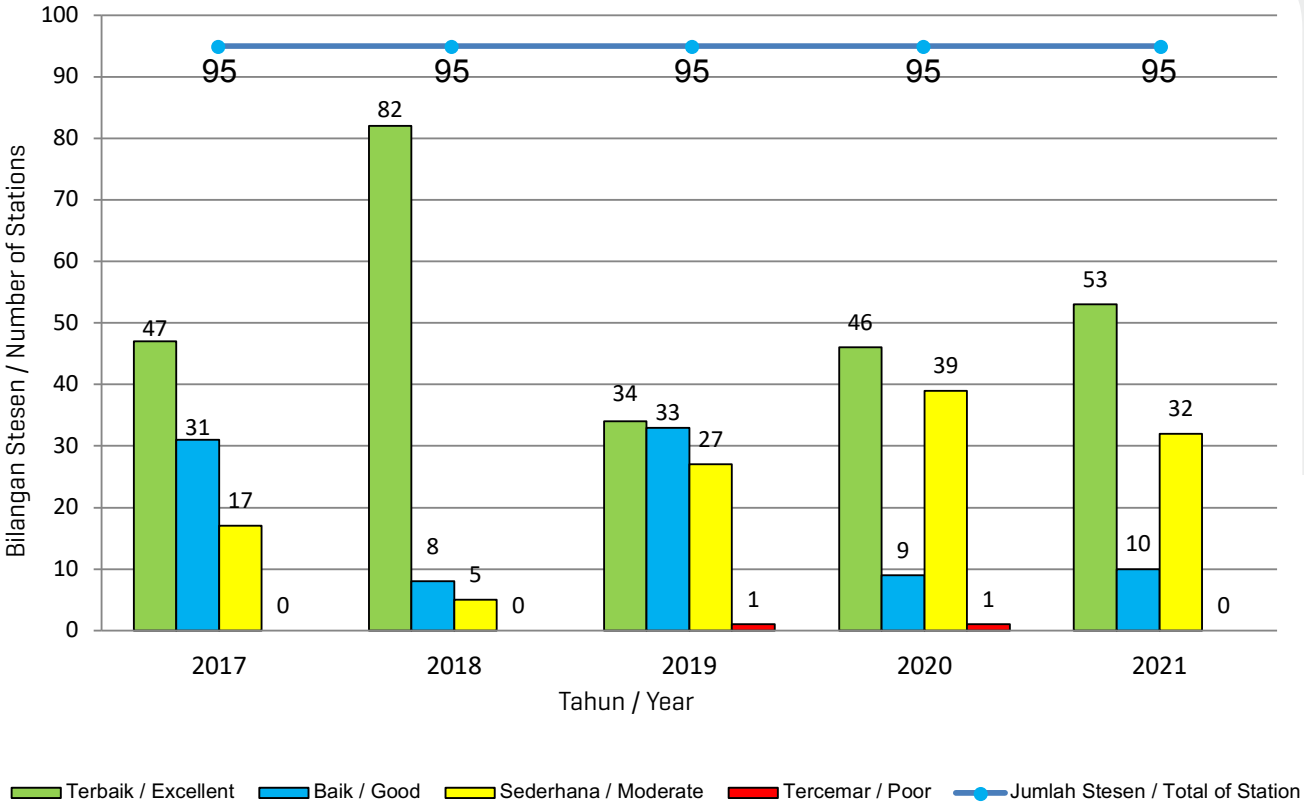
NEGERI / STATE	KLASIFIKASI STESEN / STATION CLASSIFICATION	KAWASAN / AREA	ID STESEN / STATION ID	NILAI IKAMM / MMWQI VALUE					KATEGORI (2021) / CATEGORY (2021)
				2017	2018	2019	2020	2021	
Sabah	Pulau / Island	Kalampunian Besar	MMSM002	86	93	89	67	58	Sederhana / Moderate
		Selingan	MMSP001	89	93	85	60	74	Sederhana / Moderate
		Gulisan	MMSP002	89	93	80	65	70	Sederhana / Moderate
		Bakungan Kecil	MMSP003	87	93	83	59	75	Sederhana / Moderate
		Gaya	MMSR001	73	93	86	68	72	Sederhana / Moderate
		Mabul	MMSR002	87	93	60	58	71	Sederhana / Moderate
		Sipadan (N)	MMSR003	88	93	63	59	66	Sederhana / Moderate
		Sipadan (W)	MMSR004	85	93	77	58	61	Sederhana / Moderate
		Manukan	MMSR005	70	93	85	75	86	Baik / Good
		Tiga	MMSR006	85	92	87	72	58	Sederhana / Moderate
		Kapalai	MMSR007	85	93	77	58	77	Sederhana / Moderate
		Molleangan Besar	MMSR008	88	93	91	61	61	Sederhana / Moderate
		Banggi (South)	MMSR009	87	93	79	65	58	Sederhana / Moderate
		Banggi (East)	MMSR010	88	93	93	75	60	Sederhana / Moderate
		Balambangan	MMSR011	88	93	88	69	71	Sederhana / Moderate
		Mantanani Besar	MMSR012	85	93	95	72	58	Sederhana / Moderate
W.P Labuan	Pulau / Island	Pohon Batu	MMLD001	63	92	86	67	58	Sederhana / Moderate
		Water Front	MMLD002	66	92	61	59	58	Sederhana / Moderate
		Lubuk Temiang	MMLD003	72	92	67	69	58	Sederhana / Moderate
		Ranca-Ranca	MMLD004	91	92	90	59	60	Sederhana / Moderate
		Kuraman	MMLM001	89	93	88	67	58	Sederhana / Moderate
		Rusukan Besar	MMLM002	91	93	88	59	58	Sederhana / Moderate
		Rusukan Kecil	MMLM003	90	92	90	64	58	Sederhana / Moderate

Nota / Notes:

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

Rajah 4.11 menunjukkan tren status kualiti air marin bagi pulau berdasarkan IKAMM dan bilangan stesen pengawasan pulau. Bilangan stesen sebagai terbaik meningkat daripada 46 stesen pada tahun 2020 kepada 53 stesen pada tahun 2021 manakala stesen sebagai baik juga meningkat dari sembilan (9) stesen pada tahun 2020 kepada 10 stesen pada tahun 2021.

Figure 4.11 displays the trend of marine water quality status for islands based on MMWQI and the number of monitoring stations. The number of excellent station increased from 46 stations in 2020 to 53 stations in 2021, while, the number of good water quality stations also increased from nine (9) stations in 2020 to 10 stations in 2021.



Rajah 4.11: Tren Status Kualiti Air Marin bagi Pulau, 2017 - 2021
Figure 4.11: The Trend of Marine Water Quality Status for Island, 2017 - 2021

Jadual 4.10 menunjukkan status kualiti air marin mengikut bilangan stesen dan kategori stesen bagi tahun 2020 dan 2021. **Jadual 4.11** menunjukkan status kualiti air marin mengikut peratusan bilangan stesen dan kategori stesen bagi tahun 2020 dan 2021.

Table 4.10 shows the marine water quality status by number of stations and station category for 2020 and 2021. **Table 4.11** shows the marine water quality status by percentage of number of stations and station category for 2020 and 2021.

Jadual 4.10: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen, 2020 - 2021

Table 4.10: Marine Water Quality Status by Number of Stations and Station Category, 2020 - 2021

KATEGORI STESEN / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
	2020	2021	2020	2021	2020	2021	2020	2021
Pantai / Coastal	55	85	41	40	88	63	4	0
Muara Sungai / Estuary	3	7	6	10	63	63	13	5
Pulau / Island	46	53	9	10	39	32	1	0
Pulau- Pembangunan / Island- Development	4	4	1	1	6	6	0	0
Pulau- Taman Laut / Island- Marine Park	22	25	2	1	7	5	0	0
Pulau- Dilindungi / Island- Protected	6	10	2	2	9	5	0	0
Pulau- Peranginan / Island- Resort	14	14	4	6	17	16	1	0
Jumlah / Total	104	145	56	60	190	158	18	5

Pulau Redang

Jadual 4.11: Status Kualiti Air Marin Mengikut Peratusan Bilangan Stesen dan Kategori Stesen, 2020 - 2021

Table 4.11: Marine Water Quality Status by Percentage of Number of Stations and Station Category, 2020 - 2021

JENIS STESEN / STATION TYPE	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
	2020	2021	2020	2021	2020	2021	2020	2021
Pantai / Coastal	29	45	22	21	47	34	2	0
Muara Sungai / Estuary	4	8	7	12	74	74	15	6
Pulau / Island	48	56	9	11	41	34	1	0
Pulau- Pembangunan / Island- Development	36	36	9	9	55	55	0	0
Pulau- Taman Laut / Island- Marine Park	71	81	6	3	23	16	0	0
Pulau- Dilindungi / Island- Protected	35	59	12	12	53	29	0	0
Pulau- Peranginan / Island- Resort	39	39	11	17	47	44	3	0
Jumlah / Total	28	39	15	16	52	43	5	1

Jadual 4.12 menunjukkan status kualiti air marin mengikut bilangan stesen dan kategori stesen untuk negeri bagi tahun 2020 dan 2021. **Jadual 4.13** menunjukkan status kualiti air marin mengikut peratusan bilangan stesen dan kategori stesen untuk negeri bagi tahun 2020 dan 2021.

Table 4.12 shows the marine water quality status by number of stations and station category for the state for 2020 and 2021. **Table 4.13** shows the marine water quality status by number of percentage of stations and station category for the state for 2020 and 2021.

Jadual 4.12: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2020 - 2021

Table 4.12: Marine Water Quality Status by Number of Stations and Station Category for the State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
1.	Perlis		0	1	1	0	2	2	0	0
		Pantai / Coastal	-	-	-	-	-	-	-	-
		Muara Sungai / Estuary	0	0	0	0	2	2	0	0
		Pulau / Island	0	1	1	0	0	0	0	0
		Pulau- Dilindungi / Island - Protected	0	1	1	0	0	0	0	0
2.	Pulau Pinang		2	5	8	6	19	20	4	2
		Pantai / Coastal	0	3	6	4	11	10	0	0
		Muara Sungai / Estuary	0	0	0	0	3	5	4	2
		Pulau / Island	2	2	2	2	5	5	0	0
		Pulau- Pembangunan / Island- Development	0	0	1	1	2	2	0	0
		Pulau- Dilindungi / Island- Protected	0	0	0	0	1	1	0	0
		Pulau- Peranginan / Island- Resort	2	2	1	1	2	2	0	0
3.	Kedah		18	18	3	4	5	4	0	0
		Pantai / Coastal	6	6	2	3	1	0	0	0
		Muara Sungai / Estuary	0	0	0	0	4	4	0	0
		Pulau / Island	12	12	1	1	0	0	0	0
		Pulau- Pembangunan / Island- Development	4	4	0	0	0	0	0	0
		Pulau- Taman Laut / Island- Marine Park	3	3	0	0	0	0	0	0
		Pulau- Dilindungi / Island- Protected	3	3	0	0	0	0	0	0
		Pulau- Peranginan / Island- Resort	2	2	1	1	0	0	0	0

Jadual 4.12: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2020 - 2021

Table 4.12: Marine Water Quality Status by Number of Stations and Station Category for the State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
4.	Perak		9	11	3	1	5	6	2	1
		Pantai / Coastal	5	7	3	0	0	1	0	0
		Muara Sungai / Estuary	0	0	0	0	4	5	2	1
		Pulau / Island	4	4	0	1	1	0	0	0
		Pulau- Dilindungi / Island- Protected	1	1	0	0	0	0	0	0
		Pulau- Peranginan / Island- Resort	3	3	0	1	1	0	0	0
5.	Selangor		1	0	2	6	10	11	6	2
		Pantai / Coastal	1	0	0	3	5	3	0	0
		Muara Sungai / Estuary	0	0	2	2	3	6	5	2
		Pulau / Island	0	0	0	1	2	2	1	0
		Pulau- Peranginan / Island- Resort	0	0	0	1	2	2	1	0
6.	N. Sembilan		6	10	7	3	4	4	0	0
		Pantai / Coastal	5	9	7	3	2	2	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		7	4	5	6	11	13	0	0
		Pantai / Coastal	3	0	2	5	4	4	0	0
		Muara Sungai / Estuary	0	0	1	0	7	8	0	0
		Pulau / Island	4	4	2	1		1	0	0
		Pulau- Peranginan / Island- Resort	4	4	2	1	0	1	0	0
8.	Johor		17	23	9	6	12	14	5	0
		Pantai / Coastal	12	17	7	5	7	7	3	0
		Muara Sungai / Estuary	0	1	1		3	5	2	0
		Pulau / Island	5	5	1	1	2	2	0	0
		Pulau- Taman Laut / Island- Marine Park	2	3	1	0	1	1	0	0
		Pulau- Dilindungi / Island- Protected	1	0	0	1	1	1	0	0
		Pulau- Peranginan / Island- Resort	2	2	0	0	0	0	0	0

Jadual 4.12: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2020 - 2021

Table 4.12: Marine Water Quality Status by Number of Stations and Station Category for the State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
9.	Pahang		17	27	6	2	13	7	0	0
		Pantai / Coastal	9	18	5	1	8	3	0	0
		Muara Sungai / Estuary	1			1	4	4	0	0
		Pulau / Island	7	9	1		1		0	0
		Pulau- Taman Laut / Island- Marine Park	7	9	1		1		0	0
10.	Terengganu		26	30	3	3	11	7	0	0
		Pantai / Coastal	13	15	2	1	1	0	0	0
		Muara Sungai / Estuary	2	4	1	2	10	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		1	8	5	1	8	5	0	0
		Pantai / Coastal	1	6	4	0	1	0	0	0
		Muara Sungai / Estuary	0	0	0	1	6	5	0	0
		Pulau / Island	0	2	1	0	1	0	0	0
		Pulau- Dilindungi / Island- Protected	0	2	1	0	1	0	0	0
12.	Sabah		0	0	0	5	43	38	0	0
		Pantai / Coastal	0	0	0	3	24	21	0	0
		Muara Sungai / Estuary	0	0	0	0	2	2	0	0
		Pulau / Island	0	0	0	2	17	15	0	0
		Pulau- Taman Laut / Island- Marine Park	0	0	0	1	2	1	0	0
		Pulau- Dilindungi / Island- Protected	0	0	0	0	3	3	0	0
		Pulau- Peranginan / Island- Resort	0	0	0	1	12	11	0	0

Jadual 4.12: Status Kualiti Air Marin Mengikut Bilangan Stesen dan Kategori Stesen untuk Negeri, 2020 - 2021

Table 4.12: Marine Water Quality Status by Number of Stations and Station Category for the State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
13.	Sarawak		0	8	4	17	35	15	1	0
		Pantai / Coastal	0	4	3	12	19	7	1	0
		Muara Sungai / Estuary	0	2	1	4	13	8	0	0
		Pulau / Island	0	2	0	1	3	0	0	0
		Pulau- Dilindungi / Island- Protected	0	2	0	1	3	0	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

Pulau Rawa

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
1.	Perlis		0	33.33	33.33	0	66.67	66.67	0	0
		Pantai / Coastal	-	-	-	-	-	-	-	-
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	0	100	100	0	0	0	0	0
		Pulau- Dilindungi / Island- Protected	0	100	100	0	0	0	0	0
2.	Pulau Pinang		6.06	15.15	24.24	18.18	57.58	60.61	12.12	6.06
		Pantai / Coastal	0	17.65	35.29	23.53	64.71	58.82	0	0
		Muara Sungai / Estuary	0	0	0	0	42.86	71.43	57.14	28.57
		Pulau / Island	22.22	22.22	22.22	22.22	55.56	55.56	0	0
		Pulau- Pembangunan / Island Development	0	0	33.33	33.33	66.67	66.67	0	0
		Pulau- Dilindungi / Island- Protected	0	0	0	0	100	100	0	0
		Pulau- Peranginan / Island- Resort	40	40	20	20	40	40	0	0

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
3.	Kedah		69.23	69.23	11.54	15.38	19.23	15.38	0	0
		Pantai / Coastal	66.67	66.67	22.22	33.33	11.11	0	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	92.31	92.31	7.69	7.69	0	0	0	0
		Pulau- Pembangunan / Island- Development	100	100	0	0	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	66.67	66.67	33.33	33.33	0	0	0	0
4.	Perak		47.37	57.89	15.79	5.26	26.32	31.58	10.53	5.26
		Pantai / Coastal	62.50	87.50	37.50	0	0	12.50	0	0
		Muara Sungai / Estuary	0	0	0	0	66.67	83.33	33.33	16.67
		Pulau / Island	80	80	0	20	20	0	0	0
		Pulau- Dilindungi / Island- Protected	100	100	0	0	0	0	0	0
		Pulau- Peranginan / Island- Resort	75	75	0	25	25	0	0	0

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
5.	Selangor		5.26	0	10.53	31.58	52.63	57.89	31.58	10.53
		Pantai / Coastal	16.67	0	0	50	83.33	50	0	0
		Muara Sungai / Estuary	0	0	20	20	30	60	50	20
		Pulau / Island	0	0	0	33.33	66.67	66.67	33.33	0
		Pulau- Peranginan / Island- Resort	0	0	0	33.33	66.67	66.67	33.33	0
6.	N. Sembilan		35.29	58.82	41.18	17.65	23.53	23.53	0	0
		Pantai / Coastal	35.71	64.29	50.00	21.43	14.29	14.29	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		30.43	17.39	21.74	26.09	47.83	56.52	0	0
		Pantai / Coastal	33.33	0	22.22	55.56	44.44	44.44	0	0
		Muara Sungai / Estuary	0	0	12.50	0	87.50	100	0	0
		Pulau / Island	66.67	66.67	33.33	16.67	0	16.67	0	0
		Pulau- Peranginan / Island- Resort	66.67	66.67	33.33	16.67	0	16.67	0	0

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
8.	Johor		39.53	53.49	20.93	13.95	27.91	32.56	11.63	0
		Pantai / Coastal	41.38	58.62	24.14	17.24	24.14	24.14	10.34	0
		Muara Sungai / Estuary	0	16.67	16.67	0	50	83.33	33.33	0
		Pulau / Island	62.50	62.50	12.50	12.50	25	25	0	0
		Pulau- Taman Laut / Island- Marine Park	50	75.00	25	0	25	25	0	0
		Pulau- Dilindungi / Island- Protected	50	0	0	50	50	50	0	0
		Pulau- Peranginan / Island- Resort	100	100	0	0	0	0	0	0
9.	Pahang		47.22	75	16.67	5.56	36.11	19.44	0	0
		Pantai / Coastal	40.91	81.82	22.73	4.55	36.36	13.64	0	0
		Muara Sungai / Estuary	20	0	0	20	80	80	0	0
		Pulau / Island	77.78	100	11.11	0	11.11	0	0	0
		Pulau- Taman Laut / Island- Marine Park	77.78	100	11.11	0	11.11	0	0	0
10.	Terengganu		65	75	7.50	7.50	27.50	17.50	0	0
		Pantai / Coastal	81.25	93.75	12.50	6.25	6.25	0	0	0
		Muara Sungai / Estuary	15.38	30.77	7.69	15.38	76.92	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

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
11.	Kelantan		7.14	57.14	35.71	7.14	57.14	35.71	0	0
		Pantai / Coastal	16.67	100	66.67	0	16.67	0	0	0
		Muara Sungai / Estuary	0	0	0	16.67	100	83.33	0	0
		Pulau / Island	0	100	50	0.00	50	0	0	0
		Pulau- Dilindungi / Island- Protected	0	100	50	0	50	0	0	0
12.	Sabah		0	0	0	11.63	100	88.37	0	0
		Pantai / Coastal	0	0	0	12.50	100	87.50	0	0
		Muara Sungai / Estuary	0	0	0	0	100	100	0	0
		Pulau / Island	0	0	0	11.76	100	88.24	0	0
		Pulau- Taman Laut / Island- Marine Park	0	0	0	50	100	50	0	0
		Pulau- Dilindungi / Island- Protected	0	0	0	0	100	100	0	0
		Pulau- Peranginan / Island- Resort	0	0	0	8	100	92	0	0

Jadual 4.13 : Peratusan Status Kualiti Air Marin berdasarkan Kategori Stesen Mengikut Negeri, 2020 - 2021

Table 4.13 : Percentage of Marine Water Quality Status based on Station Category by State, 2020 - 2021

BIL. / NO.	NEGERI / STATE	STATUS KUALITI AIR MARIN / KATEGORI STESEN MARINE WATER QUALITY STATUS / STATION CATEGORY	TERBAIK / EXCELLENT		BAIK / GOOD		SEDERHANA / MODERATE		TERCEMAR / POOR	
			2020	2021	2020	2021	2020	2021	2020	2021
13.	Sarawak		0	20.00	10.00	42.50	87.50	37.50	2.50	0
		Pantai / Coastal	0	17.39	13.04	52.17	82.61	30.43	4.35	0
		Muara Sungai / Estuary	0	14.29	7.14	28.57	92.86	57.14	0	0
		Pulau / Island	0	66.67	0	33.33	100	0	0	0
		Pulau- Dilindungi / Island- Protected	0	66.67	0.00	33.33	100	0	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

Stesen Marin dalam Kategori Tercemar

Jadual 4.14 menunjukkan terdapat lima (5) stesen marin tercemar iaitu kelima-limanya merupakan stesen muara sungai. Unjuran peratusan sub-indeks adalah dengan menggunakan skala 0 hingga 100%. Sub-indeks yang memberikan nilai 49% dan ke bawah dijadikan sebagai tanda aras yang ditandakan warna merah bermaksud kemerosotan pada IKAMM.

Jadual ini juga menunjukkan semua stesen marin yang mengalami kemerosotan adalah disebabkan oleh parameter faecal coliform. Selain itu, oksigen terlarut, jumlah pepejal terampai dan nitrat yang juga turut mempengaruhi nilai IKAMM.

Stesen muara sungai di Kuala Sungai Klang, Selangor, Kuala Sungai Selangor, Selangor dan Kuala Sungai Tanjung Piandang, Perak adalah stesen yang menerima kesan daripada dua (2) parameter manakala stesen yang lain terkesan daripada satu (1) parameter sahaja.

Marine Stations in Poor Category

Table 4.14 shows the list of five (5) marine stations that were ranked poor, all five of which are estuary stations. Sub-index projection percentages are used on a scale of 0 to 100%. A sub-index of 49% and below is a benchmark and marked in red to indicate a decline in MMWQI.

The table shows that this degradation is primarily due to faecal coliform parameter. In addition, dissolved oxygen, total suspended solids and nitrate also have had a slight impact on the value of MMWQI.

The estuary station of Kuala Sungai Klang, Selangor, Kuala Sungai Selangor, Selangor and Kuala Sungai Tanjung Piandang, Perak was most impacted by two (2) parameters, while other stations were mostly impacted by one (1) parameter only.

Pulau Tioman

Jadual 4.14: Senarai Stesen Pengawasan Kualiti Air Marin dengan Status Kategori Tercemar dan Peratusan Sub-Indeks Mengikut Parameter, 2021

Table 4.14: Lists of Marine Water Quality Monitoring Stations under the Category of Poor Status and their Sub-Index Percentages by Parameter, 2021

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 TERAMPAI / TOTAL SUSPENDED SOLID	NITRAT / NITRATE	FOSFAT / PHOSPHATE
Pulau Pinang	Muara Sungai / Estuary	Kuala Sungai Jawi	MMPE001	**43**	96	88	8	85	84	50
	Muara Sungai / Estuary	Kuala Sungai Juru	MMPE002	**42**	81	78	8	89	82	60
Perak	Muara Sungai / Estuary	Kuala Sungai - Tanjung Piandang	MMAE004	**45**	65	96	8	49	88	80
Selangor	Muara Sungai / Estuary	Kuala Sungai Klang	MMBE005	**40**	29	91	8	93	80	66
	Muara Sungai / Estuary	Kuala Sungai - Selangor	MMBE008	**43**	89	99	8	50	39	93

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 4.15 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.

Pada tahun 2021, purata dan median untuk parameter kualiti air marin yang dipantau di semua stesen CMWQM menunjukkan pematuhan yang tinggi bagi setiap kelas kualiti air marin sepertimana yang dinyatakan dalam SKAMM. Suhu air laut lebih rendah secara purata semasa Monsun Timur Laut dari Januari hingga Mac, terutamanya di Sabah dan W.P. Labuan, dan sedikit di Kedah dan Terengganu. Walau bagaimanapun, impak Monsun Timur Laut terhadap stesen-stesen kualiti air marin adalah kurang pada bulan Disember 2021.

Parameter oksigen terlarut (DO), jumlah pepejal terampai (TSS) dan polycylic aromatic hydrocarbon (PAHs) didapati mematuhi SKAMM. Seperti yang direkodkan pada tahun sebelumnya, ketidakpatuhan DO adalah tertinggi di CM11Q Santubong. Semasa air surut, paras DO stesen menurun hampir setiap hari. DO yang rendah ini berkemungkinan disebabkan oleh interaksi yang kompleks antara air laut dan air tawar di muara Sungai Santubong, di mana ianya dipengaruhi oleh sifat hidrologi muara sungai tersebut. Tiada bukti yang menunjukkan punca pencemaran dikaitkan dengan ketidakpatuhan DO.

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

In 2021, 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 defined by the MMWQS. Seawater temperatures are lower on average during the Northeast Monsoon from January to March, particularly in Sabah and Federal Territory of Labuan, and to a lesser extent in Kedah and Terengganu. However, the Northeast monsoon's impact on the marine water quality in the stations was less profound in December 2021.

Dissolved oxygen (DO), total suspended solids (TSS), and polycyclic aromatic hydrocarbons (PAHs) all met the MMWQS. As was the case the year before, DO non-conformance was highest in the CM11Q Santubong. During the low tide, the station's DO level dropped almost every day. The low DO levels are most likely due to a complex interaction between seawater and freshwater in the Santubong river estuary, which has influenced the estuary's hydrological characteristics. There is no evidence that the source of pollution is linked to DO non-conformance.

CM12A Pulau Mentagor dan (pada tahap yang lebih rendah), CM13T Pulau Kapas telah menunjukkan tren ketidapatuhan DO yang sama seperti CM11Q. Ia berkemungkinan besar disebabkan oleh permintaan oksigen sedimen pada dasar laut yang mengakibatkan kemerosotan tahap DO apabila arus laut menjadi perlahan.

CM12A Pulau Mentagor and to a lesser extent, CM13T Pulau Kapas showed similar trend of DO non-conformance with CM11Q. The overabundances were most likely caused by the sediment oxygen demand in seabed, which depleted DO as the sea currents became slow.

Berdasarkan kepada SKAMM, semua stesen melaporkan pematuhan PAH yang sangat baik iaitu melebihi 90% mengikut kelas masing-masing. Tahap ketidakpatuhan dikenalpasti pada CM02N Pulau Undan, CM03N Port Dickson dan CM04J Tanjung Piai. Pada tahun 2021, kualiti air marin yang dipantau secara keseluruhannya di semua rangkaian CMWQM adalah berada pada status baik.

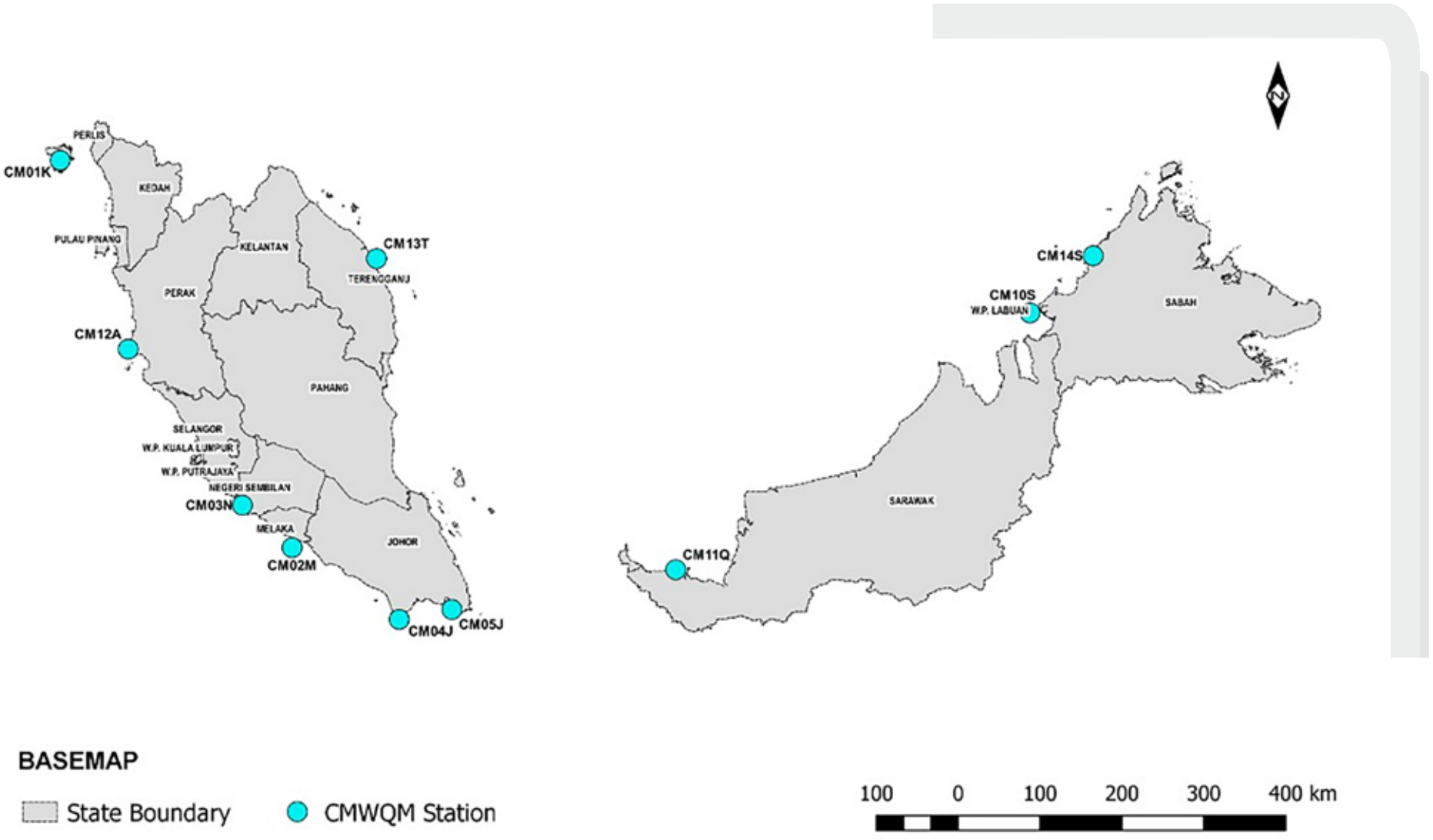
According to the MMWQS, all stations reported excellent PAH compliance of more than 90% with their respective water quality classes (MMWQS). The higher levels of non-conformance were found in CM02N Pulau Undan, CM03N Port Dickson, and CM04J Tanjung Piai. In 2021, the overall marine water quality monitored by the CMWQM network was deemed good.

Jadual 4.16 menunjukkan tahap pematuhan stesen CMWQM terhadap kelas masing-masing pada tahun 2021.

Table 4.16 shows the status of CMWQM stations were in compliance with their respective classes in 2021.

Jadual 4.15: Stesen Pengawasan Kualiti Air Marin Automatik
Table 4.15: Continuous Marine Water Quality Monitoring Stations

BIL. / NO.	LOKASI STESEN / STATION LOCATION	ID STESEN / STATION ID	STRUKTUR / STRUCTURE	KATEGORI STESEN / STATION CATEGORY
1	Jeti Pulau Langkawi, Kedah	CM01K	Jeti / Jetty	Kelas 2 / Class 2
2	Jeti Pulau Undan, Melaka	CM02M	Jeti / Jetty	Kelas 2 / Class 2
3	Port Dickson, Negeri Sembilan	CM03N	Beacon	Kelas 2 / Class 2
4	Tanjung Piai, Johor	CM04J	Beacon	Kelas E / Class E
5	Tanjung Pengelih, Johor	CM05J	Jeti / Jetty	Kelas 3 / Class 3
6	W.P Labuan	CM10S	Jeti / Jetty	Kelas 3 / Class 3
7	Santubong, Sarawak	CM11Q	Jeti / Jetty	Kelas E / Class E
8	Pulau Mentagor, Perak	CM12A	Jeti / Jetty	Kelas 2 / Class 2
9	Pulau Kapas, Terengganu	CM13T	Jeti / Jetty	Kelas 1 / Class 1
10	Teluk Sepanggar	CM14S	Jeti / Jetty	Kelas 3 / Class 3



Rajah 4.11: Lokasi Stesen Pengawasan Kualiti Air Marin Automatik

Figure 4.11: Location of Continuous Marine Water Quality Monitoring Stations

Jadual 4.16: Peratusan Pematuhan Parameter DO, TSS dan PAHs mengikut Kelas (SKAMM)

Table 4.16: 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)	POLYCYLIC AROMATIC HYDROCARBONS (PAHs)
Kedah	Pulau Langkawi	CM01K	2	98.25	99.78	100
Melaka	Jeti Pulau Undan	CM02M	2	99.99	99.05	99.57
N.Sembilan	Port Dickson	CM03N	2	100	99.16	98.87
Johor	Tanjung Piai	CM04J	E1	99.70	94.89	84.05
	Tanjung Pengelih	CM05J	3	100	99.86	100
W.P. Labuan	W.P Labuan	CM10S	3	100	99.97	100
Sarawak	Santubong	CM11Q	E3	47.13	98.48	99.89
Perak	Pulau Mentagor	CM12A	2	77.00	98.82	100
Terengganu	Pulau Kapas	CM13T	1	78.34	99.72	100
Sabah	Teluk Sepanggar	CM14S	3	100	99.67	100

Nota/ Note:
* Berdasarkan data 8 bulan/ Based on 8 months data

BAB 5
CHAPTER 5

INVENTORI PUNCA PENCEMARAN
POLLUTION SOURCES INVENTORY

INVENTORI PUNCA PENCEMARAN
POLLUTION SOURCES INVENTORY

PENGIRAAN BEBAN PENCEMARAN

Sungai merupakan antara sistem semulajadi utama yang mempunyai keupayaan asimilasi untuk mengurangkan kesan pencemaran melalui proses daripada penguraian, penyebaran dan pelarutan. Namun begitu, keupayaan ini terbatas dan sekiranya ia melebihi keupayaan tersebut maka kemerosotan kualiti air sungai akan terjadi.

Keupayaan asimilasi sungai ini amat berkait rapat dengan beban pencemaran yang ditakrifkan sebagai kepekatan bahan cemar yang dibawa oleh jasad air pada sesuatu masa yang diberikan. Beban pencemaran ini dipengaruhi oleh faktor kadar alir jasad air tersebut dan juga kepekatan bahan cemar yang dibawa.

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

Punca beban pencemaran air terbahagi kepada dua (2) kategori utama, iaitu punca tetap dan 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 pengolahan kumbahan dan sebagainya.

POLLUTION LOAD CALCULATION

Rivers are one of the ecosystems that have the assimilative capacity to reduce the impacts from pollution through the processes of degradation, dispersion and dilution. However, this capacity has its limitation and once exceeded, it will cause the quality of the river to deteriorate.

This assimilative capacity is co-related to the pollution load which is defined as concentration of pollutants carried by a given time. Pollution load is influenced by the water body flow rate and the concentrations of pollutants carried by the water body.

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

Sources of water pollution load can be divided into two (2) main categories which are point sources and non-points sources. Point sources can be described as the pollution sources that have specific identifiable discharge points which are unchanged over time. Sectors such as industry, livestock and sewage treatment system fall under this category.

Manakala punca tidak tetap seperti aktiviti pertanian, kerja tanah, perlombongan dan kumbahan bukan najis (air cucian selain kumbahan) tidak mempunyai takat pelepasan yang tetap dan sering berubah-ubah yang menyukarkan anggaran pelepasan beban pencemaran dibuat. Kajian berkaitan beban pencemaran di bawah kategori ini di Malaysia tidak banyak dijalankan dan kurang rujukan pada masa kini.

Meanwhile the non-point sources such as agricultural activities, earthworks, mining, and sullage (domestic wastewater other than sewage) do not have specific identifiable discharge points and the locations are varied over time. This makes it difficult to estimate the amount of amount pollution loads released. Studies on this particular category for Malaysia are currently not widely available for reference.

BEBAN PENCEMARAN AIR

Untuk tahun 2021, sebanyak lima (5) jenis punca pencemaran air ditumpukan dalam pelaporan status beban pencemaran air, iaitu industri pembuatan, industri berasaskan pertanian, sistem pengolahan kumbahan, ternakan babi dan pasar basah.

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

Pengiraan beban pencemaran ditumpukan kepada tiga (3) parameter utama yang memberikan kesan ketara kepada kualiti air sungai iaitu keperluan oksigen biokimia (BOD), pepejal terampai (SS) dan ammoniakal nitrogen (AN).

WATER POLLUTION LOAD

For the year of 2021, this report focusses on five (5) types of water pollution load sources which are the manufacturing industries, agricultural-based industries, sewage treatment plants, pig farming and wet markets.

The source of data for manufacturing industries and agricultural-based industries were provided by the Department of Environment (DOE) State offices while data for sewage treatment plants were obtained from Indah Water Konsortium Sdn. Bhd. and the Local Authority. All data regarding pig farming were provided by Department of Veterinary Services and data on wet markets were acquired from Ministry of Housing and Local Government.

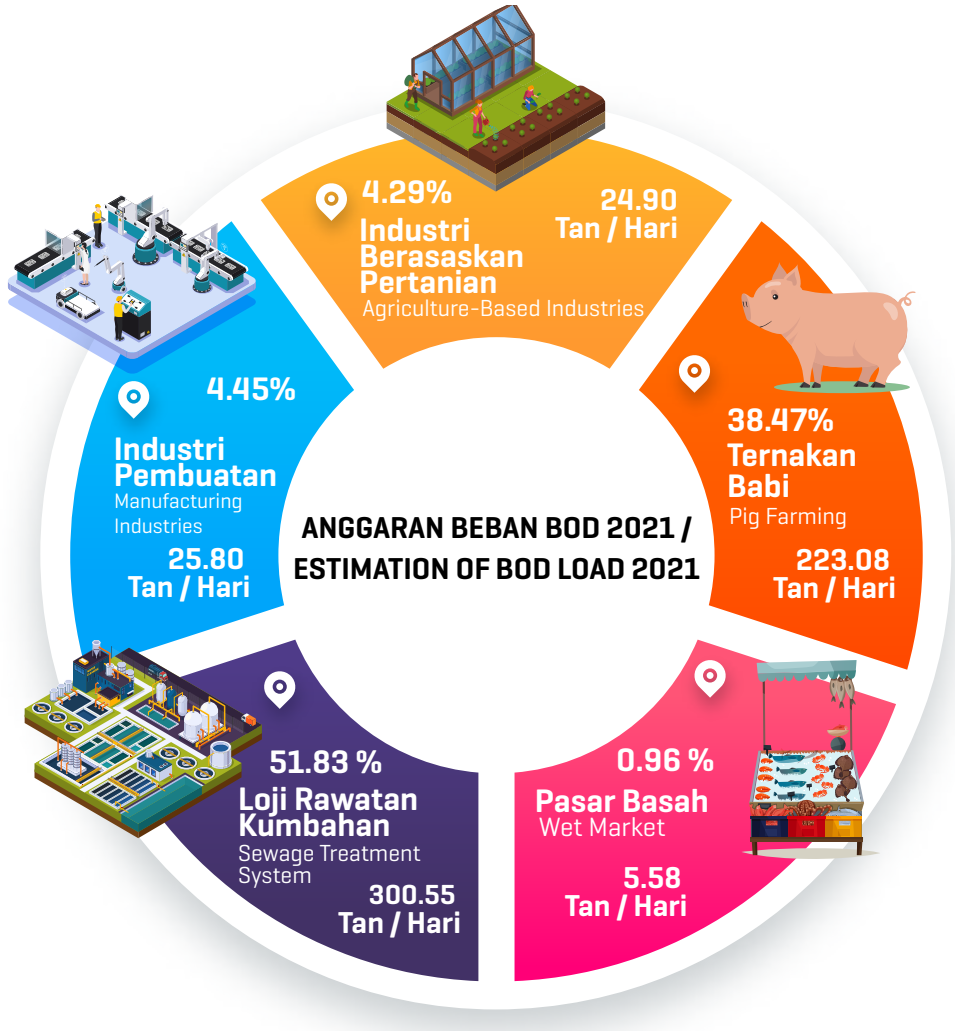
Calculation on pollution load are mainly focused on three (3) main parameters that caused significant impact to the river water quality which are biochemical oxygen demand (BOD), suspended solids (SS) and ammoniacal nitrogen (AN).

KEPERLUAN OKSIGEN BIOKIMIA

Pada tahun 2021, anggaran jumlah beban pencemaran BOD terhasil adalah sebanyak 579.90 tan/hari. Pelepasan daripada loji rawatan kumbahan adalah penyumbang beban pencemaran BOD tertinggi iaitu sebanyak 300.55 tan/hari (51.83%), diikuti dengan aktiviti ternakan babi 223.08 tan/hari (38.47%), industri pembuatan 25.80 tan/hari (4.45%), industri berasaskan pertanian 24.90 tan/hari (4.29%) dan pasar basah 5.58 tan/hari (0.96%) **(Rajah 5.1).**

BIOCHEMICAL OXYGEN DEMAND

In the year 2021, an estimated BOD pollution load of 579.90 tonnes/day was generated. Sewage treatment plants remain the largest BOD load contributor with a total load of 300.55 tonnes/day (51.83%), followed by pig farming activities which contributed 223.08 tonnes/day (38.47%), manufacturing industries 25.80 tonnes/day (4.45%), agriculture-based industries 24.90 tonnes/day (4.29%) and wet markets 5.58 tonnes/ day (0.96%) **(Figure 5.1)**.



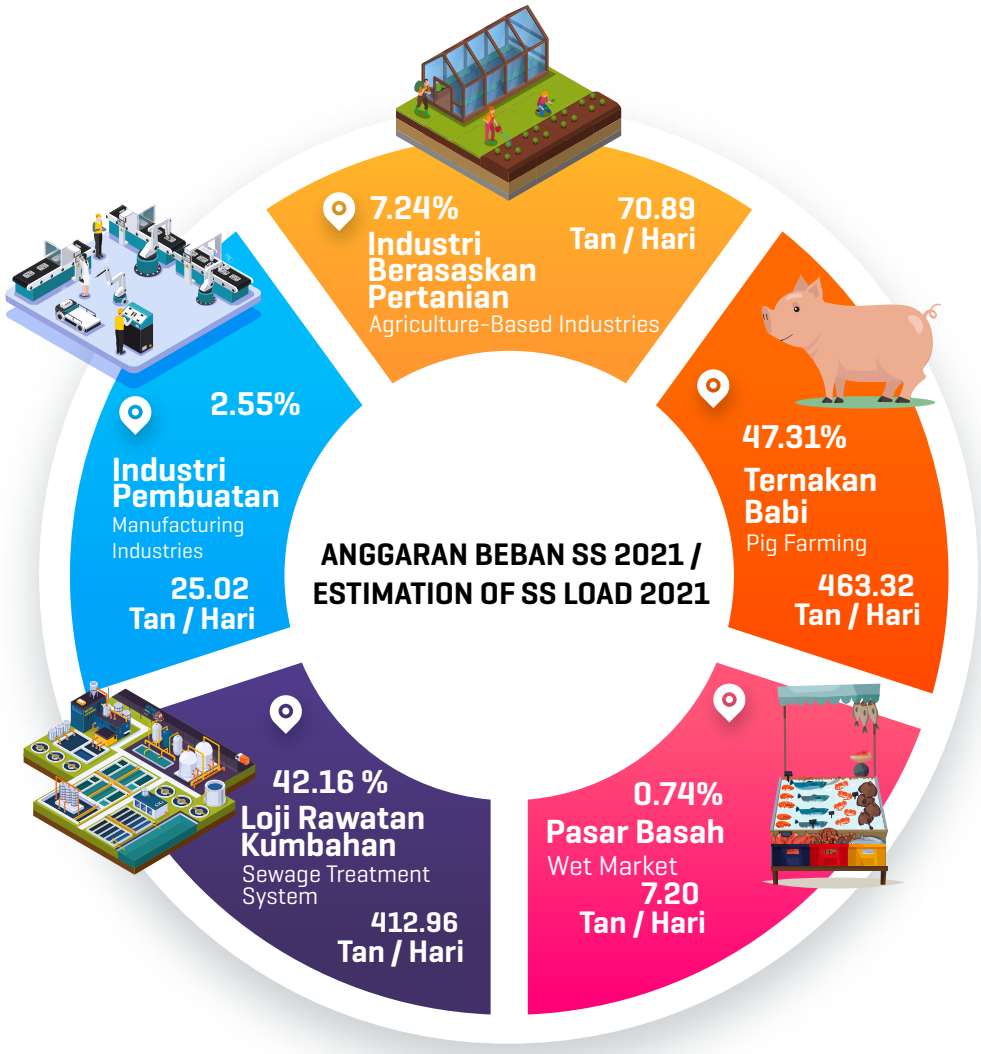
Rajah 5.1: Anggaran Beban BOD (Tan/Hari) mengikut Punca Pencemaran Air, 2021
Figure 5.1: Estimation of BOD Load (Tonnes/Day) by Sources of Water Pollution, 2021

BEBAN PEPEJAL TERAMPAI

Pada tahun 2021, anggaran beban pencemar bagi SS adalah sebanyak 979.39 tan/hari. Jumlah beban pencemaran daripada ternakan babi adalah yang tertinggi iaitu sebanyak 463.32 tan/hari (47.31%) diikuti dengan sistem pengolahan kumbahan 412.96 tan/hari (42.16%). Industri berasaskan pertanian pula adalah sebanyak 70.89 tan/hari (7.24%), industri pembuatan 25.02 tan/hari (2.55%) dan pasar basah 7.20 tan/hari (0.74%) **(Rajah 5.2).**

SUSPENDED SOLIDS LOAD

The overall estimation in the year 2021 for SS load was 979.39 tonnes/day. Total pollution load from pig farming activities shows the highest load 463.32 tonnes/day (47.31%) followed by sewage treatment system with 412.96 tonnes/day (42.16%). Agriculture-based industries contributed 70.89 tonnes/day (7.24%), followed by manufacturing industries 25.02 tonnes/day (2.55%) and wet markets 7.20 tonnes/day (0.74%) **(Figure 5.2)**.



Rajah 5.2: Anggaran Beban SS (Tan/Hari) mengikut Punca Pencemaran Air, 2021

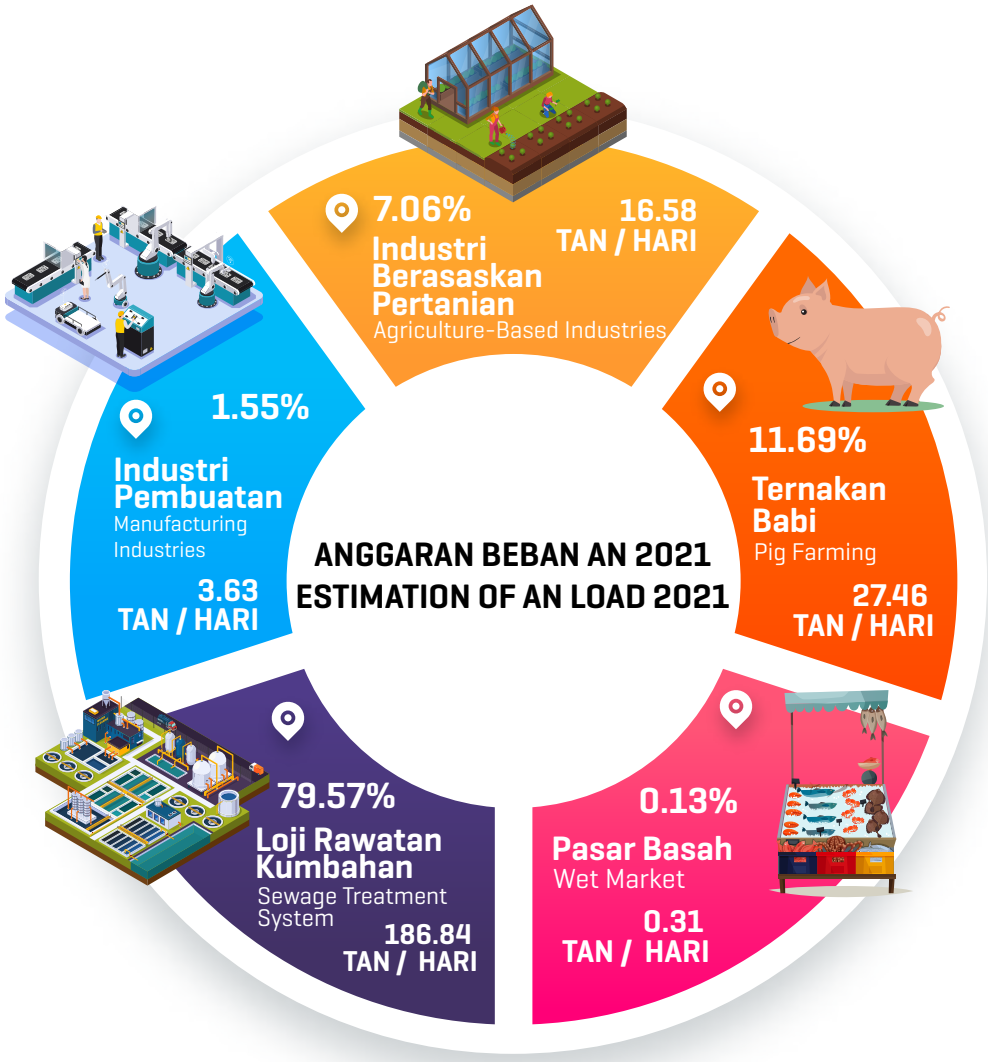
Figure 5.2: Estimation of SS Load (Tonnes/Day) by Sources of Water Pollution, 2021

BEBAN AMMONIAKAL NITROGEN

Pada tahun 2021, anggaran beban pencemar AN adalah sebanyak 234.82 tan/hari di mana pelepasan sistem pengolahan kumbahan adalah penyumbang terbesar beban AN dengan jumlah sebanyak 186.84 tan/hari (79.57%), diikuti aktiviti ternakan babi iaitu 27.46 tan/hari (11.69%), industri berasaskan pertanian 16.58 tan/hari (7.06%), industri pembuatan 3.63 tan/hari (1.55%) dan pasar basah 0.31 tan/hari (0.13%) **(Rajah 5.3).**

AMMONIACAL NITROGEN LOAD

In 2021, the AN load was estimated to be 234.82 tonnes/day in which sewage treatment remained the largest contributor with a total load of 186.84 tonnes/day (79.57%), followed by pig farming activities 27.46 tonnes/ day (11.69%), agriculture-based industries 16.58 tonnes/day (7.06%), manufacturing industries 3.63 tonnes/day (1.55%) and wet markets 0.31 tonnes/day (0.13%) **(Figure 5.3)**.



Rajah 5.3: Anggaran Beban AN (Tan/Hari) mengikut Punca Pencemaran Air, 2021

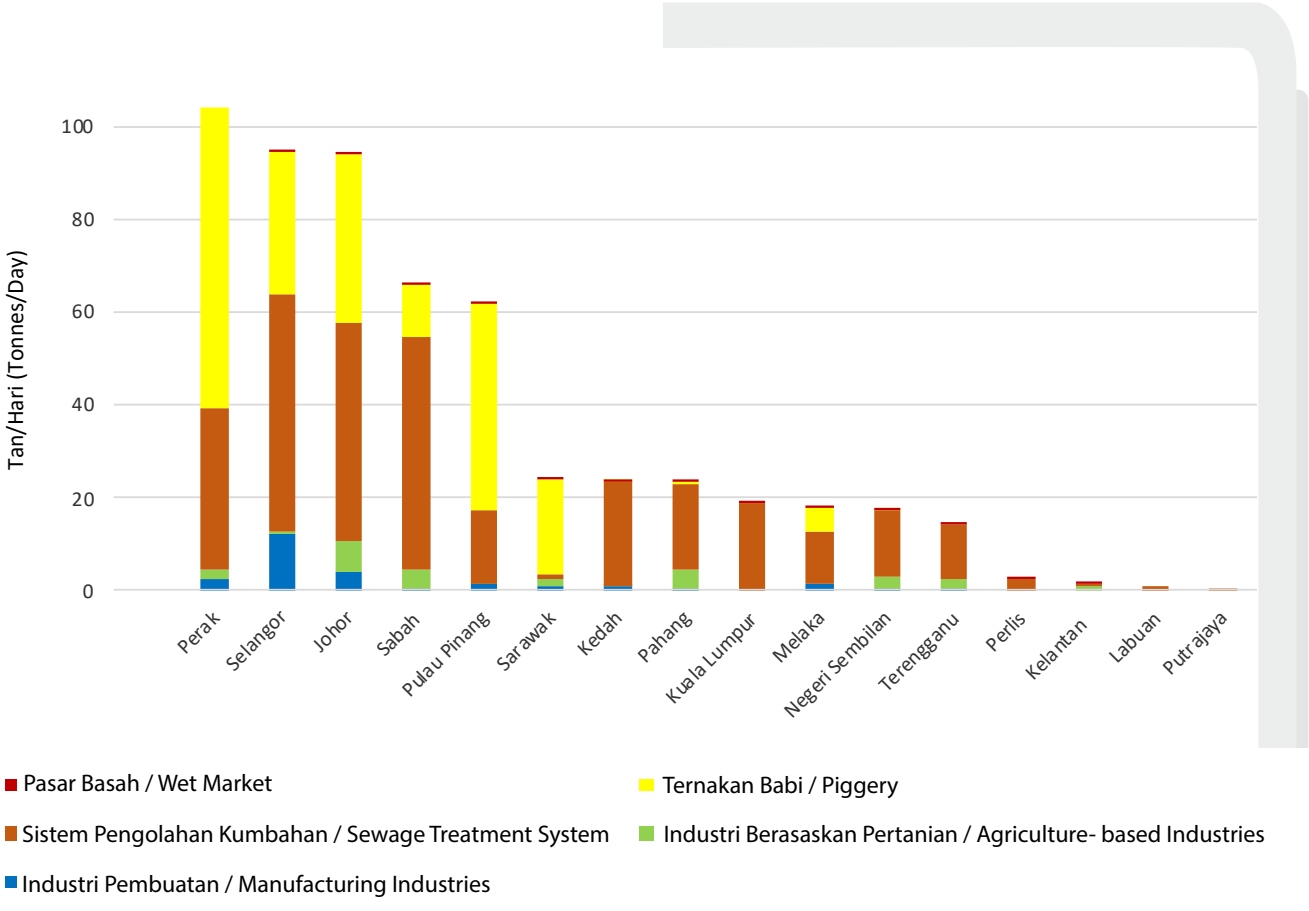
Figure 5.3: Estimation of AN Load (Tonnes/Day) by Sources of Water Pollution, 2021

Beban Pencemaran Keperluan Oksigen Biokimia mengikut Negeri

Pada tahun 2021, anggaran penghasilan beban BOD di Perak adalah tertinggi iaitu sebanyak 113.30 tan/hari, Selangor 95.07 tan/hari, Johor 94.79 tan/hari, Sabah 66.74 tan/hari, Pulau Pinang 62.32 tan/hari dan Sarawak 24.53 tan/hari. Beban BOD untuk lain-lain negeri adalah kurang daripada 24.02 tan/hari. Beban pencemar BOD mengikut negeri ditunjukkan pada **Rajah 5.4.**

Biochemical Oxygen Demand Load by States

In the year 2021, the estimation of BOD loads generated in Perak was recorded to be the highest with a value of 113.30 tonnes/day, followed by Selangor 95.07 tonnes/day, Johor 94.79 tonnes/day, Sabah 66.74 tonnes/day, Pulau Pinang 62.32 tonnes/day and Sarawak 24.53 tonnes/day. BOD load for the rest of the states was less than 24.02 tonnes/day. BOD pollution load based on states is shown in **Figure 5.4.**



Rajah 5.4: Taburan Anggaran Beban BOD (Tan/Hari) dan Punca Pencemaran Air mengikut Negeri, 2021

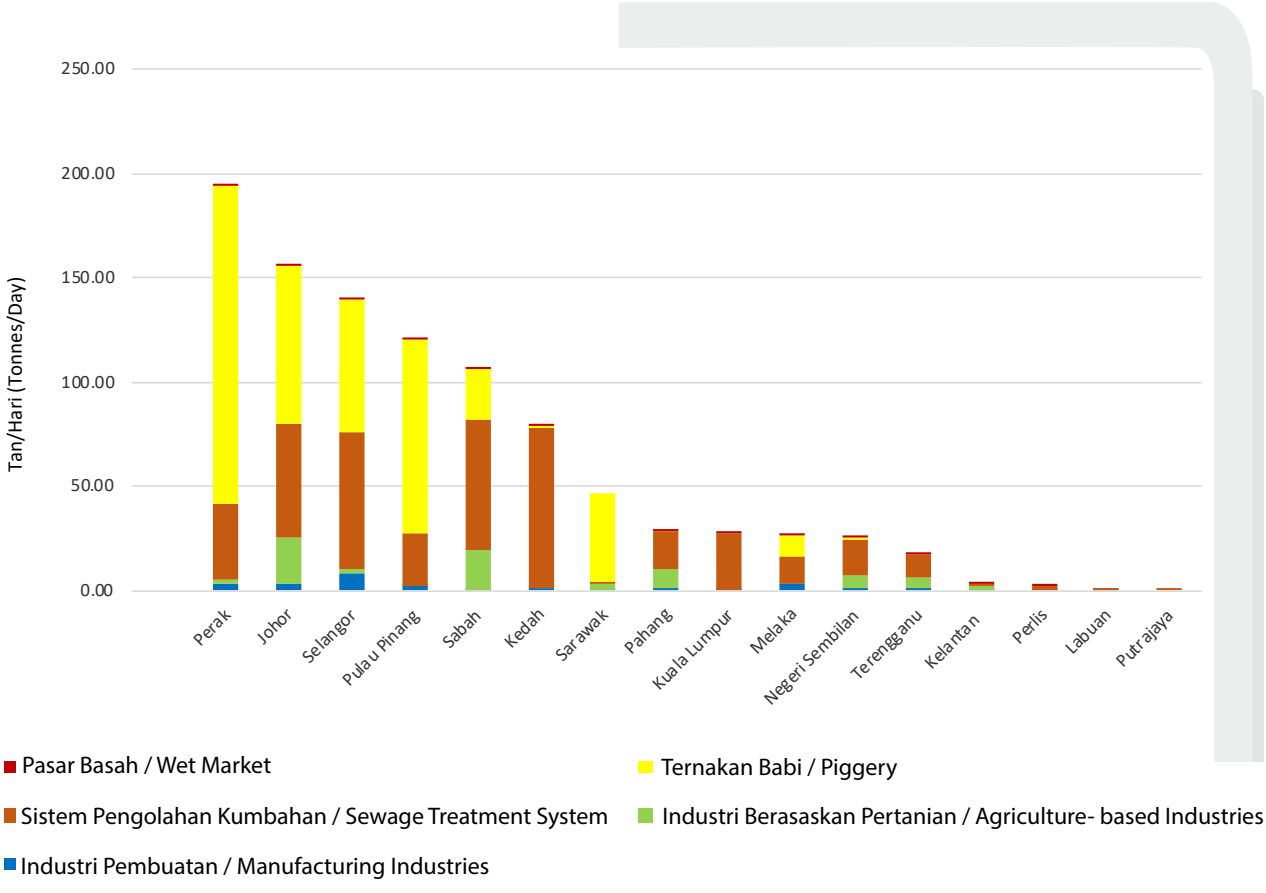
Figure 5.4: Distribution of BOD Load (Tonnes/Day) Estimation and Sources of Water Pollution by States, 2021

Beban Pencemaran Pepejal Terampai mengikut Negeri

Anggaran penghasilan beban SS di Negeri Perak adalah tertinggi iaitu sebanyak 194.67 tan/hari, diikuti Johor 156.46 tan/hari, Selangor 140.21 tan/hari, Pulau Pinang 120.35 tan/hari dan Sabah 106.86 tan/hari. Beban SS untuk lain-lain negeri adalah kurang daripada 79.08 tan/hari. Beban pencemar SS mengikut negeri ditunjukkan pada **Rajah 5.5**.

Suspended Solids Load by State

The estimatied SS loads generated in Perak was recorded to be the highest with a value of 194.67 tonnes/day, followed by Johor 156.46 tonnes/day, Selangor 140.21 tonnes/day, Pulau Pinang 120.35 tonnes/day and Sabah 106.86 tonnes/day. The SS load for the rest of the states generated less than 79.08 tonnes/day. SS pollution loads according to states is shown in **Figure 5.5**.



Rajah 5.5: Taburan Anggaran Beban SS (Tan / Hari) dan Punca Pencemaran Air mengikut Negeri, 2021

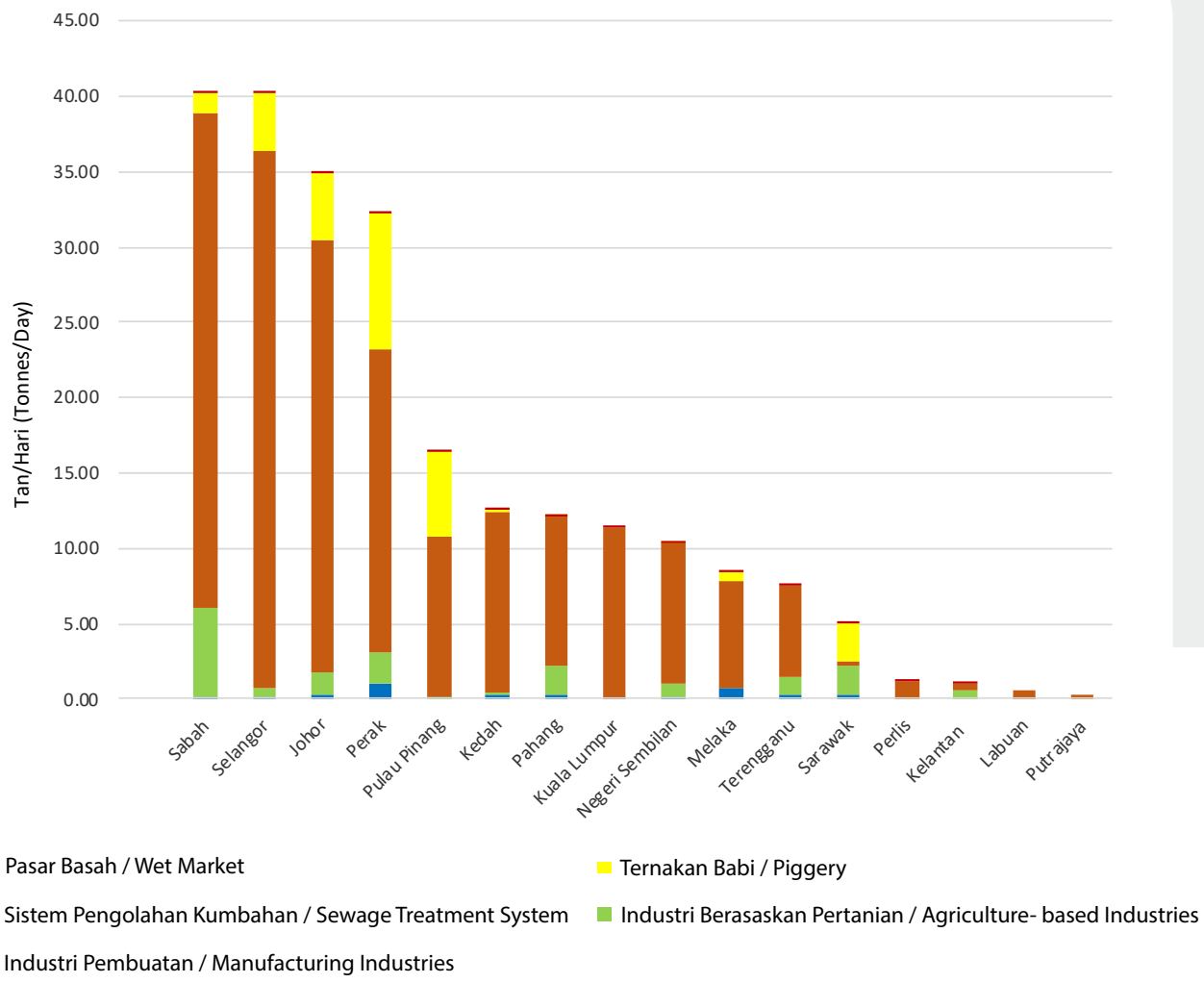
Figure 5.5: Distribution of SS Load (Tonnes / Day) Estimation and Sources of Water Pollution by States, 2021

Beban Pencemaran Ammoniakal Nitrogen mengikut Negeri

Anggaran penghasilan beban AN di Sabah adalah tertinggi iaitu sebanyak 40.33 tan/hari, diikuti Selangor 40.23 tan/hari, Johor 34.97 tan/hari, Perak 32.22 tan/hari, dan Pulau Pinang 16.36 tan/hari beban AN untuk lain-lain negeri adalah kurang daripada 12.55 tan/hari. Beban pencemar AN mengikut negeri ditunjukkan pada **Rajah 5.6.**

Ammoniacal Nitrogen Load by States

The estimation of AN loads generated in Sabah was recorded to be the highest with a value of 40.33 tonnes/day, followed by Selangor at 40.23 tonnes/day, Johor at 34.97 tonnes/day, Perak at 32.22 tonnes/day, and Pulau Pinang 16.36 tonnes/day. AN load for the rest of the states was generated less than 12.55 tonnes/day. AN pollution load based on states is shown in **Figure 5.6.**



Rajah 5.6: Taburan Anggaran Beban AN (Tan/Hari) dan Punca Pencemaran Air mengikut Negeri, 2021

Figure 5.6: Distribution of AN (Tonnes/Day) Estimation and Sources of Water Pollution by States, 2021

PUNCA-PUNCA PENCEMARAN UDARA

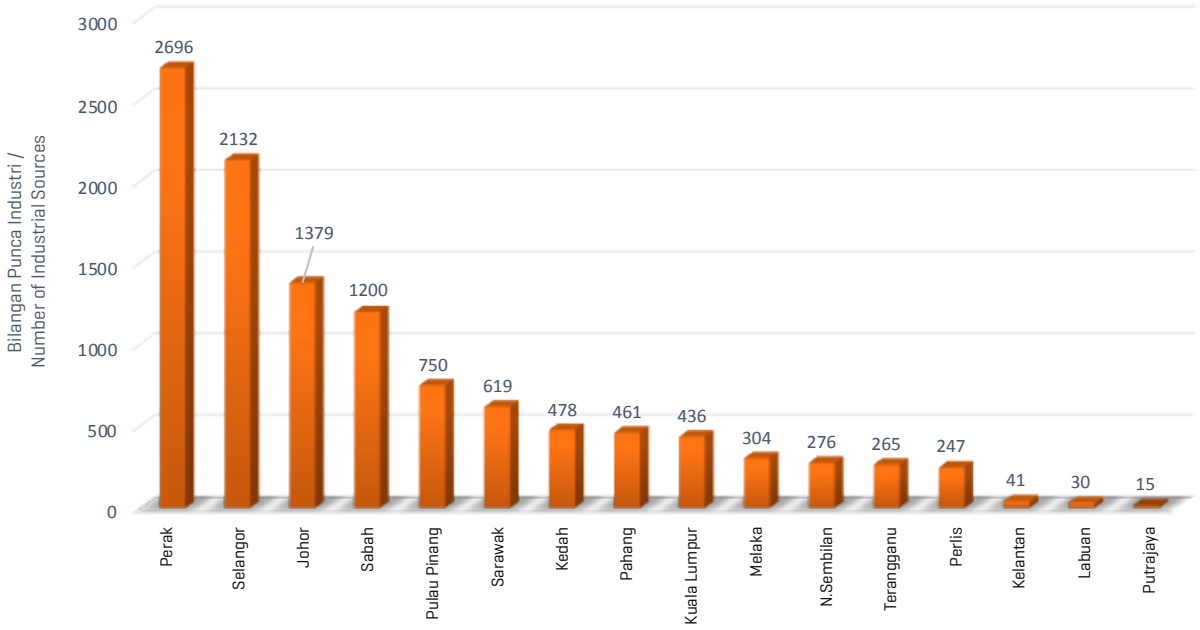
Peningkatan punca industri boleh menyebabkan pencemaran udara yang teruk jika pelepasan pencemar udara dari aktiviti industri tidak dikawal dengan berkesan.

Sehingga Disember 2021, jumlah punca industri yang melepaskan bahan pencemar ke udara adalah sebanyak 11,329. Bilangan punca pencemar yang tertinggi adalah di Selangor 2,696 (23.8%) diikuti Johor 2,132 (18.8%) dan Perak 1,379 (12.2%) seperti ditunjukkan dalam **Rajah 5.7**

SOURCES OF AIR POLLUTION

The increase in industrial sources could cause severe air pollution if the emissions of pollutants, from industrial activity is not effectively controlled.

As of December 2021, a total of 11,329 industrial sources were emitting air pollutants. The highest pollution sources were in Selangor 2,696 (23.8%) followed by Johor 2,132 (18.8%) and Perak 1,379 (12.2%) as indicated in **Figure 5.7.**



Rajah 5.7 : Punca Pencemaran Udara Industri mengikut Negeri, 2021
Figure 5.7 : Industrial Air Pollution Sources by State, 2021

KENDERAAN BERMOTOR

Kenderaan bermotor adalah salah satu faktor penyebab pencemaran udara. Masyarakat moden amat bergantung kepada pengangkutan bermotor dalam menjalankan aktiviti harian. Setiap pergerakan kenderaan motor akan menyebabkan pembakaran bahan api fosil untuk pergerakan yang menghasilkan asap yang dapat mencemarkan udara. Semakin tinggi kenderaan berdaftar yang digunakan dalam Malaysia bermaksud potensi pencemaran ke udara juga semakin tinggi.

Pada tahun 2021, terdapat peningkatan bagi jumlah terkumpul keseluruhan kenderaan bermotor yang berdaftar berbanding tahun sebelumnya. Jumlah terkumpul keseluruhan kenderaan bermotor berdaftar bagi tahun 2021 adalah sebanyak 32,763,382 sementara tahun 2020 adalah sebanyak 31,641,647.

Bilangan motosikal dan motokar termasuk van dan jip didapati merekodkan pertambahan masing-masing sebanyak 4.13% dan 3.71%, sementara bilangan bas menunjukkan penurunan iaitu sebanyak 2.66%, teksi dan kenderaan sewa berkurangan sebanyak 5.19% dan kenderaan barangan juga berkurangan sebanyak 3.90%.

Bilangan terkumpul kenderaan bermotor yang berdaftar yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2020 dan 2021 adalah seperti yang ditunjukkan dalam **Rajah 5.8.**

MOTOR VEHICLES

Motor vehicles is one of the factors causing air pollution. Nowadays, modern society is highly dependent on motorized transportation in their daily activities. Every movement of motor vehicle will cause burning of fossil fuel that produces smoke and pollute the air. The higher the number of registered vehicles used in Malaysia, the higher the potential of air pollution.

In 2021, there was an increase in the overall number of cumulative registered motor vehicles. Total cumulative registered motor vehicles for 2021 was 32,763,382 compared to 2020 which was 31,641,647.

The number of registered motorcycles and motorcars including vans and jeeps increased by 4.13% and 3.71%, meanwhile buses decreased by 2.66%, taxis and self-driving rental vehicles decreased by 5.19%, followed by freight vehicles which has also decreased by 3.90%.

The number of registered vehicles in Malaysia as reported by the Road Transport Department for 2020 and 2021 is shown in **Figure 5.8.**

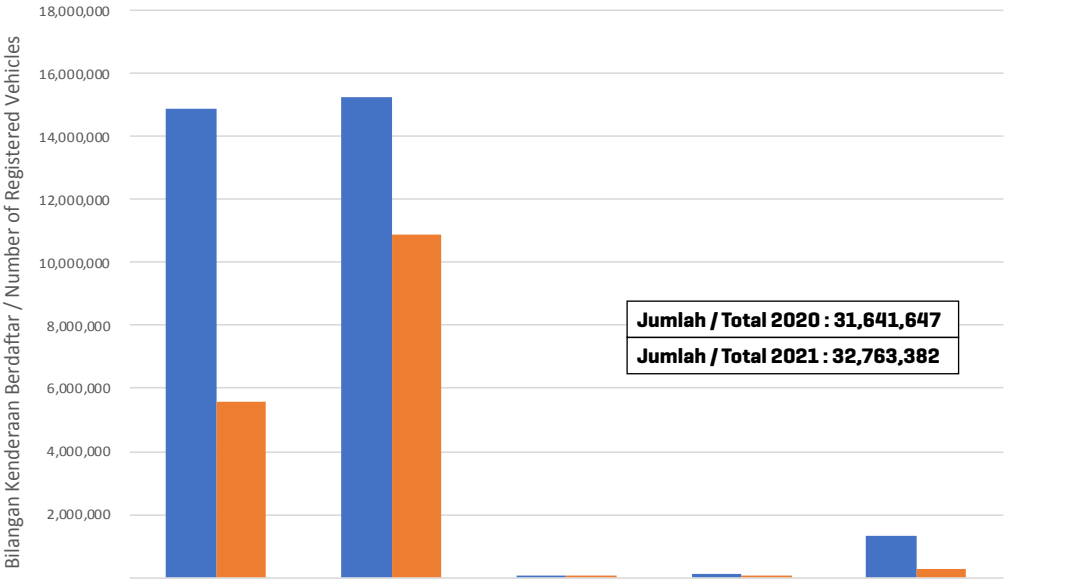
Sementara itu, jumlah kenderaan berdaftar yang sedang digunakan (aktif) berkurangan sebanyak 15.40% berbanding dengan tahun 2020 di mana jumlah kenderaan berdaftar aktif yang dilaporkan pada tahun 2021 adalah sebanyak 16,764,491 sementara tahun sebelumnya adalah sebanyak 19,815,256. Jumlah penurunan yang ketara ini didapati berpunca dari Perintah Kawalan Pergerakan (PKP) yang telah dikuatkuasakan ke seluruh negara yang telah menyebabkan aktiviti sosial dan ekonomi seluruh negara turut terjejas. Banyak kenderaan yang didapati telah berdaftar namun tidak digunakan.

Penurunan bilangan kenderaan aktif ini merangkumi bilangan kenderaan barangan yang berkurangan sebanyak 68.02%, bilangan bas berkurangan sebanyak 50.44%, sementara bilangan teksi / kereta sewa menurun sebanyak 29.22%, motosikal menurun sebanyak 25.89% manakala motokar termasuk van dan jip turut berkurangan sebanyak 4.79%. Bilangan kenderaan berdaftar yang sedang digunakan (aktif) adalah seperti ditunjukkan dalam **Rajah 5.9**.

Meanwhile, the number of registered in-use (active) vehicles decreased by 15.40% compared to year 2020 where the number of registered in-use vehicles in 2021 was 16,764,491 compared to 2020 which was 19,815,256. The significant decrease was due to the Movement Control Orders (MCO) that have been enforced throughout the country which had affected social and economic activities. Many vehicles were found to be registered but not in-use.

The number of freight vehicles decreased by 68.02%, buses decreased by 50.44% while taxis and self-driving rental vehicles decreased by 29.22%. Motorcycles decreased by 25.89% and cars including jeep and vans also decreased by 4.79%. Number of registered in-use vehicles (active) are shown in **Figure 5.9**.

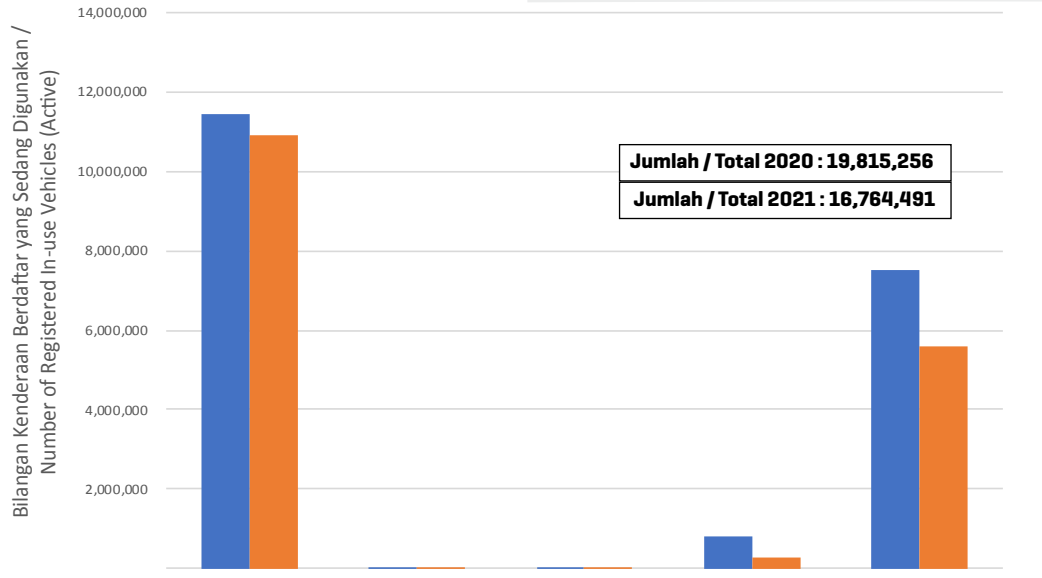
Bukit Bintang , Kuala Lumpur



	Motosikal / Motocycle	Motokar / Motorcars	Bas / Bus	Teksi dan Kereta Sewa / Taxi and Rental Cars	Kenderaan Barang / Freight Vehichles
2020	14,891,568	15,240,296	63,390	120,754	1,325,639
2021	15,506,498	15,806,527	61,700	114,647	1,274,010

[Sumber: Jabatan Pengangkutan Jalan, Malaysia 2021]
[Source: Road Transport Department, Malaysia, 2021]

Rajah 5.8 : Bilangan Kenderaan Berdaftar Terkumpul, 2020-2021
Figure 5 .8 : Number of Registered Vehicles, 2020-2021



	Motokar / Motorcars	Teksi / Texi	Bas / Bus	Kenderaan Barang / Freight Vehichles	Motosikal / Motocycle
2020	11,461,510	18,738	10,071	799,097	7,525,840
2021	10,912,994	13,263	4,991	255,543	5,577,700

[Sumber: Jabatan Pengangkutan Jalan, Malaysia 2021]
[Source: Road Transport Department, Malaysia, 2021]

Rajah 5.9 : Bilangan Kenderaan Berdaftar yang Sedang Digunakan(Aktif), 2020 - 2021
Figure 5.9 : Number of Registered In-use Vehicle (Active), 2020 - 2021

BEBAN PENCEMARAN PENCEMAR UDARA

Beban Pencemaran Secara Menyeluruh

Dianggarkan pada tahun 2021, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 1,687,860 tan metrik, 800,177 tan metrik bagi nitrogen dioksida (NO_2), 214,392 tan metrik bagi sulfur dioksida (SO_2) dan 22,649 tan metrik bagi habuk halus (PM). Perbandingan keseluruhan beban pencemaran bagi tahun 2019, 2020 dan 2021 seperti ditunjukkan dalam **Rajah 5.10.**

Beban pencemaran bagi CO menurun pada tahun 2021 berbanding dengan 2019 dan 2020. Penurunan adalah sebanyak 26.9% bagi beban pencemar CO dan penurunan 14.5% bagi beban pencemar NO_2. Penurunan sebanyak 26.7% bagi pencemar SO_2 dan pencemar PM juga menunjukkan penurunan sebanyak 22.6% berbanding dengan tahun 2020.

Beban pencemar bagi parameter pencemar CO, NO_2, SO_2 dan PM mula menurun sejak tahun 2020. Ini mungkin kerana wabak Covid 19 melanda seluruh dunia yang menghadkan aktiviti antropogenik.

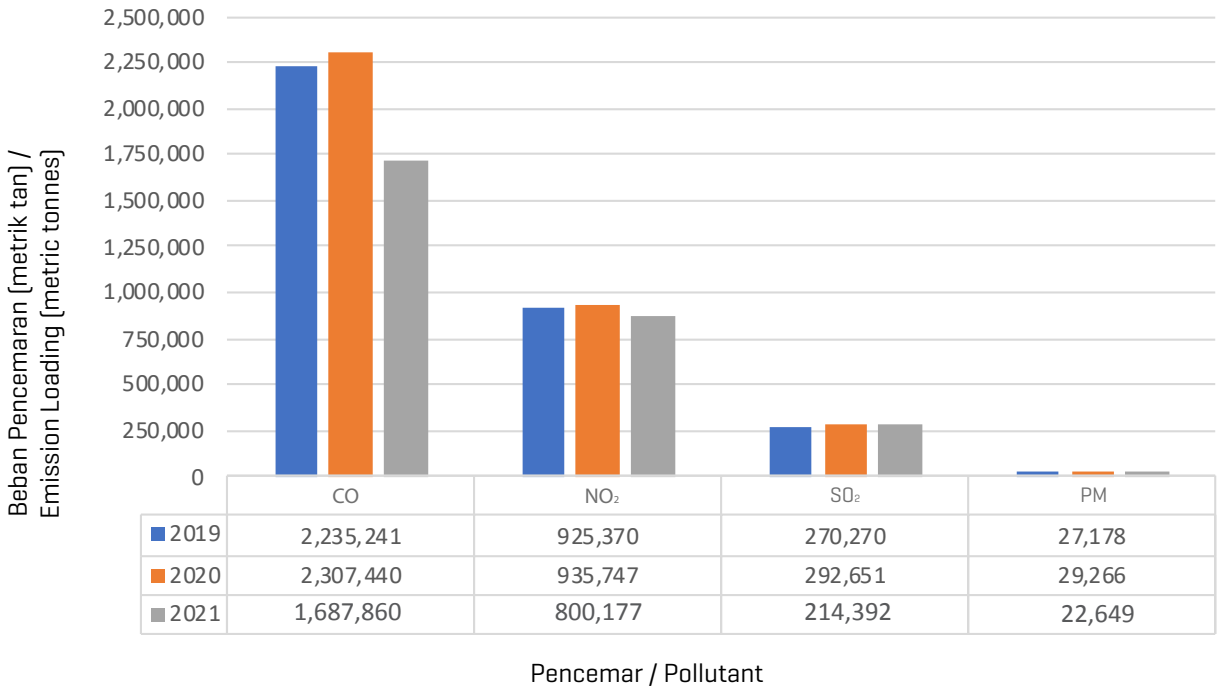
AIR POLLUTION EMISSION LOAD

Overall Emission Load

It was estimated that in 2021 the overall cumulative air pollutant emission load was 1,687,860 metric tonnes of carbon monoxide (CO), 800,177 metric tonnes of nitrogen dioxide (NO_2), 214,392 metric tonnes of sulphur dioxide (SO_2) and 22,649 metric tonnes of particulate matter (PM). A comparison of the combined air pollutants emission load in 2019, 2020 and 2021 is shown in **Figure 5.10.**

Emission load for CO had decreased in 2021 compared to 2019 and 2020. In 2021, the decrement in CO emission load was 26.9% and 14.5% for NO_2. There was a decrease of 26.7% for SO_2 and for pollutant PM, the decrement was 22.6% compared to 2020.

Overall, emission load for CO, NO_2, SO_2 and PM had decreased since 2020. This was probably due to Covid-19 pandemic that hits the globe and restrict the anthropogenic activity.



	CO	NO_2	SO_2	PM
2019	2,235,241	925,370	270,270	27,178
2020	2,307,440	935,747	292,651	29,266
2021	1,687,860	800,177	214,392	22,649

[Sumber: Daripada National Energy Balance 2019]
[Source:From National Energy Balance 2019]

Rajah 5.10 : Beban Pencemaran Bahan Pencemar Udara dari Semua Punca, 2019-2021
Figure 5.10 : Air Pollutant Emission Load from All Sources, 2019-2021

Punca Beban Pencemaran

Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO_2 (62%), diikuti dengan lain-lain kategori (24%), industri (9%) dan kenderaan bermotor (5%) **(Rajah 5.11).** Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada loji janakuasa (38%), industri (34%), diikuti lain-lain kategori (16%) dan kenderaan bermotor (12%) **(Rajah 5.12).**

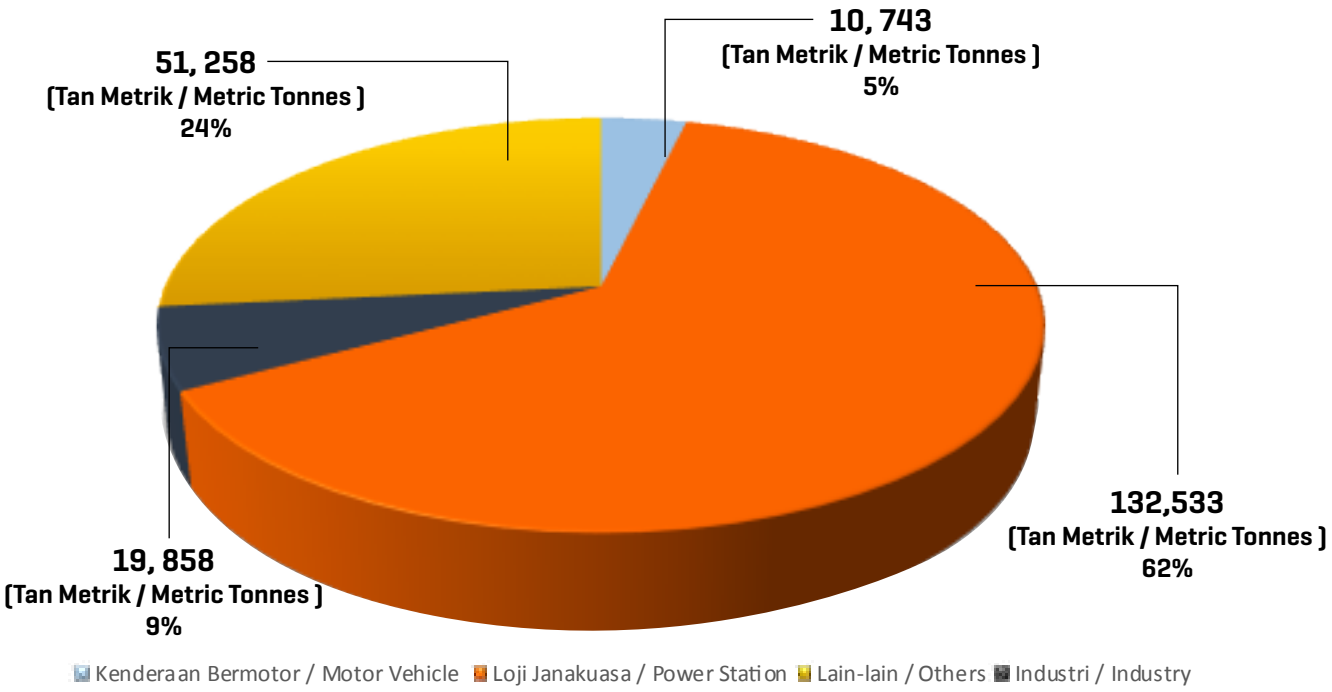
Penyumbang terbesar bagi NO_2 adalah daripada loji janakuasa (71%) diikuti kenderaan bermotor (21%), industri (7%) dan lain-lain kategori (1%) **(Rajah 5.13).** Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95.6%) **(Rajah 5.14).** Punca-punca bagi kategori 'Lain-lain' yang dinyatakan di dalam rajah-rajah adalah merupakan pelepasan bahan pencemar udara dari kawasan perumahan, komersial dan penggunaan bukan tenaga. Anggaran pencemaran yang dihasilkan oleh beban pencemar udara daripada kenderaan bermotor iaitu HC, CO, PM, NO_2 dan SO_2 pada tahun 2020 dan 2021 ditunjukkan dalam **Rajah 5.15.**

Emission Load by Sources

Power plants contributed the highest SO_2 emission load (62%), followed by other categories (24%), industries (9%) and motor vehicles (5%) **(Figure 5.11).** As for PM, the highest contributors were power plants (38%) followed by industries (34%), others (16%) and motor vehicles (12%) **(Figure 5.12).**

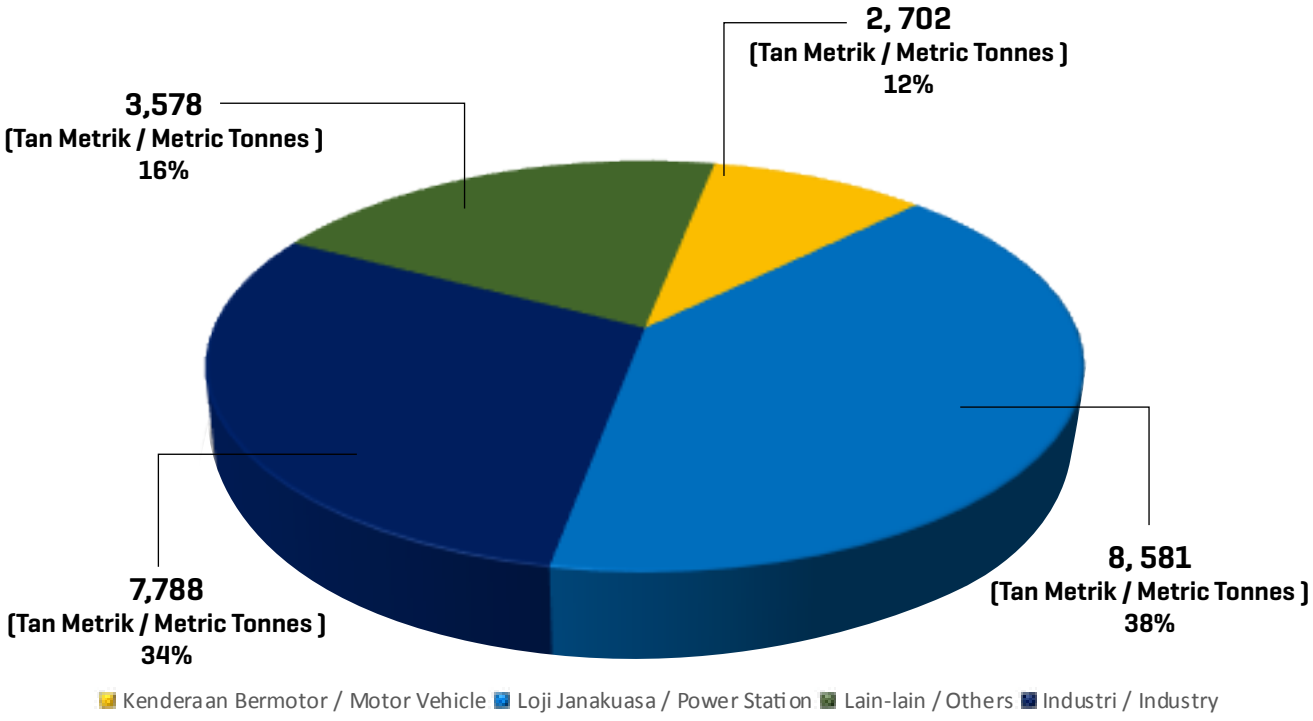
The highest contributors of NO_2 were power plants (71%) followed by motor vehicles (21%), industries (7%), and others (1%) **(Figure 5.13).** However, motor vehicles remained the highest contributor of CO (95.6%) **(Figure 5.14).** 'Others' in the figures represent air pollutant emission from residential, commercial and non-energy use sources. The estimated annual air pollutant emission loads of HC, CO, PM, NO_2 and SO_2 from motor vehicles for 2020 and 2021 are shown in **Figure 5.15.**

Loji Janakuasa



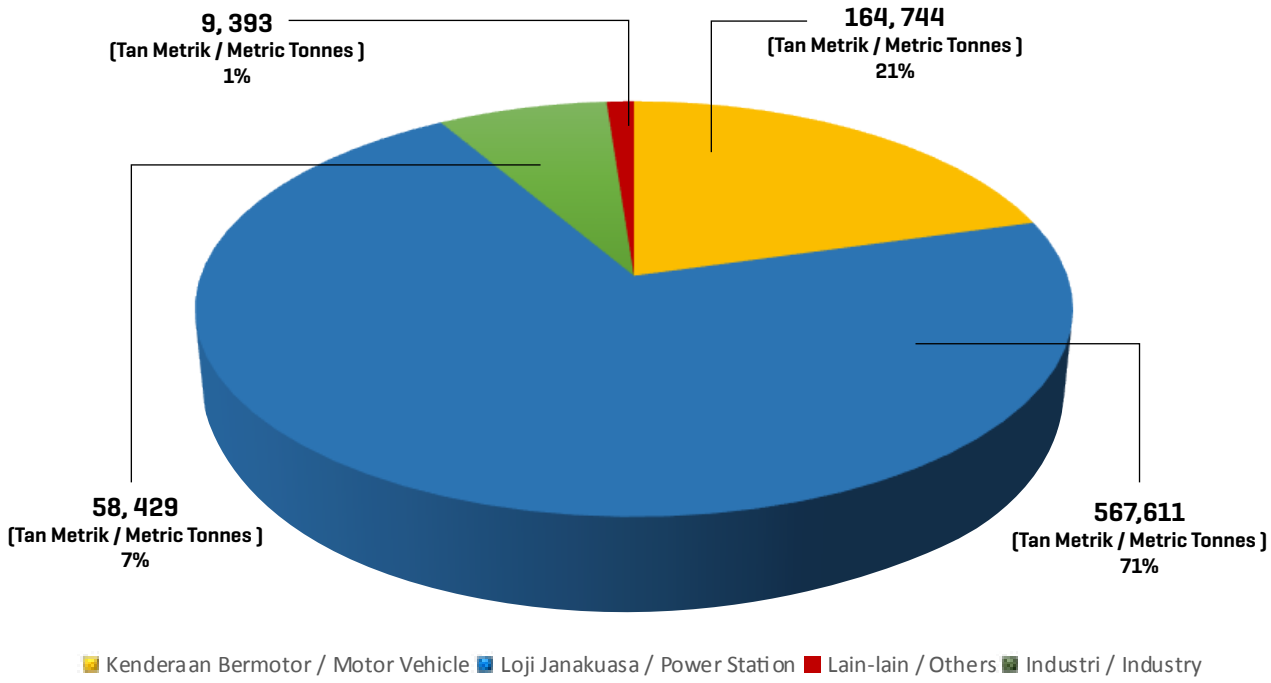
Rajah 5.11 : Punca Beban Pencemaran SO_2 (Tan Metrik), 2021

Figure 5.7 : SO_2 Emission Load by Sources (Metric Tones), 2021



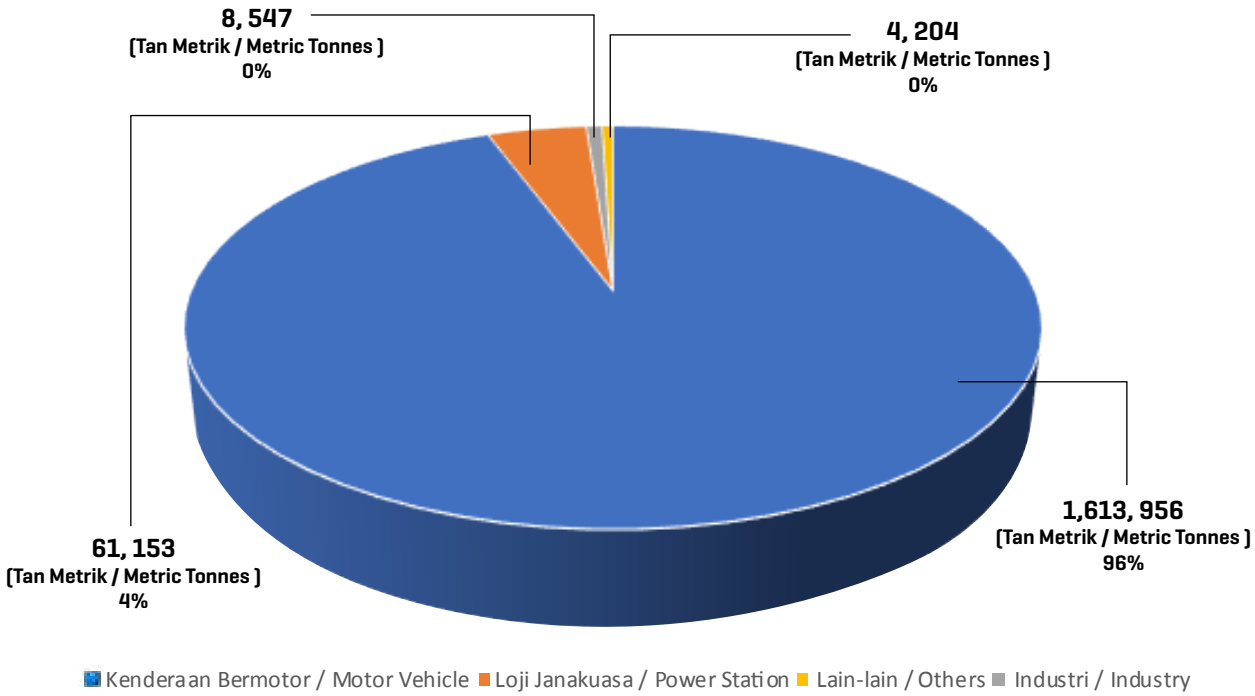
Rajah 5.12 : Punca Beban Pencemaran PM (Tan Metrik), 2021

Figure 5.12 : PM Emission Load by Sources (Metric Tonnes), 2021



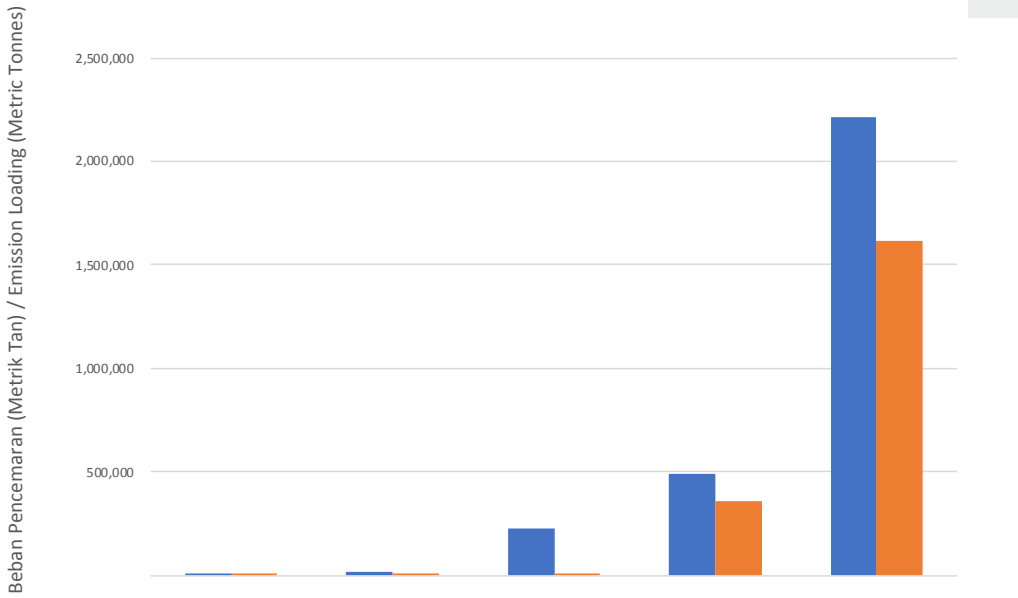
Rajah 5.13 : Punca Beban Pencemaran NO_2 (Tan Metrik), 2021

Figure 5.13 : NO_2 Emission Load by Sources (Metric Tonnes), 2021



Rajah 5.14 : Punca Beban Pencemaran CO (Tan Metrik), 2021

Figure 5.14 : CO Emission Load by Sources (Metric Tonnes), 2021



	PM	SO_2	NO_2	HC	CO
2020	3,645	14,652	225,369	492,170	2,210,695
2021	2,702	10,743	164,744	362,446	1,613,956

Rajah 5.15 : Beban Pencemar Udara dari Kenderaan Bermotor, 2020-2021(Metrik Tan),

Figure 5.15 : Air Pollutant Emission Load from Motor Vehicles, 2020-2021(Metric Tonnes),

INVENTORI BUANGAN TERJADUAL

Pada tahun 2021 sebanyak 7,505,195.76 tan metrik buangan terjadual telah dihasilkan. Ini merupakan peningkatan sebanyak 4.45% berbanding 7,185,227.76 tan metrik yang dilaporkan pada 2020. Kategori utama buangan yang dihasilkan adalah dros / sanga / klinker / abu, enapcemar logam berat dan buangan gipsum **(Jadual 5.1).** Selangor telah menghasilkan jumlah terbesar buangan terjadual (27.8%), diikuti oleh Perak (26.08%), Johor (13.74%), N. Sembilan (8.49%), Sarawak (7.20%), Pulau Pinang (4.42%) manakala 10 negeri-negeri yang lain menghasilkan sebanyak (12.27%) **(Rajah 5.16).** Berdasarkan jumlah buangan terjadual yang dihasilkan mengikut jenis industri, loji janakuasa didapati menghasilkan buangan terjadual yang tertinggi sebanyak 3,141,511.77 tan metrik diikuti loji rawatan air 1,167,603.14 tan metrik dan pengilangan logam 642,947.93 tan metrik **(Jadual 5.2).**

SCHEDULED WASTES INVENTORY

A total of 7,505,195.76 metric tonnes of scheduled wastes were generated in the year of 2021. This represents an overall increase of 4.45% as compared to 7,185,227.76 metric tonnes reported in 2020. The main categories of waste generated were dross/slag/clinker/ash, heavy metal sludge and gypsum **(Table 5.1).** Selangor generated the largest amount of scheduled wastes (27.8%), followed by Perak (26.08%), Johor (13.74%), N. Sembilan (8.49%), Sarawak (7.20%), Pulau Pinang (4.42%) while the other ten (10) states generated a total of (12.27%) **(Figure 5.16).** Based on the scheduled waste generated by industry, power plant contributed the largest with a total of 3,141,511.77 metric tonnes followed by water treatment plant 1,167,603.14 metric tonnes and metal fabrication 642,947.93 metric tonnes **(Table 5.2).**

Tren pengurusan buangan terjadual dalam negara adalah seperti di **Rajah 5.17.**

Sebanyak 511,617.94 tan metrik (6.82%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara. Ini menunjukkan penurunan sebanyak 28.37% berbanding 714,292.11 tan metrik pada tahun 2020. Daripada jumlah itu, 396,773.42 tan metrik (5.29%) daripada buangan terjadual yang diperoleh kembali di kemudahan pemerolehan kembali luar tapak tempatan manakala 114,844.52 tan metrik (1.53%) telah diberi kebenaran eksport untuk pemerolehan kembali di kemudahan di luar negara.

Sebanyak 256,653.03 tan metrik (3.0%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan iaitu di Kualiti Alam Sdn. Bhd (168,208.55 tan metrik), Trienekens (Sarawak) Sdn. Bhd (31,066.00 tan metrik) dan 57,378.48 tan metrik daripada buangan klinikal telah dibakar dan dilupuskan di kemudahan luar tapak yang dilesenkan. Jumlah ini menunjukkan peningkatan sebanyak 20% daripada sejumlah 214,351.09 tan metrik buangan berjadual dilupuskan pada tahun 2020. Sebanyak 1,191,005.58 tan metrik (15.87%) daripada buangan terjadual terhasil telah diolah di tapak, manakala 3,543,396.88 tan metrik (47.21%) distor di premis pengeluar buangan **(Jadual 5.3).**

The scheduled waste management trend in the country is as shown in **Figure 5.17.**

A total of 511,617.94 metric tonnes (6.82%) of scheduled wastes had gone through recovery process both locally and abroad. This showed decrease of 28.37% as compared to 714,292.11 metric tonnes in 2020 where 396,773.42 metric tonnes (5.29%) of scheduled wastes was processed at local off-site facilities while 114,844.52 metric tonnes (1.53%) were exported for recovery process.

A total of 256,653.03 metric tonnes (3.0%) of scheduled wastes were treated for final disposal at Kualiti Alam Sdn. Bhd. (168,208.55 metric tonnes), at Trienekens (Sarawak) Sdn. Bhd. (31,066.00 metric tonnes) and 57,378.48 metric tonnes of clinical wastes were managed at licensed off-site facilities. This was an increase of 20% compared to 214,351.09 metric tonnes of scheduled waste disposed in 2020. About 1,191,005.58 metric tonnes (15.87%) of scheduled waste were treated on-site, while 3,543,396.88 metric tonnes (47.21%) were stored on site at waste generator premises **(Table 5.3).**

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2021, sebanyak 2,002,522.33 tan metrik (26.68%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan-Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005 **(Jadual 5.4).** Jumlah ini merupakan penurunan sebanyak 7.65% berbanding 2,168,426.92 tan metrik pada tahun 2020. Buangan yang terlibat adalah kebanyakannya enap cemar daripada kemudahan loji rawatan air (56.18%), abu dari loji jana kuasa arang batu (32.59%) dan lain-lain (11.23%) .

Of the total wastes produced in 2021, 2,002,522.33 metric tonnes (26.68%) were granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations 2005 **(Table 5.4).** This amount is a decrease of 7.65% as compared to 2,168,426.92 metric tonnes in 2020. These waste streams are mostly sludge from water treatment plant facilities (56.18%), ashes from coal-fired power plant (32.59%) and others (11.23%).

Jadual 5.1 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2021

Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2021

BIL / NO	NAMA BUANGAN / NAME OF WASTE	KOD BUANGAN / WASTE CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT/TAHUN) / (MT/YEAR)	PERATUSAN (%) / PERCENTAGE (%)
1	Dros / sanga / klinker / abu / Dross / Slag / Clinker / Ash	SW 104	3,828,937.30	51
2	Enap cemar logam berat / Heavy Metal Sludges	SW 204	1,473,272.71	20
3	Gipsum / Gypsum	SW 205	480,892.21	6
4	Minyak Pelincir Terpakai / Spent Lubricating oil	SW 305	219,193.88	3
5	Buangan getah atau lateks yang mengandungi logam berat / Rubber/Latex Waste Containing Heavy Metal	SW 321	207,616.96	3
6	Buangan pelarut organic bukan terhalogen / Waste of Non-Halogenated Solvent	SW 322	173,571.20	2
7	Asid Terpakai / Spent Acids	SW 206	137,075.08	2
8	Campuran buangan terjadual dan buangan tidak terjadual / Mixture of Scheduled Waste & Non-Scheduled Waste	SW 422	110,997.10	1
9	Enap cemar yang mengandungi fluoride / Sludge Containing Fluoride	SW 207	105,264.67	1
10	Buangan elektronik / E-Waste	SW 110	85,640.98	1
11	Bekas tercemar / Used Container	SW 409	82,130.68	1
12	Buangan minyak atau enap cemar berminyak / Waste oil/Oily sludges	SW 311	75,569.91	1
13	Enap cemar mineral / Mineral Sludges	SW 427	62,146.95	1
14	Buangan patogenik / klinikal / Pathogenic Clinical Waste	SW 404	57,378.48	1
15	Kain buruk, plastik, kertas atau turas tercemar / Rags/Plastics/Papers contaminated with Scheduled Waste	SW 410	46,915.47	1
16	Sisa dari pengolahan atau pemerolehan kembali buangan terjadual / Residue from Recovery	SW 501	35,752.07	0
17	Buangan dakwat dan cat / Waste of Inks & Paints	SW 417	35,367.78	0
18	Emulsi minyak mineral-air terpakai / Spent mineral oil-water emulsion	SW 307	34,638.57	0
19	Buangan resin yang mengandungi pelarut organik / Waste of Resin Containing Organic	SW 325	23,281.62	0
20	Minyak hidraulik terpakai / Spent Hydraulic oil	SW 306	22,282.24	0
21	Buangan fotografi / Photographic Waste	SW 423	20,978.09	0
22	Buangan pelekat / glu yang mengandungi pelarut organik / Adhesive/Glue Containing Organic Solvent	SW 303	19,812.52	0

Jadual 5.1 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2021

Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2021

BIL / NO	NAMA BUANGAN / NAME OF WASTE	KOD BUANGAN / WASTE CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT/TAHUN) / (MT/YEAR)	PERATUSAN (%) / PERCENTAGE (%)
23	Buangan mangkin / Waste Catalyst	SW 202	18,539.33	0
24	Buangan kimia / Lab Waste	SW 429	16,813.33	0
25	Enap cemar dakwat dan cat / Ink & Paints Sludges	SW 416	16,053.19	0
26	Campuran minyak-air / Oil -Water mixture	SW 309	13,906.81	0
27	Karbon teraktif terpakai / Contaminated Active Carbon	SW 411	9,680.00	0
28	Produk dakwat, cat, pigmen atau lakuer yang tidak mengikut spesifikasi / Discarded of Ink/Paint/Pigment/Lacquer Containing Organic Solvent	SW 418	8,985.15	0
29	Buangan bateri asid plumbum / Waste of acid lead batteries	SW 102	8,825.76	0
30	Campuran buangan terjadual / Mixture of Scheduled Waste	SW 421	8,539.54	0
31	Klinker, sanga dan abu dari penunu buangan terjadual / Clinker/Slag/Ashes from Incinerator	SW 406	7,951.19	0
32	Buangan cecair terma / Waste of Thermal Fluids	SW 327	7,604.53	0
33	Alkali terpakai / Spent Alkalis	SW 401	7,262.88	0
34	Buangan pelarut organik terhalogen / Waste of Halogenated Solvents	SW 323	7,227.13	0
35	Tanah/puing tercemar / Contaminated Land/oil	SW 408	4,369.64	0
36	Asid organik terpakai / Spent Organic Acids	SW 301	4,350.34	0
37	Alkali terpakai dengan pH ≥ 11.5 / Spent Alkalis with PH > 11.5	SW 402	4,263.17	0
38	Buangan kimia / Waste Of Batteries Containing Cadmium/Hg/Lithium	SW 103	3,682.76	0
39	Minyak/Enapcemar daripada loji penapisan minyak / Oil/Sludges from Oil Refinery	SW 314	3,274.41	0
40	Larutan alkali berair terpakai yang mengandungi sianida / Spent Aqueous alkaline Containing Cyanide	SW 414	2,783.04	0
41	Sisa berminyak dari bengkel automotive / Oily Residue from Workshop	SW 312	2,479.80	0
42	Buangan mengandungi merkuri / Waste containing Mercury/Compound	SW 109	1,773.80	0
43	Buangan mengandungi formaldehid / Waste Containing Formaldehyde	SW 320	1,764.29	0
44	Enap cemar dari tangki penyimpanan minyak mineral / Sludges from mineral oil storage tank	SW 310	1,359.87	0
45	Tar atau sisa bertar dari loji penapisan minyak / Tar Residue from Oil Refinery/Petrochemical Plant	SW 315	866.78	0

Jadual 5.1 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2021

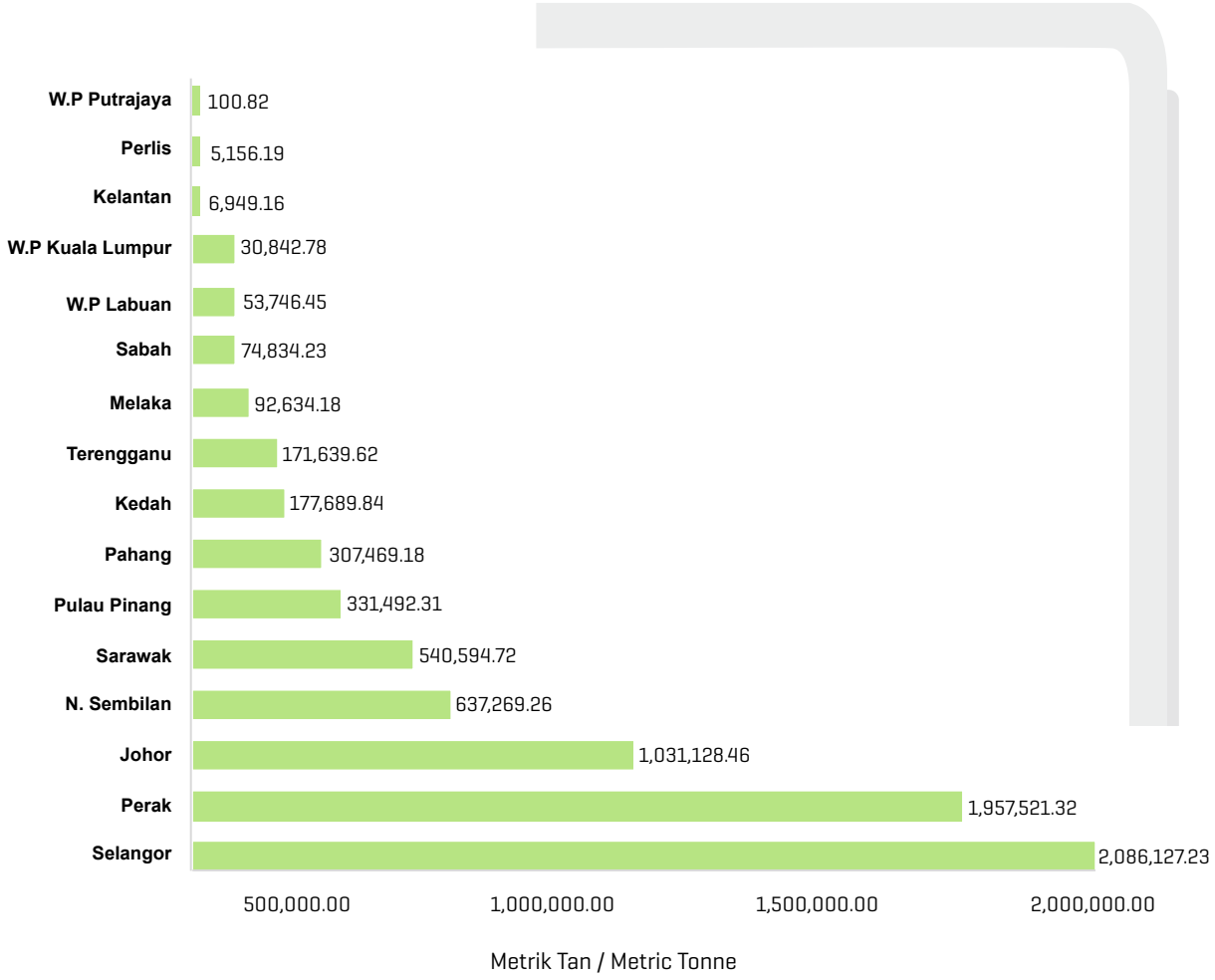
Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2021

BIL / NO	NAMA BUANGAN / NAME OF WASTE	KOD BUANGAN / WASTE CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT/TAHUN) / (MT/YEAR)	PERATUSAN (%) / PERCENTAGE (%)
46	Agen pengoksidaan terpakai / Spent Oxidizing Agent	SW 424	719.95	0
47	Buangan farmaseutikal / Discarded Drug	SW 405	575.97	0
48	Dadah terbuang / Expired Drug	SW 403	440.31	0
49	Buangan sisa penyulingan tidak berair terhalogen atau bukan / Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process	SW 324	424.95	0
50	Buangan Asbestos / Asbestos	SW 201	402.14	0
51	Buangan makmal / Chemical Waste	SW 430	356.42	0
52	Tanah yang dicemari dengan minyak daripada penapisan / Contaminated Oil from re-refining/used lubricating Oil	SW 313	318.41	0
53	Enap cemar yang distabilkan / Stabilized Sludges	SW 203	181.05	0
54	Buangan fluks / Flux Waste	SW 302	178.57	0
55	Sisa dari pemerolehan kembali likuor penjerukan asid / Residue from Recovery of Acid Pickling Liquor	SW 106	138.82	0
56	Buangan racun perosak / Pesticide	SW 425	99.76	0
57	Produk racun perosak yang tidak mengikut spesifikasi / Used Pesticide/Herbicides/Biocides	SW 426	90.41	0
58	Buangan fenol / Waste of Phenols/Its Compound	SW 319	53.71	0
59	Buangan yang mengandungi peroksida / Waste Containing Peroxides	SW 432	33.88	0
60	Diisosianat terpakai / Spent di-Isocyanates	SW 419	32.51	0
61	Enap cemar dari tangki minyak / Oil tankers sludges	SW 308	22.32	0
62	Buangan daripada opearsi pengawetan kayu / Waste from Wood Containing Heavy Metals	SW 428	17.67	0
63	Buangan dari pengilangan bahan letupan / Waste from Manufacturing/Processing or use of explosive	SW 431	14.69	0

Jadual 5.1 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2021

Table 5.1 : Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2021

BIL / NO	NAMA BUANGAN / NAME OF WASTE	KOD BUANGAN / WASTE CODE	KUANTITI BUANGAN / QUANTITY OF WASTE	
			(MT/TAHUN) / (MT/YEAR)	PERATUSAN (%) / PERCENTAGE (%)
64	Buangan yang mengandungi arsenik / Waste containing arsenic	SW 101	7.94	0
65	Enap cemar asid / Acid Sludges	SW 316	6.41	0
66	Enap cemar yang mengandungi sianida / Sludges Containing Cyanide	SW 412	2.90	0
67	Sisa dari pemprosesan zink / Zink Residue	SW 108	0.98	0
68	Garam terpakai yang mengandungi sianida / Spent salt containing Cyanide	SW 413	0.96	0
69	Buangan sebatian fosforus organik / Waste of Organic phosphorus compound	SW 326	0.89	0
70	Sanga kuprum / Slag of Copper	SW 107	0.85	0
71	Sebatian organologam terpakai / Spent of Organometallic compound	SW 317	0.10	0
72	Buangan yang mengandungii dioksin atau furan / Waste Containing Dioxins Or Furans	SW 407	0.02	0
73	Buangan yang mengandungi BFT dan TFT / Waste containing PCB or PCT	SW 318	-	0
74	Minyak pelindapan terpakai yang mengandungi sianida / Spent quenching Oil Containing Cyanide	SW 415	-	0
75	kek tekan daripada prapengolahan lai sabun gliserol / Cake from Glycerol Soap Iye	SW 304	-	0
76	Enap cemar galvani / Galvanic sludges	SW 105	-	0
77	Larutan resap dari tapak pelupusan buangan terjadual / Leachate from Scheduled Waste Landfill	SW 420	-	0
	JUMLAH		7,505,195.76	100



Rajah 5.16: Penghasilan Buangan Terjadual Mengikut Negeri 2021
Figure 5.16: Distribution of Scheduled Waste Generated by State 2021

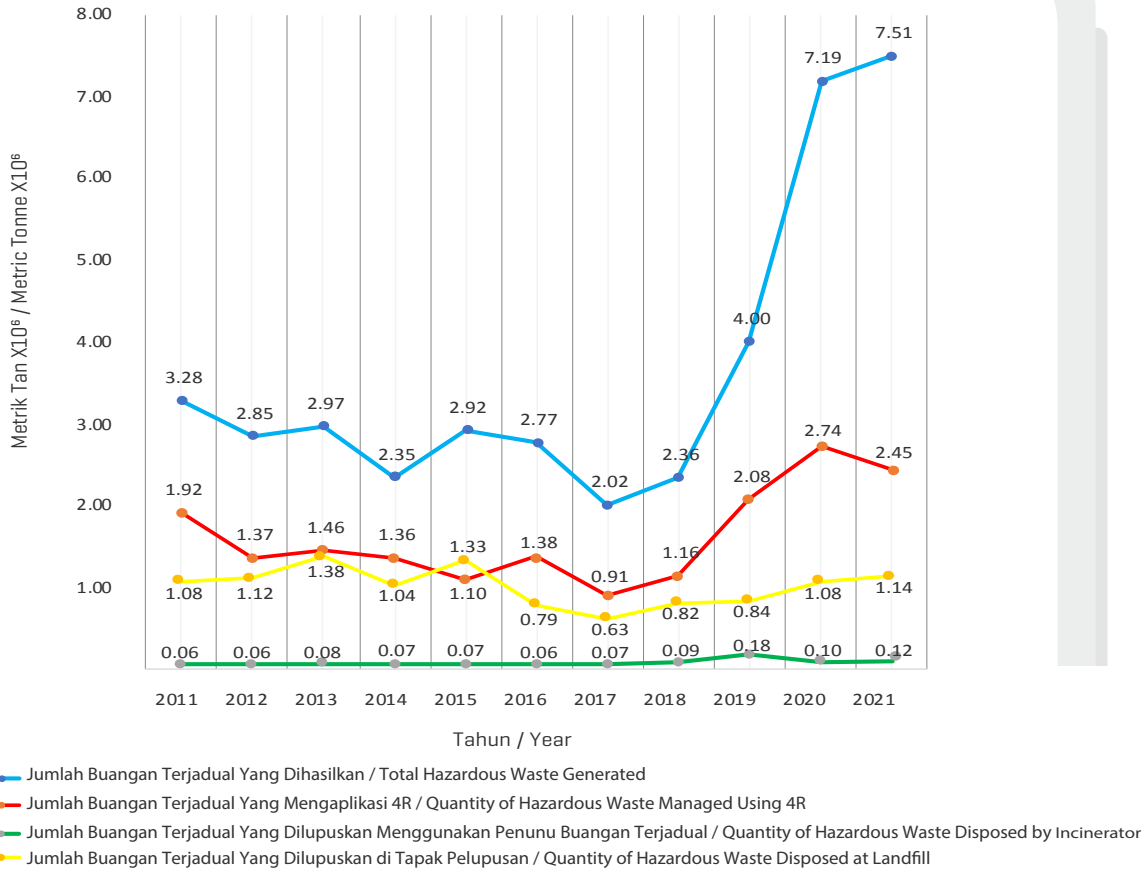

Trienekens (Sarawak) Sdn Bhd

Jadual 5.2 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2021
Table 5.2: Quantity of Scheduled Wastes Generated by Industry, 2021

BIL / NO	JENIS INDUSTRI / TYPE OF INDUSTRY	JUMLAH BUANGAN / TOTAL WASTE GENERATED	
		(MT/YEAR) (MT/TAHUN)	PERATUS (%) / PERCENTAGE (%)
1	Loji Janakuasa / Power Plant	3,141,511.77	41.86
2	Loji Rawatan Air / Water Treatment Plant	1,167,603.14	15.56
3	Pengilangan Logam / Metal Refinery	642,947.93	8.57
4	Industri Kimia / Chemical Industry	595,492.44	7.93
5	Elektrik Dan Elektronik / Electric And Electronic	427,121.96	5.69
6	Premis Buangan Terjadual (PYDT) / Scheduled Waste Treatment And Disposal Facilities	328,677.17	4.38
7	Berasaskan Getah / Rubber Base	225,648.94	3.01
8	Bengkel / Workshop	150,999.38	2.01
9	Kenderaan / Vehicle	138,891.30	1.85
10	Lain-lain / Others	122,705.93	1.63
11	Penapisan Petroleum / Petroleum Refinery	95,176.64	1.27
12	Jentera / Machinery	76,726.79	1.02
13	Perubatan / Health Care Services	67,206.35	0.9
14	Penyudahan Logam Dan Sadur Elektrik / Metal Finishing and Coating	51,696.83	0.69
15	Fabrikasi Logam / Metal Fabrication	43,250.04	0.58
16	Kertas / Paper	41,414.71	0.55
17	Penapisan Minyak Makan / Edible Oil Refinery	35,269.51	0.47
18	Percetakan / Printing	31,987.79	0.43
19	Kuari / Quarry	28,980.69	0.39
20	Plastik / Plastic	25,569.30	0.34
21	Galian Bukan Logam / Excavation Non Metal	16,268.13	0.22
22	Makanan & Minuman / Food & Drink	10,258.35	0.14
23	Gudang / Warehouse	8,962.64	0.12
24	Perlombongan / Mining	5,605.04	0.07
25	Kilang Kelapa Sawit (PYDT) / Palm Oil Mill	5,198.82	0.07
26	Tekstil / Textiles	4,121.79	0.05
27	Berasaskan Kayu / Wood Base	3,431.18	0.05
28	Pembuatan Payung dan Lain-lain Industri Pembuatan / Others Manufacturing	3,376.73	0.04
29	Pertanian / Agriculture	3,133.75	0.04
30	Simen / Cement	2,060.81	0.03
31	Kilang Getah (PYDT) / Rubber Factory	1,392.48	0.02
32	Peralatan Sukan Dan Permainan / Sports Equipment and Games	974.56	0.01
33	Perkhidmatan / Services	447.1	0.01
34	Tapak Pelupusan Sampah / Sanitary Landfill	334.6	0.00
35	Peralatan Pejabat dan Alat Tulis / Office Supplies and Stationery	281.74	0.00
36	Kulit / Leather	198.6	0.00

Jadual 5.2 : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2021
Table 5.2: Quantity of Scheduled Wastes Generated by Industry, 2021

BIL / NO	JENIS INDUSTRI / TYPE OF INDUSTRY	JUMLAH BUANGAN / TOTAL WASTE GENERATED	
		(MT/YEAR) (MT/TAHUN)	PERATUS (%) / PERCENTAGE (%)
37	Loji Pengolahan Kumbahan (IWK, Majari, PBT) / Sewage Treatment Plant (IWK,Majari,PBT)	88.69	0.00
38	Loji Pengolahan Kumbahan Persendirian / Private Sewage Treatment Plant	67.21	0.00
39	Rokok Dan Tembakau / Cigarettes and Tobacco	61.23	0.00
40	Makanan Ternakan / Livestock Food	35.71	0.00
41	Hotel / Hotel	8.73	0.00
42	Kilang Padi / Rice Mill	4.53	0.00
43	Perikanan / Fishery	2.24	0.00
44	Perhutanan / Forestry	2.23	0.00
45	Restoran / Restaurant	0.21	0.00
46	Penternakan	0.05	0.00
	JUMLAH	7,505,195.76	100



Rajah 5.17 : Tren Pengurusan Buangan Terjadual, 2011-2021
Figure 5.17: Scheduled Waste Management Trend, 2011-2021

Jadual 5.3 : Kemudahan Yang Mengendalikan Buangan Terjadual, 2021
Table 5.3: Facilities Handling Scheduled Wastes, 2021

BIL / NO	KEMUDAHAN / FACILITIES	(MT/YEAR) / (MT/TAHUN)	PERCENTAGE (%) / PERATUSAN (%)
1	Pengurusan Khas / Special Waste Management	2,002,522.33	26.68
2	Pengolahan DalamTapak / OnSite Treatment	1,191,005.58	15.87
3	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan / Local Off-Site Recovery Facilities	396,773.42	5.29
4	Penstoran Dalam Tapak / On Site Storage	3,543,396.88	47.21
5	Kualiti Alam Sdn Bhd / Kualiti Alam Sdn Bhd	168,208.55	2.24
6	Kemudahan Buangan Klinikal (Penunu Buangan Klinikal, Gelombang Mikro dan Tapak Pelupusan Selamat) / Off-Site Clinical Waste Facilities (Incinerator, Microwave and Secured Landfill)	57,378.48	0.76
7	Kemudahan Luar Negara (Ekspot) / Foreign Facilities (Export)	114,844.52	1.53
8	Trienekens (Sarawak) Sdn Bhd / Trienekens (Sarawak) Sdn Bhd	31,066.00	0.41
	Jumlah	7,505,195.76	100.00

Radicare (M) Sdn Bhd

Jadual 5.4 : Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas 2021
Table 5.4: Scheduled Waste Managed Under Special Management, 2021

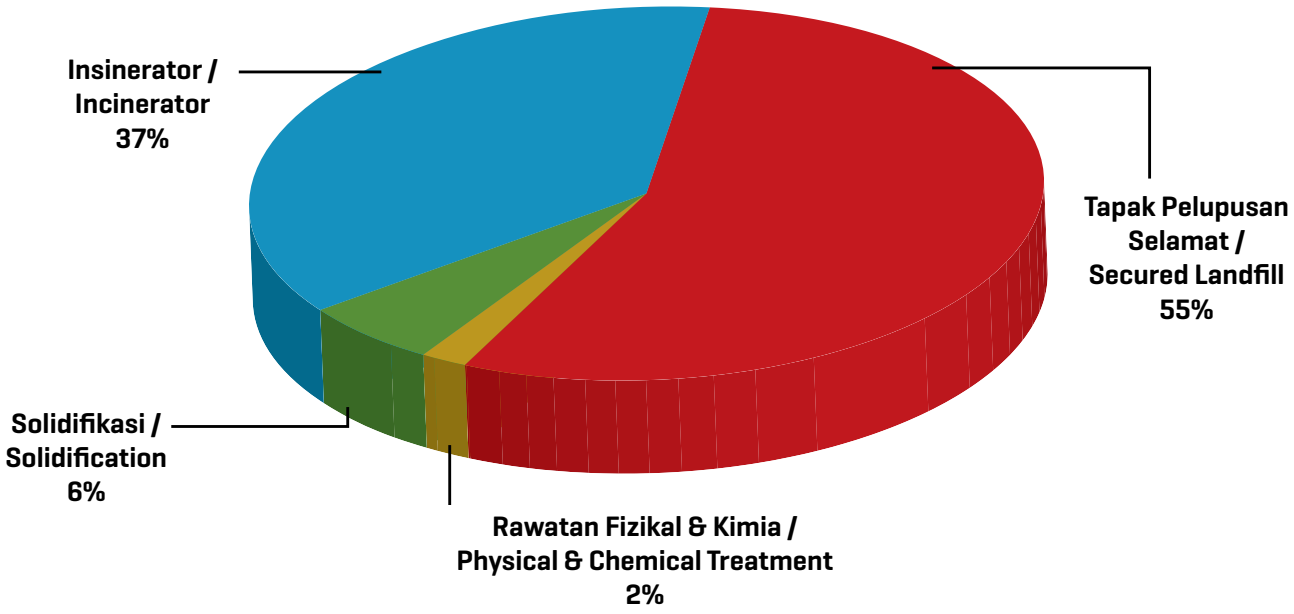
BIL / NO.	KATEGORI BUANGAN / WASTE CATEGORY	KOD BUANGAN / WASTE CODE	SUMBER / SOURCE	METRIK TAN / TONNES	PERATUS (%) / PERCENT (%)	KAEDAH PELUPUSAN / METHOD OF DISPOSAL
1	Enap Cemar Logam Berat / Heavy Metal Sludge	SW 204	Loji Rawatan Air Minuman / Drinking Water Treatment Plant	1,125,107.13	56.18	Tapak Pelupusan Sanitari / Sanitary Landfill
			Industri / Industry	6,860.61	0.34	
				44,770.16	2.24	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
2	Fly Ash & Bottom Ash	SW 104	Coal-Fired Power Plant	652,565.40	32.59	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
			Industri / Industry	156,987.08	7.84	
3	Buangan yang Mengandungi Formaldehid, Resin, Serbuk Epoksi Terbuang / Waste Containing Formaldehyde, Resin, Discarded Epoxy Powder	SW 320, 325, 418	Industri / Industry	670.09	0.03	Tapak Pelupusan Sanitari / Sanitary Landfill
4	Abu dari Enapcemar Kertas / Ash of Paper Sludge	SW 406	Industri / Industry	4,624.39	0.23	Tapak Pelupusan Sanitari / Reuse as raw material for product

Jadual 5.4 : Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas 2021
Table 5.4: Scheduled Waste Managed Under Special Management, 2021

BIL / NO.	KATEGORI BUANGAN / WASTE CATEGORY	KOD BUANGAN / WASTE CODE	SUMBER / SOURCE	METRIK TAN / TONNES	PERATUS (%) / PERCENT (%)	KAEDAH PELUPUSAN / METHOD OF DISPOSAL
5	Peralatan yang dicemari buangan terjadual / Equipment contaminated with scheduled waste	SW 409	Industri / Industry	1.72	0.00	Guna semula sebagai bahan mentah pembuatan produk / Reuse as raw material for product
6	*Activated Carbon* Terpakai / Spent activated carbon	SW 411	Industri / Industry	6,471.00	0.32	Guna semula sebagai bahan mentah pembuatan produk
7	Minyak terpakai bercampur / Spent Mixed Oil	SW 421	Industri / Industry	3,759.72	0.19	Guna semula sebagai bahan mentah pembuatan produk
8	Enap Cemar Mineral / Mineral sludge	SW 427	Industri / Industry	690.34	0.03	Guna semula sebagai bahan agen peneutralan / Reuse as neutralizing agent
9	Buangan daripada bahan letupan terpakai / Waste use of explosive	SW 431	Industri / Industry	14.69	0.00	Kaedah pembakaran / Burning method
			Jumlah	2,002,522.33	100.00	

Kategori buangan terjadual yang dihantar ke premis berlesen (Kualiti Alam Sdn Bhd dan Trinekens (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 5.18**, sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah dibakar dengan menggunakan kaedah tapak pelupusan selamat (55%), insinerator (37%), solidifikasi (6%) dan keadah rawatan fizikal & kimia (2%).

The categories of scheduled wastes sent to the licensed premises (Kualiti Alam Sdn Bhd and Trienekens (Sarawak) Sdn Bhd) for final disposal were sludge containing one or several heavy metals, mixed wastes, dust/ slag/dross or ash containing arsenic/ mercury and spent inorganic acid. As shown in **Figure 5.18,** wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were landfilled (55%), followed by incineration (37%), solidification (6%) and physical & chemical treatment (2%).



Rajah 5.18: Kualiti Alam and Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2021
Figure 5.18: Kualiti Alam and Trienekens: Types of Scheduled Waste Treatment and Disposal, 2021

ANNEX

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS				
		I	IIA/IIB	III#	IV	V
A l	mg/l	NATURAL LEVEL OR ABSENT	-	(0.06)	0.5	LEVEL ABOVE IV
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr (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_2	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO_2	mg/l		0.4	0.4 (0.03)	-	
NO_3	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Silica	mg/l		50	-	-	
SO_4	mg/l		250	-	-	
S	mg/l		0.05	(0.001)	-	
CO_2	mg/l		-	-	-	
Gross- α	Bq/l		0.1	-	-	
Gross- β	Bq/l		1	-	-	
Ra-226	Bq/l		< 0.1	-	-	
Sr-90	Bq/l		< 1	-	-	
CCE	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	-	-

Notes :
* = At hardness 50 mg/l CaCO
# = Maximum (unbracketed) and 24-$h_3$our 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)[a]	5000 (20000)[a]	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000

Notes :

N : No visible floatable materials or debris, no objectional odour or no objectional taste

* : Related parameters, only one recommended for use

** : Geometric mean

a : Maximum not to be exceeded

WATER CLASSES AND USES

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

DOE WATER QUALITY CLASSIFICATION BASED ON WATER QUALITY INDEX

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

DOE WATER QUALITY INDEX CLASSIFICATION

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

WQI FORMULA AND CALCULATION

FORMULA

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

SIDO = Subindex DO (% saturation)
SIBOD = Subindex BOD
SICOD = Subindex COD
SIAN = Subindex NH_3-N
SISS= Subindex SS
SIpH = Subindex pH
$0 \leq WQI \leq 100$

Best Fit Equations for the Estimation of Various Subindex Values

Subindex for DO (in % saturation)

SIDO = 0	for $x \leq 8$
SIDO = 100	for $x \geq 92$
$SIDO = -0.395 + 0.030x^2 - 0.00020x^3$	for $8 < x < 92$

Subindex for BOD

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

WQI FORMULA AND CALCULATION

FORMULA

Subindex for COD

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

Subindex for NH_3-N

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

Subindex for SS

SISS= 97.5 *exp(-0.00676x) + 0.05x for x ≤ 100
SISS= 71*exp(-0.0016x) - 0.015x for 100 < x < 1000
SISS= 0 for x ≥ 1000

Subindex for pH

SIpH = 17.2 - 17.2x + 5. 02x^2 for x < 5.5
SIpH = -242 + 95.5x - 6.67x^2 for 5.5 ≤ x < 7
SIpH = -181 + 82.4x - 6.05x^2 for 7 ≤ x < 8.75
SIpH = 536 - 77.0x + 2.76x^2 for x ≥8.75

Note:
* means multiply with

MALAYSIAN MARINE WATER QUALITY STANDARDS

PARAMETER (µ G/L) UNLESS OTHERWISESTATED	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	ESTUARIES		
				COASTAL PLAIN	LAGOON	COMPLEX DISTRIBUTARY 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
Cyniade	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	27.0	27.0	55.0	27.0	27.0	27.0
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)	≤ 2 °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

$$MMWQI = qi\ DO^{0.18} \times qi\ FC^{0.19} \times qi\ NH_3{}^{0.15} \times qi\ NO_3{}^{0.16} \times qi\ PO_4{}^{0.17} \times qi\ TSS^{0.15}$$

whereby;

qi DO = Subindex Dissolved Oxygen
qi FC = Subindex Faecal Coliform
qi NH_3 = Subindex Unionized Ammonia
qi NO_3 = Subindex Nitrate
qi PO_4 = Subindex Phosphate
qi 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

$qi\ FC = 100*EXP^{(-0.005(\text{Faecal Coliform}))}$

If FC is more than (>) 500 cfu/100ml, $qi\ FC = 8$

Unionized Ammonia (NH_3) in µg/l

$qi\ NH_3 = 100*EXP^{(-0.0046(\text{Unionized Ammonia}))}$

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

Nitrate (NO_3) in µg/l

$qi\ NO3 = 94.8*EXP^{(-0.00035(\text{Nitrate}))}$

Phosphate (PO_4) in µg/l

$qi\ PO4 = 95.2*EXP^{(-0.002(\text{Phosphate}))}$

If PO_4 is more than (>) 900 µg/l, $qi\ PO_4 = 10$

Total Suspended Solids (TSS) in mg/l

$qi\ TSS = 95.8*EXP^{(-0.0043(\text{Total Suspended Solid}))}$

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)

$$IS = \frac{19.9273 * Salinity}{(1000 - 1.005109 * Salinity)}$$

Salinity in part per thousand (ppt)

b. Calculation of PKa

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

Temperature in °C

c. Calculation of working pH

$pHsw = pH - (0.0007 \times IS) - 0.131$

d. Calculation of mole fraction for unionized ammonia

Mole Fraction =
equation 1:

Ammoniacal nitrogen (NH_3-N) x mole fraction x 17/14

Ammoniacal nitrogen should be measured in µg/l

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

GROUNDWATER QUALITY INDEX (GWQI) FORMULA AND CALCULATION

To calculate the GWQI, the additive equation is used as follows:

$GWQI = \Sigma W_i q_i$

or

$GWQI = 0.13Si(pH) + 0.17Si(Fe) + 0.17Si(E.coli) + 0.04Si(TDS) + 0.09Si(SO_4^{2-}) + 0.22Si(NO_3) + 0.17\ Si(Phenol)$

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 Ci exceeds 5.0 mg/L; Ci 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 Ci exceeds 3000 mg/L; Ci 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 Ci 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 Ci exceeds 0.015 mg/L; Ci is the concentration of phenol determined in the groundwater sample.

E-coli Sub Index

$Si\ (E\text{-}coli) = (1 - C_i/5000) \times 100$

Si (*E-coli*) = 0, if Ci exceeds 5000 MPN / 100ml; Ci is the MPN *E-coli* measured in the groundwater sample.