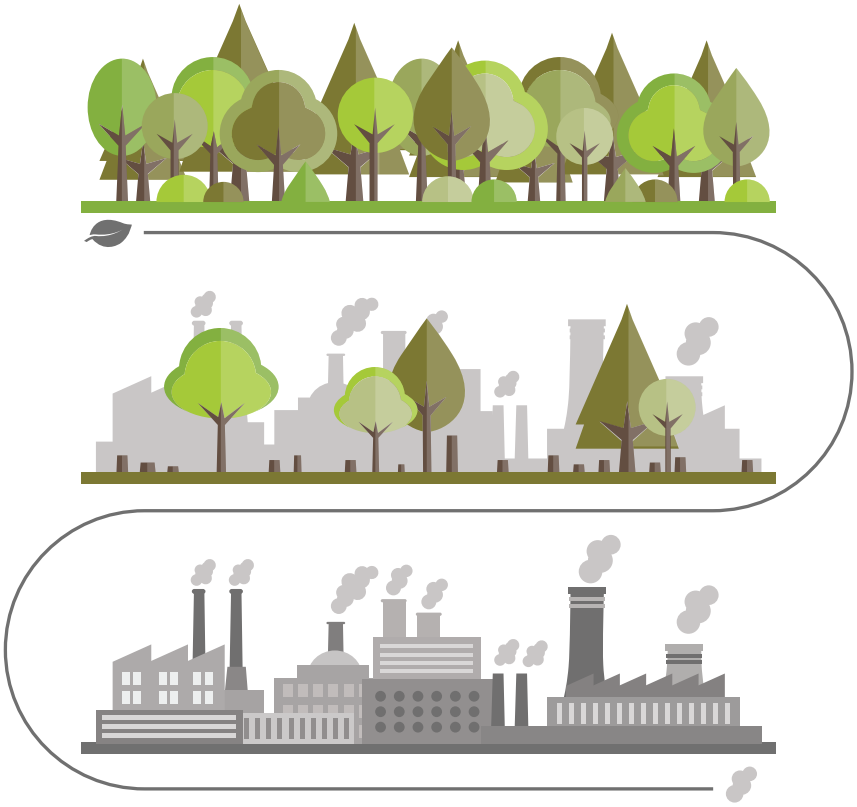
MALAYSIA
ENVIRONMENTAL QUALITY REPORT 2014



Jabatan Alam Sekitar
Kementerian Sumber Asli dan Alam Sekitar

Department of Environment
Ministry of Natural Resources and Environment

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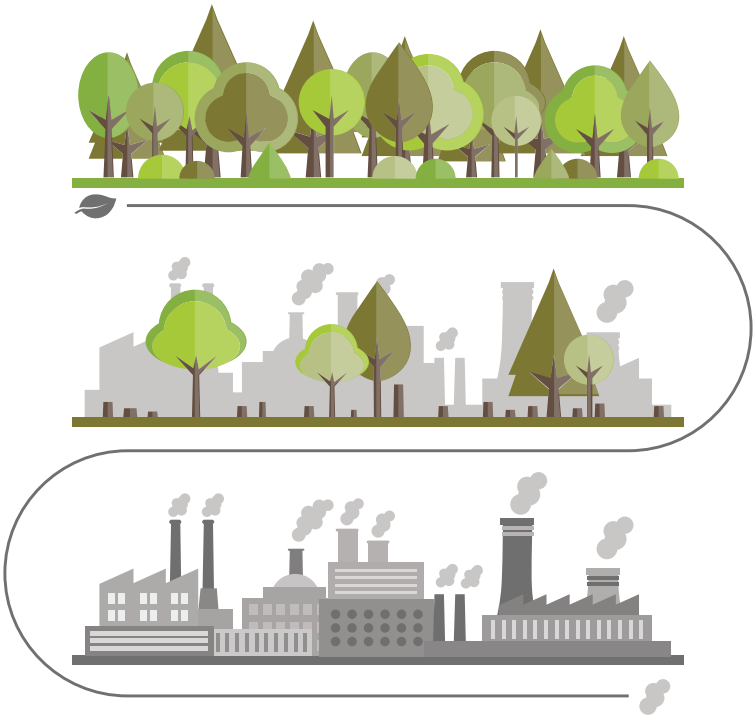

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PRAKATA / FOREWORD

Dato' Halimah Hassan

Ketua Pengarah Alam Sekitar Malaysia

Director-General of Environmental Quality Malaysia

Saya amat berbesar hati untuk membentangkan Laporan Kualiti Alam Sekeliling 2014 seperti yang dikehendaki di bawah Seksyen 3(1)(i) Akta Kualiti Alam Sekeliling 1974.

It is my pleasure to present the Environmental Quality Report 2014 as required under Section 3(1)(i) of the Environmental Quality Act 1974.

Malaysia telah mengalami episod jerebu sederhana yang singkat daripada bulan Februari, 2014 hingga Mac 2014 yang disebabkan oleh kebakaran hutan dan tanah gambut di Semenanjung Malaysia. Pada 14 Mac 2014, IPU meningkat ke paras Berbahaya di Pelabuhan Klang dan Banting yang mengakibatkan penutupan dua ratus tiga (203) buah sekolah.

Malaysia experienced a short period of moderate haze episode from February, 2014 to March, 2014 due to forest and peat land fires especially in Peninsular Malaysia. On 14th March 2014, API level reached Hazardous level at Pelabuhan Klang & Banting which lead to closures of two hundred and three (203) schools.

Kualiti persekitaran marin kawasan pantai, kuala dan pulau menunjukkan peningkatan pada tahun 2014. Bilangan stesen Terbaik menunjukkan peningkatan daripada empat (4) stesen pada tahun 2013 kepada tiga puluh (30) stesen pada tahun 2014. Manakala bagi stesen Tercemar menunjukkan penurunan daripada sebelas (11) stesen pada tahun 2013 kepada sifar (0) stesen pada tahun 2014.

The quality of the marine environment with respect to coastal, estuarine and island areas has increased in year 2014. Numbers of stations in Excellent category have increased from four (4) stations in year 2013 to thirty (30) stations in year 2014. Meanwhile stations under Polluted category have declined from eleven (11) in years 2013 to nil (0) in year 2014.

Sementara itu kualiti air sungai telah menunjukkan kemerosotan pada tahun 2014, di mana peratus bilangan sungai yang dikategorikan sebagai bersih telah menurun kepada 52% pada tahun 2014 berbanding 58% berbanding tahun 2013. Peratus bilangan sungai yang dikategorikan sebagai tercemar telah meningkat daripada 5% pada tahun 2013 kepada 9% pada tahun 2014.

On contrary, river water quality has declined in year 2014, where the percentage of clean rivers have decreased to 52% in year 2014 compared to 58% in year 2013. Meanwhile the percentage of polluted rivers has increased from 5% in year 2013 to 9% in year 2014.

Melindung dan memulihara alam sekitar bukanlah sesuatu yang mudah malahan tugas tersebut bukannya khas untuk JAS sahaja. Jadikan gaya hidup lestari sebagai amalan dan bantulah JAS dalam melindung dan memulihara alam sekitar kita ini.

Protecting and Conserving our environment is not an easy task and it's not an exclusive task of DOE only, it's a common task for every Malaysian. Practice the sustainable lifestyle and let's help DOE to protect and conserve our environment.

Pemuliharaan Alam Sekitar, Tanggungjawab Bersama

Environmental Conservation, Our Shared Responsibility

Dato' Halimah Hassan

Ketua Pengarah Alam Sekitar Malaysia

Director-General of Environmental Quality Malaysia

10 September 2015

Bab 1
Chapter 1

PENGAWASAN KUALITI UDARA /
AIR QUALITY MONITORING

Bab 1 / Chapter 1
PENGAWASAN KUALITI UDARA
AIR QUALITY MONITORING

PENGAWASAN KUALITI UDARA
AIR QUALITY MONITORING

Pengawasan status kualiti udara dilaksanakan oleh Jabatan Alam Sekitar (JAS) melalui 52 stesen pengawasan kualiti udara yang ditempatkan di seluruh negara. Stesen-stesen pengawasan kualiti udara tersebut ditempatkan di lokasi yang strategik iaitu di kawasan bandar, sub-bandar dan perindustrian **(Peta 1.1 dan Peta 1.2)** bertujuan untuk mengesan sebarang perubahan ketara ke atas kualiti udara yang mungkin memberi kesan berbahaya kepada kesihatan dan alam sekitar.

*The Department of Environment (DOE) monitors ambient air quality throughout the country at 52 continuous monitoring stations. These monitoring stations are strategically located in urban, sub urban and industrial areas **(Map 1.1 and Map 1.2)** to detect any significant change in the air quality which may be harmful to human health and the environment.*

Rangkaian Stesen Pengawasan Kualiti Udara Kebangsaan turut dilengkapi stesen-stesen pengawasan kualiti udara secara manual yang ditempatkan di 14 kawasan yang berbeza. Pengawasan udara di stesen-stesen manual ini melibatkan pengukuran parameter-parameter seperti kumin pepejal, habuk halus bersaiz kurang dari 10 mikron (PM_{10}) dan beberapa logam berat termasuk plumbum. Bagi stesen manual ini, pengukuran dibuat sekali bagi tempoh enam hari dengan menggunakan alat *"High Volume Sampler"*.

The National Air Quality Monitoring Network is also complemented by manual air quality monitoring stations located at 14 different sites. At these sites, total suspended particulates, particulate matter of less than 10 microns in size (PM_{10}) and heavy metals such as lead are measured at interval of six days using High Volume Sampler.

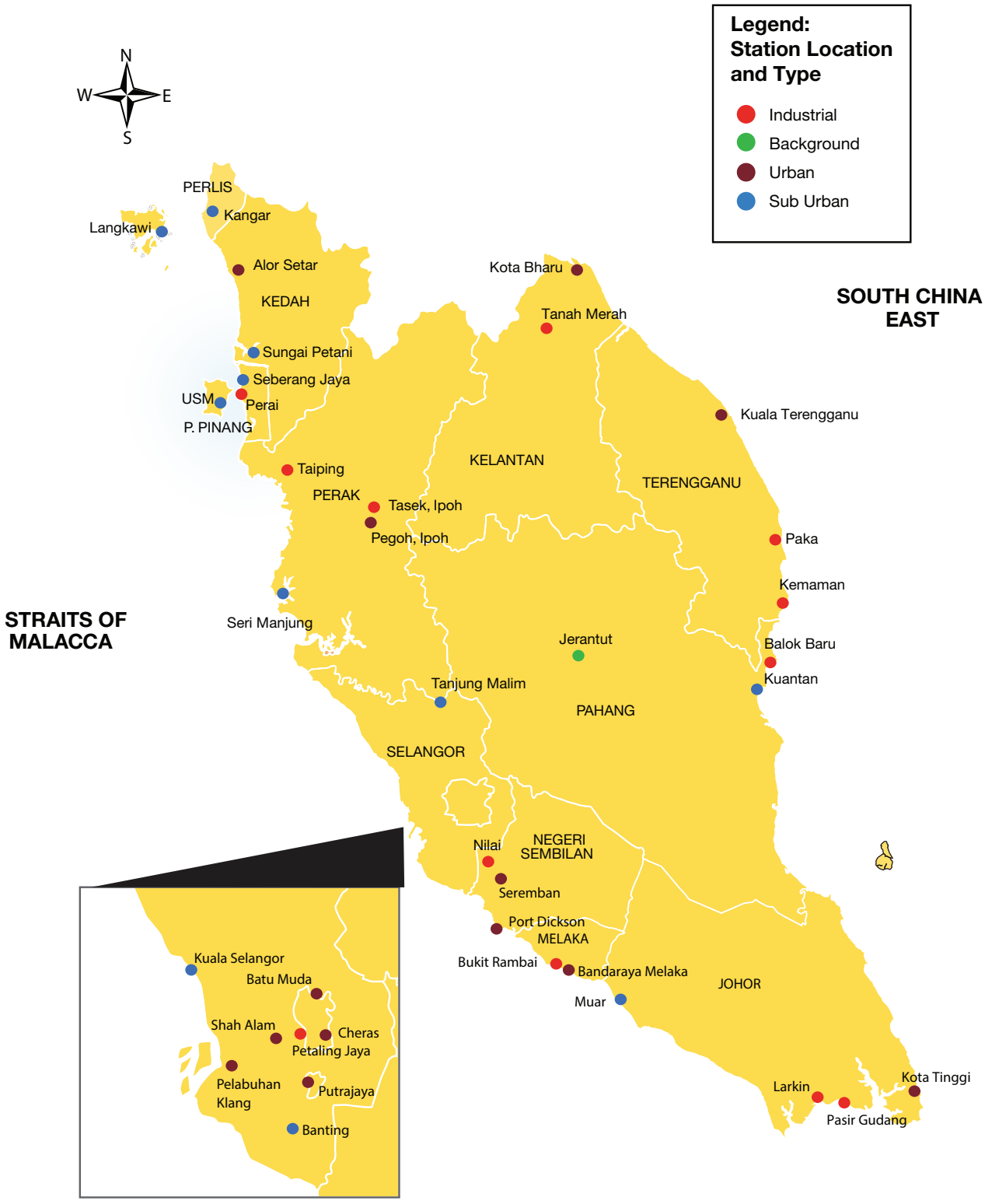
Status kualiti udara dilaporkan dalam bentuk Indeks Pencemar Udara (IPU). IPU adalah dikira berdasarkan kepekatan lima bahan pencemar utama iaitu ozon di permukaan bumi (O_3), karbon monoksida (CO), nitrogen dioksida (NO_2), sulfur dioksida (SO_2) dan habuk halus bersaiz kurang dari 10 mikron (PM_{10})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

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

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*

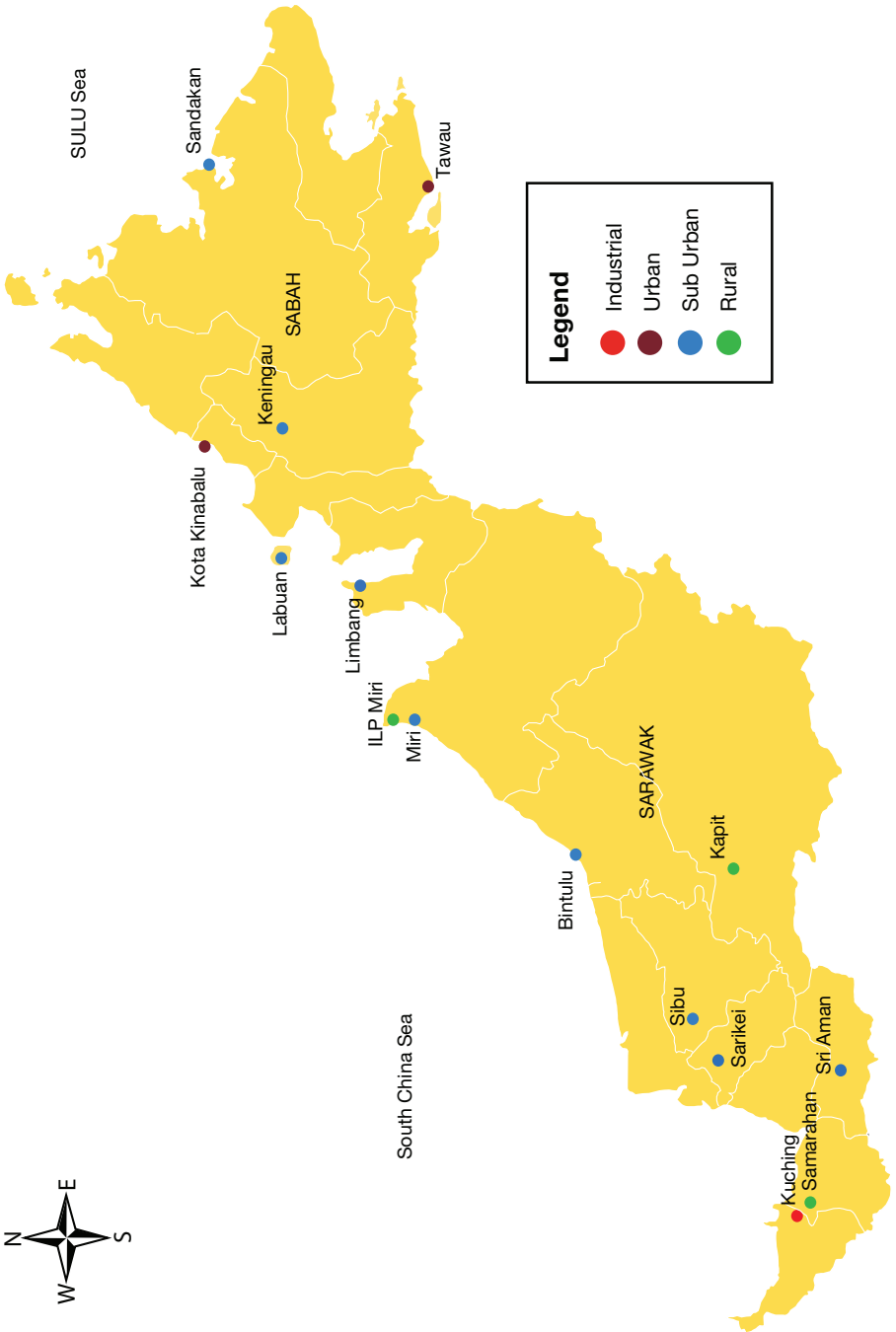
Jadual 1.1 Malaysia : Status Kualiti Udara (IPU)

Table 1.1 Malaysia : Air Pollutant Index (API)



Peta 1.1 Malaysia: Lokasi Stesen Pengawasan Kualiti Udara Automatik, 2014 di Semenanjung Malaysia

Map 1.1 Malaysia: Location of Continuous Air Quality Monitoring Stations in Peninsular Malaysia, 2014



Peta 1.2 Malaysia: Lokasi Stesen Pengawasan Kualiti Udara Automatik di Sabah & Sarawak, 2014

Map 1.2 Malaysia: Location of Continuous Air Quality Monitoring Stations in Sabah and Sarawak, 2014

STATUS KUALITI UDARA

Berdasarkan Indeks Pencemar Udara (IPU), kualiti udara keseluruhan bagi Malaysia pada tahun 2014 adalah berstatus baik dan sederhana pada kebanyakan masa kecuali terdapat beberapa hari yang tidak sihat dicatatkan di beberapa lokasi di Pantai Barat, Pantai Timur Semenanjung Malaysia dan Negeri Sarawak.

Semasa musim kering antara bulan Februari dan Mac 2014, Semenanjung Malaysia telah mengalami episod jerebu sederhana di mana kualiti udara merosot kepada paras tidak sihat dan berbahaya. Kawasan dan Negeri yang terlibat adalah Lembah Klang, Perak, Melaka, Negeri Sembilan dan Johor. Jerebu yang dialami adalah disebabkan oleh kebakaran hutan dan tanah gambut di beberapa negeri iaitu di Selangor, Perak, Pahang, Johor, Kedah, Kelantan dan Terengganu.

Episod jerebu bertambah buruk pada 14 Mac 2014 di mana paras IPU meningkat ke paras berbahaya (IPU melebihi 300) di dua (2) kawasan iaitu Pelabuhan Klang dan Banting, Selangor. Keadaan jerebu ini menyebabkan 203 buah sekolah di Klang dan Kuala Langat di Selangor ditutup kerana bacaan IPU yang mencapai tahap sangat tidak sihat iaitu IPU melebihi 200.

Semasa Monsun Barat Daya, terdapat kejadian jerebu merentas sempadan daripada bulan Jun hingga pertengahan bulan Oktober akibat kebakaran tanah dan hutan yang berlaku di Sumatera dan Kalimantan, Indonesia. Habuk halus bersaiz kurang dari 10 mikron (PM_{10}) adalah pencemar utama yang menyebabkan kejadian jerebu.

Terdapat sedikit kemerosotan tren kualiti udara di Lembah Klang pada tahun 2014 berbanding tahun 2013 seperti yang ditunjukkan dalam **Rajah 1.1 (a)**. PM_{10} merupakan pencemar utama yang menyebabkan kualiti udara menjadi tidak sihat berikutan musim panas dan kering yang dialami

AIR QUALITY STATUS

Based on the Air Pollutant Index (API), the overall air quality for Malaysia in 2014 was between good to moderate levels most of the time except for a number of unhealthy days recorded at various locations in the West and East Coast of Peninsular Malaysia and in Sarawak.

During the dry period between February and Mac 2014, Peninsular Malaysia had experienced moderate haze episode where air quality deteriorated to unhealthy and hazardous levels. The affected areas and States were the Klang Valley, Perak, Melaka, Negeri Sembilan and Johor. The haze was due to forest and peatland fires in several States namely in Selangor, Perak, Pahang, Johor, Kedah, Kelantan and Terengganu.

The haze episode worsened on 14 March 2014 as the API level rose to hazardous level (API more than 300) in two (2) areas namely Port Klang and Banting, Selangor. The haze situation had caused 203 schools in the Klang and Kuala Langat Districts in Selangor to be closed as the API reached very unhealthy levels of more than 200.

During Southwest Monsoon, the country had experienced transboundary haze pollution from June to middle of October due to land and forest fires in Sumatra and Kalimantan, Indonesia. Particulate matter of less than 10 microns in size (PM_{10}) was the major pollutant that had caused the haze.

*There had been slight deterioration in the overall trend of air quality in Klang Valley in 2014 as compared to 2013 as shown in **Figure 1.1(a)**. PM_{10} was the predominant pollutant that had caused unhealthy conditions during the dry seasons in the late Northeast Monsoon (February until March) and*

semasa fasa akhir Monsun Timur Laut (Februari hingga Mac) dan Monsun Barat Daya (Mei hingga September). Status kualiti udara tidak sihat di Lembah Klang sepanjang tempoh ini adalah disebabkan oleh kebakaran tanah dan hutan. **Rajah 1.1 (b)** menunjukkan kepekatan harian PM_{10} bagi Klang secara perbandingan dengan beberapa stesen terpilih di kawasan-kawasan sub-bandar dan luar bandar dengan paras PM_{10} yang lebih rendah. Nilai kepekatan kumin pepejal (PM_{10}) di Klang (kawasan bandar) adalah lebih tinggi berbanding dengan kawasan-kawasan sub-bandar dan luar bandar.

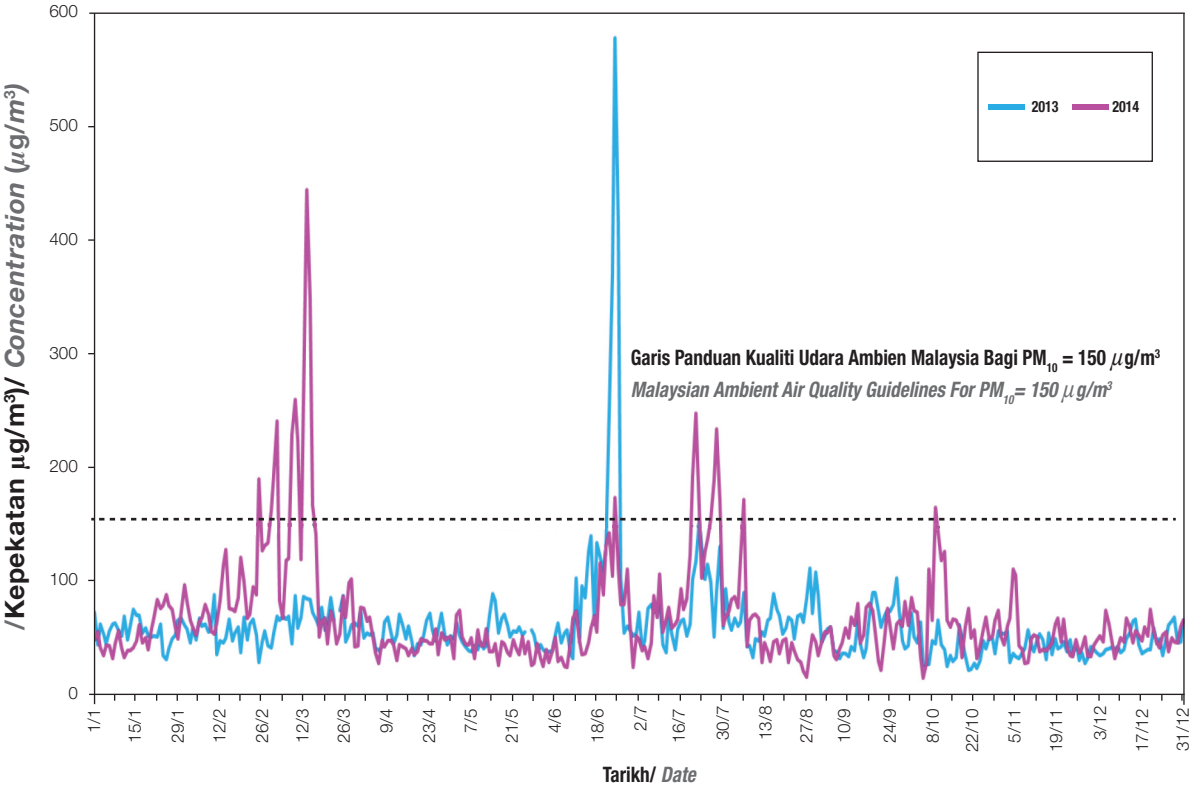
Southwest Monsoon (May until September). The unhealthy days in Klang Valley during these periods were due to forest and peatland fires. ***Figure 1.1(b)*** *shows the daily concentrations of PM10 for Klang in comparison with selected stations in sub-urban and rural areas which recorded lower levels of* PM_{10}*. The concentration* PM_{10} *in Klang (urban area) was significantly higher compared to the suburban and rural areas.*

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

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

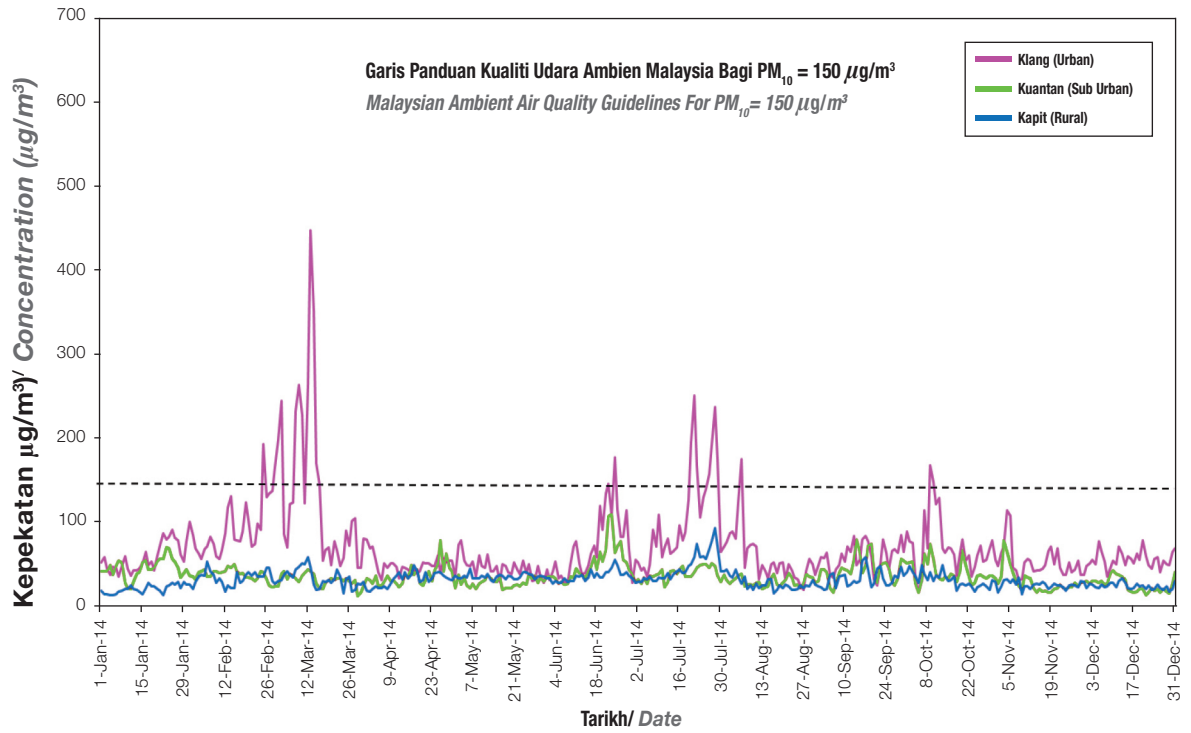
Kadangkala terdapat kepekatan maksimum harian bagi parameter O_3 dalam tempoh 1 jam adalah melebihi Garis Panduan Kualiti Udara Ambien Malaysia terutamanya di beberapa kawasan di Lembah Klang, Negeri Perak, Negeri Sembilan dan Negeri Kedah seperti yang ditunjukkan dalam **Rajah 1.1 (c), Rajah 1.1 (d)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

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



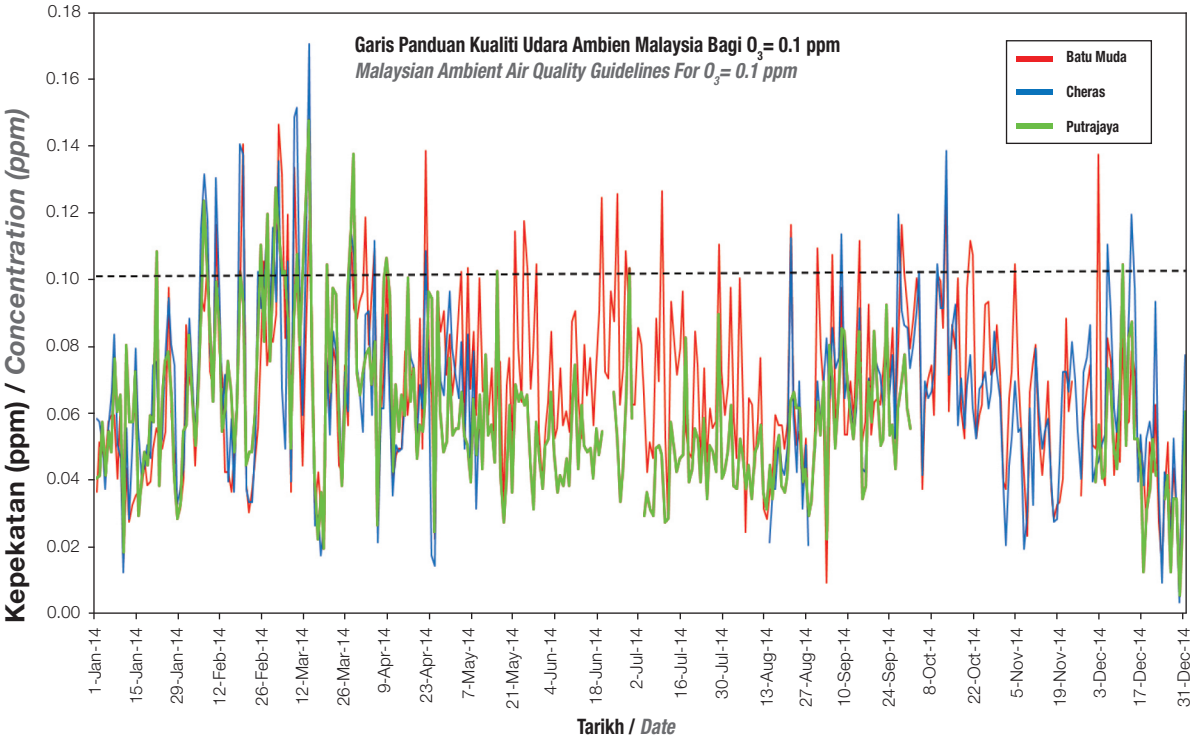
Rajah 1.1 (a) : Tren Kepekatan 24 Jam Bagi Pepejal Terampai (PM_{10}), Lembah Klang, 2013 dan 2014

Figure 1.1 (a) : Trend of 24-hour Concentration of Particulate Matter (PM_{10}), Klang Valley, 2013 and 2014



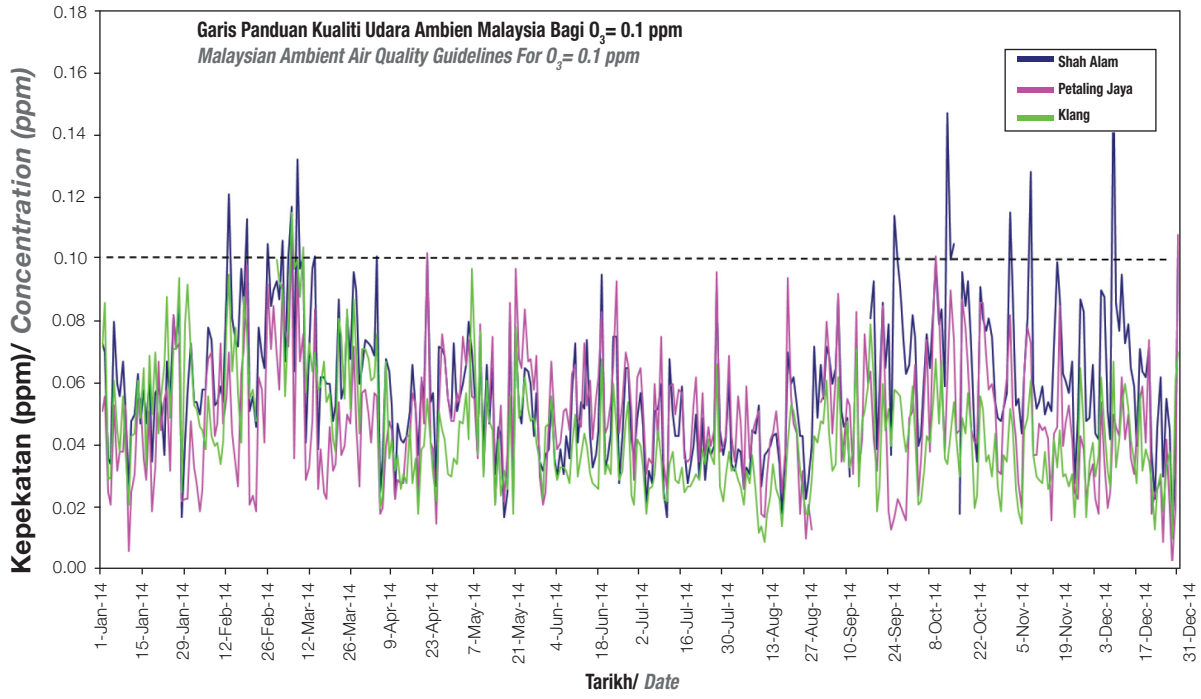
Rajah 1.1 (b) : Tren Kepekatan 24 Jam Bagi Pepejal Terampai (PM_{10}), Malaysia, 2014

Figure 1.1 (b) Malaysia : Trend of 24 Hours Concentration of Particulate Matter (PM_{10}), Malaysia, 2014



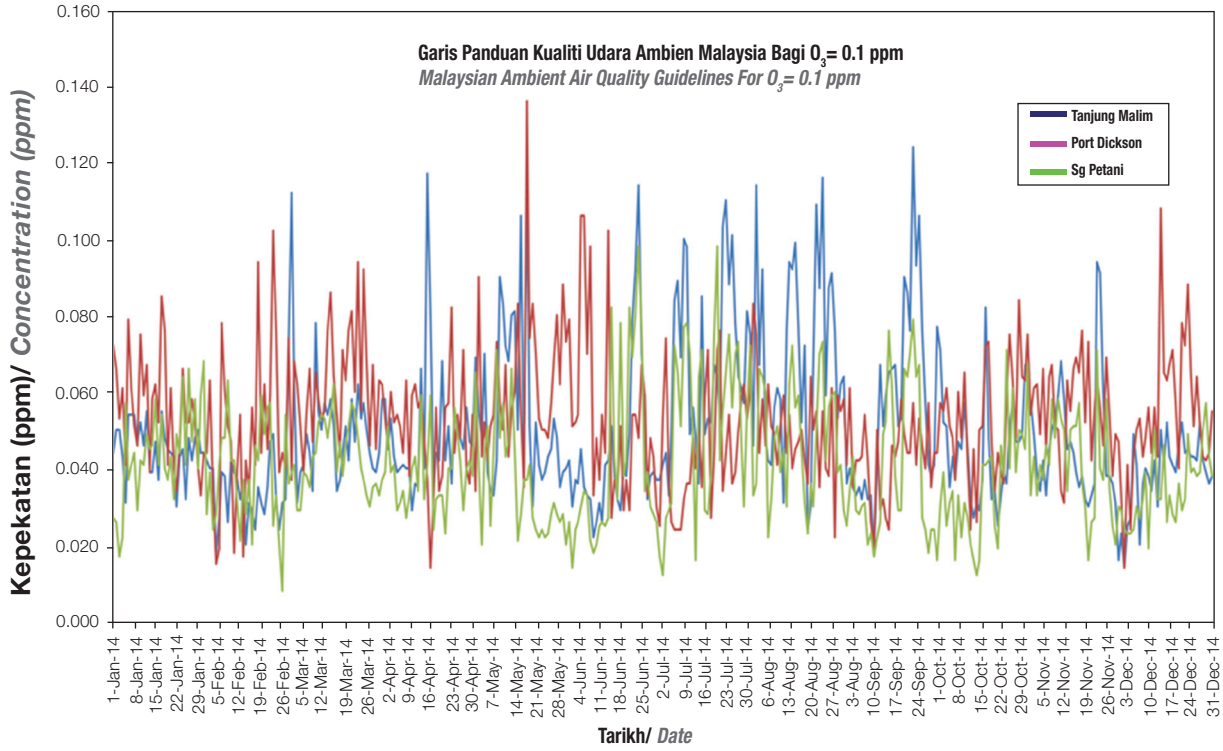
Rajah 1.1 (c) Malaysia : Tren Kepekatan Maksimum Harian Ozon (0_3) 1 Jam, Lembah Klang, 2014

Figure 1.1 (c) Malaysia : Trend of Daily Maximum 1-hour Concentration of Ozone (0_3), Klang Valley, 2014



Rajah 1.1 (d) Malaysia : Tren Kepekatan Maksimum Harian Ozon (0_3) 1-Jam, Lembah Klang, 2014

Figure 1.1 (d) Malaysia : Trend of Daily Maximum 1-hour Concentration of Ozone (0_3), Klang Valley, 2014



Rajah 1.1 (e) Malaysia: Tren Kepekatan Maksimum Harian Ozon (0_3) 1 Jam, Malaysia 2014

Figure 1.11(e) Malaysia: Trend of Daily Maximum 1-hour Concentration of Ozone (0_3), Malaysia 2014

Status Kualiti Udara di Pantai Barat

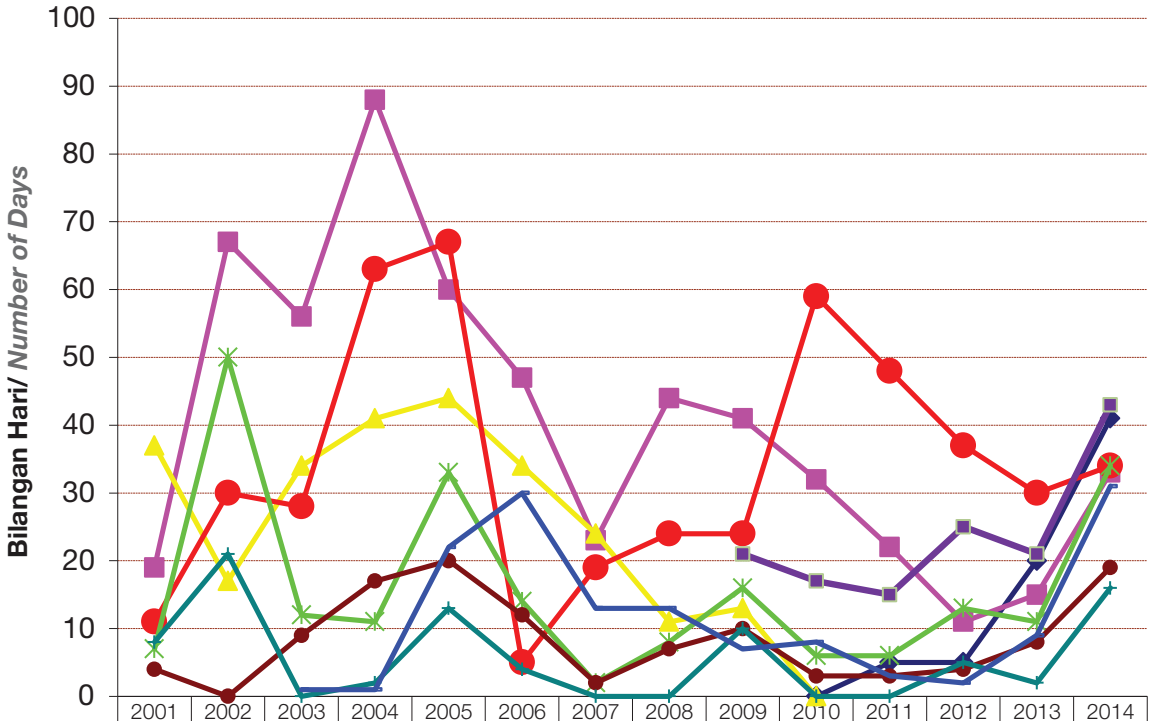
Lembah Klang

Pada tahun 2014, status kualiti udara di Lembah Klang mencatatkan 61% baik, 36 peratus sederhana, 2% tidak sihat dan 1% pada tahap sangat tidak sihat. Bilangan hari di mana status kualiti udara mencatatkan paras tidak sihat yang tertinggi adalah di Batu Muda, Kuala Lumpur (43 hari) **(Rajah 1.1)**. Status kualiti udara tidak sihat yang dicatatkan adalah disebabkan oleh ozon di permukaan bumi (O_3) dan PM_{10}. Di kawasan Klang, status kualiti udara tidak sihat adalah sebahagian besarnya disebabkan oleh kumin pepejal (PM_{10}) yang terhasil daripada kebakaran tanah dan hutan di peringkat tempatan dan pencemaran merentas sempadan. Status kualiti udara di Lembah Klang secara keseluruhannya ditunjukkan seperti di **Rajah 1.2**.

Air Quality Status in the West Coast

Klang Valley

In 2014, the air quality in the Klang Valley was good 61% of the time, moderate 36%, 2% at an unhealthy level and one (1) percent at an very unhealthy level. The highest number of unhealthy days was recorded in Batu Muda, Kuala Lumpur (43 days) ***(Figure 1.1)****. The unhealthy days recorded were due to ground level ozone (O_3) and PM_{10}. In Klang area, the unhealthy days were caused by particulate matter (PM_{10}) mainly from forest and peatland fires that occurred locally and transboundary pollution. The overall air quality status in Klang Valley is shown in* ***Figure 1.2****.*



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Banting										0	5	5	20	41
Shah Alam	19	67	56	88	60	47	23	44	41	32	22	11	15	33
Kajang	37	17	34	41	44	34	24	11	13	0				
Cheras	11	30	28	63	67	5	19	24	24	59	48	37	30	34
Klang	7	50	12	11	33	14	2	8	16	6	6	13	11	34
Petaling Jaya	4	0	9	17	20	12	2	7	10	3	3	4	8	19
Kuala Selangor	8	21	0	2	13	4	0	0	10	0	0	5	2	16
Putrajaya			1	1	22	30	13	13	7	8	3	2	9	31
Batu Muda									21	17	15	25	21	43

Rajah 1.1 Malaysia : Bilangan Hari Tidak Sihat, Lembah Klang, 2001-2014

Figure 1.1 Malaysia : Number of Unhealthy Days, Klang Valley, 2001 - 2014

Nota 1: Bacaan adalah berdasarkan IPU Maksimum Harian

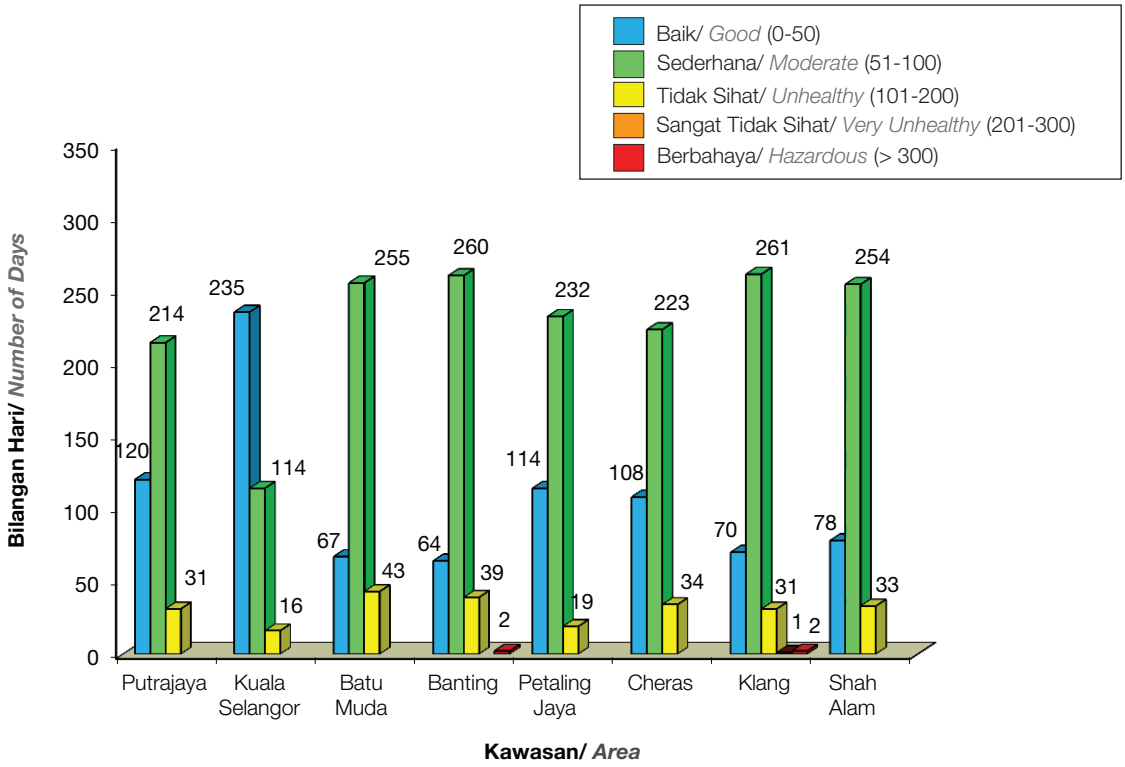
Note 1: Reading based on Daily Maximum API

Nota 2: Stesen di Banting, Putrajaya dan Batu Muda mula beroperasi masing-masingnya pada 2010, 2003 dan 2009

Note 2: Stations in Banting, Putrajaya & Batu Muda have started operation since 2010, 2003 & 2009, respectively

Nota 3: Stesen di Kajang tidak lagi beroperasi semenjak 2011

Note 3: Station in Kajang has been in operation since 2011.



Rajah 1.2 Malaysia : Lembah Klang, Status Kualiti Udara, 2014
Figure 1.2 Malaysia : Klang Valley Air Quality Status, 2014

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

Wilayah Utara

Secara keseluruhan, status kualiti udara di utara Pantai Barat Semenanjung Malaysia yang meliputi Negeri Perlis, Negeri Kedah, Negeri Pulau Pinang dan Negeri Perak adalah baik dan sederhana sepanjang masa. Walau bagaimanapun, Manjung mencatatkan 1 hari status kualiti udara sangat tidak sihat dan 8 hari status kualiti udara tidak sihat disebabkan pencemaran jerebu merentas sempadan. Stesen lain yang mencatatkan status kualiti udara tidak sihat adalah Tanjung Malim dan Sungai Petani (masing-masing 13 hari), Taiping (6 hari), Alor Setar (1 hari), Seberang Jaya (8 hari), USM Pulau Pinang (9 hari), Perai (2 hari), Ipoh (5 hari) dan Tasek (4 hari). Status kualiti udara tidak sihat di kawasan-kawasan berkenaan adalah disebabkan oleh pencemar O_3 dan PM_{10}.

Northern Region

The overall air quality of the northern region of the West Coast of Peninsular Malaysia covering Perlis, Kedah, Pulau Pinang and Perak, was between good to moderate most of the time. However, Manjung recorded 1 very unhealthy day and 8 unhealthy days due to transboundary haze pollution. Unhealthy days were also recorded in other stations namely Tanjung Malim and Sungai Petani (13 days respectively), Taiping (6 days), Alor Setar (1 day), Seberang Jaya (8 days), USM Pulau Pinang (9 days), Perai, (2 days), Ipoh (5 days) and Tasek (4 days). Unhealthy days recorded at those areas were mainly due to O_3 and PM_{10} pollutants.

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

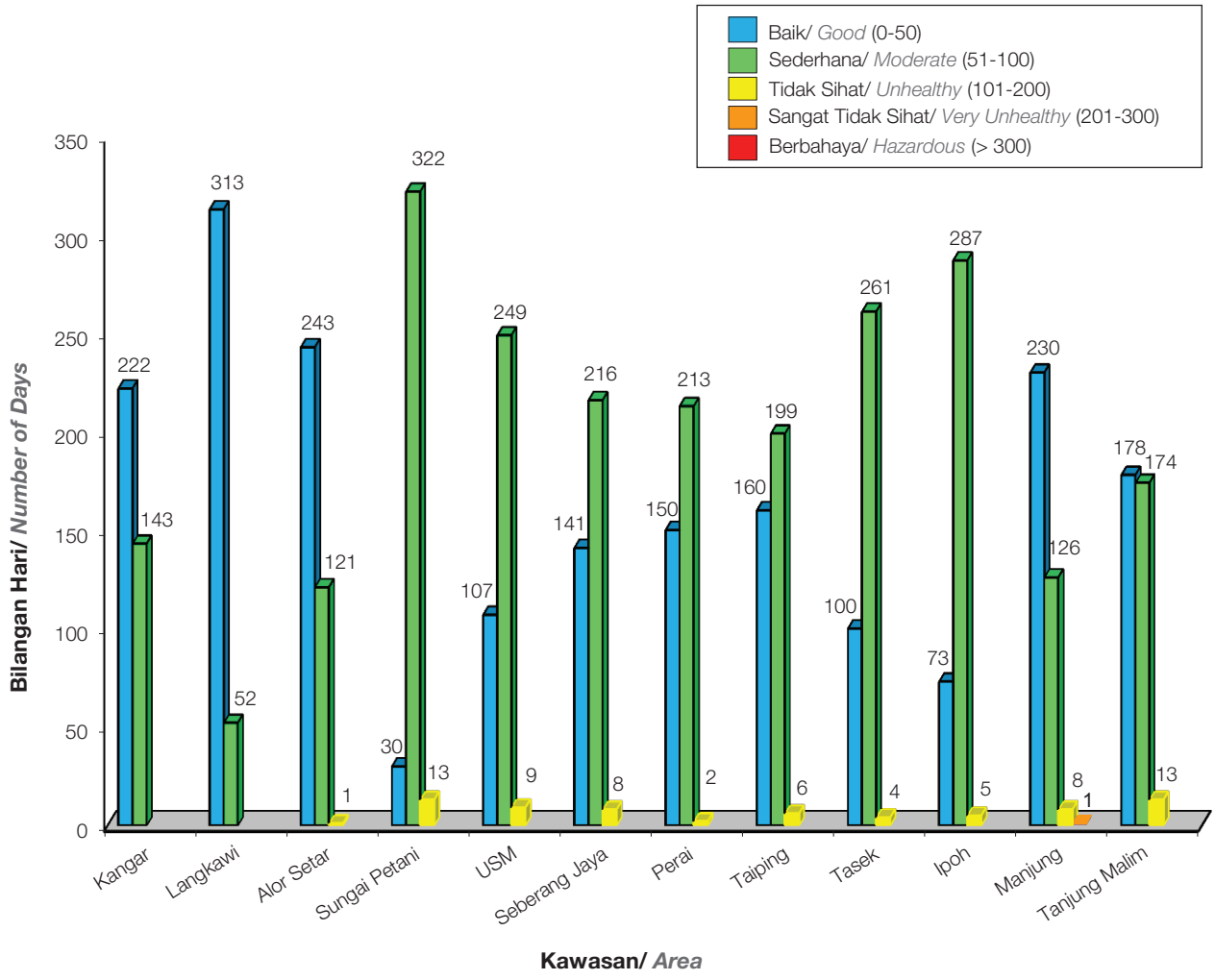
__Figure 1.3__ shows the overall air quality status for the northern region of the West Coast of Peninsular Malaysia.

Wilayah Selatan

Kualiti udara di wilayah selatan Pantai Barat Semenanjung Malaysia (Negeri Sembilan, Negeri Melaka dan Negeri Johor) adalah baik dan sederhana pada kebanyakan masa, kecuali terdapat beberapa hari yang mencatatkan status kualiti udara tidak sihat iaitu Nilai (14), Seremban (18), Port Dickson (10), Bukit Rambai (6), Melaka (4), Muar (5), Larkin (3), and Kota Tinggi (3). Status kualiti udara tidak sihat di kawasan-kawasan berkenaan adalah disebabkan oleh pencemar O_3 dan PM_{10}. **Rajah 1.4** menunjukkan status kualiti udara secara keseluruhan bagi Wilayah Selatan di Pantai Barat Semenanjung Malaysia.

Southern Region

In the southern region of the West Coast of Peninsular Malaysia (Negeri Sembilan, Melaka and Johor) the air quality was also between good to moderate most of the time, with the exception of a few unhealthy days in Nilai (14), Seremban (18), Port Dickson (10), Bukit Rambai (6), Melaka (4), Muar (5), Larkin (3),and Kota Tinggi (3). Unhealthy days recorded at those areas were mainly due to O_3 and PM_{10} pollutants. __Figure 1.4__ shows the overall air quality status for Southern Region of the West Coast of Peninsular Malaysia.

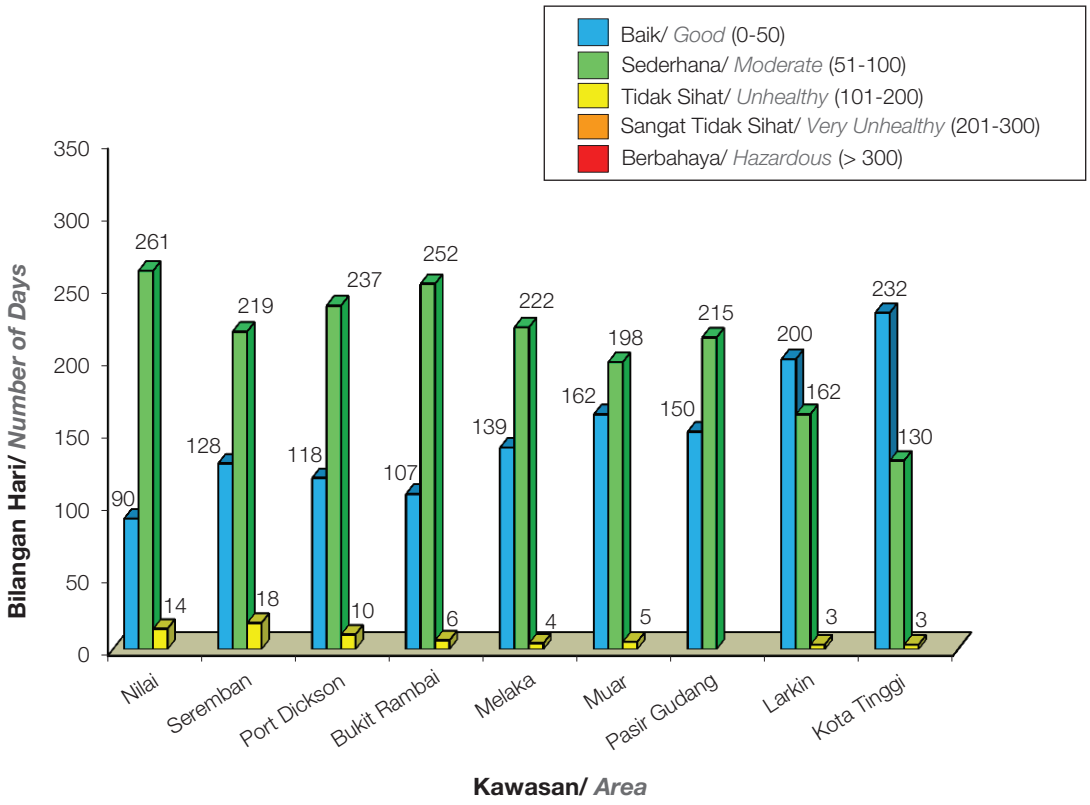


Rajah 1.3 Malaysia : Status Kualiti Udara, Wilayah Utara Pantai Barat Semenanjung Malaysia, 2014

Figure 1.3 Malaysia : Air Quality Status, Northern Region of The West Coast Peninsular Malaysia, 2014

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian

Note: Reading based on daily Maximum API



Rajah 1.4 Malaysia : Status Kualiti Udara, Wilayah Selatan Pantai Barat Semenanjung Malaysia, 2014

Figure 1.4 Malaysia : Air Quality Status, Southern Region of The West Coast Peninsular Malaysia, 2014

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian

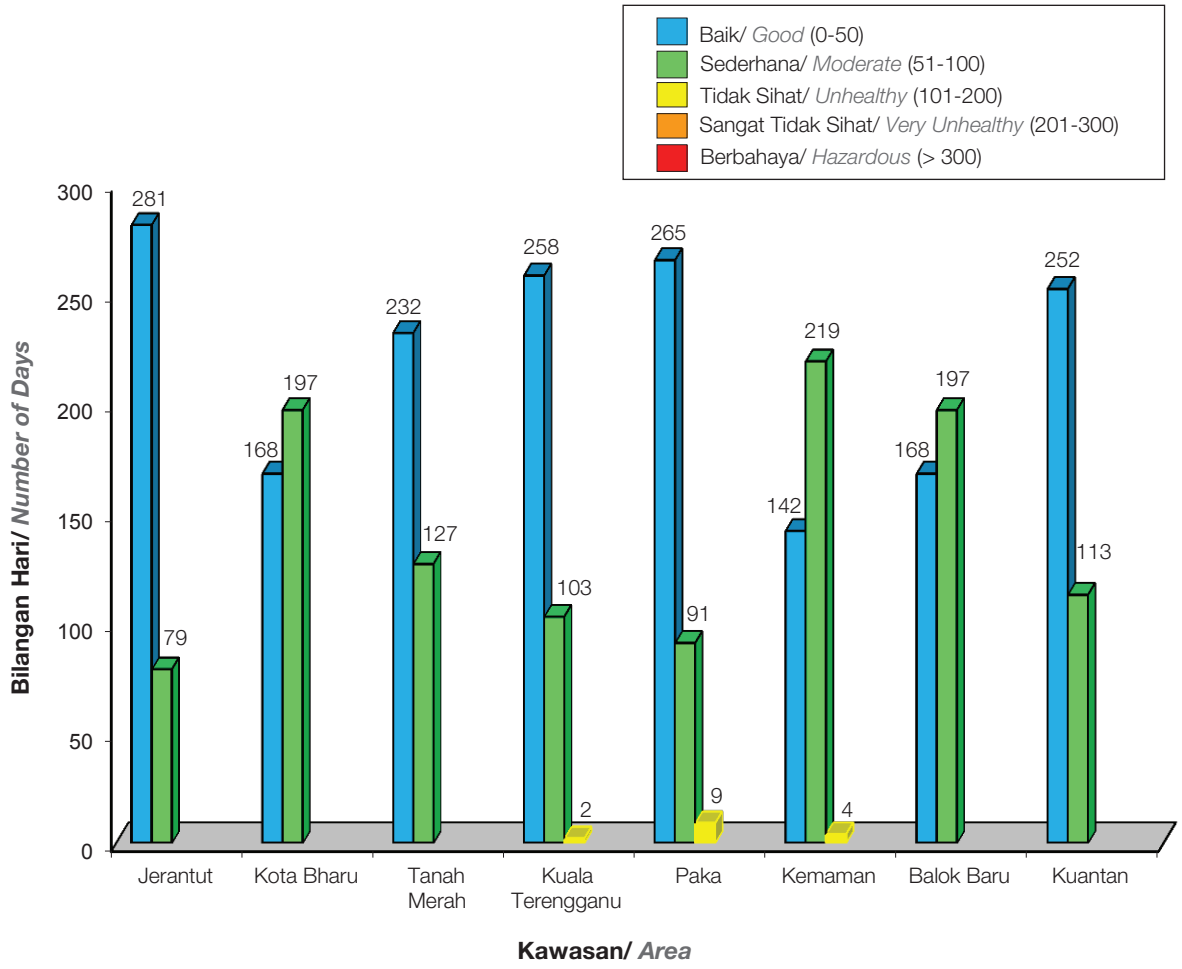
Note: Reading based on daily Maximum API

Status Kualiti Udara di Pantai Timur

Kualiti udara di Pantai Timur Semenanjung Malaysia (Negeri Pahang, Negeri Terengganu, Negeri Kelantan dan timur Negeri Johor) kekal berstatus baik dan sederhana pada kebanyakan masa, kecuali terdapat beberapa hari yang mencatatkan status kualiti udara tidak sihat semasa musim kering iaitu pada bulan Jun hingga September iaitu di Kuala Terengganu (2), Paka (9), Kemaman (4). Status kualiti udara tidak sihat di kawasan-kawasan berkenaan adalah disebabkan oleh pencemar PM_{10} semasa episod jerebu di peringkat tempatan. Status kualiti udara di Pantai Timur Semenanjung Malaysia secara keseluruhan adalah seperti di **Rajah 1.5**.

Air Quality Status in the East Coast

*In the East Coast of Peninsular Malaysia (Pahang, Terengganu, Kelantan and East Johor) the air quality remained between good to moderate most of the time, with the exception of a few unhealthy days during the dry period of June to September which are in Kuala Terengganu (2), Paka (9), Kemaman (4). Unhealthy days recorded at those areas were due to PM_{10} pollutant during local haze episode. The overall air quality status in the East Coast of Peninsular Malaysia is shown in **Figure 1.5**.*



Rajah 1.5 Malaysia : Status Kualiti Udara, Pantai Timur Semenanjung Malaysia, 2014

Figure 1.5 Malaysia : Air Quality Status, East Coast Peninsular Malaysia, 2014

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian

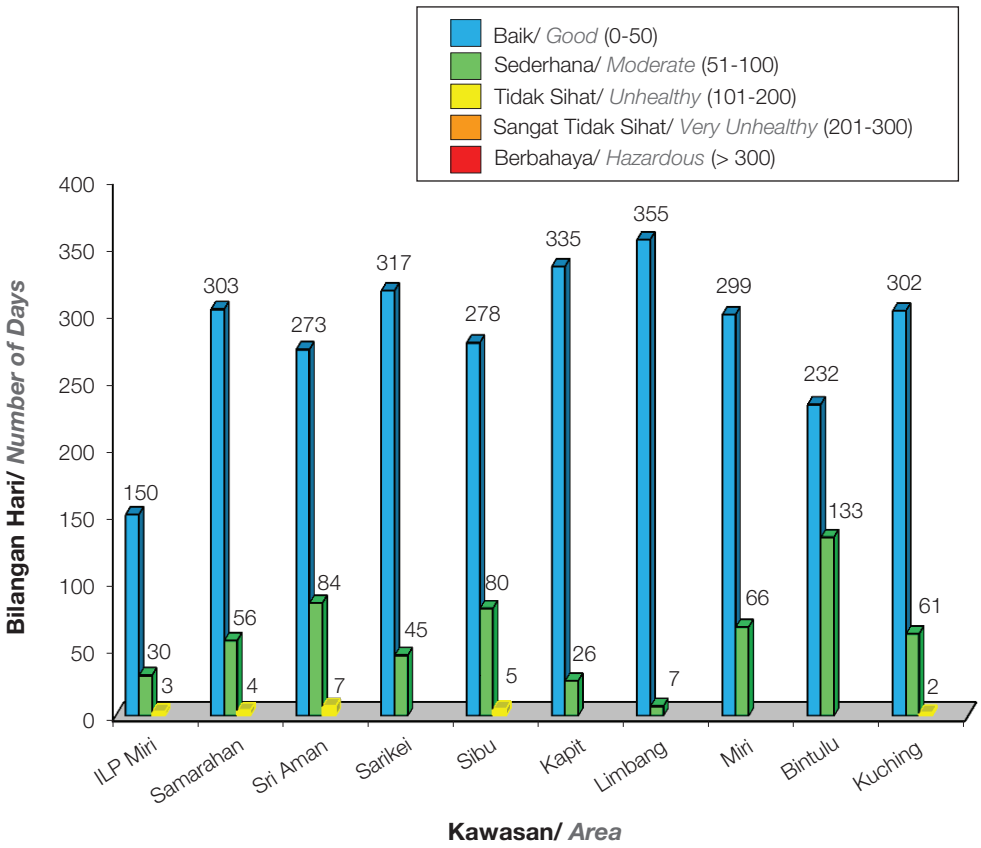
Note: Reading based on daily Maximum API

Status Kualiti Udara di Sabah, Labuan dan Sarawak

Kualiti udara di Sabah, Labuan dan Sarawak kekal berstatus baik dan sederhana pada kebanyakan masa. Hanya beberapa tempat di Sarawak mencatatkan status kualiti udara tidak sihat iaitu di ILP Miri (3), Samarahan (4), Sri Aman (7), Sibu (5) dan Kuching (2). Status kualiti udara tidak sihat di kawasan-kawasan berkenaan adalah disebabkan oleh pencemar PM_{10} semasa episod jerebu merentas sempadan. 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 most of the time. Only few places in Sarawak recorded unhealthy days ILP Miri (3), Samarahan (4), Sri Aman (7), Sibu (5) and Kuching (2). Unhealthy days recorded at those areas were due to PM_{10} pollutant during transboundary haze episode. 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.*

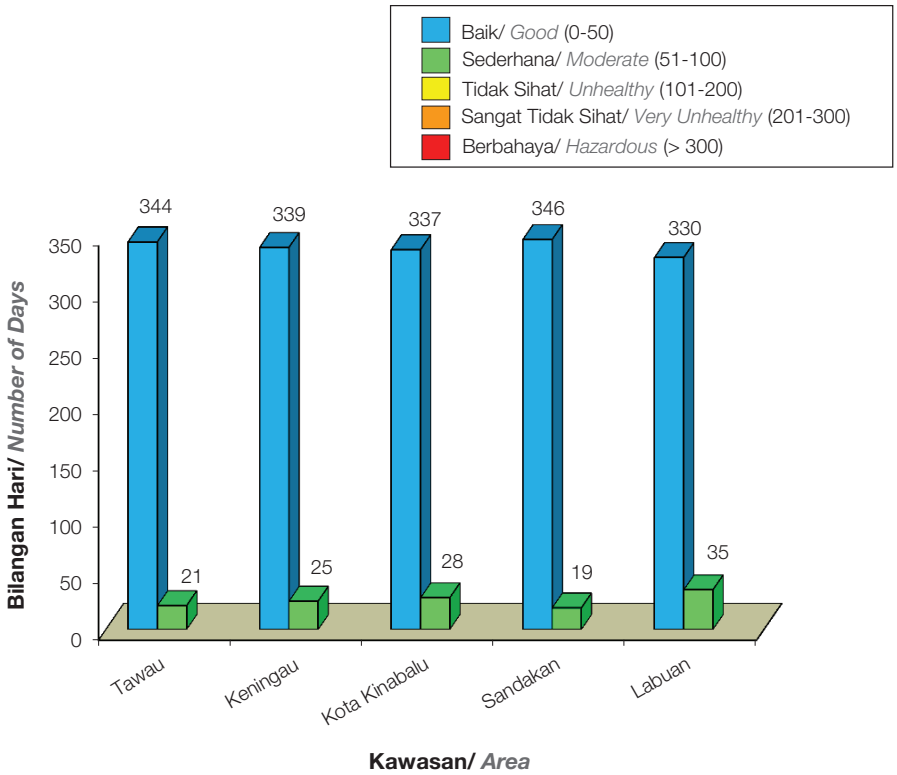


Rajah 1.6 Malaysia : Status Kualiti Udara, Sarawak, 2014

Figure 1.6 Malaysia : Air Quality Status, Sarawak, 2014

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian

Note: Reading based on daily Maximum API



Rajah 1.7 Malaysia : Status Kualiti Udara, Sabah dan Labuan, 2014

Figure 1.7 Malaysia : Air Quality Status, Sabah and Labuan, 2014

Nota: Bacaan adalah berdasarkan IPU Maksimum Harian

Note: Reading based on daily Maximum API

TREN KUALITI UDARA

Lima (5) pencemar udara iaitu kumin pepejal (PM_{10}), ozon permukaan bumi (O_3), sulfur dioksida (SO_2), nitrogen dioksida (NO_2) dan karbon monoksida (CO) dipantau secara berterusan di 52 buah lokasi. Tren kualiti udara dari tahun 2000 hingga 2014 ditentukan dengan mengambilkira purata data kualiti udara tahunan daripada stesen-stesen pengawasan dan merujuk kepada Garis Panduan Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Jadual 1.2**.

AIR QUALITY TREND

Five (5) air pollutants, namely particulate matter (PM_{10}), ozone (O_3), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) were monitored continuously at 52 locations. The air quality trend for the period of 2000 to 2014 was computed by averaging direct measurement from the monitoring sites on a yearly basis and cross-reference with Malaysia Ambient Air Quality Guidelines as shown in ***Table 1.2****.*

Bahan Pencemar/ ***Pollutant***	**Masa Purata/** ***Averaging Time***	**Garis Panduan Malaysia/** ***Malaysia Guidelines***	
		ppm	**(µg/m³)**
Ozon/ *Ozone*	*1 Hour* *8 Hours*	0.10 0.06	200 120
Karbon Dioksida/ *Carbon Monoxide*	*1 Hour* *8 Hours*	30.0 9.0	35** 10**
Nitrogen Dioksida/ *Nitrogen Dioxide*	*1 Hour* *24 hours*	0.17 0.04	320
Sulfur Dioksida/ *Sulphur Dioxide*	*1 hour* *24 Hours*	0.13 0.04	350 105
Pepejal Terampai (PM_{10}) *Particulate Matter (PM_{10})*	*24 Hours* *12 Months*		150 50
Total Suspended Particulate (TSP)/	*24 Hours* *12 Months*		260 90
Besi/ *Lead*	*3 Months*		1.5

*Nota/ Note : ** mg/m³*

Jadual 1.2 Malaysia: Garis Panduan Kualiti Udara Ambien Malaysia

Table 1.2 Malaysia: Ambient Air Quality Guidelines

Kumin Pepejal (PM_{10})

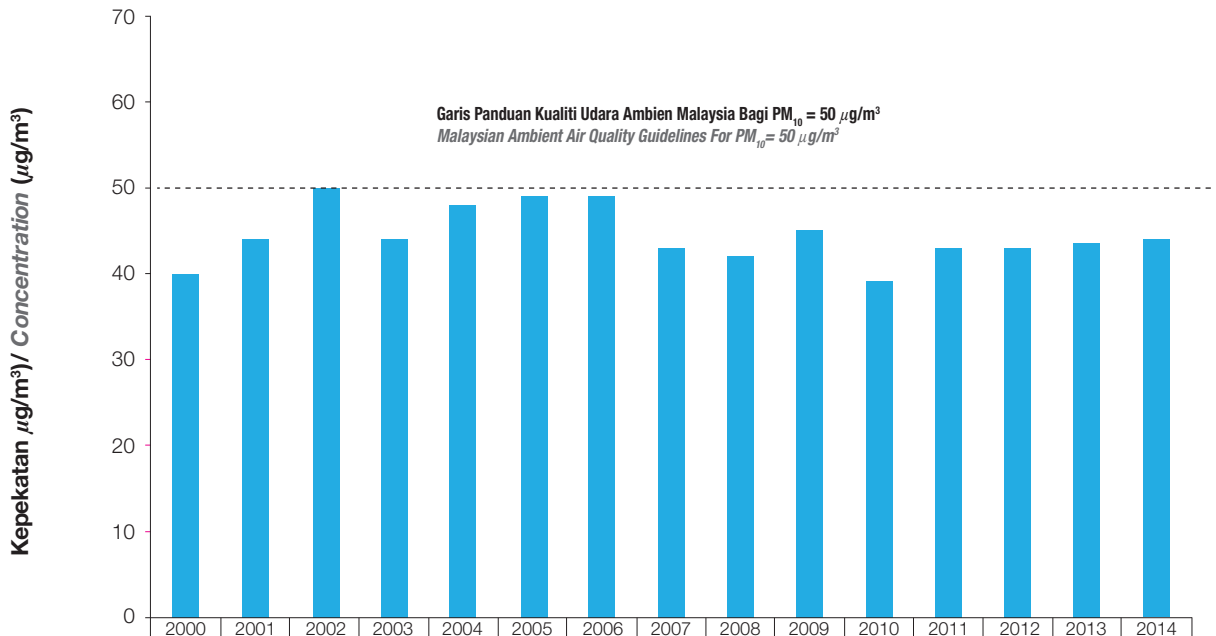
Pada tahun 2014, nilai purata tahunan PM_{10} dalam udara ambien adalah 44 µg/m^3 iaitu di bawah had yang ditetapkan dalam Garis Panduan Kualiti Udara Ambien Malaysia iaitu sebanyak 50 µg/m^3. Tiada sebarang perubahan yang ketara bagi PM_{10} berbanding tahun 2013. Kejadian kebakaran tanah gambut dalam negara dan jerebu merentas sempadan dari Sumatera dan Kalimantan, Indonesia telah menyumbang kepada bacaan PM_{10} yang tinggi dicatatkan di beberapa kawasan di Lembah Klang, Perak, Johor, Melaka dan Negeri Sembilan.

Tren purata tahunan kepekatan PM_{10} dalam udara ambien antara tahun 2000 hingga 2014 didapati mematuhi Garis Panduan Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Rajah 1.8**. Berdasarkan kategori guna tanah, nilai kepekatan PM_{10} adalah mematuhi Garis Panduan Kualiti Udara Ambien Malaysia seperti yang ditunjukkan dalam **Rajah 1.8 (a)**.

Particulate Matter (PM_{10})

In 2014, the annual average value of PM_{10} in the ambient air was 44 µg/m^3 which is below the Malaysian Ambient Air Quality Guidelines value of 50 µg/m^3. There was no significant change of PM_{10} concentration compared to the 2013 level.Incidences of local peatland fires and transboundary smoke haze from Sumatra and Kalimantan, Indonesia had contributed to the higher PM_{10} recorded intermittently in several areas in Klang Valley, Perak, Johor, Melaka and Negeri Sembilan.

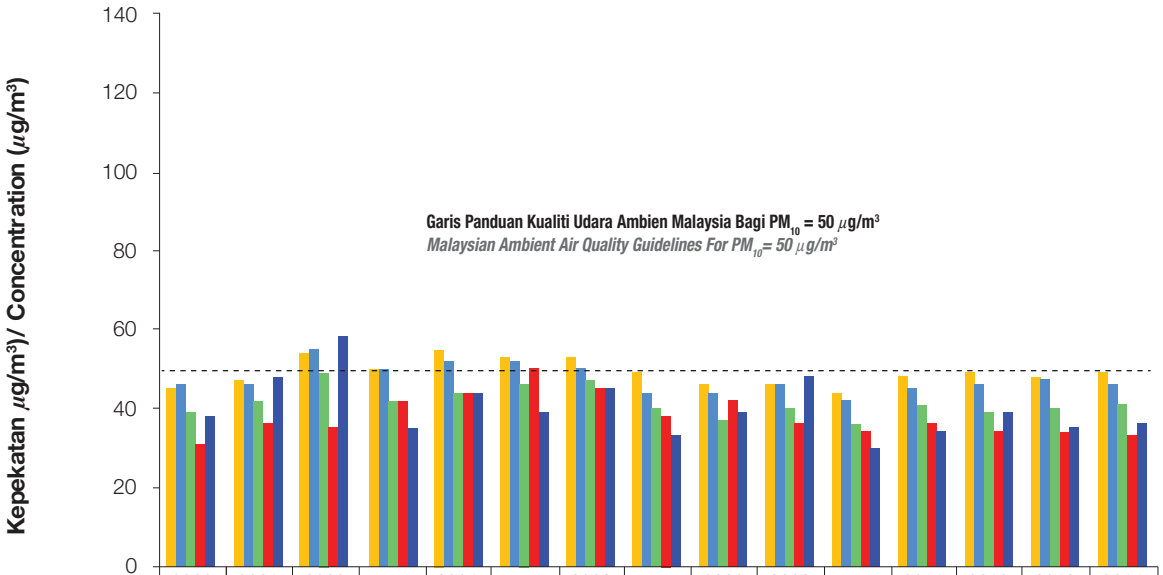
*The trend of the annual average levels of PM_{10} concentration in the ambient air between 2000 and 2014 complied to the Malaysian Ambient Air Quality Guidelines as shown in **Figure 1.8**. Based on land use categories, PM_{10} concentration was in compliance with Malaysian Ambient Air Quality Guidelines as shown in **Figure 1.8(a)**.*



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Concentration/ Kepekatan	40	44	50	44	48	49	49	43	42	45	39	43	43	44	44
Number of Sites/ Nombor Lokasi	50	50	50	51	51	51	51	51	51	51	52	52	52	52	52

Rajah 1.8 Malaysia : Purata Kepekatan Tahunan Kumin Pepejal (PM_{10}), 2000 - 2014

Figure 1.8 Malaysia : Annual Average Concentration of Particulate Matter (PM_{10}), 2000 - 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industri/ *Industrial*	45	47	54	50	55	53	53	49	46	46	44	48	49	48	49
Bandar/ *Urban*	46	46	55	50	52	52	50	44	44	46	42	45	46	48	46
Luar Bandar/ *Sub Urban*	39	42	49	42	44	46	47	40	37	40	36	41	39	40	41
Background	31	36	35	42	44	50	45	38	42	36	34	36	34	34	33
Rural	38	48	58	35	44	39	45	33	33	48	30	34	39	35	36

Rajah 1.8(a) Malaysia : Purata Kepekatan Tahunan Kumin Pepejal (PM_{10}), Mengikut Guna Tanah 2000 - 2014

Figure 1.8(a) Malaysia : Annual Average Concentration of Particulate Matter (PM_{10}), by Land Use 2000 - 2014

Ozon Permukaan Bumi (O_3)

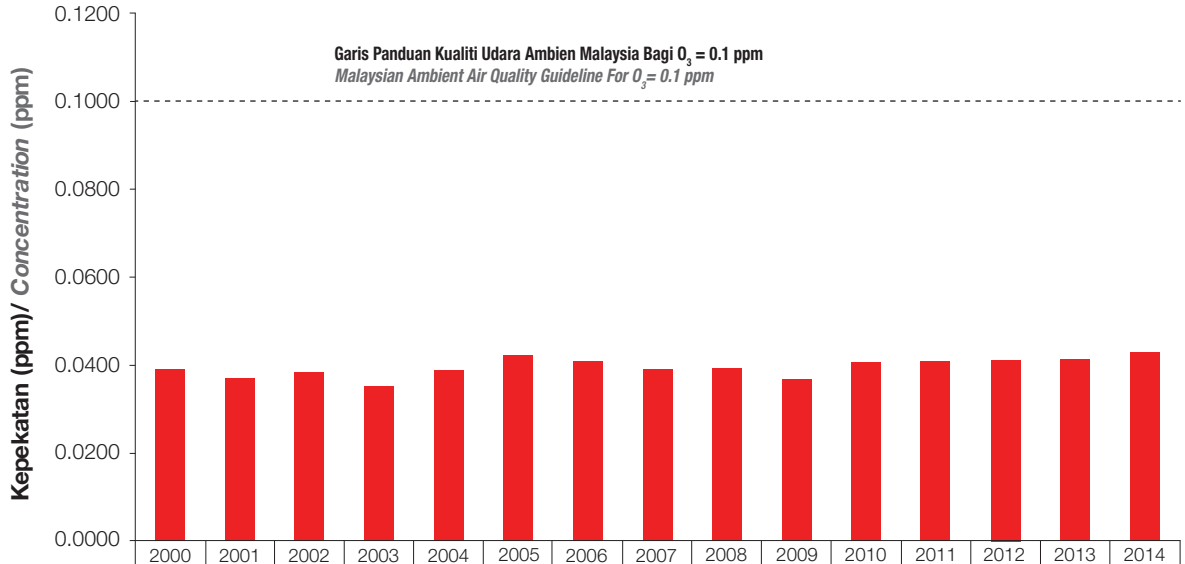
Pada tahun 2014, purata tahunan kepekatan maksimum harian ozon adalah meningkat sebanyak 4 peratus berbanding tahun 2013. Walau bagaimanapun, tren keseluruhan purata tahunan kepekatan maksimum ozon dalam udara ambien dari tahun 2000 hingga 2014 adalah mematuhi had sebanyak 0.1 ppm seperti yang ditetapkan dalam Garis Panduan Kualiti Udara Ambien Malaysia dan tren tersebut adalah seperti yang ditunjukkan dalam **Rajah 1.9**.

Rajah 1.9(a) menunjukkan kepekatan ozon untuk pelbagai kategori guna tanah dari tahun 2000 hingga 2014. Kawasan bandar mencatatkan bacaan ozon lebih tinggi disebabkan oleh jumlah trafik yang lebih tinggi dan keadaan atmosfera yang kondusif menyebabkan pembentukan ozon. Pencemaran ozon juga ketara di beberapa kawasan bandar dan sub-bandar disebabkan oleh pergerakan angin yang membawa pencemar ozon yang terhasil daripada tindakbalas oksid-oksid nitrogen (NO_x) dan sebatian organik meruap (VOC) daripada kenderaan bermotor dan industri.

Ground Level Ozone (O_3)

In 2014, the annual average daily maximum one-hour ozone concentrations slightly increased by 4 percent compared to 2013. However, the overall trend on the annual average daily maximum one-hour ozone concentrations in ambient air from 2000 to 2014 were well below the limit of 0.1 ppm as stipulated in the Malaysian Ambient Quality Guidelines and the trend is as shown in ***Figure 1.9****.*

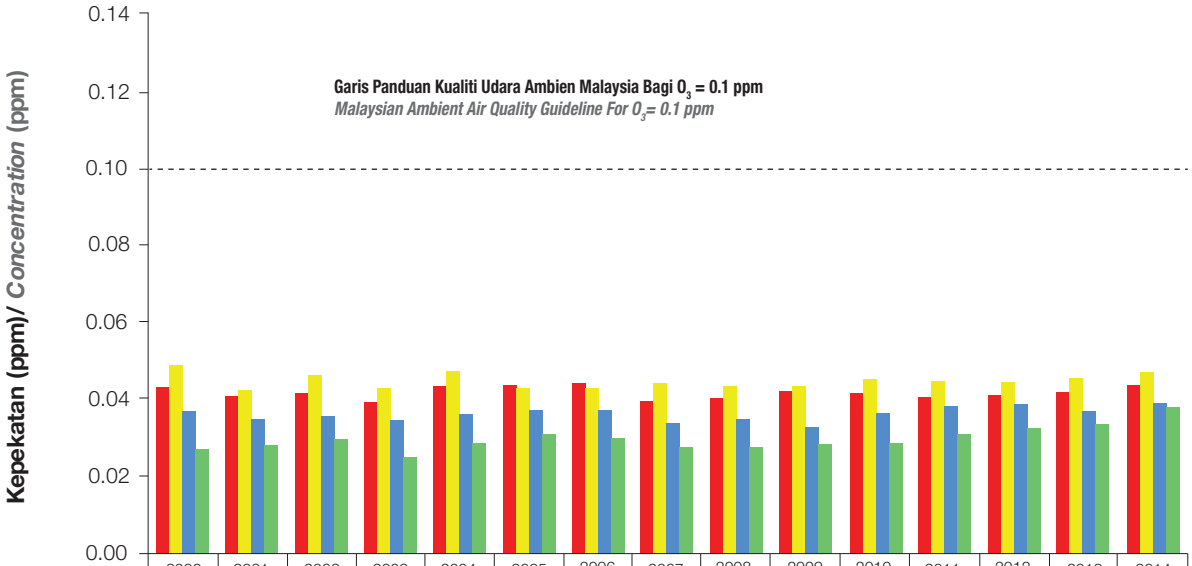
Figure 1.9(a) *shows the ozone concentration for various land use categories between 2000 and 2014. Urban areas recorded higher levels of ozone due to higher traffic volume and a conducive atmospheric condition resulting in its formation. Ozone pollution also dominant in some rural and sub urban areas due to downwind effect transporting ozone pollution from the sources of ozone precursors namely nitrogen oxides (NO_x) and volatile organic compound (VOC) emitted from motor vehicles and industries.*



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kepekatan/ *Concentration*	0.0390	0.0370	0.0382	0.0353	0.0388	0.0421	0.0408	0.0390	0.0392	0.0398	0.0406	0.0408	0.0409	0.0413	0.0429
Nombor Lokasi/*Number of Sites*	39	39	39	41	41	41	41	41	41	41	41	41	41	41	41

Rajah 1.9 Malaysia : Purata Kepekatan Tahunan Ozone (O_3), 2000 - 2014

Figure 1.9 Malaysia : Annual Average Concentration of Ozone (O_3), 2000 - 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industri/ *Industrial*	0.04300	0.40500	0.04130	0.03890	0.04290	0.04310	0.04400	0.03910	0.03990	0.04180	0.04120	0.04016	0.04070	0.0417	0.0431
Bandar/ *Urban*	0.04900	0.04600	0.04610	0.04280	0.04710	0.04280	0.04285	0.04410	0.04350	0.04370	0.04530	0.04472	0.04410	0.0457	0.0469
Luar Bandar/ *Sub Urban*	0.03700	0.03480	0.03550	0.03450	0.03630	0.03730	0.03714	0.03410	0.03510	0.03310	0.03640	0.03833	0.03860	0.0370	0.0388
Background	0.02700	0.02790	0.02980	0.02500	0.02870	0.03110	0.03000	0.02770	0.02780	0.02840	0.02870	0.03085	0.03270	0.0335	0.0378

Rajah 1.9(a) Malaysia : Purata Kepekatan Tahunan Ozone (O_3), mengikut Guna Tanah, 2000 - 2014

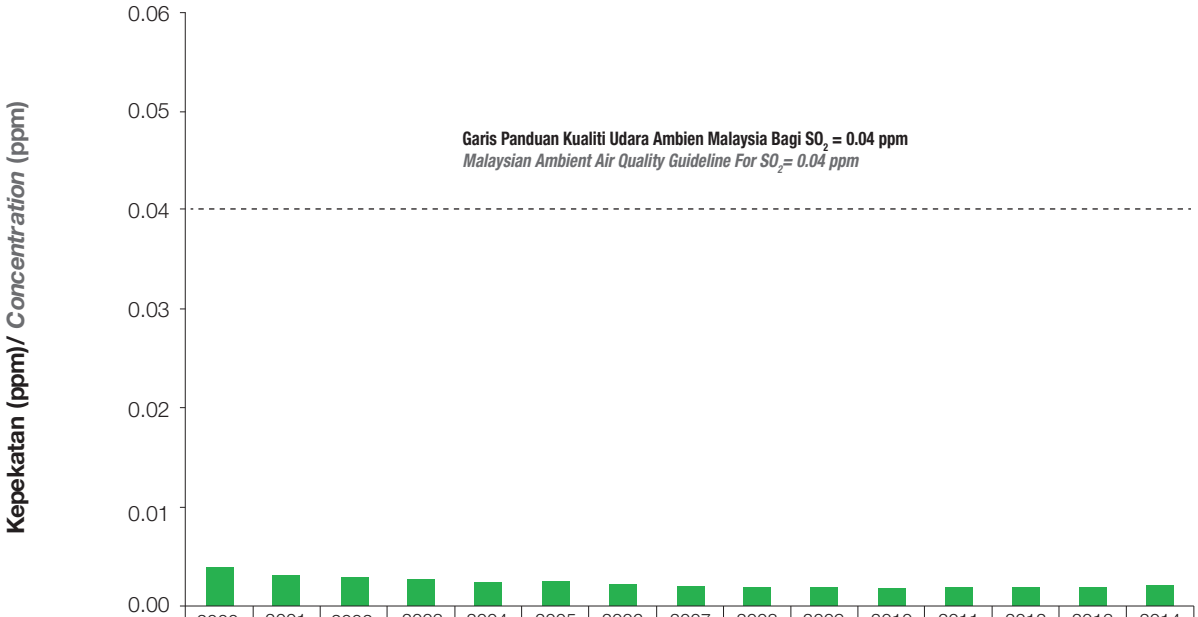
Figure 1.9(a) Malaysia : Annual Average Concentration of Ozone (O_3), by Land Use, 2000 - 2014

Sulfur Dioksida (SO_2)

Secara umumnya, purata kepekatan tahunan SO_2 menunjukkan tren penurunan dari tahun 2000 hingga 2014 **(Rajah 1.10)** dan ia adalah jauh di bawah had sebanyak 0.04 ppm seperti yang ditetapkan dalam Garis Panduan Kualiti Udara Ambien Malaysia. Ini adalah disebabkan oleh penggunaan bahan api berkualiti EURO-2M yang lebih baik di negara ini bermula dari bulan September 2009 dan penguatkuasaan yang lebih ketat oleh JAS serta penggunaan gas asli secara meluas dalam proses industri dan kegunaan kenderaan. **Rajah 1.10(a)** menunjukkan kepekatan purata tahunan bagi sulfur dioksida mengikut kategori guna tanah.

Sulphur Dioxide (SO_2)

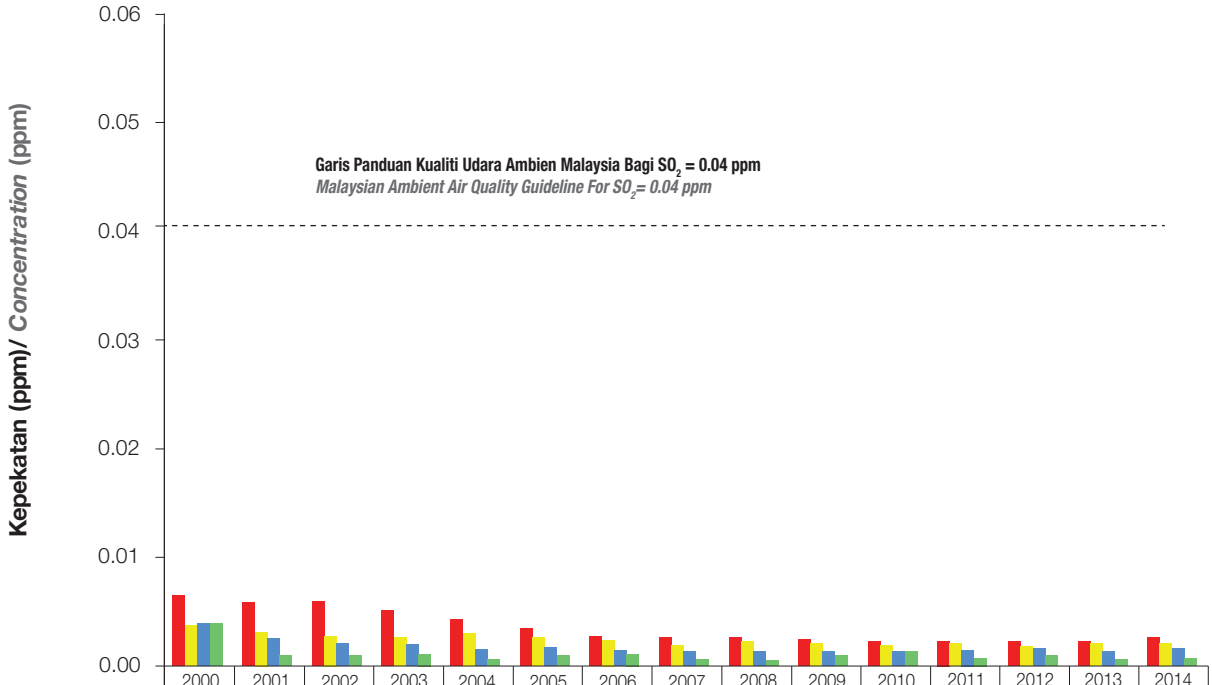
Generally, the annual average SO_2 concentration shows a declining trend between 2000 and 2014 ***(Figure 1.10)*** *and it is well below the limit of 0.04 ppm as stipulated in the Malaysian Ambient Air Quality Guidelines. This was attributed by the use of better fuel quality EURO-2M in this country starting from September 2009 and also stricter enforcement by the DOE as well as widely use of natural gas for industrial combustion process and vehicles.* ***Figure 1.10(a)*** *shows the annual average concentrations of sulphur dioxide from different categories of land use.*



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kepekatan/ *Concentration*	0.0038	0.003	0.0029	0.0026	0.0023	0.0024	0.0021	0.0019	0.0018	0.0018	0.0017	0.0018	0.0018	0.0018	0.0020
Nombor Lokasi/ *Number of Sites*	43	43	43	44	44	44	44	44	44	44	44	44	44	44	44

Rajah 1.10 Malaysia : Purata Kepekatan Tahunan Sulfur Dioksida (SO_2), 2000 - 2014

Figure 1.10 Malaysia : Annual Average Concentration of Sulphur Dioxida (SO_2), 2000 - 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industri/ *Industrial*	0.0064	0.0057	0.0058	0.005	0.0042	0.0034	0.0027	0.0025	0.0025	0.0023	0.0022	0.0022	0.0022	0.0022	0.0026
Bandar/ *Urban*	0.0037	0.0030	0.0027	0.0026	0.0029	0.0025	0.0023	0.0019	0.0022	0.0020	0.0019	0.0020	0.0017	0.0020	0.0020
Luar Bandar/ *Sub Urban*	0.0038	0.0024	0.0020	0.0018	0.0015	0.0016	0.0014	0.0013	0.0013	0.0013	0.0012	0.0014	0.0014	0.0013	0.0015
Background	0.0013	0.0009	0.0009	0.0010	0.0006	0.0009	0.0010	0.0005	0.0004	0.0009	0.0014	0.0007	0.0008	0.0005	0.0006

Rajah 1.10(a) Malaysia : Purata Kepekatan Tahunan Sulfur Dioksida (SO_2) Mengikut Guna Tanah, 2000 - 2014

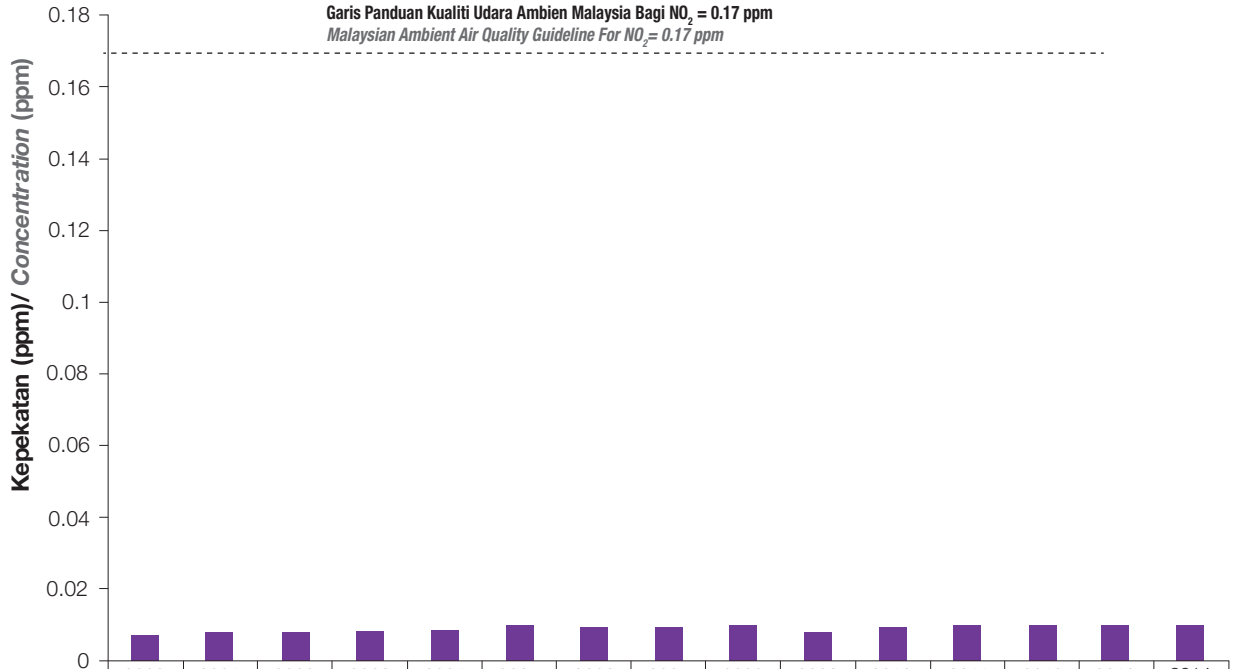
Figure 1.10(a) Malaysia : Annual Average Concentration of Sulphur Dioxida (SO_2) By Land Use, 2000 - 2014

Nitrogen Dioksida (NO_2)

Pada tahun 2014, tiada sebarang perubahan yang ketara bagi NO_2 berbanding tahun 2013. Kepekatan NO_2 kekal tinggi di kawasan bandar dan perindustrian disebabkan oleh peningkatan yang ketara dalam bilangan kenderaan bermotor dan proses pembakaran. Anggaran beban pelepasan NO_2 menunjukkan sebanyak 64.8% adalah daripada loji janakuasa, 26.7% daripada pelepasan kenderaan bermotor, 7.1% daripada industri dan 1.4% daripada lain-lain sumber. Kepekatan purata tahunan NO_2 dalam udara ambien dari tahun 2000 hingga 2014 adalah stabil dan berada jauh di bawah had yang ditetapkan dalam Garis Panduan Kualiti Udara Ambien Malaysia. (**Rajah 1.11** dan **Rajah 1.11 (a)**)

Nitrogen Dioxide (NO_2)

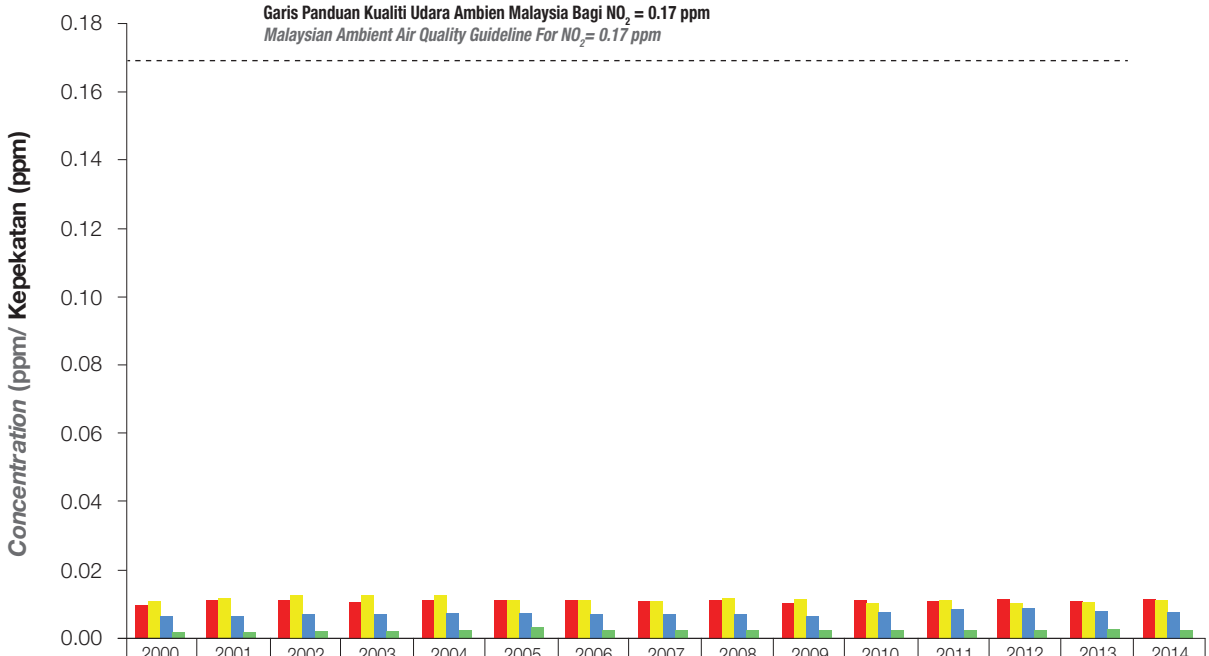
*In 2014, there was no significant change of NO_2 concentration compared to the 2013 level. The NO_2 concentrations remain high in urban and industrial areas mainly due to a significant increase in the number of motor vehicles and combustion processes. Estimate on NO_2 emission load indicates 64.8% was from power plants while 26.7 percent from motor vehicles, 7.1% from industries and 1.4% from other sources. The annual average concentration of NO_2 in the ambient air from 2000 to 2014 remains almost constant and well below the Malaysia Ambient Air Quality Guidelines. (**Figure 1.11** and **Figure 1.11(a)**)*



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kepekatan/ *Concentration*	0.0068	0.0073	0.0078	0.0078	0.0079	0.0095	0.0091	0.0089	0.0094	0.0073	0.0089	0.0094	0.0095	0.0094	0.0094
Nombor Lokasi/ *Number of Sites*	39	43	43	43	44	44	44	44	44	44	44	44	44	44	44

Rajah 1.11 Malaysia : Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2), 2000 - 2014

Figure 1.11 Malaysia : Annual Average Concentration of Nitrogen Dioxida (NO_2), 2000 - 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industrial/ Industri	0.0093	0.0105	0.0106	0.0104	0.0105	0.0105	0.0105	0.0103	0.0105	0.0100	0.0105	0.0104	0.0109	0.0109	0.0110
Urban/ Bandar	0.0104	0.0113	0.0122	0.0123	0.0122	0.0106	0.0105	0.0104	0.0115	0.0110	0.0098	0.0105	0.0101	0.0103	0.0107
Sub Urban/ Luar Bandar	0.0062	0.0062	0.0065	0.0066	0.0068	0.0069	0.0066	0.0065	0.0066	0.0063	0.0073	0.0081	0.0083	0.0077	0.0073
Background	0.0014	0.0013	0.0018	0.0017	0.0020	0.0026	0.0020	0.0022	0.0020	0.0020	0.0019	0.0021	0.0022	0.0023	0.0021

Rajah 1.11(a) Malaysia : Purata Kepekatan Tahunan Nitrogen Dioksida (NO_2) Mengikut Guna Tanah, 2000 - 2014

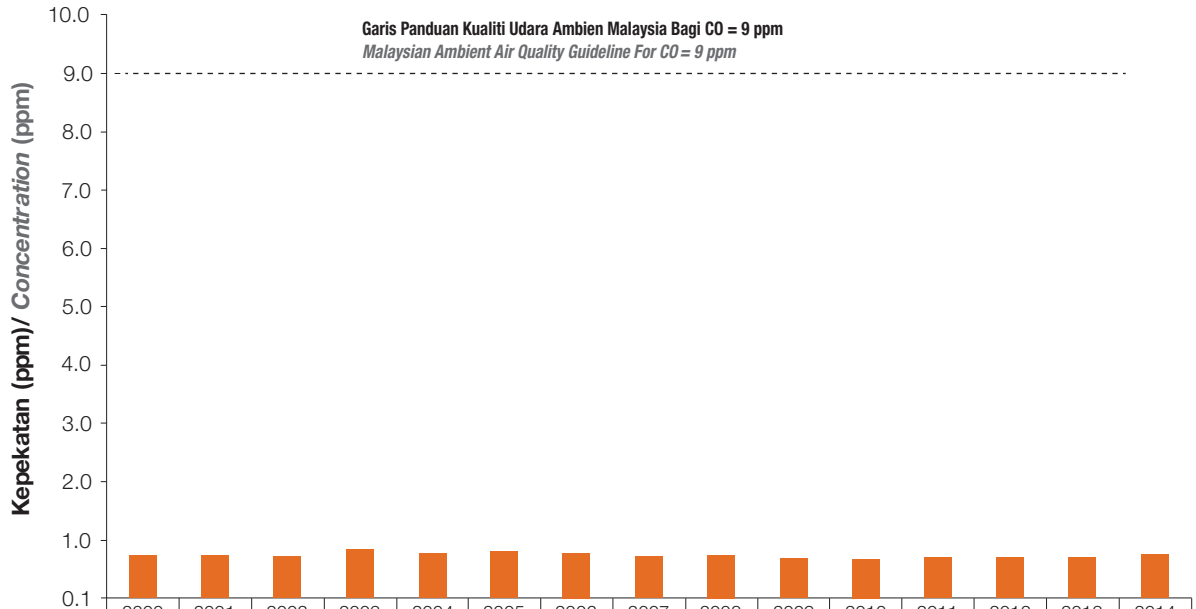
Figure 1.11(a) Malaysia : Annual Average Concentration of Nitrogen Dioxida (NO_2) by Land Use, 2000 - 2014

Karbon Monoksida (CO)

Terdapat sedikit peningkatan iaitu sebanyak 5 peratus tahap kepekatan CO pada tahun 2014 berbanding dengan tahun 2013. Walau bagaimanapun, tren kepekatan CO dari tahun 2000 hingga 2014 adalah stabil. Tahap kepekatan yang dicatatkan juga mematuhi Garis Panduan Kualiti Udara Ambien Malaysia **(Rajah 1.12)**. Di kawasan bandar, kepekatan CO adalah lebih tinggi yang berpunca daripada pelepasan kenderaan bermotor dengan menyumbang sebanyak 95 peratus daripada beban pelepasan CO pada tahun 2014. **Rajah 1.12 (a)** menunjukkan kepekatan CO untuk pelbagai kategori guna tanah.

Carbon Monoxide (CO)

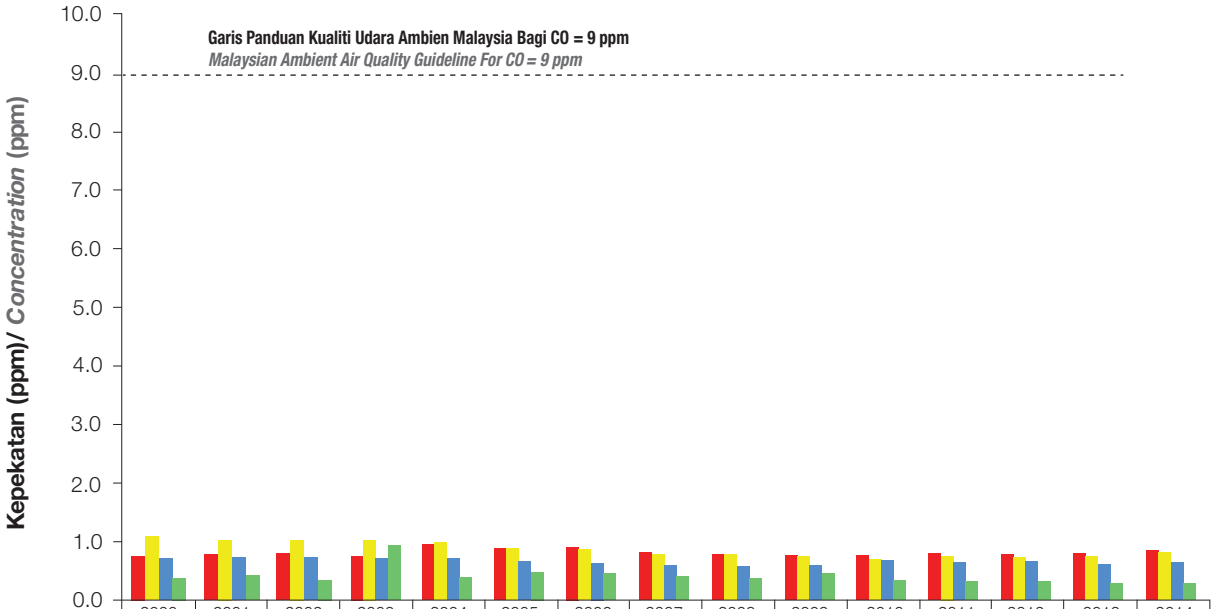
*There was a slight increase of 5 percent CO level in 2014 compared to 2013. However the trend of CO concentration from 2000 to 2014 remains almost constant. The levels recorded were well in compliance to the Malaysian Ambient Air Quality Guidelines **(Figure 1.12)**. In urban areas, the concentration of CO was higher where the main source of emission was motor vehicles which contributed to 95 percent of CO emission load in 2014. **Figure 1.12(a)** shows CO concentrations for various categories of land use.*



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kepekatan/ *Concentration*	0.7120	0.7213	0.6995	0.8325	0.7389	0.7918	0.7649	0.6973	0.7309	0.6752	0.6510	0.6809	0.6827	0.6855	0.7238
Nombor Lokasi/ *Number of Sites*	39	39	39	41	41	41	41	41	41	41	41	41	41	41	41

Rajah 1.12 Malaysia : Purata Kepekatan Tahunan Karbon Monoksida (CO), 2000 - 2014

Figure 1.12 Malaysia : Annual Average Concentration of Carbon Monoxide (CO), 2000 - 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industri/ *Industrial*	0.7390	0.7614	0.7676	0.7405	0.9442	0.8734	0.8830	0.7977	0.7537	0.7501	0.7439	0.7662	0.7576	0.7670	0.8116
Bandar/ *Urban*	1.0710	1.0091	1.9934	1.9981	0.9632	0.8636	0.8529	0.7635	0.7511	0.7288	0.6933	0.7221	0.7004	0.7418	0.7923
Luar Bandar/ *Sub Urban*	0.6890	0.7169	0.7187	0.6768	0.6784	0.6335	0.6150	0.5766	0.5509	0.5775	0.6541	0.6146	0.6447	0.6012	0.6258
Background	0.3470	0.3978	0.3182	0.9145	0.3700	0.4582	0.4500	0.3924	0.3579	0.4379	0.3357	0.3123	0.2932	0.2899	0.2886

Rajah 1.12(a) Malaysia : Purata Kepekatan Tahunan Karbon Monoksida (CO) Mengikut Guna Tanah, 2000 - 2014

Figure 1.12(a) Malaysia : Annual Average Concentration of Carbon Monoxide (CO) by Land Use, 2000 - 2014

Bab 2
Chapter 2

PENGAWASAN BUNYI BISING AMBIEN /
AMBIENT NOISE MONITORING

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PENGAWASAN BUNYI BISING AMBIEN
AMBIENT NOISE MONITORING

PENGAWASAN BUNYI BISING AMBIEN
AMBIENT NOISE MONITORING

Pada tahun 2014, Jabatan Alam Sekitar (JAS) meneruskan pelaksanaan program pengawasan bunyi bising ambien di tiga (3) jenis penerimaan gunatanah yang berbeza iaitu kawasan sensitif bunyi bising, trafik dan industri seperti yang ditunjukkan dalam **Jadual 2.1**.

*In 2014, the Department of Environment (DOE) continue to conduct the ambient noise monitoring programme at three (3) different types of receiving land use namely noise sensitive areas, traffic and industry as shown in **Table 2.1**.*

Kategori *Categories*	**Lokasi** *Location*
Sensitif Bunyi Bising *Noise Sensitive*	Sekolah *School*
	Hospital *Hospital*
	TempatKeagamaan *Place of Worship*
	LapanganTerbang *Airport*
Trafik *Traffic*	Lebuhraya *Highway*
	Jalan Persekutuan *Federal Road*
	JalanLuar Bandar *Suburban Road*
Industri *Industry*	Industri Berat *Heavy Industry*
	Industri Sederhana *Medium Industry*
	Industri Kecil *Small Industry*

Jadual 2.1: Kategori Guna Tanah
Table 2.1: Categories of Land Use

Bagi tujuan pengawasan, 60 minit sampel bunyi bising diukur bagi empat (4) tempoh masa sepanjang hari. Pengukuran tersebut dilaksanakan oleh JAS Negeri. Data yang dikumpul daripada program ini akan memberi manfaat sebagai data asas untuk tujuan perancangan dan pembangunan peraturan bunyi bising pada masa hadapan. Data bunyi

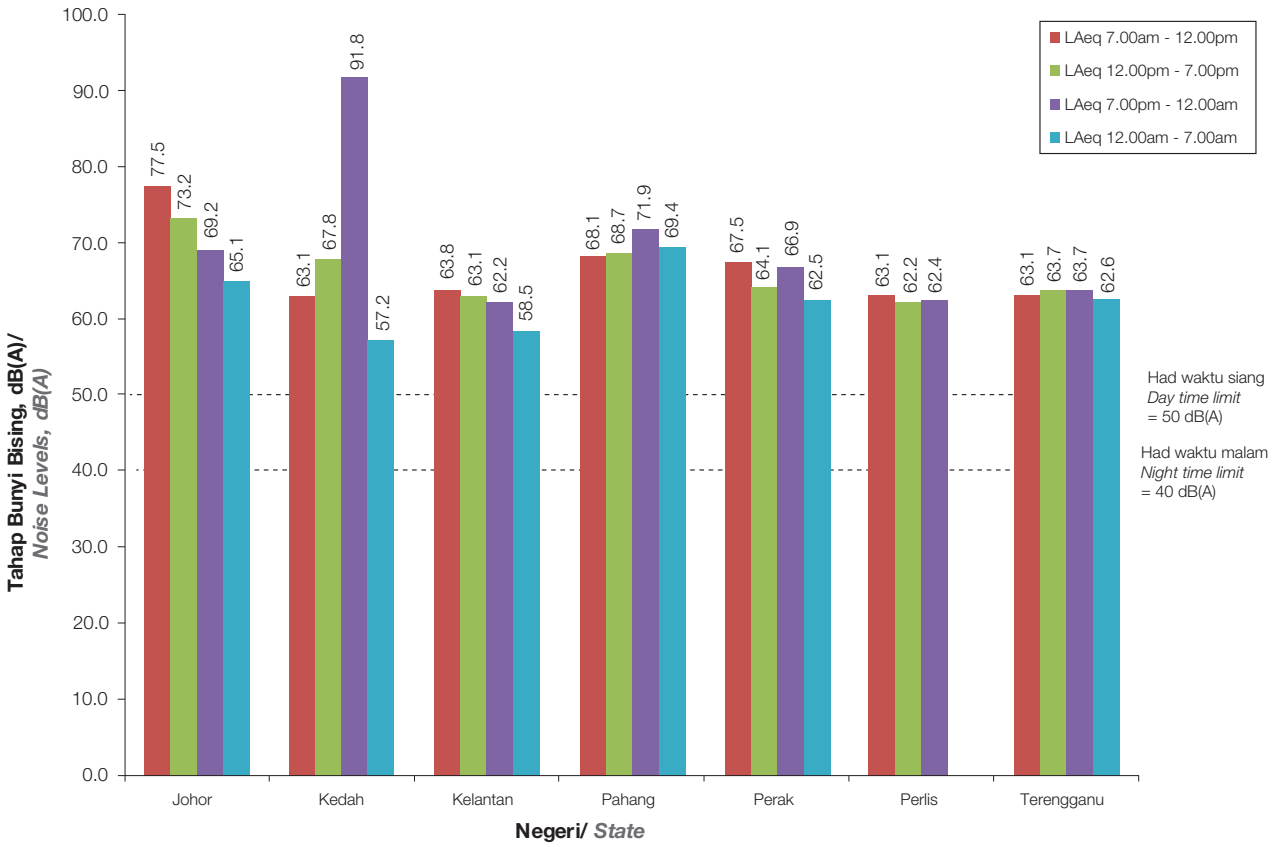
For monitoring purposes, a 60 minutes sample on noise level were measured during four (4) period of the day. Measurements were carried out by the DOE state offices. The data collected from this programme would be beneficial as a baseline data for planning purposes and the development of regulations for noise in the future. The noise data

bising dicatatkan semasa program pengawasan dan perbandingan dibuat dengan Garis Panduan Perancangan Untuk Had Dan Kawalan Bunyi Bising Persekitaran, 2004 yang diterbitkan oleh Jabatan Alam Sekitar.

recorded during the monitoring programme and comparison were made with The Planning Guidelines for Environmental Noise Limits and Control, 2004 published by Department of Environment.

Rajah 2.1 menunjukkan perbandingan tahap bunyi bising di kawasan sensitif seperti sekolah, masjid, lapangan terbang dan hospital. Pada tahun 2014, semua pengawasan di kawasan ini melebihi had waktu siang iaitu 50 dB(A) dan had waktu malam iaitu 40 dB(A) kerana pembangunan pesat di sekitar kawasan itu. Bacaan tertinggi iaitu 91.8 dB(A) dicatatkan di Kedah antara 7.00pm hingga 12.00am dan bacaan terendah iaitu 57.2 dB(A) telah juga dicatatkan di Kedah antara 12.00am hingga 7.00am.

***Figure 2.1** shows a comparison of noise levels in sensitive areas such as school, mosque, airport and hospital. In 2014, all the monitoring in this area exceeded the daytime limit of 50 dB(A) and night time limit of 40 dB(A) due to rapid development surrounding the area. The highest reading of 91.8dB(A) recorded in Kedah between 7.00pm to 12.00am and the lowest reading of 57.2 dB(A) were also recorded in Kedah between 12.00am to 7.00am.*

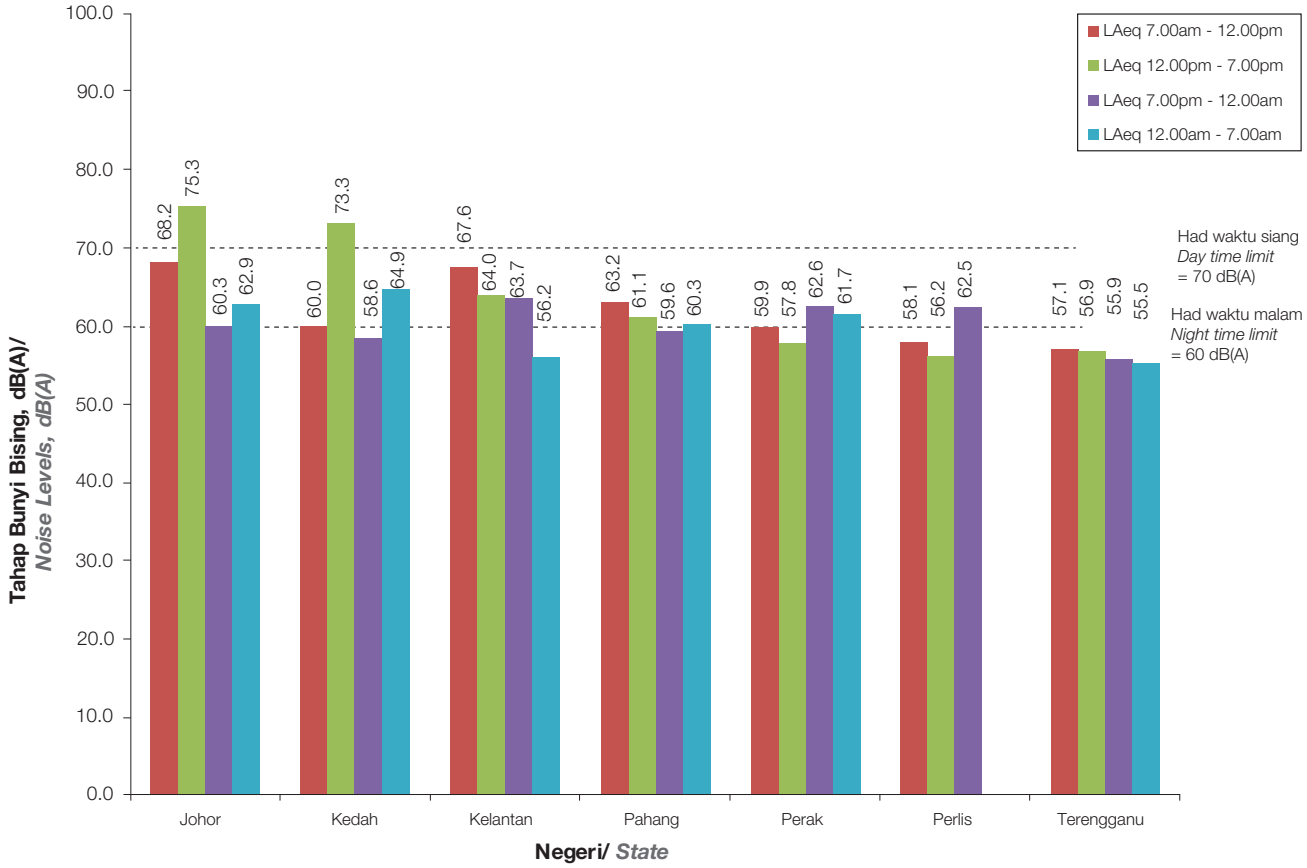


Rajah 2.1: Perbandingan Tahap Bunyi Bising di Kawasan Sensitif Bunyi Mengikut Negeri

Figure 2.1: Comparison of Noise Levels for Noise Sensitive Area by State

Rajah 2.2 menunjukkan perbandingan tahap bunyi bising di pelbagai kawasan industri. Kawasan ini dibahagikan kepada 3 jenis lokasi seperti industri berat, industri sederhana dan industri kecil. Ia menunjukkan bacaan tertinggi dicatatkan di Johor dengan bacaan 75.3 dB(A) di antara 12.00pm hingga 7.00pm dan bacaan terendah yang dicatatkan adalah di Terengganu dengan bacaan 55.5 dB(A) di antara 12.00am hingga 7.00am.

Figure 2.2 *shows a comparison of noise levels in various industrial areas. The areas comprised into 3 location type such as heavy industry, medium industry and small industry. It was found the highest reading was recorded in Johor with 75.3 dB(A) between 12.00pm to 7.00pm and the lowest reading recorded is in Terengganu with 55.5 dB(A) between 12.00am to 7.00am.*

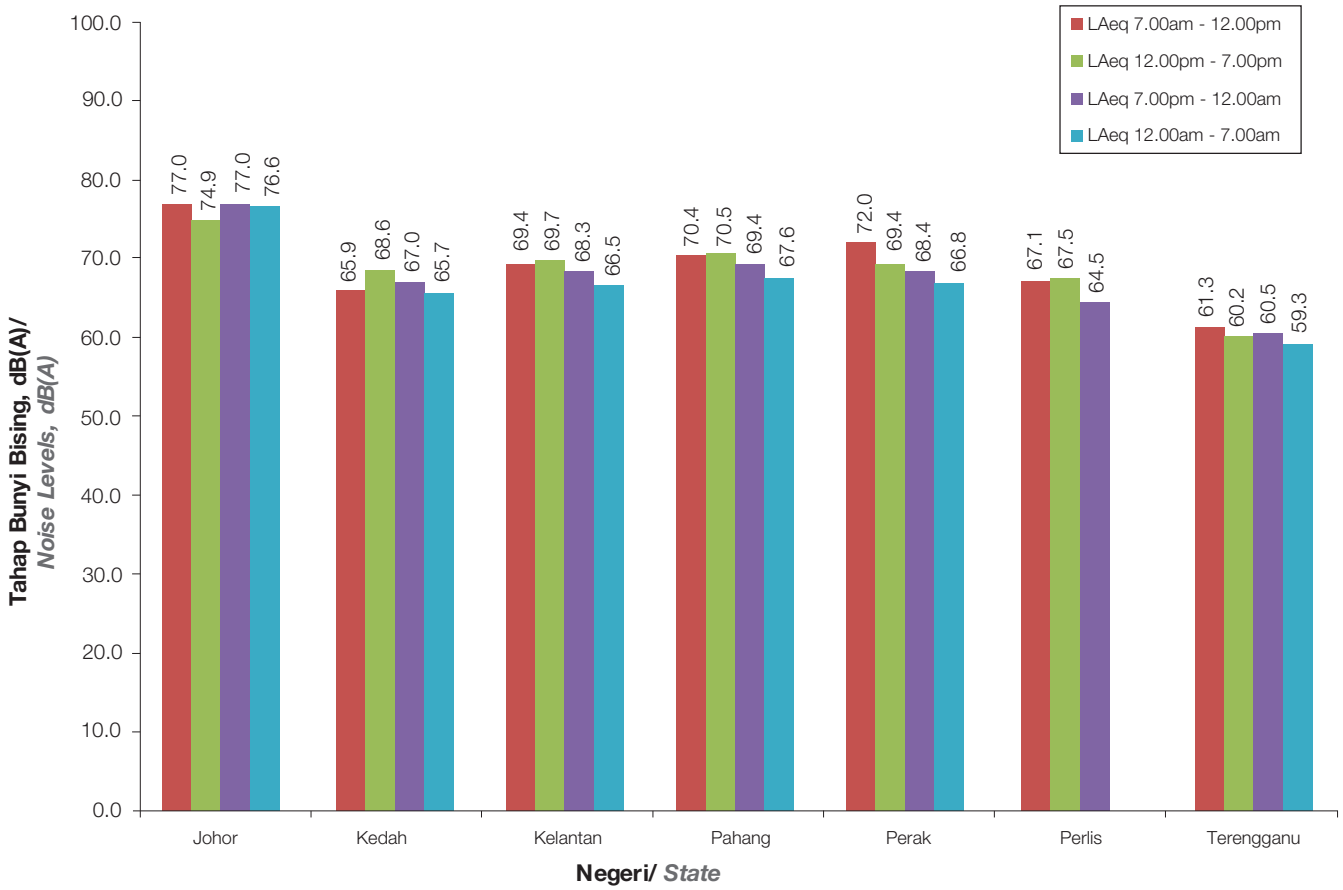


Rajah 2.2 : Perbandingan Tahap Bunyi Bising di Kawasan Sensitif Bunyi Mengikut Negeri

Figure 2.2 : Comparison of Noise Levels for Industrial for Noise Sensitive Area by State

Rajah 2.3 menunjukkan perbandingan tahap bunyi bising di pelbagai kawasan trafik seperti lebuhraya, jalan persekutuan dan jalan luar bandar. Tahap bunyi bising di lokasi-lokasi ini adalah di antara 60.2 dB(A) hingga 77.0 dB(A) bagi pemantauan pada waktu siang manakala pemantauan pada waktu malam mencatatkan bacaan antara 59.3 dB(A) hingga77.0 dB(A). Ia juga menunjukkan bahawa bacaan pengawasan pada waktu siang mencatatkan bacaan yang lebih tinggi berbanding pengawasan pada waktu malam. Ini mungkin disebabkan bilangan kenderaan bermotor yang berkurangan di jalanraya pada waktu malam.

Figure 2.3 *shows a comparison of noise level in various traffic areas such as highway, federal road and suburban road. The noise levels in these locations ranged between 60.2 dB(A) to 77.0 dB(A) for day time monitoring while night time monitoring recorded reading between 59.3 dB(A) to 77.0 dB(A). It also showed that daytime monitoring recorded higher reading than night time monitoring. This may due to the decreasing number of motor vehicles on the road during night time.*



Rajah 2.3 : Perbandingan Tahap Bunyi Bising Bagi Kawasan Trafik Mengikut Negeri

Figure 2.3 : Comparison of Noise Levels for Industrial for selected Traffic Mode in Various State

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Chapter 3

KUALITI AIR SUNGAI /
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KUALITI AIR SUNGAI
RIVER WATER QUALITY

PENGAWASAN KUALITI AIR SUNGAI

Jabatan Alam Sekitar (JAS) meneruskan program pengawasan kualiti air sungai pada tahun 2014 bagi menentukan kualiti air sungai dan mengesan perubahan ke atas kualiti air sungai. Kualiti sampel air sungai daripada rangkaian stesen-stesen yang tertentu dinilai secara in-situ dan analisis makmal bagi menentukan kandungan fisiko-kimia dan biologi jasad air sungai tersebut. Indeks Kualiti Air (IKA) digunakan untuk merujuk tahap pencemaran air sungai dan dikaitkan dengan pengkelasan dan kegunaan air berpandukan Standard Kualiti Air Kebangsaan, Malaysia (National Water Quality Standards for Malaysia) **(ANNEX)**. IKA telah mengambilkira parameter Oksigen Terlarut, Keperluan Oksigen Biokimia, Keperluan Oksigen Kimia, Ammonia Nitrogen, Pepejal Terampai dan pH. Pada tahun 2014, kualiti air sungai telah dinilai berdasarkan sejumlah 6,076 sampel air sungai yang telah diambil daripada sejumlah 891 stesen pengawasan manual yang merangkumi 477 sungai. Stesen-stesen tersebut adalah terdiri daripada 801 stesen ambien dan baseline, 55 stesen di hulu muka sauk terpilih, dan 35 stesen bagi projek River Of Life (ROL). Kualiti air sungai turut dinilai berdasarkan data daripada 10 stesen pengawasan automatik.

STATUS KUALITI AIR SUNGAI

Sejumlah 244 (52%) sungai daripada 473 sungai yang diawasi telah menunjukkan kualiti air bersih, 186 (39%) adalah sederhana tercemar dan 43 (9%) adalah tercemar **(Rajah 3.1)**. Status kualiti air sungai-sungai yang diawasi adalah seperti dalam **Jadual 3.1, 3.2 dan 3.3**.

RIVER WATER QUALITY MONITORING

The Department of Environment (DOE) continued with the river water quality monitoring programme in 2014 to determine the status of river water quality and to detect changes in river water quality. Water samples were collected at regular intervals from designated stations for in-situ and laboratory analysis to determine its physico-chemical and biological characteristics. The Water Quality Index (WQI) is used to indicate the level of pollution and the corresponding water classes and uses compared to 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 (NH_3-N), Suspended Solids (SS) and pH. In 2014, river water quality was assessed based on a total of 6,076 samples taken from a total of 891 manual monitoring stations covering 477 rivers. The stations comprised of 801 ambient and baseline stations, 55 located upstream of selected water intakes, and 35 stations for River of Life (ROL) project. Water quality was also assessed from 10 continuous water quality monitoring stations.*

RIVER WATER QUALITY STATUS

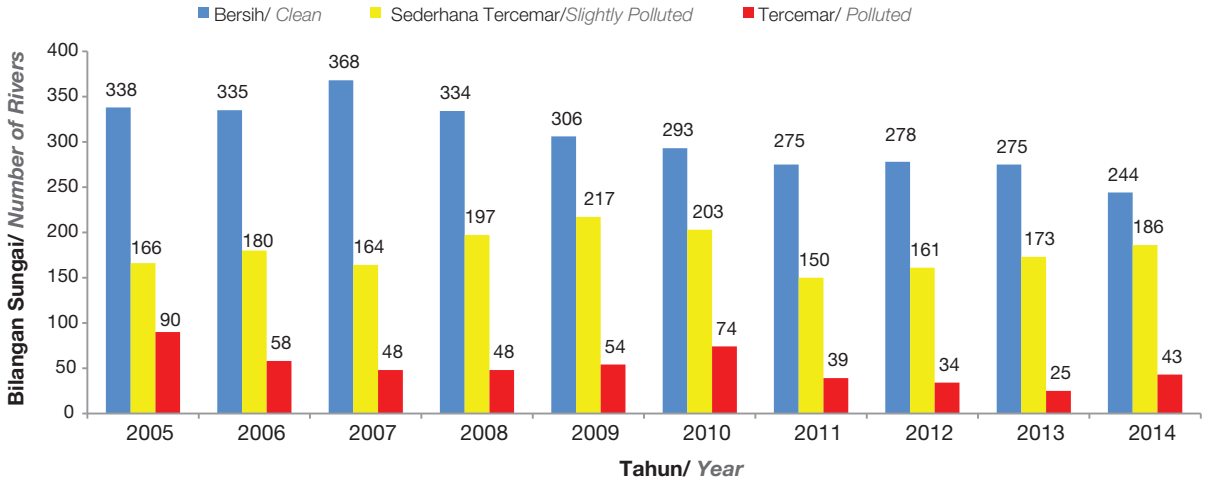
Out of the 473 rivers monitored, 244 (52%) were found to be clean, 186 (39%) slightly polluted and 43 (9%) polluted ***(Figure 3.1)****. The monitored rivers and their overall quality status are as in* ***Tables 3.1, 3.2 and 3.3****.*

Keperluan Oksigen Biokimia (BOD), Ammonia Nitrogen (NH_3-N) dan Pepejal Terampai (SS) masih menjadi punca kepada pencemaran sungai. BOD yang tinggi kerap kali dikaitkan dengan pengolahan sisa kumbahan yang tidak mencukupi, atau akibat pelepasan effluen daripada industri-industri pengilangan dan berasaskan pertanian. Punca utama NH_3-N pula boleh dikaitkan dengan aktiviti penternakan dan kumbahan domestik manakala punca utama SS adalah kerja-kerja tanah yang tidak teratur dan aktiviti pembukaan tanah.

As in previous years, the Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH_3-N) and Suspended Solids (SS) remained to be significant in terms of river pollution. High BOD can be attributed to inadequate treatment of sewage or effluent from agro-based and manufacturing industries. The main sources of NH_3-N were livestock farming and domestic sewage. While the sources for SS were mainly due to improper earthworks and land clearing activities.

Jadual 3.4 menunjukkan sebanyak 25 daripada 43 sungai tercemar masih tergolong dalam Kelas III manakala 18 sungai adalam Kelas IV. Berdasarkan BOD, sebanyak 10 sungai diklasifikasikan sebagai Kelas IV manakala 33 adalah Kelas V. Dari segi NH_3-N pula, tiga sungai tergolong dalam Kelas II, dua sungai Kelas III, 14 sungai Kelas IV dan 24 sungai adalah Kelas V. Dari segi SS, sebanyak 24 sungai telah diklasifikasikan sebagai Kelas I, 14 sungai Kelas II, dan lima adalah Kelas III.

***Table 3.4** shows that out of the 43 polluted rivers, 25 rivers were classified as Class III, 18 rivers as Class IV. In terms of BOD, 10 rivers were classified as Class IV and 33 rivers as Class V. In terms of NH_3-N, three rivers were classified as Class II, two as Class III, 14 rivers as Class IV and 24 rivers as Class V. In terms of SS, 24 rivers were classified as Class I, 14 rivers as Class II, and five rivers as Class III.*



Rajah 3.1: Malaysia: Tren Kualiti Air Sungai, 2005-2014
Figure 3.1: Malaysia: River Water Quality Trend, 2005-2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
Perlis	Perlis	Sg. Pelarit	1	91	87	II	B/C
		Sg. Wang Kelian	1	91	88	II	B/C
Kedah	Kedah	Sg. Janing	1	93	93	I	B/C
		Sg. Pdg Terap	3	81	82	II	B/C
		Sg. Pedu	1	87	85	II	B/C
		Sg. Tekai	1	87	83	II	B/C
	Merbok	Sg. Merbok	1	77	82	II	B/C
		Sg. Tok Pawang	1	87	91	II	B/C
		Sg. Tupah	1	90	93	II	B/C
Kedah (Langkawi)	Kisap	Sg. Kisap	1	94	89	II	B/C
	Melaka	Sg. Melaka	1	84	81	II	B/C
		Sg. Petang	1	92	94	I	B/C
Kedah/ P.Pinang	Muda	Sg. Chepir	1	89	81	II	B/C
		Sg. Ketil	2	89	86	II	B/C
		Sg. Muda	4	87	83	II	B/C
		Sg. Pegang	1	94	93	I	B/C
		Sg. Sedim	1	83	81	II	B/C
P.Pinang	Pinang	Sg. Air Terjun	1	91	89	II	B/C
	Kluang	Sg. Ara	2	88	84	II	B/C
	Jawi	Sg. Junjong	1	90	84	II	B/C
P.Pinang/ Kedah	Perai	Sg. Kulim	2	85	81	II	B/C
P.Pinang/ Kedah/Perak	Kerian	Sg. Kechil	1	91	88	II	B/C
		Sg. Kerian	4	79	81	II	B/C
Perak	Bruas	Sg. Bruas	3	84	86	II	B/C
		Sg. Dandang	1	87	89	II	B/C
		Sg. Rotan	1	91	93	I	B/C
	Kurau	Sg. Ara	2	92	94	I	B/C
	Perak	Sg. Batang Padang	3	86	87	II	B/C
		Sg. Bidor	3	82	83	II	B/C
		Sg. Chenderiang	1	86	84	II	B/C
		Sg. Chepor	1	91	85	II	B/C
		Sg. Kampar	2	90	90	II	B/C
		Sg. Kangsar	1	86	84	II	B/C
		Sg. Kinjang	1	92	89	II	B/C
		Sg. Kinta	6	82	82	II	B/C
		Sg. Klah	1	85	90	II	B/C
		Sg. Kuang	1	87	86	II	B/C
		Sg. Pelus	2	84	83	II	B/C
		Sg. Perak	8	88	85	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
		Sg. Raia	2	88	87	II	B/C
		Sg. Sungkai	2	91	87	II	B/C
	Raja Hitam	Sg. Manjong	2	85	85	II	B/C
		Sg. Nyior	1	95	95	I	B/C
	Sepetang	Sg. Batu Tegoh	3	88	86	II	B/C
		Sg. Jana	1	90	91	II	B/C
		Sg. Limau	1	92	86	II	B/C
		Sg. Temerloh	2	89	86	II	B/C
		Sg. Trong	1	93	88	II	B/C
Selangor/ Perak	Bernam	Sg. Bernam	4	89	88	II	B/C
		Sg. Inki	1	93	94	I	B/C
		Sg. Slim	2	88	85	II	B/C
		Sg. Trolak	1	92	93	I	B/C
Selangor	Selangor	Sg. Batang Kali	1	88	87	II	B/C
		Sg. Kanching	1	86	86	II	B/C
		Sg. Kerling	1	91	91	II	B/C
		Sg. Selangor	4	83	81	II	B/C
		Sg. Serendah	1	87	88	II	B/C
	Sepang	Sg. Sepang	2	84	83	II	B/C
Selangor/ Putrajaya/ N.Sembilan	Langat	Sg. Chuau	2	82	87	II	B/C
		Sg. Jijan	1	84	82	II	B/C
		Sg. Lui	1	94	93	I	B/C
		Sg. Semenyih	1	90	84	II	B/C
Selangor/ Wpkl	Klang	Sg. Penchala	1	88	85	II	B/C
		Sg. Semelah	1	83	83	II	B/C
N.Sembilan/ Melaka	Linggi	Sg. Batang Penar	1	92	88	II	B/C
		Sg. Chembong	1	80	84	II	B/C
		Sg. Kundur Besar	1	75	82	II	B/C
		Sg. Pedas	1	87	83	II	B/C
		Sg. Rembau	2	82	82	II	B/C
Melaka/ N.Sembilan	Melaka	Sg. Batang Melaka	2	83	84	II	B/C
		Sg. Dusun	1	90	90	II	B/C
		Sg. Kemunting	1	83	85	II	B/C
		Sg. Tampin	1	93	94	I	B/C
Melaka	Kesang	Sg. Chohong	2	91	93	I	B/C
	Duyong	Sg. Gapam	1	88	82	II	B/C
Johor	Batu Pahat	Sg. Bantang	1	91	88	II	B/C
		Sg. Chaah	1	76	87	II	B/C
		Sg. Lenik	1	79	84	II	B/C
		Sg. Merek	1	85	87	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Benut	Sg. Parit Hj. Yassin	1	85	82	II	B/C
	Jemaluang	Sg. Jemaluang	2	79	81	II	B/C
	Johor	Sg. Belitong	1	82	82	II	B/C
		Sg. Bukit Besar	1	85	91	II	B/C
		Sg. Johor	4	81	85	II	B/C
		Sg. Layang	1	85	90	II	B/C
		Sg. Layau Kiri	1	85	86	II	B/C
		Sg. Lebam	1	70	83	II	B/C
		Sg. Linggiu	1	83	85	II	B/C
		Sg. Panti	1	85	82	II	B/C
		Sg. Pelepah	2	90	92	II	B/C
		Sg. Penggeli	2	83	85	II	B/C
		Sg. Remis	1	83	83	II	B/C
		Sg. Santi	1	79	90	II	B/C
		Sg. Sayong	4	82	81	II	B/C
		Sg. Seluyut	1	82	82	II	B/C
		Sg. Semangar	1	84	87	II	B/C
		Sg. Telor	1	85	86	II	B/C
	Mersing	Sg. Mersing	2	80	83	II	B/C
	Paloi	Sg. Paloi	1	86	86	II	B/C
	Sedili Besar	Sg. Ambat	1	81	84	II	B/C
		Sg. Dohol	1	90	85	II	B/C
		Sg. Pasir Panjang	1	88	86	II	B/C
		Sg. Temubor Kanan	1	83	87	II	B/C
Johor/ N.Sembilan/ Pahang	Muar	Sg. Air Panas	1	92	87	II	B/C
		Sg. Gemencheh	1	79	84	II	B/C
		Sg. Juasseh	1	90	90	II	B/C
		Sg. Meda	1	79	82	II	B/C
Pahang/Johor	Endau	Sg. Endau	3	86	86	II	B/C
		Sg. Jasin	1	94	91	II	B/C
		Sg. Kahang	1	87	87	II	B/C
		Sg. Lenggor	1	80	81	II	B/C
		Sg. Mamai	1	88	83	II	B/C
		Sg. Paloh	1	83	82	II	B/C
		Sg. Selai	1	92	90	II	B/C
		Sg. Tamok	1	86	85	II	B/C
Pahang/ N.Sembilan	Pahang	Sg. Bentong	1	87	89	II	B/C
		Sg. Benus	2	91	90	II	B/C
		Sg. Berkapor	1	87	85	II	B/C
		Sg. Jelai	2	89	83	II	B/C
		Sg. Jempol	2	88	84	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
		Sg. Kelau	1	90	89	II	B/C
		Sg. Kertam	1	89	83	II	B/C
		Sg. Koyan	1	91	87	II	B/C
		Sg. Lepar	3	88	83	II	B/C
		Sg. Lipis	3	92	86	II	B/C
		Sg. Luit	1	87	87	II	B/C
		Sg. Maran	1	90	82	II	B/C
		Sg. Pahang	8	86	83	II	B/C
		Sg. Perting	1	92	90	II	B/C
		Sg. Semantan	4	85	85	II	B/C
		Sg. T. Paya Bungor	1	87	84	II	B/C
		Sg. Tahan	1	92	85	II	B/C
		Sg. Tanglir	1	89	89	II	B/C
		Sg. Tasik Bera	1	79	83	II	B/C
		Sg. Telang	1	89	84	II	B/C
		Sg. Tembeling	1	91	86	II	B/C
		Sg. Teranum	1	91	93	I	B/C
		Sg. Teras	1	89	91	II	B/C
		Sg. Teris	3	88	86	II	B/C
		Sg. Triang	2	86	83	II	B/C
Pahang	Bertam	Sg. Bertam	1	86	81	II	B/C
		Sg. Burung	1	91	93	I	B/C
		Sg. Habu	1	92	90	II	B/C
		Sg. Lenggok	1	87	84	II	B/C
		Sg. Ringlet	1	90	82	II	B/C
		Sg. Telom	2	84	84	II	B/C
		Sg. Terla	1	89	86	II	B/C
		Sg. Tringkap	1	90	87	II	B/C
	Cherating	Sg. Cherating	1	81	83	II	B/C
	Kuantan	Sg. Charu	1	79	85	II	B/C
		Sg. Kenau	1	85	88	II	B/C
		Sg. Kuantan	5	83	84	II	B/C
		Sg. Pandan	1	88	84	II	B/C
	Merchong	Sg. Merchong	1	87	85	II	B/C
	Rompin	Sg. Aur	1	86	84	II	B/C
		Sg. Keratong	2	86	82	II	B/C
		Sg. Pukin	1	87	87	II	B/C
Terengganu	Besut	Sg. Besut	2	91	86	II	B/C
	Chukai	Sg. Ibok	1	81	82	II	B/C
	Dungun	Sg. Dungun	4	90	83	II	B/C
	Kemaman	Sg. Cherul	1	82	85	II	B/C
		Sg. Kemaman	2	88	85	II	B/C
	Kertih	Sg. Kertih	1	88	82	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Marang	Sg. Marang	1	85	81	II	B/C
	Setiu	Sg. Chalok	2	81	87	II	B/C
		Sg. Setiu	2	89	89	II	B/C
	Terengganu	Sg. Berang	1	90	88	II	B/C
		Sg. Nerus	1	84	85	II	B/C
		Sg. Pueh	1	85	89	II	B/C
		Sg. Telemong	1	89	83	II	B/C
		Sg. Terengganu	3	85	85	II	B/C
Kelantan	Golok	Sg. Golok	5	89	84	II	B/C
		Sg. Lanas	1	90	88	II	B/C
	Kelantan	Sg. Belatop	2	84	82	II	B/C
		Sg. Ber	1	89	90	II	B/C
		Sg. Berok	3	84	82	II	B/C
		Sg. Betis	1	89	90	II	B/C
		Sg. Galas	5	88	83	II	B/C
		Sg. Kelantan	3	85	82	II	B/C
		Sg. Kerilla	1	92	88	II	B/C
		Sg. Lebir	3	87	82	II	B/C
		Sg. Nal	2	88	89	II	B/C
		Sg. Nenggiri	3	86	84	II	B/C
		Sg. Pergau	6	92	90	II	B/C
		Sg. Sokor	1	86	85	II	B/C
		Sg. Tuang	1	92	91	II	B/C
Sabah	Bingkongan	Sg. Bandau	1	88	91	II	B/C
		Sg. Bingkongan	2	90	91	II	B/C
		Sg. Menggaris	2	90	90	II	B/C
		Sg. Tandek	1	84	82	II	B/C
	Bongawan	Sg. Bongawan	1	86	82	II	B/C
	Brantian	Sg. Brantian	1	87	87	II	B/C
	Kalumpang	Sg. Kalumpang	3	87	83	II	B/C
	Kedamaian	Sg. Kedamaian	1	92	88	II	B/C
		Sg. Tempasuk	2	91	90	II	B/C
		Sg. Wariu	1	92	90	II	B/C
	Kimanis	Sg. Kimanis	1	86	82	II	B/C
	Kinabatangan	Sg. Karamuak	1	90	91	II	B/C
		Sg. Kinabatangan	3	86	84	II	B/C
		Sg. Koyah	1	87	89	II	B/C
		Sg. Menanggul	1	84	84	II	B/C
	Labok	Sg. Kinipir	2	93	92	II	B/C
		Sg. Liwagu	2	91	91	II	B/C
		Sg. Maliau	1	92	92	II	B/C
	Lakutan	Sg. Lakutan	1	87	84	II	B/C
	Likas	Sg. Menggatal	2	89	83	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Menggalong	Sg. Menggalong	2	87	84	II	B/C
	Mounad	Sg. Mounad	2	89	88	II	B/C
	Moyog	Sg. Moyog	4	91	89	II	B/C
	Padas	Sg. Bunsit	1	91	93	I	B/C
		Sg. Liawan	1	89	90	II	B/C
		Sg. Pegalan	3	89	81	II	B/C
		Sg. Tandulu	1	90	92	II	B/C
	Paitan	Sg. Paitan	1	85	84	II	B/C
	Papar	Sg. Papar	3	88	88	II	B/C
	Sapi	Sg. Sualong	1	87	90	II	B/C
	Segaliud	Sg. Segaliud	2	83	82	II	B/C
	Segama	Sg. Segama	3	86	86	II	B/C
	Silabukan	Sg. Silabukan	2	87	86	II	B/C
	Sugut	Sg. Bongkud	1	91	93	I	B/C
		Sg. Lohan	1	90	92	II	B/C
		Sg. Merali	1	91	93	I	B/C
		Sg. Sugut	3	89	89	II	B/C
	Tenghilan	Sg. Tenghilan	1	89	81	II	B/C
	Tingkayu	Sg. Tingkayu	2	87	83	II	B/C
	Tuaran	Sg. Song Sai	1	89	90	II	B/C
		Sg. Tuaran	2	89	92	II	B/C
	Tungku	Sg. Tungku	2	89	87	II	B/C
Sarawak	Baram	Sg. Baram	4	75	82	II	B/C
		Sg. Tutuh	1	82	85	II	B/C
	Kayan	Sg. Kayan	3	73	85	II	B/C
	Lawas	Sg. Lawas	3	87	85	II	B/C
	Lupar	Sg. Ai	2	87	87	II	B/C
		Sg. Sekerang	1	83	81	II	B/C
	Miri	Sg. Padang Liku	1	86	88	II	B/C
	Niah	Sg. Sekaloh	1	81	81	II	B/C
	Rajang	Sg. Kanowit	1	79	84	II	B/C
	Sarawak	Sg. Sarawak	6	80	82	II	B/C
		Sg. Sarawak Kiri	1	84	86	II	B/C
		Sg. Semadang	1	85	86	II	B/C
	Semunsam	Sg. Semunsam	1	79	87	II	B/C
	Sibuti	Sg. Kejapil	1	80	85	II	B/C
	Tatau	Sg. Tatau	1	79	82	II	B/C
	Trusan	Sg. Trusan	1	85	81	II	B/C

Jadual 3.1 Malaysia: Status Kualiti Air bagi Sungai Bersih, 2014

Table 3.1 Malaysia: Water Quality Status of Clean Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
Perlis	Perlis	Sg. Jarum	1	82	77	II	ST/SP
		Sg. Jernih	1	86	76	III	ST/SP
		Sg. Ngulang	1	83	72	III	ST/SP
		Sg. Perlis	1	67	66	III	ST/SP
Kedah	Merbok	Sg. Bongkok	1	69	64	III	ST/SP
	Kedah	Sg. Kedah	1	65	66	III	ST/SP
		Sg. Pendang	1	78	78	II	ST/SP
Kedah/ P.Pinang	Muda	Sg. Jerong	1	67	69	III	ST/SP
		Sg. Karangan	1	84	78	II	ST/SP
P.Pinang	Bayan Lepas	Sg. Bayan Lepas	1	73	61	III	ST/SP
		Sg. Tiram	2	72	71	III	ST/SP
	Jawi	Sg. Machang Bubok	1	74	72	III	ST/SP
	Juru	Sg. Kilang Ubi	4	71	73	III	ST/SP
		Sg. Pasir	1	63	65	III	ST/SP
	Kluang	Sg. Relau	1	76	74	III	ST/SP
	Pinang	Sg. Air Itam	5	67	61	III	ST/SP
		Sg. Dondang	1	67	61	III	ST/SP
		Sg. Pinang	1	60	61	III	ST/SP
P.Pinang/ Kedah	Perai	Sg. Jarak	3	73	73	III	ST/SP
		Sg. Keladi	1	79	80	II	ST/SP
		Sg. Perai	2	60	63	III	ST/SP
P.Pinang/ Kedah/Perak	Kerian	Sg. Selama	2	76	74	III	ST/SP
Perak	Kurau	Sg. Kurau	4	82	80	II	ST/SP
	Perak	Sg. Kepayang	2	63	75	III	ST/SP
		Sg. Kerdah	1	81	74	III	ST/SP
		Sg. Nyamok	1	68	68	III	ST/SP
		Sg. Pari	1	70	68	III	ST/SP
		Sg. Pinji	2	68	60	III	ST/SP
		Sg. Tumboh	1	66	65	III	ST/SP
	Raja Hitam	Sg. Raja Hitam	2	69	73	III	ST/SP
	Sepetang	Sg. Sepetang	2	76	74	III	ST/SP
	Wangi	Sg. Deralik	1	76	67	III	ST/SP
		Sg. Wangi	1	78	73	III	ST/SP
Selangor	Selangor	Sg. Sembah	1	68	75	III	ST/SP
	Tengi	Sg. Tengi	3	81	76	III	ST/SP
Selangor/ Putrajaya/ N.Sembilan	Langat	Sg. Anak Chuau	1	70	74	III	ST/SP
		Sg. Batang Nilai	1	68	66	III	ST/SP
		Sg. Langat	7	72	69	III	ST/SP
		Sg. Pajam	1	70	69	III	ST/SP

Jadual 3.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2014

Table 3.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
Selangor/ Wpkl	Klang	Sg. Ampang	2	66	67	III	ST/SP
		Sg. Anak Air Batu	1	74	75	III	ST/SP
		Sg. Batu	4	76	78	II	ST/SP
		Sg. Damansara	2	76	80	II	ST/SP
		Sg. Gombak	3	73	75	III	ST/SP
		Sg. Jinjang	3	60	65	III	ST/SP
		Sg. Keroh	2	75	75	III	ST/SP
		Sg. Klang	8	65	64	III	ST/SP
		Sg. Rasau	1	75	79	II	ST/SP
Melaka/ N.Sembilan	Melaka	Sg. Durian Tunggal	1	74	78	II	ST/SP
		Sg. Melaka	5	75	73	III	ST/SP
N.Sembilan/ Melaka	Linggi	Sg. Kepayong	1	75	74	III	ST/SP
		Sg. Linggi	5	75	74	III	ST/SP
		Sg. Simin	1	74	75	III	ST/SP
		Sg. Siput	1	78	80	II	ST/SP
Melaka	Duyong	Sg. Duyong	3	72	65	III	ST/SP
	Kesang	Sg. Kesang	3	78	72	III	ST/SP
Johor	Batu Pahat	Sg. Amran	1	83	71	III	ST/SP
		Sg. Bekok	5	78	77	II	ST/SP
		Sg. Berlian	1	77	76	III	ST/SP
		Sg. Merpo	1	78	69	III	ST/SP
		Sg. Simpang Kiri	3	66	65	III	ST/SP
	Benut	Sg. Benut	4	72	68	II	ST/SP
		Sg. Ulu Benut	1	71	78	III	ST/SP
	Johor	Sg. Anak Sg. Sayong	1	77	73	III	ST/SP
		Sg. Chemangar	1	71	78	II	ST/SP
		Sg. Papan	1	81	74	III	ST/SP
		Sg. Sebol	1	73	71	III	ST/SP
		Sg. Semenchu	1	78	63	III	ST/SP
		Sg. Temoh	1	76	74	III	ST/SP
		Sg. Tiram	4	78	77	II	ST/SP
	Kaw. Pasir Gudang	Sg. Latoh	1	61	67	III	ST/SP
		Sg. Masai	1	54	64	III	ST/SP
	Kim-Kim	Sg. Kim-Kim	2	65	75	III	ST/SP
	Pontian Besar	Sg. Air Hitam	1	67	68	III	ST/SP
		Sg. Pontian Besar	5	69	67	III	ST/SP
	Pontian Kecil	Sg. Pontian Kecil	2	74	71	III	ST/SP
	Pulai	Sg. Pulai	2	76	74	III	ST/SP
		Sg. Ulu Choh	1	64	68	III	ST/SP

Jadual 3.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2014

Table 3.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Rambah	Sg. Rambah	2	58	60	III	ST/SP
	Sedili Besar	Sg. Sedili Besar	5	78	77	II	ST/SP
	Sedili Kecil	Sg. Anak Sedili Kecil	1	75	75	III	ST/SP
		Sg. Bahan	2	77	73	III	ST/SP
		Sg. Sedili Kecil	2	80	77	II	ST/SP
	Skudai	Sg. Melana	2	67	60	III	ST/SP
		Sg. Skudai	9	71	66	III	ST/SP
Johor/ N.Sembilan/ Pahang	Muar	Sg. Labis	1	88	71	III	ST/SP
		Sg. Muar	8	78	80	II	ST/SP
		Sg. Segamat	1	85	79	II	ST/SP
Pahang/Johor	Endau	Sg. Jebong	1	68	60	III	ST/SP
		Sg. Melatai	1	68	68	III	ST/SP
		Sg. Mengkibol	3	74	73	III	ST/SP
		Sg. Pamol	1	62	62	III	ST/SP
		Sg. Semberong	5	77	79	III	ST/SP
		Sg. Singol	1	72	71	III	ST/SP
Pahang/ N.Sembilan	Pahang	Sg. Bera	2	80	79	II	ST/SP
		Sg. Chini	1	77	79	II	ST/SP
		Sg. Jengka	2	80	77	II	ST/SP
		Sg. Kundang	1	77	74	III	ST/SP
		Sg. Mentiga	1	70	76	III	ST/SP
		Sg. Serting	2	74	71	III	ST/SP
		Sg. Tasik Chini	1	86	78	II	ST/SP
		Sg. Tekal	1	83	79	II	ST/SP
		Sg. Tekam	2	82	77	II	ST/SP
Pahang	Anak Endau	Sg. Anak Endau	2	83	80	II	ST/SP
	Balok	Sg. Balok	2	69	67	III	ST/SP
		Sg. Panjang	1	75	71	III	ST/SP
	Bebar	Sg. Merba	1	82	75	III	ST/SP
		Sg. Serai	2	82	71	III	ST/SP
	Kuantan	Sg. Belat	1	79	79	II	ST/SP
		Sg. Riau	1	75	77	II	ST/SP
		Sg. Talam	1	81	77	II	ST/SP
	Rompin	Sg. Pontian	1	84	80	II	ST/SP
		Sg. Rompin	4	82	80	II	ST/SP
	Tonggok	Sg. Tonggok	1	73	69	III	ST/SP
Terengganu	Chukai	Sg. Bungkus	1	81	80	II	ST/SP
		Sg. Chukai	1	80	78	II	ST/SP
		Sg. Ruang	1	81	73	III	ST/SP
	Ibai	Sg. Ibai	3	75	74	III	ST/SP
	Kluang	Sg. Kluang	1	73	74	III	ST/SP
	Merang	Sg. Merang	1	64	73	III	ST/SP
	Merchang	Sg. Merchang	1	70	69	III	ST/SP

Jadual 3.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2014

Table 3.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Paka	Sg. Paka	1	85	80	II	ST/SP
		Sg. Rasau	1	86	78	II	ST/SP
Kelantan	Kelantan	Sg. Relai	1	89	74	III	ST/SP
	Kemasin	Sg. Kemasin	2	73	72	III	ST/SP
		Sg. Semerak	2	84	79	II	ST/SP
	Pengkalan Chepa	Sg. Keladi	1	78	73	III	ST/SP
		Sg. Pengkalan Chepa	2	79	76	III	ST/SP
		Sg. Raja Gali	1	83	75	III	ST/SP
	Pengkalan Datu	Sg. Pengkalan Datu	3	80	78	II	ST/SP
Sabah	Apas	Sg. Apas	1	86	80	II	ST/SP
	Balung	Sg. Balung	1	88	77	II	ST/SP
	Bengkoka	Sg. Bengkoka	2	88	75	III	ST/SP
	Kalabakan	Sg. Kalabakan	3	86	79	II	ST/SP
	Labok	Sg. Labok	1	87	80	II	ST/SP
	Labok	Sg. Tungud	1	89	77	II	ST/SP
	Likas	Sg. Inanam	3	85	78	II	ST/SP
		Sg. Likas	2	79	70	III	ST/SP
	Lingkungan	Sg. Bukau	1	84	75	III	ST/SP
		Sg. Lingkungan	1	85	73	III	ST/SP
	Membakut	Sg. Membakut	1	84	78	II	ST/SP
	Merotai	Sg. Merotai	3	82	79	II	ST/SP
	Padas	Sg. Padas	3	84	74	III	ST/SP
		Sg. Pangatan	1	88	70	III	ST/SP
	Sapi	Sg. Sapi	3	80	79	II	ST/SP
	Sembulan	Sg. Sembulan	2	78	68	III	ST/SP
	Tawau	Sg. Tawau	4	84	80	II	ST/SP
	Telipok	Sg. Telipok	2	77	75	III	ST/SP
	Tuaran	Sg. Damit	2	90	79	II	ST/SP
	Umas-Umas	Sg. Umas-Umas	1	87	79	II	ST/SP
Sarawak	Balingian	Sg. Balingian	2	72	72	III	ST/SP
	Kemena	Sg. Kemena	3	79	80	II	ST/SP
		Sg. Sibiu	1	77	79	II	ST/SP
	Kerian	Sg. Kerian	2	70	74	III	ST/SP
		Sg. Seblak	1	76	68	III	ST/SP
	Limbang	Sg. Limbang	5	84	80	III	ST/SP
	Lupar	Sg. Lupar	3	74	76	III	ST/SP
		Sg. Seterap	1	75	76	III	ST/SP
		Sg. Undup	1	84	79	II	ST/SP
	Miri	Sg. Lutong	1	67	64	III	ST/SP
		Sg. Miri	2	66	68	III	ST/SP
	Mukah	Sg. Mukah	4	72	73	III	ST/SP
	Niah	Sg. Niah	2	82	80	II	ST/SP

Jadual 3.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2014

Table 3.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
	Oya	Sg. Oya	3	70	74	III	ST/SP
	Rajang	Sg. Baloi	1	78	76	III	ST/SP
		Sg. Binatang	1	87	80	II	ST/SP
		Sg. Julau	1	82	80	II	ST/SP
		Sg. Meradong	1	79	78	II	ST/SP
		Sg. Rajang	11	77	75	III	ST/SP
		Sg. Salim	1	72	76	III	ST/SP
		Sg. Sarikei	2	82	78	II	ST/SP
	Sadong	Sg. Karangan	2	78	75	III	ST/SP
		Sg. Sadong	4	81	75	III	ST/SP
	Sarawak	Sg. Kuap	1	71	79	II	ST/SP
		Sg. Maong Kiri	1	63	68	III	ST/SP
		Sg. Samarahan	2	73	75	III	ST/SP
		Sg. Sarawak Kanan	1	81	76	III	ST/SP
		Sg. Semenggoh	1	64	66	III	ST/SP
		Sg. Tabuan	1	70	71	III	ST/SP
	Saribas	Sg. Layar	2	83	79	II	ST/SP
		Sg. Saribas	1	79	75	III	ST/SP
	Sibuti	Sg. Kabuloh	2	69	66	III	ST/SP
		Sg. Satap	1	62	76	III	ST/SP
		Sg. Sibuti	2	75	78	II	ST/SP
	Similajau	Sg. Similajau	2	83	79	II	ST/SP
	Suai	Sg. Suai	1	79	76	III	ST/SP

Jadual 3.2 Malaysia: Status Kualiti Air Sungai bagi Sungai Sederhana Tercemar, 2014

Table 3.2 Malaysia: Water Quality Status of Slightly Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
Kedah	Merbok	Sg. Petani	1	68	59	III	T/P
P.Pinang/ Kedah	Perai	Sg. Kereh	2	52	53	III	T/P
		Sg. Pertama	1	48	51	IV	T/P
P.Pinang	Jawi	Sg. Jawi	1	55	51	IV	T/P
	Pinang	Sg. Jelutong	1	35	37	IV	T/P
	Juru	Sg. Juru	2	55	54	III	T/P
		Sg. Rambai	1	57	55	III	T/P
Perak	Perak	Sg. Seluang	1	61	49	IV	T/P
		Sg. Serokai	1	64	59	III	T/P
Selangor	Buloh	Sg. Buloh	4	60	56	III	T/P
Selangor/ Wpkl	Klang	Sg. Bunos	3	59	58	III	T/P
		Sg. Toba	1	59	55	III	T/P
		Sg. Untut	1	48	44	IV	T/P

Jadual 3.3 Malaysia: Status Kualiti Air bagi Sungai Tercemar, 2014

Table 3.3 Malaysia: Water Quality Status of Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Bilangan Stesen/ *Number Of Stations*	IKA/ *WQI*		Status 2014	
				2013	2014	Kelas/ *Class*	Kategori/ *Category*
Melaka/ N.Sembilan	Melaka	Sg. Rembia	1	64	49	IV	T/P
Melaka	Merlimau	Sg. Merlimau	2	45	50	IV	T/P
	Seri Melaka	Sg. Seri Melaka	1	57	59	III	T/P
Johor	Air Baloi	Sg. Air Baloi	3	49	46	IV	T/P
	Batu Pahat	Sg. Batu Pahat	1	64	57	III	T/P
		Sg. Semberong	2	62	58	III	T/P
		Sg. Simpang Kanan	2	60	57	III	T/P
	Benut	Sg. Pinggan	1	63	56	III	T/P
	Danga	Sg. Danga	2	47	56	III	T/P
	Kaw. Pasir Gudang	Sg. Buluh	1	48	50	IV	T/P
		Sg. Perembi	1	58	59	III	T/P
		Sg. Tukang Batu	1	38	40	IV	T/P
	Kempas	Sg. Kempas	2	49	48	IV	T/P
	Pontian Besar	Sg. Ayer Merah	1	32	33	IV	T/P
	Sanglang	Sg. Sanglang	1	60	58	III	T/P
	Segget	Sg. Segget	5	52	48	IV	T/P
	Tebrau	Sg. Bala	1	61	54	III	T/P
		Sg. Pandan	1	63	57	III	T/P
		Sg. Plentong	1	61	52	III	T/P
		Sg. Sebulung	1	48	34	IV	T/P
		Sg. Sengkuang	1	37	36	IV	T/P
		Sg. Tampoi	1	57	47	IV	T/P
		Sg. Tebrau	4	64	59	III	T/P
Johor/N. Sembilan/ Pahang	Muar	Sg. Sarang Buaya	1	65	53	III	T/P
Pahang	Bebar	Sg. Bebar	1	64	57	III	T/P
Terengganu	Kemaman	Sg. Ransan	1	74	58	III	T/P
Kelantan	Pengkalan Chepa	Sg. Alor B	1	68	56	III	T/P
		Sg. Alor Lintah	1	66	53	III	T/P
Sarawak	Miri	Sg. Adong	1	63	58	III	T/P
		Sg. Dalam	1	57	51	IV	T/P

Jadual 3.3 Malaysia: Status Kualiti Air bagi Sungai Tercemar, 2014

Table 3.3 Malaysia: Water Quality Status of Polluted Rivers, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Status 2014		Kelas Berdasarkan:/ *Class Based On:*		
			IKA/ *WQI*	Kelas/ *Class*	BOD	AN	SS
Melaka	Seri Melaka	Sg. Seri Melaka	59	III	V	V	I
Kedah	Merbok	Sg. Petani	59	III	IV	IV	I
Johor	Tebrau	Sg. Tebrau	59	III	IV	V	II
Perak	Perak	Sg. Serokai	59	III	V	V	I
Johor	Kaw. Pasir Gudang	Sg. Perembi	59	III	V	V	II
Terengganu	Kemaman	Sg. Ransan	58	III	V	IV	III
Selangor/ Wpkl	Klang	Sg. Bunos	58	III	V	V	I
Johor	Batu Pahat	Sg. Semberong	58	III	IV	IV	I
Johor	Sanglang	Sg. Sanglang	58	III	V	II	III
Sarawak	Miri	Sg. Adong	58	III	V	IV	I
Johor	Tebrau	Sg. Pandan	57	III	V	IV	II
Johor	Batu Pahat	Sg. Simpang Kanan	57	III	IV	IV	I
Pahang	Bebar	Sg. Bebar	57	III	V	II	I
Johor	Batu Pahat	Sg. Batu Pahat	57	III	IV	IV	I
Johor	Benut	Sg. Pinggan	56	III	V	III	III
Selangor	Buloh	Sg. Buloh	56	III	V	IV	II
Johor	Danga	Sg. Danga	56	III	IV	V	II
Kelantan	Pengkalan Chepa	Sg. Alor B	56	III	IV	V	I
Selangor/ Wpkl	Klang	Sg. Toba	55	III	V	V	II
P.Pinang	Juru	Sg. Rambai	55	III	IV	V	I
P.Pinang	Juru	Sg. Juru	54	III	IV	V	I
Johor	Tebrau	Sg. Bala	54	III	IV	V	II
Johor/N. Sembilan/ Pahang	Muar	Sg. Sarang Buaya	53	III	V	III	I
Kelantan	Pengkalan Chepa	Sg. Alor Lintah	53	III	V	IV	II
P.Pinang/ Kedah	Perai	Sg. Kereh	53	III	V	V	II
Johor	Tebrau	Sg. Plentong	52	IV	V	V	I
P.Pinang/ Kedah	Perai	Sg. Pertama	51	IV	V	IV	III
P.Pinang	Jawi	Sg. Jawi	51	IV	V	IV	II
Sarawak	Miri	Sg. Dalam	51	IV	V	V	II

Jadual 3.4 Malaysia: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2014

Table 3.4 Malaysia: The Polluted Rivers and Classes Based on BOD, AN and SS, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	Status 2014		Kelas Berdasarkan:/ *Class Based On:*		
			IKA/ *WQI*	Kelas/ *Class*	BOD	AN	SS
Melaka	Merlimau	Sg. Merlimau	50	IV	V	V	I
Johor	Kaw. Pasir Gudang	Sg. Buluh	50	IV	V	IV	I
Melaka/N. Sembilan	Melaka	Sg. Rembia	49	IV	V	V	I
Perak	Perak	Sg. Seluang	49	IV	V	IV	I
Johor	Segget	Sg. Segget	48	IV	V	V	II
Johor	Kempas	Sg. Kempas	48	IV	V	V	II
Johor	Tebrau	Sg. Tampoi	47	IV	V	V	I
Johor	Air Baloi	Sg. Air Baloi	46	IV	V	II	III
Selangor/ Wpkl	Klang	Sg. Untut	44	IV	V	V	I
Johor	Kaw. Pasir Gudang	Sg. Tukang Batu	40	IV	V	V	I
P.Pinang	Pinang	Sg. Jelutong	37	IV	V	V	I
Johor	Tebrau	Sg. Sengkuang	36	IV	V	V	I
Johor	Tebrau	Sg. Sebulung	34	IV	V	V	I
Johor	Pontian Besar	Sg. Ayer Merah	33	IV	V	IV	II

Jadual 3.4 Malaysia: Sungai Tercemar dan Kelas Kualiti Air Berdasarkan BOD, AN dan SS, 2014
Table 3.4 Malaysia: The Polluted Rivers and Classes Based on BOD, AN and SS, 2014

PENGAWASAN KUALITI AIR SUNGAI AUTOMATIK

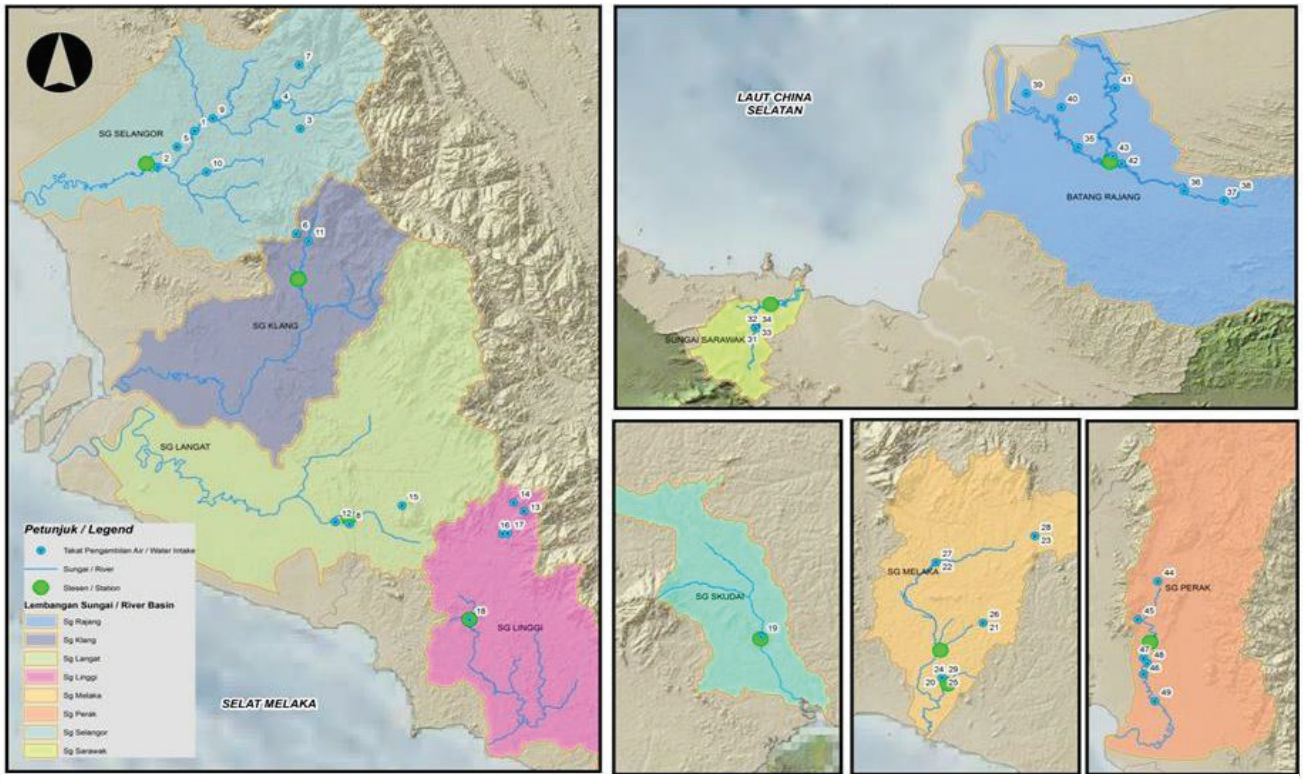
Rajah 3.2 menunjukkan lokasi sepuluh stesen pengawasan sungai automatik serta takat pengambilan air yang disenaraikan seperti dalam **Jadual 3.5**.

Oksigen Terlarut adalah penunjuk kepada kehadiran BOD yang disebabkan oleh bahan pencemar organik. Berdasarkan Oksigen Terlarut, 78% daripada data yang direkodkan di stesen automatik di Sg. Perak adalah berada dalam julat Kelas IIB NWQS, dikuti oleh Sg. Rajang (46 %), Sg. Labu (37%), Sg. Linggi (34%), Sg. Melaka (29%), Sg. Selangor (18%), Sg. Putat (6%), Sg. Skudai (5%) dan Sg. Sarawak (5%). Manakala hanya 3% daripada data yang direkodkan di stesen automatik di Sg. Jinjang adalah berada dalam Kelas IIB **(Rajah 3.3)**.

CONTINUOUS RIVER WATER QUALITY MONITORING

Figure 3.2 *shows the location of the ten continuous river monitoring stations and subsequent water intakes as listed in* ***Table 3.5****.*

The dissolved oxygen is an indicator of BOD strength exerted by organic pollutants. In terms of dissolved oxygen level, about 78% of the data recorded at Sg. Perak were within the Class IIB of the NWQS, followed by Sg. Rajang (46 %), Sg. Labu (37%), Sg. Linggi (34%), Sg. Melaka (29%), Sg. Selangor (18%), Sg. Putat (6%), Sg. Skudai (5%) and Sg. Sarawak (5%). Meanwhile, only 3% of the data recorded at Sg. Jinjang were within the Class IIB ***(Figure 3.3)****.*



Rajah 3.2: Stesen Pengawasan Sungai Automatik dan Takat Pengambilan Air

Figure 3.2: Continuous Water Quality Stations and Water Intakes

Nombor/ *Number*	Negeri/ *State*	Sungai/ *River*	Skim Perbekalan/ *Supply Scheme*
1	Selangor	Sungai Selangor	SSP 2, Bukit Badong
2		Sungai Selangor	Rantau Panjang
3		Sungai Batang Kali	Batang Kali
4		Sungai Selangor	Rasa
5		Sungai Selangor	SSP 3, Bukit Badong
6		Sungai Rangkap	Sungai Rangkap
7		Sungai Kubu	Kuala Kubu Bharu
8		Sungai Labu	Sungai Labu
9		Sungai Tengi	Sungai Tengi
10		Sungai Darah	Sungai Buaya
11		Empangan Batu	Sungai Batu
12		Sungai Labu	Salak Tinggi
13	N. Sembilan	Sg Batang Penar	Pantai
14		Sg. Ngoi-Ngoi	Ngoi-ngoi
15		Sg Mahang	Mahang
16		Sg Batang Penar	Sungai Terip
17		Empangan Sg. Terip	Terip
18		Sg. Linggi	Sg. Linggi

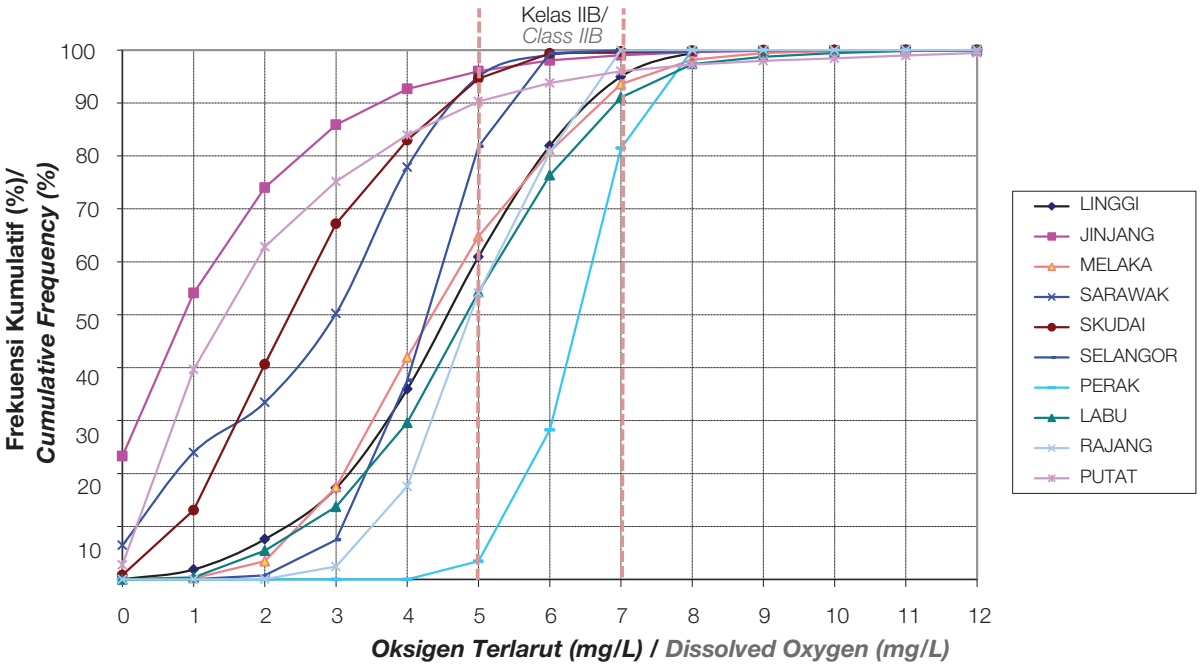
Jadual 3.5: Senarai Takat Pengambilan Air dalam Kawasan Tadahan seperti dalam Rajah 3.2

Table 3.5: Water Intake List within cacthments as in the Figure 3.2

Nombor/ *Number*	Negeri/ *State*	Sungai/ *River*	Skim Perbekalan/ *Supply Scheme*
19	Johor	Sg. Skudai	Johor Bahru
20	Melaka	Sg. Melaka	Jasin, Melaka Tengah dan Alor Gajah
21		Empangan Durian Tunggal	Melaka Tengah, Alor Gajah dan Jasin
22		Sg. Melaka (Bunded Storage)	Melaka Tengah, Alor Gajah dan Jasin
23		Sg. Kesang	Jasin dan Merlimau
24		Sg. Muar	Melaka Tengah, Alor Gajah dan Jasin
25		Sg. Melaka	Jasin, Melaka Tengah dan Alor Gajah
26		Empangan Durian Tunggal	Melaka Tengah, Alor Gajah dan Jasin
27		Sg. Melaka (Bunded Storage)	Melaka Tengah, Alor Gajah dan Jasin
28		Sg. Kesang	Jasin dan Merlimau
29		Sg. Muar	Melaka Tengah, Alor Gajah dan Jasin
30	Sarawak	Sg. Sarawak Kiri	Weir Batu Kitang
31		Sg. Sarawak Kiri	Sungai Sarawak (Sarawak Kiri- Intake- Takat Pengambilan No. 1)
32		Sg. Sarawak Kiri	Sungai Sarawak (Sarawak Kiri- Intake- Takat Pengambilan No. 2)
33		Sg. Sarawak Kiri	Sungai Sarawak (Sarawak Kiri- Intake- Takat Pengambilan No. 3)
34		Sg. Sarawak Kiri	Sungai Sarawak (Sarawak Kiri- Intake- Takat Pengambilan No. 4)
35		Sg.Bawang Assan	Bawang Assan
36		Sg.Kanowit	Kanowit
37		Batang Rajang	Ng.Dap
38		Sg.Kabah	Ng.Tada
39		Sg.Daro	Daro
40		Sg. Nanggar	Kut
41		Sg.Rasau	Rasau
42		Batang Rajang	Sibu
43		Batang Rajang	Sibu
44	Perak	Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Kota Lama Kiri
45		Sg. Guar	Manong
46		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Teluk Kepayang
47		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	Kampung Paloh
48		Sg. Perak (dalam kawasan tadahan LPA Kg. Gajah)	BB Seri Iskandar
49		Sg. Perak	Kampung Gajah

Jadual 3.5: Senarai Takat Pengambilan Air dalam Kawasan Tadahan seperti dalam Rajah 3.2

Table 3.5: Water Intake List within cacthments as in the Figure 3.2



Rajah 3.3 Perbandingan Frekuensi Kumulatif bagi 10 Stesen-stesen CWQM untuk Oksigen Terlarut, 2014

Figure 3.3 Comparison of Cumulative Frequency for 10 CWQM Stations for Dissolved Oxygen, 2014

Ammonium adalah satu bentuk ammonia yang telah terion. Pengukuran ammonium boleh memberi petunjuk kepada potensi kehadiran pencemar ammonia atau ammonia nitrogen dalam air sungai apabila pH dan suhu air berubah. Sebanyak 70% daripada data ammonium yang direkodkan di Sg. Perak adalah dalam Kelas IIB bagi julat ammonia nitrogen diikuti dengan Sg. Rajang (24%), Sg. Sarawak (13%), Sg. Selangor (10%), Sg. Linggi (3%) dan Sg. Melaka (1%).

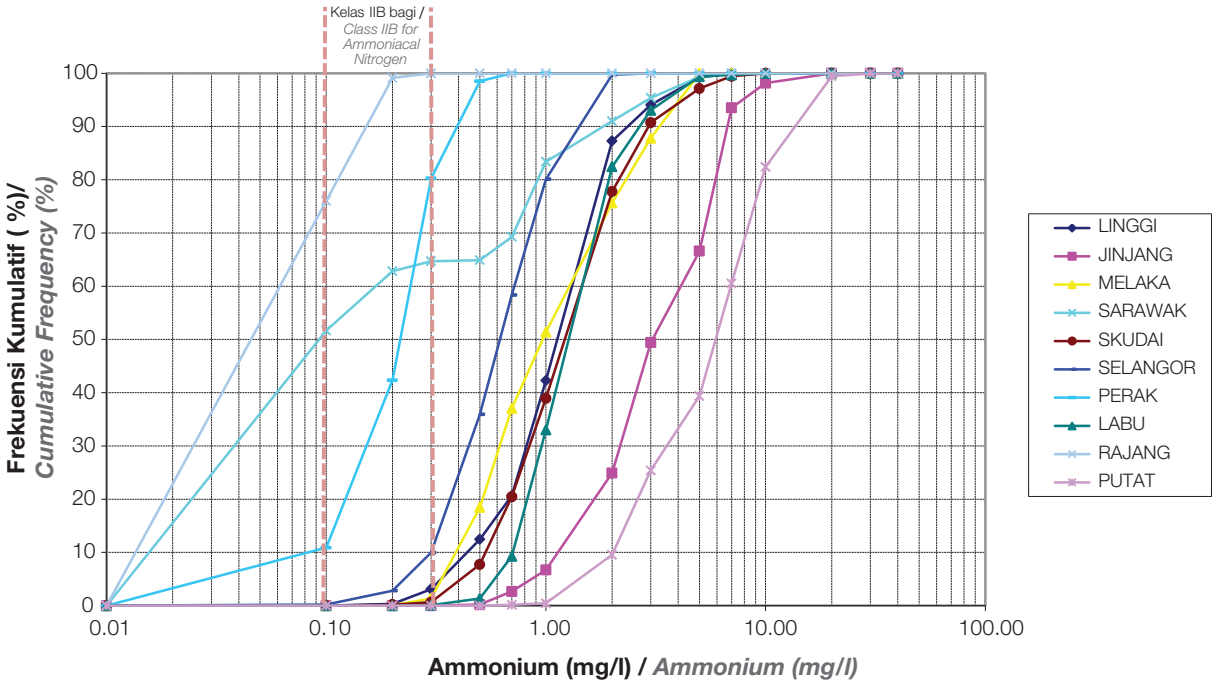
The ammonium is an ionized form of ammonia. The measurement of ammonium can indicate the potential to form ammonia or ammoniacal nitrogen pollutants in rivers when pH and temperature changes. It is about 70% of the ammonium levels recorded at Sg. Perak were within Class IIB limit for ammoniacal nitrogen followed by Sg. Rajang (24%), Sg. Sarawak (13%), Sg. Selangor (10%), Sg. Linggi (3%) and Sg. Melaka (1%).

Manakala kurang daripada 1% data ammonium daripada Sg. Skudai, Sg. Labu, Sg. Jinjang, dan Sg. Putat berada dalam Kelas IIB **(Rajah 3.4)**.

*Meanwhile, less than 1% of ammonium from Sg. Skudai, Sg. Labu, Sg. Jinjang, and Sg. Putat were within the Class IIB limits **(Figure 3.4).***

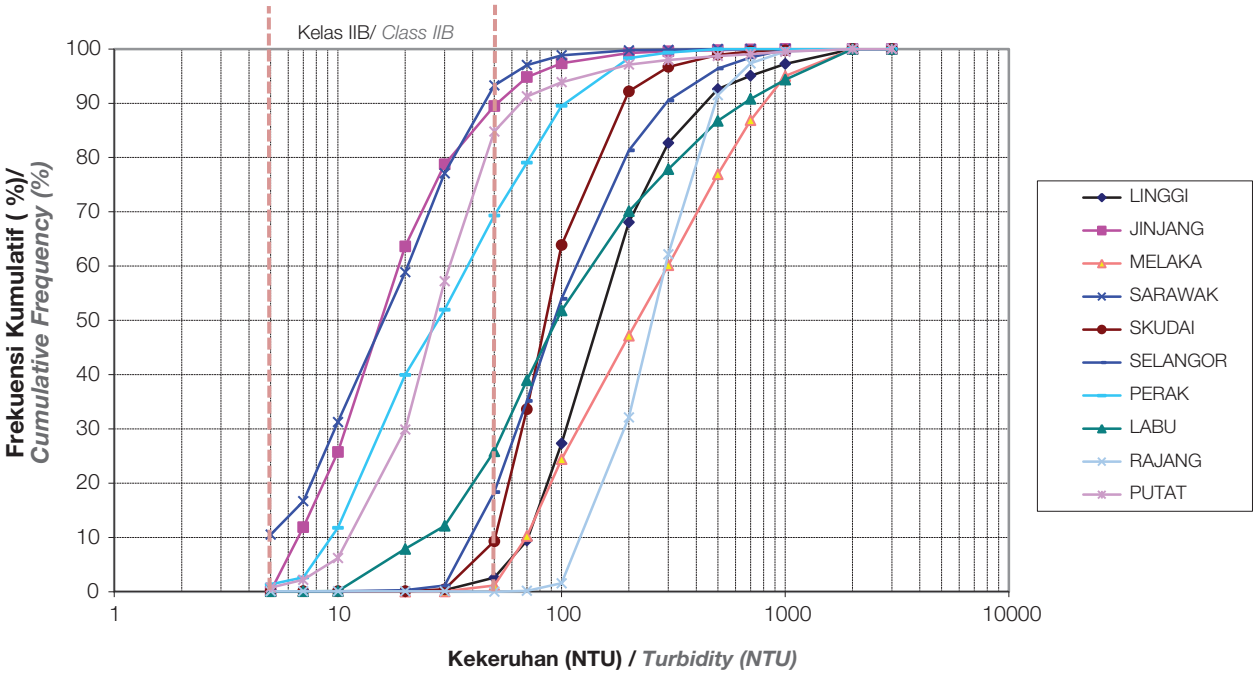
Kekeruhan digunakan sebagai penunjuk kehadiran Pepejal Terampai di dalam sungai. Sebanyak 89% daripada keseluruhan data kekeruhan yang dicatatkan di stesen automatik Sg. Jinjang adalah berada dalam julat Kelas IIB NWQS dikuti oleh Sg. Putat (85%), Sg. Sarawak (83%), Sg. Perak (69%), Sg. Labu (26%), dan Sg. Selangor (18%). Manakala, kurang daripada 10% daripada data kekeruhan di Sg. Skudai, Sg Linggi, Sg. Melaka dan Sg. Rajang berada dalam julat tersebut dan kesemua data kekeruhan yang direkodkan di stesen automatik di Sg. Melaka telah melebihi had 50 NTU bagi Kelas IIB **(Rajah 3.5)**.

*Turbidity is used as an indicator of suspended solids in a river. Of all data recorded, 89% of turbidity data for Sg. Jinjang were within the Class IIB of the NWQS followed by Sg. Putat (85%), Sg. Sarawak (83%), Sg. Perak (69%), Sg. Labu (26%), and Sg. Selangor (18%). Meanwhile, less than 10% of turbidity data for Sg. Skudai, Sg Linggi, Sg. Melaka and Sg. Rajang were within the Class IIB limit of the NWQS **(Figure 3.5)**.*



Rajah 3.4: Perbandingan Frekuensi Kumulatif bagi 10 Stesen-Stesen CWQM untuk Ion Ammonium, 2014

Figure 3.4: Comparison of Cumulative Frequency for 10 CWQM Stations for Ammonium Ion Concentration, 2014

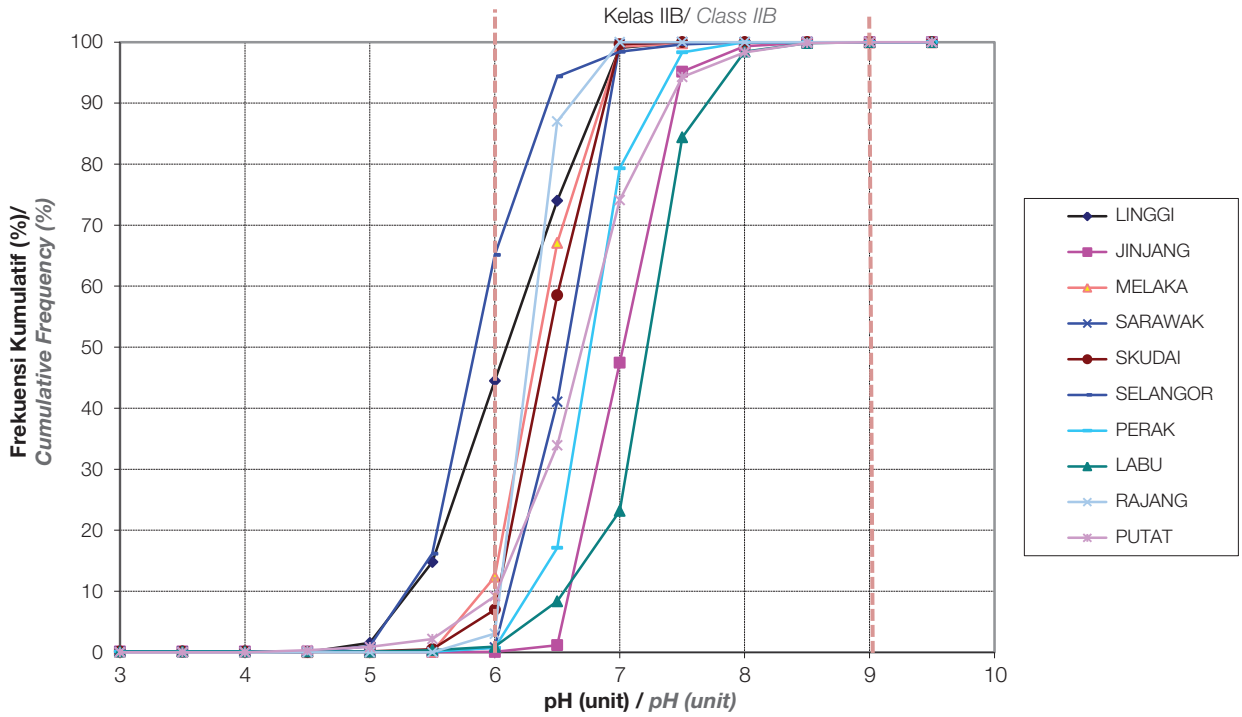


Rajah 3.5: Perbandingan Frekuensi Kumulatif bagi 10 Stesen-Stesen CWQM untuk Kekeruhan, 2014

Figure 3.5: Comparison of Cumulative Frequency for 10 CWQM Stations for Turbidity, 2014

pH adalah ukuran bagi keasidan dan kealkalian mengikut skala pH. Lebih 99% data pH yang direkodkan di stesen automatik di Sg. Jinjang, Sg. Perak, Sg. Sarawak, dan Sg. Labu adalah dalam julat Kelas II NWQS diikuti oleh Sg. Rajang (97%, Sg. Skudai (93%), Sg. Putat (91%), Sg. Melaka (88%) dan Sg. Linggi (56%). Manakala, hanya 35% daripada data pH yang direkodkan di stesen aitomatik di Sg. Selangor berada dalam Kelas II. **(Rajah 3.6)**.

*pH is a measurement of acidity and alkalinity based on pH scale. More than 99% of pH data recorded at automatic stations in Sg. Jinjang, Sg. Perak, Sg. Sarawak and Sg. Labu, were within Class IIB NWQS followed by Sg. Rajang (97%), Sg. Skudai (93%), Sg. Putat (91%), Sg. Melaka (88%) and Sg. Linggi (56%). Meanwhile, only 35% of pH data from automatic station at Sg. Selangor were within the limit of Class IIB **(Figure 3.6)**.*



Rajah 3.6: Perbandingan Frekuensi Kumulatif bagi 10 Stesen-Stesen CWQM untuk pH, 2014
Figure 3.6: Comparison of Cumulative Frequency for 10 CWQM Stations for pH, 2014

TREN PENCEMARAN AIR SUNGAI

Kualiti air sungai yang ditentukan dari segi IKA telah menunjukkan kemerosotan pada tahun 2014. Peratus bilangan sungai yang dikategorikan sebagai bersih telah menurun kepada 52% pada tahun 2014 berbanding 58% berbanding tahun sebelumnya. Peratus bilangan sungai yang dikategorikan sebagai tercemar telah meningkat daripada 5% kepada 9% pada tahun 2014. Trend ini adalah ditunjukkan oleh **Rajah 3.1**.

TREND IN RIVER WATER POLLUTION

*The river water quality in terms of WQI had shown a decrease in 2014. The percentage of clean rivers has dropped to 52% in 2014 compared to the 58% in the previous year. The percentage of polluted river has increased from 5% to 9% in year 2014. These trends are shown in **Figure 3.1**.*

Berdasarkan sub-indeks BOD, bilangan sungai yang dikategorikan sebagai bersih kekal pada tahun 2014 **(Rajah 3.7)**. Walau bagaimanapun, bilangan sungai yang tercemar dari segi sub-indeks BOD telah meningkat dengan ketara daripada 277 pada tahun 2013 kepada 362 sungai pada tahun 2014. Kemerosotan kualiti air yang disebabkan oleh BOD adalah berpunca daripada pelbagai punca pencemaran bahan organik seperti industri, serta aktiviti komersil dan domestik.

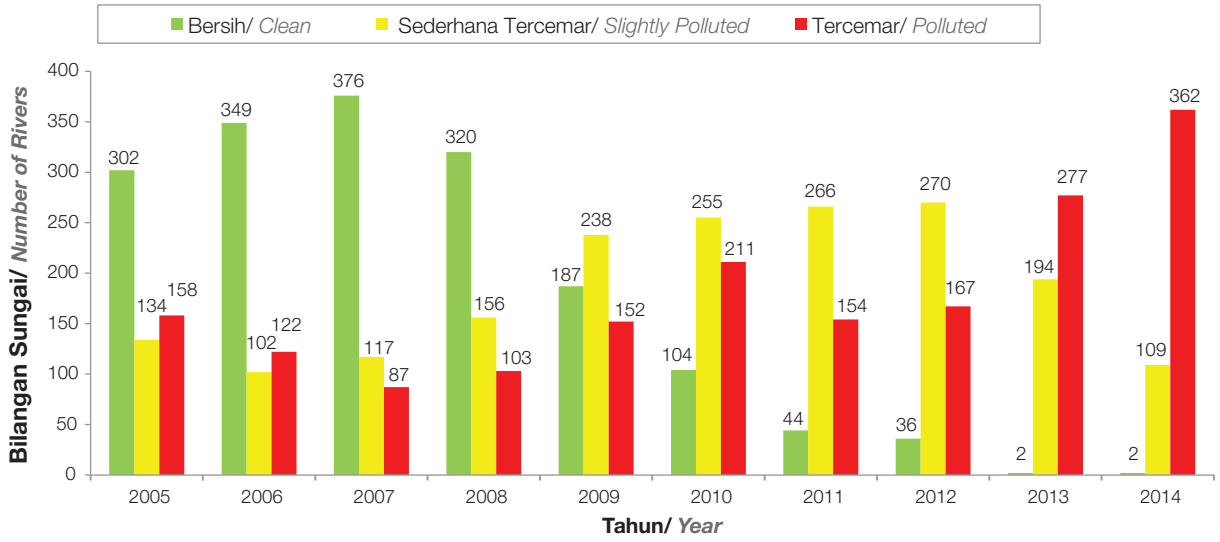
In terms of BOD sub-index, the number of clean rivers remain unchanged in 2014 ***(Figure 3.7)****. However, the number of polluted rivers in terms of BOD sub-index has increased significantly from 277 rivers in 2013 to 362 rivers in 2014. The degradation of river water quality caused by BOD may have been continuously attributed to various sources of organic pollutants including industrial, domestic and commercials activities.*

Dari segi sub-indeks NH_3-N pula, bilangan sungai bersih telah sedikit menurun daripada 174 pada tahun 2013 kepada 155 pada tahun 2014 **(Rajah 3.8)**. Kemerosotan kualiti air sungai yang disebabkan oleh NH_3-N boleh dikaitkan dengan pelepasan air sisa kumbahan yang yang tidak diolah dan diolah.

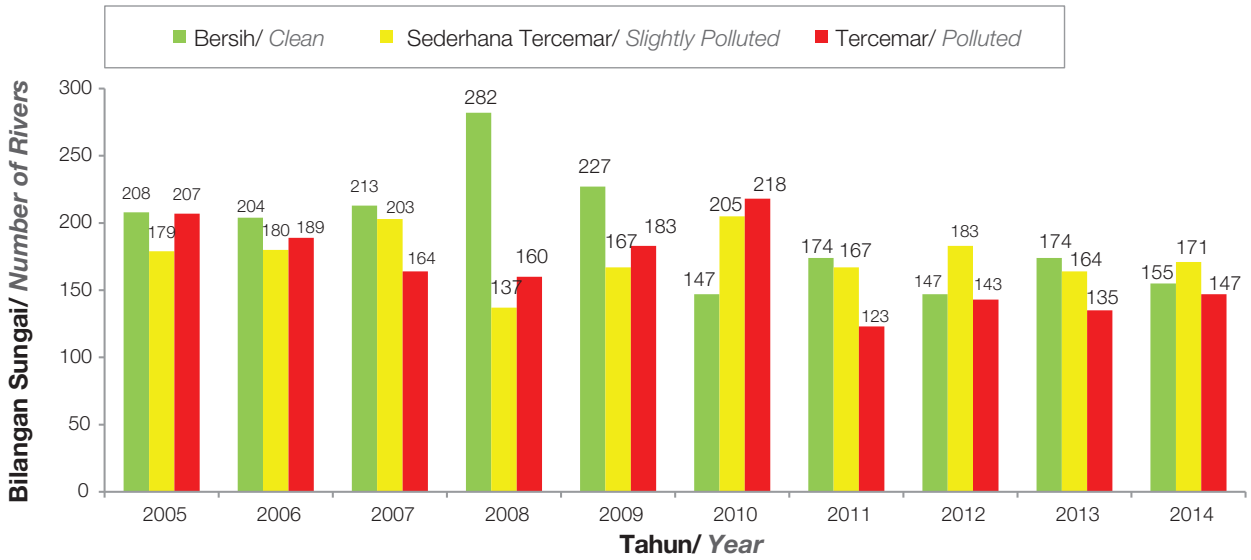
In term of NH_3-N sub-index, the number of clean rivers has slightly decreased from 174 in 2013 to 155 rivers in 2014 ***(Figure 3.8)****. The degradation of river water quality caused by NH_3-N can be associated with the discharge of treated and untreated sewage.*

Dari segi sub-indeks SS pula, bilangan sungai yang dikategorikan bersih telah meningkat daripada 351 pada tahun 2013 kepada 367 pada tahun 2014 **(Rajah 3.9)**. Peningkatan kualiti air sungai dari segi SS tersebut telah disebabkan oleh kawalan berterusan ke atas aktiviti kerja tanah dan pembukaan tanah.

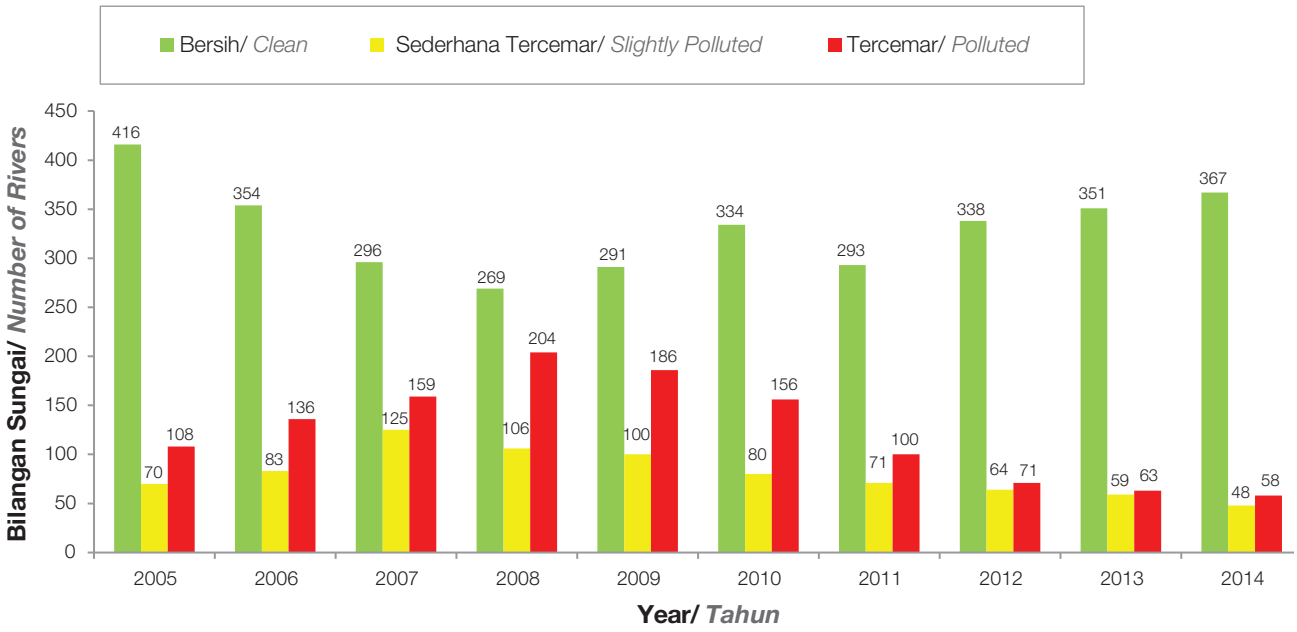
In term of SS sub-index, the number of clean rivers has increased from 351 rivers in 2013 to 367 rivers in 2014 ***(Figure 3.9)****.The improvement in river water quality can be attributed by continuous control against improper earthworks and land clearing activities.*



Rajah 3.7 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks BOD (2005- 2014)
Figure 3.7 Malaysia: River Water Quality Trend Based on BOD Sub-Index (2005-2014)



Rajah 3.8 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks AN (2005- 2014)
Figure 3.8 Malaysia: River Water Quality Trend Based on AN Sub-Index (2005-2014



Rajah 3.9 Malaysia: Tren Kualiti Air Sungai Berdasarkan Sub-Indeks SS (2005- 2014)
Figure 3.9 Malaysia: River Water Quality Trend Based on SS Sub-Index (2005-2014)

LOGAM BERAT DALAM SUNGAI

Analisis kandungan beberapa jenis logam berat dalam air sungai telah dilakukan ke atas Raksa (Hg), Arsenik (As), Kadmium (Cd), Kromium (Cr), Plumbum (Pb), and Zink (Zn). Sebanyak 99.98% daripada data Pb dan 97.97% daripada data As yang direkodkan adalah berada dalam had Kelas II NWQS diikuti dengan 99.95% data Zn, 99.93% data Cr, 99.91% data Cd, dan 99.20% data Hg.

HEAVY METALS IN RIVERS

Heavy metals were analysed for Mercury (Hg), Arsenic (As), Cadmium (Cd), Chromium (Cr), Plumbum (Pb), and Zinc (Zn). About 99.98% of Pb data and 97.97% of As data recorded were within the Class IIB limits of the NWQS followed by 99.95% of Zn data, 99.93% of Cr data, 99.91% of Cd data, and 99.20% of Hg data.

KUALITI AIR SUNGAI DI HULU MUKA SAUK

Pada tahun 2014, 43 (78%) stesen pengawasan kualiti air di hulu muka sauk telah menunjukkan kualiti air bersih sementara 12 (22%) stesen dikategorikan sebagai sederhana tercemar. Berdasarkan IKA, sembilan (16%) stesen telah dikategorikan sebagai kelas I dan 37 (68%) adalah Kelas II manakala sembilan (16%) adalah Kelas III. **Jadual 3.6** menunjukkan status kualiti air di stesen hulu muka sauk terpilih berdasarkan IKA.

Dari segi BOD, tiga stesen menunjukkan kualiti air Kelas II, 31 Kelas III, 15 dan enam stesen adalah masing-masing Kelas IV dan Kelas V. Berdasarkan NH_3-N pula, sebanyak 26 stesen menunjukkan kualiti air masing-masing Kelas I dan Kelas II, dua stesen Kelas III dan satu stesen Kelas IV. Sementara dari segi SS, 33 stesen telah dikategorikan sebagai Kelas I, 16 stesen Kelas II, dan 6 stesen Kelas III.

Rajah 3.10 menunjukkan peratusan stesen hulu muka sauk berdasarkan kelas kualiti air dan parameter utama. J**adual 3.7, Jadual 3.8** dan **Jadual 3.9** menunjukkan kualiti air sungai di stesen di hulu muka sauk masing-masing berdasarkan sub-indeks BOD, AN dan SS.

RIVER WATER QUALITY UPSTREAM WATER INTAKES

In 2014, 43 (78%) monitoring stations upstream water intakes have shown clean water quality while 12 (22%) other stations were categorized as slightly polluted. Based on overall WQI, nine (16%) stations were categorized as Class I, 37 (68%) were Class II while nine (16%) were Class III. ***Table 3.6*** *shows the water quality of the selected water intake stations based on WQI.*

In term of BOD, three stations have shown Class II water quality, 31 as Class III, 15 and 6 stations as Class IV and Class V respectively. In term of NH_3-N, 26 stations showed water quality of Class I and Class II respectively, two as Class III, while one station as Class IV. Meanwhile in term of SS, 33 stations were categorized as Class I, 16 as Class II, and 6 as Class III.

Figure 3.10 *shows the percentage of water quality upstream of intake stations in term of classes based on main pollutant parameters.* ***Table 3.7, Table 3.8*** *and* ***Table 3.9*** *show the water quality of stations upstream of water intake points based on BOD, AN and SS sub-indexes respectively.*

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ Stesen ID	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					IKA/WQI	Kategori/ *Category*	Kelas/ *Class*
PERLIS	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	85	B/C	II
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	82	B/C	II
KEDAH	Kedah	Sg. Ahning	2KD11	Padang Sanai	87	B/C	II
		Sg. Pdg Terap	2KD12	Kuala Nerang	85	B/C	II
		Sg. Temin	2KD10	Changloon	78	ST/SP	II
KEDAH (LANGKAWI)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	81	B/C	II
		Sg. Saga	2LG06	Padang Saga	89	B/C	II
KEDAH/ P.PINANG	Muda	Sg. Muda	2MD16	Jeneri	86	B/C	II
			2MD17	Jeniang	82	B/C	II
			2MD18	Bukit Selambau	83	B/C	II
			2MD20	Pinang Tunggal	86	B/C	II
		Sg. Nami	2MD21	Nami	88	B/C	II
		Sg. Sedim	2MD19	Bikan	89	B/C	II
P.PINANG	Pinang	Sg. Satu	2PG12	Batu Feringgi	93	B/C	I
PERAK	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	92	B/C	II
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	93	B/C	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	89	B/C	II
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	93	B/C	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	93	B/C	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	92	B/C	II
SELANGOR/ PERAK	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	93	B/C	I
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	95	B/C	I
SELANGOR/ PUTRAJAYA/ N.SEMBILAN	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	72	ST/SP	III
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	74	ST/SP	III
SELANGOR/ WPKL	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	94	B/C	I
MELAKA	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	81	B/C	II
JOHOR	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	70	ST/SP	III

Jadual 3.6 Malaysia: Status Kualiti Air di Hulu Muka Sauk, 2014

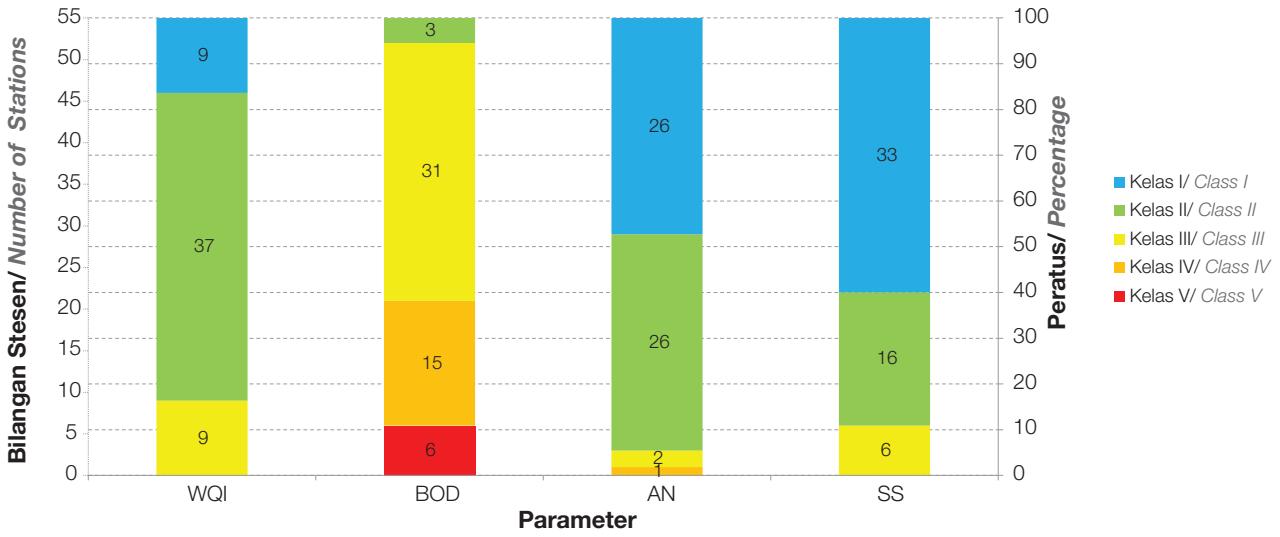
Table 3.6 Malaysia: Water Quality Status of Upstream Water Intakes, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ Stesen ID	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					IKA/WQI	Kategori/ *Category*	Kelas/ *Class*
	Benut	Sg. Machap Dam	3BN10	Machap Dam	83	B/C	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	88	B/C	II
JOHOR/ N. SEMBILAN/ PAHANG	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	83	B/C	II
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	90	B/C	II
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	75	ST/SP	III
PAHANG	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	93	B/C	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	90	B/C	II
		Sg. Ulong	2CH16	Brinchang Dam	88	B/C	II
PAHANG/ JOHOR	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	88	B/C	II
PAHANG/ N.SEMBILAN	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	93	B/C	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	84	B/C	II
			4PH97	Loji Air Jengka 3	83	B/C	II
		Sg. Mentiga	4PH98	Loji Air Chini	78	ST/SP	II
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	84	B/C	II
TERENGGANU	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	85	B/C	II
KELANTAN	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	85	B/C	II
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	86	B/C	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	83	B/C	II
		Sg. Pehi	4KE67	Loji Air Pahi	85	B/C	II
SABAH	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	74	ST/SP	III
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	92	B/C	II
			75PP05	Water Intake Kogopon	92	B/C	II
SARAWAK	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	87	B/C	II
	Mukah Rajang	Sg. Mukah	58MH05	Mukah Water Intake	66	ST/SP	III
		Sg. Daro	56DR01	Daro Water Intake	68	ST/SP	III
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	62	ST/SP	III
		Sg. Pakan	56PN01	Pakan Water Intake	78	ST/SP	II
		Sg. Pila Parit	56PL01	Igan Water Intake	66	ST/SP	III

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

Jadual 3.6 Malaysia: Status Kualiti Air di Hulu Muka Sauk, 2014

Table 3.6 Malaysia: Water Quality Status of Upstream Water Intakes, 2014



Rajah 3.10 Kualiti Air Sungai di Stesen di Hulu Muka Sauk, 2014

Figure 3.10 River Water Quality at Stations Upstream of Water Intakes, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks BOD/ *BOD Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PERLIS	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	73	P/T	IV
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	70	P/T	IV
KEDAH	Kedah	Sg. Ahning	2KD11	Padang Sanai	80	SP/ST	III
		Sg. Pdg Terap	2KD12	Kuala Nerang	72	P/T	IV
		Sg. Temin	2KD10	Changloon	78	P/T	III
KEDAH (LANGKAWI)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	80	SP/ST	III
		Sg. Saga	2LG06	Padang Saga	83	SP/ST	III
KEDAH/ P.PINANG	Muda	Sg. Muda	2MD16	Jeneri	81	SP/ST	III
			2MD17	Jeniang	63	P/T	III
			2MD18	Bukit Selambau	78	P/T	IV
			2MD20	Pinang Tunggal	81	SP/ST	III
		Sg. Nami	2MD21	Nami	85	SP/ST	III
		Sg. Sedim	2MD19	Bikan	85	SP/ST	III
P.PINANG	Pinang	Sg. Satu	2PG12	Batu Feringgi	83	SP/ST	III
PERAK	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	80	SP/ST	III
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	88	SP/ST	II

Jadual 3.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2014

Table 3.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks BOD/ *BOD Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
	Sepetang	Sg. Sauk	2PK61	Loji Rawatan Air Sauk	83	SP/ST	III
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	83	SP/ST	III
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	85	SP/ST	III
		Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	80	SP/ST	III
SELANGOR/ PERAK	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	86	SP/ST	III
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	89	SP/ST	II
SELANGOR/ PUTRAJAYA/ N.SEMBILAN	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	63	P/T	IV
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	68	P/T	IV
SELANGOR/ WPKL	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	87	SP/ST	III
MELAKA	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	75	P/T	IV
JOHOR	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	43	P/T	V
	Benut	Sg. Machap Dam	3BN10	Machap Dam	67	P/T	VI
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	77	P/T	III
JOHOR/ N. SEMBILAN/ PAHANG	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	69	P/T	IV
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	80	SP/ST	IIII
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	66	P/T	IV
PAHANG	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	83	SP/ST	III
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	81	SP/ST	III
		Sg. Ulong	2CH16	Brinchang Dam	70	P/T	IV
PAHANG/ JOHOR	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	84	SP/ST	III

Jadual 3.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2014

Table 3.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks BOD/ *BOD Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PAHANG/ N.SEMBILAN	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	81	SP/ST	III
		Sg. Jempol	4PH96	Loji Air Sg Jerik	76	P/T	IV
			4PH97	Loji Air Jengka 3	80	SP/ST	III
		Sg. Mentiga	4PH98	Loji Air Chini	67	P/T	IV
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	76	P/T	IV
TERENGGANU	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	83	SP/ST	III
KELANTAN	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	80	SP/ST	III
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	86	SP/ST	III
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	83	SP/ST	III
		Sg. Pehi	4KE67	Loji Air Pahi	75	P/T	IV
SABAH	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	48	P/T	V
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	87	SP/ST	III
			75PP05	Water Intake Kogopon	88	SP/ST	II
SARAWAK	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	80	SP/ST	III
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	48	P/T	V
	Rajang	Sg. Daro	56DR01	Daro Water Intake	38	P/T	V
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	37	P/T	V
		Sg. Pakan	56PN01	Pakan Water Intake	77	P/T	III
		Sg. Pila Parit	56PL01	Igan Water Intake	44	P/T	V

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

Jadual 3.7 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks BOD, 2014

Table 3.7 Malaysia: Water Quality Status of Upstream Water Intakes Based on BOD Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks AN/ *AN Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PERLIS	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	92	C/B	I
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	86	SP/ST	II
KEDAH	Kedah	Sg. Ahning	2KD11	Padang Sanai	74	SP/ST	II
		Sg. Pdg Terap	2KD12	Kuala Nerang	79	SP/ST	II
		Sg. Temin	2KD10	Changloon	68	P/T	III
KEDAH (LANGKAWI)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	73	SP/ST	II
		Sg. Saga	2LG06	Padang Saga	83	SP/ST	II
KEDAH/ P.PINANG	Muda	Sg. Muda	2MD16	Jeneri	98	C/B	I
			2MD17	Jeniang	98	C/B	I
			2MD18	Bukit Selambau	80	SP/ST	II
			2MD20	Pinang Tunggal	88	SP/ST	II
		Sg. Nami	2MD21	Nami	99	C/B	I
		Sg. Sedim	2MD19	Bikan	95	C/B	I
P.PINANG	Pinang	Sg. Satu	2PG12	Batu Feringgi	98	C/B	I
PERAK	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	100	C/B	I
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	88	SP/ST	II
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	75	SP/ST	II
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	99	C/B	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	97	C/B	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	101	C/B	I
SELANGOR/ PERAK	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	96	C/B	I
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	102	C/B	I
SELANGOR/ PUTRAJAYA/ N.SEMBILAN	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	48	P/T	IV
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	69	SP/ST	II
SELANGOR/ WPKL	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	98	C/B	I

Jadual 3.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2014

Table 3.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks AN/ *AN Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
MELAKA	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	67	P/T	III
JOHOR	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	72	SP/ST	II
	Benut	Sg. Machap Dam	3BN10	Machap Dam	89	SP/ST	II
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	83	SP/ST	II
JOHOR/ N. SEMBILAN/ PAHANG	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	89	SP/ST	II
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	93	C/B	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	94	C/B	I
PAHANG	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	98	C/B	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	83	SP/ST	II
		Sg. Ulong	2CH16	Brinchang Dam	94	C/B	I
PAHANG/ JOHOR	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	88	SP/ST	II
PAHANG/ N.SEMBILAN	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	100	C/B	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	84	SP/ST	II
			4PH97	Loji Air Jengka 3	88	SP/ST	II
		Sg. Mentiga	4PH98	Loji Air Chini	90	SP/ST	II
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	96	C/B	I
TERENGGANU	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	84	SP/ST	II
KELANTAN	Golok	Sg. Jeduk	4GL10	Syarikat Air Kelantan	94	C/B	I
	Kelantan	Sg. Chiku	4KE66	Felda Ciku 2	88	SP/ST	II
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	81	SP/ST	II
		Sg. Pehi	4KE67	Loji Air Pahi	90	SP/ST	II
SABAH	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	94	C/B	I
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	99	C/B	I
			75PP05	Water Intake Kogopon	99	C/B	I

Jadual 3.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2014

Table 3.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks AN/ *AN Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
SARAWAK	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	94	C/B	I
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	92	C/B	I
	Rajang	Sg. Daro	56DR01	Daro Water Intake	90	SP/ST	II
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	87	SP/ST	II
		Sg. Pakan	56PN01	Pakan Water Intake	96	C/B	I
		Sg. Pila Parit	56PL01	Igan Water Intake	77	SP/ST	II

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

Jadual 3.8 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks AN, 2014

Table 3.8 Malaysia: Water Quality Status of Upstream Water Intakes Based on AN Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks SS/ *SS Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PERLIS	Perlis	Sg. Terusan Mada	2PS13	Loji Rawatan Air Arau Fasa IV	85	C/B	I
			2PS14	Loji Rawatan Air TTPC, Sg. Baru	86	C/B	I
KEDAH	Kedah	Sg. Ahning	2KD11	Padang Sanai	91	C/B	I
		Sg. Pdg Terap	2KD12	Kuala Nerang	92	C/B	I
		Sg. Temin	2KD10	Changloon	74	SP/ST	II
KEDAH (LANGKAWI)	Melaka	Sg. Melaka	2LG05	Ulu Melaka	81	C/B	II
		Sg. Saga	2LG06	Padang Saga	94	C/B	I
KEDAH/ P.PINANG	Muda	Sg. Muda	2MD16	Jeneri	71	SP/ST	III
			2MD17	Jeniang	74	SP/ST	II
			2MD18	Bukit Selambau	72	SP/ST	II
			2MD20	Pinang Tunggal	76	C/B	II
		Sg. Nami	2MD21	Nami	82	C/B	II
		Sg. Sedim	2MD19	Bikan	79	C/B	II
P.PINANG	Pinang	Sg. Satu	2PG12	Batu Feringgi	98	C/B	I

Jadual 3.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2014

Table 3.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks SS/ *SS Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PERAK	Kurau	Sg. Air Hitam	2KU07	Loji Rawatan Air Jelai	99	C/B	I
	Perak	Sg. Manong	2PK62	Loji Rawatan Air Manong	97	C/B	I
		Sg. Sauk	2PK61	Loji Rawatan Air Sauk	99	C/B	I
		Sg. Tesong	2PK64	Loji Rawatan Air Sg. Klah	98	C/B	I
		Sg. Woh	2PK63	Loji Rawatan Air Kuala Woh	98	C/B	I
	Sepetang	Sg. Batu Tegoh	2SP18	Loji Rawatan Air Bukit Larut	99	C/B	I
SELANGOR/ PERAK	Bernam	Sg. Gelinting	1BM15	Loji Rawatan Air Ulu Slim	93	C/B	I
		Sg. Trolak	1BM14	Loji Rawatan Air Trolak Timur	97	C/B	I
SELANGOR/ PUTRAJAYA/ N.SEMBILAN	Langat	Sg. Batang Labu	1L26	Loji Rawatan Air Salak Tinggi	81	C/B	II
		Sg. Semenyih	1L09	Loji Rawatan Air Semenyih	70	SP/ST	III
SELANGOR/ WPKL	Klang	Sg. Gombak	1K53	Loji Rawatan Air Gombak	97	C/B	I
MELAKA	Kesang	Sg. Chin-Chin	1KA08	Muka sauk Loji Rawatan Air Chin-chin	80	C/B	II
JOHOR	Batu Pahat	Sg. Semberong Dam	3BP27	Semberong Dam	89	C/B	I
	Benut	Sg. Machap Dam	3BN10	Machap Dam	91	C/B	I
	Pulai	Sg. Pulai Dam	3PU04	Pulai Dam	95	C/B	I
JOHOR/ N. SEMBILAN/ PAHANG	Muar	Sg. Jelai	1MN23	Loji Rawatan Air Dangi	79	C/B	II
		Sg. Jementah	3MR39	Loji Rawatan Air Jementah	95	C/B	I
		Sg. Muar	3MR38	Loji Rawatan Air Gombang	75	SP/ST	II

Jadual 3.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2014

Table 3.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2014

Negeri/ *State*	Lembangan Sungai/ *River Basin*	Sungai/ *River*	ID Stesen/ *Stesen ID*	Muka Sauk/ *Water Intake*	Kualiti Air, 2014/ *Water Quality 2014*		
					Sub-Indeks SS/ *SS Sub-Index*	Kategori/ *Category*	Kelas/ *Class*
PAHANG	Bertam	Sg. Bertam	2CH15	Loji Rawatan Air Habu	97	C/B	I
		Sg. Terla	2CH14	Loji Rawatan Air Kuala Terla	96	C/B	I
		Sg. Ulong	2CH16	Brinchang Dam	95	C/B	I
PAHANG/ JOHOR	Endau	Sg. Kahang	3ED38	Jalan Felda Kahang Timur, Kluang	92	C/B	I
PAHANG/ N.SEMBILAN	Pahang	Sg. Gapoi	4PH95	Muka sauk Loji Rawatan Air Gapoi	98	C/B	I
		Sg. Jempol	4PH96	Loji Air Sg Jerik	87	C/B	I
			4PH97	Loji Air Jengka 3	78	C/B	II
		Sg. Mentiga	4PH98	Loji Air Chini	86	C/B	I
		Sg. Triang	4PH93	Loji Rawatan Air Sg. Triang	67	P/T	III
TERENGGANU	Terengganu	Sg. Terengganu	4TE14	Loji Air Serada	86	C/B	I
KELANTAN	Golok Kelantan	Sg. Jeduk	4GL10	Syarikat Air Kelantan	84	C/B	II
		Sg. Chiku	4KE66	Felda Ciku 2	71	SP/ST	III
		Sg. Kelantan	4KE68	Loji Air Kelar, Pasir Mas	59	P/T	III
		Sg. Pehi	4KE67	Loji Air Pahi	80	C/B	II
SABAH	Padas	Sg. Padas	72PD04	Water Intake Jabatan Air Beaufort	59	P/T	III
	Papar	Sg. Papar	75PP04	Sekolah Kebangsaan Mandalipau	87	C/B	I
			75PP05	Water Intake Kogopon	86	C/B	I
SARAWAK	Kerian	Sg. Selalang	55SG01	Selalang Water Intake	96	C/B	I
	Mukah	Sg. Mukah	58MH05	Mukah Water Intake	86	C/B	I
	Rajang	Sg. Daro	56DR01	Daro Water Intake	93	C/B	I
		Sg. Jemoreng	56JG01	Jemoreng Water Intake	92	C/B	I
		Sg. Pakan	56PN01	Pakan Water Intake	83	C/B	II
		Sg. Pila Parit	56PL01	Igan Water Intake	82	C/B	II

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

Jadual 3.9 Malaysia: Status Kualiti Air di Hulu Muka Sauk Berdasarkan Sub-Indeks SS, 2014

Table 3.9 Malaysia: Water Quality Status of Upstream Water Intakes Based on SS Sub-Index, 2014

Bab 4
Chapter 4

KUALITI AIR TANAH/
GROUNDWATER QUALITY

Bab 4 / Chapter 4
KUALITI AIR TANAH
GROUNDWATER QUALITY

KUALITI AIR TANAH
GROUNDWATER QUALITY

PENGAWASAN KUALITI AIR TANAH

Program Pengawasan Kualiti Air Tanah Kebangsaan telah dimulakan pada tahun 1997 dan pada masa ini program pengawasan telah dijalankan terhadap 78 telaga pengawasan di Semenanjung Malaysia, 12 telaga di Sarawak dan 15 telaga di Sabah **(Jadual 4.1)**. Tapak telaga yang telah terpilih adalah mewakili jenis guna tanah spesifik seperti pertanian, bandar/pinggir bandar, luar bandar dan industri serta tapak yang berkepentingan tertentu seperti tapak pelupusan sampah, padang golf, kawasan pelupusan bangkai haiwan, bekalan air tempatan dan juga bekas lombong emas.

Pada tahun 2014, sebanyak 356 sampel telah diambil daripada telaga pengawasan aktif ini dan telah dianalisa untuk bahan kimia organik meruap (VOCs), racun perosak, logam berat, anion, bakteria (kolifom), sebatian berfenol, jumlah keliatan, jumlah pepejal terlarut, pH, suhu, konduktiviti dan oksigen terlarut (DO).

Hasil analisis dibandingkan dengan Garis Panduan Kebangsaan Bagi Kualiti Air untuk Minuman yang telah dibangunkan oleh Kementerian Kesihatan (Semakan Disember 2000) **(Jadual 4.2)** bagi menentukan status kualiti air tanah.

GROUNDWATER QUALITY MONITORING

*The National Groundwater Monitoring Programme was established since 1997 and presently monitoring programme being carried out at 78 wells in Peninsular Malaysia, 12 wells in Sarawak and 15 wells in Sabah **(Table 4.1)**. The sites were selected based on specific land uses such as agricultural, urban/suburban, rural, industrial and sites of special interests such as solid waste landfills, golf courses, animal burial areas, municipal water supply and ex-mining (gold mine).*

In 2014, 356 water samples were taken from these monitoring wells and analyzed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO).

*The results were then compared with the National Guidelines for Drinking Water Quality established by the Ministry of Health (Revised December 2000) **(Table 4.2)** to determine the status of the quality of groundwater.*

Kategori/ *Category*	Bilangan Telaga/ *Numbers of Wells*
Kawasan Pertanian / *Agricultural Areas*	12
Bandar & Pinggir Bandar / *Urban/Suburban Areas*	11
Tapak Perindustrian / *Industrial Sites*	18
Tapak Pelupusan Sampah / *Solid Waste Landfills*	23
Padang Golf / *Golf Courses*	7
Luar Bandar / *Rural Areas*	3
Bekas Lombong Emas / *Ex- mining Areas (Gold Mine)*	3
Bekalan Air Tempatan / *Municipal Water Supply*	6
Tapak Pelupusan Bangkai Haiwan / *Animal Burial Areas*	14
Kolam Akuakultur / *Aquaculture Farms*	6
Tapak Pelupusan Radioaktif / *Radioactive Landfill*	1
Peranginan / Resorts	1
Jumlah / *Total*	**105**

Jadual 4.1 Malaysia: Bilangan Telaga Air Tanah Mengikut Jenis Kategori Guna Tanah, 2014
Table 4.1 Malaysia: Number Of Groundwater Wells By Land Use Category, 2014

Parameter / *Parameter*	Simbol / *Symbol*	Unit/ *Unit*	Had Piawai/ *Benchmark*
Sulfat / *Sulphate*	SO_{4}^{-}	mg/l	250
Keliatan / *Hardness*	$CaCO_3$	mg/l	500
Nitrat / *Nitrate*	NO_{3}^{-}	mg/l	10
Kolifom / *Total Coliform*	-	MPN/100ml	Mesti tidak dikesan dalam sebarang 100ml sampel *Must not be detected in any 100 ml sample*
Mangan / *Manganese*	Mn	mg/l	0.1
Kromium / *Chromium*	Cr	mg/l	0.05
Zink / *Zinc*	Zn	mg/l	3
Arsenik / *Arsenic*	As	mg/l	0.01
Selenium / *Selenium*	Se	mg/l	0.01
Klorida / *Chloride*	Cl	mg/l	250
Sebatian Fenol / *Phenolics*	-	mg/l	0.002
Pepejal Terlarut / *TDS*	-	mg/l	1000
Besi / *Iron*	Fe	mg/l	0.3
Kuprum / *Copper*	Cu	mg/l	1.0
Plumbum / *Lead*	Pb	mg/l	0.01
Kadmium / *Cadmium*	Cd	mg/l	0.003
Merkuri / *Mercury*	Hg	mg/l	0.001

Jadual 4.2 Malaysia: Garis Panduan Kebangsaan Bagi Kualiti Air Untuk Minuman (Semakan Disember 2000)
Table 4.2 Malaysia: National Guidelines for Drinking Water Quality (Revised December 2000)

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

STATUS KUALITI AIR TANAH

Penilaian turut dibuat terhadap kualiti air tanah adalah berdasarkan kepada nilai peratusan yang melebihi had piawai dalam Garis Panduan Kebangsaan bagi Kualiti Air untuk Minuman, 2000 (NGDWQ). Peratusan julat di antara 0% to 49% adalah dikategorikan sebagai “rendah”; 50 - 79% sebagai “sederhana”; dan 80 - 100% sebagai “tinggi”.

Oleh kerana JAS masih belum membangunkan standard & kriteria air tanah, maka kita telah merujuk dan mengguna pakai NGDWQ dari Kementerian Kesihatan Malaysia bagi mendapatkan nilai penerimaan maksimum bagi menganalisis kandungan parameter-parameter dalam air minuman yang diambil dari dalam tanah.

Pada tahun 2014, keputusan yang diperolehi daripada pengawasan yang dijalankan menunjukkan bahawa semua stesen berada dalam julat nilai pematuhan NGDWQ kecuali bagi arsenik (As), besi (Fe), mangan (Mn), jumlah kolifom dan juga fenol **(Rajah 4.1)** .

Dari segi parameter yang melebihi NGDWQ, didapati jumlah kolifom adalah dikategorikan sebagai tinggi di semua stesen diikuti fenol, Fe , Mn dan As. Analisis lanjut diberikan dalam **Jadual 4.3**.

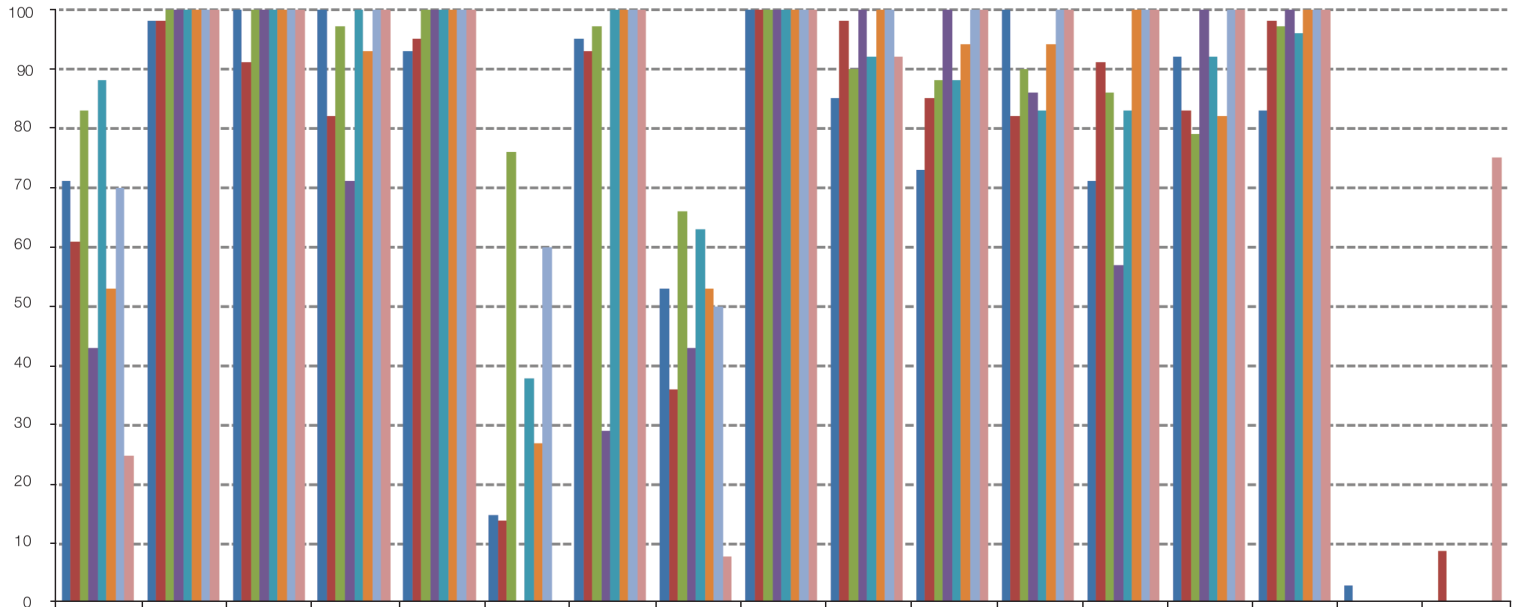
GROUNDWATER QUALITY STATUS

Assessment of groundwater quality was also conducted based on the percentage of samples exceeding the National Guidelines for Drinking Water Quality 2000 (NGDWQ). The range of 0% to 49% was categorized as “low”; 50 - 79% as “moderate”; and 80 - 100% as “high”.

As the DOE had yet to develop any groundwater standards and criteria, the department had to refer to and use NGDWQ from the Ministry of Health, in obtaining the maximum acceptable parameter value for analyzing drinking water from the soil.

*In 2014, the results derived from the monitoring showed that all stations were within the NGDWQ values except for arsenics (As), iron (Fe), manganese (Mn), total coliform and phenol **(Figure 4.1)**.*

*Among parameters exceeding NGDWQ standards, coliform was categorized as the highest in all the stations, followed by phenol, Fe , Mn and As. Detailed analysis is shown in **(Table 4.3)**.*



	As	Hg	Cd	Cr	Cu	Fe	Pb	Mn	Zn	Se	CaC03	TDS	Cl	N03	S04	T-Coliform	Phenol
Industri/ *Industry*	71	98	100	100	93	15	95	53	100	85	73	100	71	92	83	3	0
Tapak pelupusan sampah/ *Landfill*	61	98	91	82	95	14	93	36	100	98	85	82	91	83	98	0	9
Pertanian/ *Agriculture*	83	100	100	97	100	76	97	66	100	90	88	90	86	79	97	0	0
Bekalan Air Tempatan/ *Municipal Water Supply*	43	100	100	71	100	0	29	43	100	100	100	86	57	100	100	0	0
Bandar/Pinggir Bandar/ *Urban/Suburban*	88	100	100	100	100	38	100	63	100	92	88	83	83	92	96	0	0
Padang Golf/ *Golf Courses*	53	100	100	93	100	27	100	53	100	100	94	94	100	82	100	0	0
Luar Bandar/ *Rural Areas*	70	100	100	100	100	60	100	50	100	100	100	100	100	100	100	0	0
Bekas Lombong/ *Ex-mining*	25	100	100	100	100	0	100	8	100	92	100	100	100	100	100	0	75

Rajah 4.1 Malaysia: Peratusan Pematuhan oleh Pencemar Terpilih Mengikut Guna Tanah, 2014

Figure 4.1 Malaysia: Percentage of Compliance of Selected Contaminants by Land Use, 2014

Negeri/ *State*	Bilangan Stesen/ *No. of Station*	Maklumat Stesen/ *Station Description*	Nilai Peratusan yang Melebihi NGDWQ(%)/ *The Percentage of Exceedance NGDWQ (%)*				
			As	Fe	Mn	T-coliform	Phenol
Sabah	14	1) ITAC, Penampang 1	0	100	100	100	100
		2) ITAC, Penampang 2	50	100	100	100	100
		3) ITAC, Penampang 3	0	100	100	100	-
		4) ITAC, Penampang 4	0	100	100	100	100
		5) ITAC, Penampang 5	0	100	100	100	100
		6) ITAC, Penampang 6	0	100	100	100	100
		7) ITAC, Penampang 7	50	50	100	100	100
		8) Limbawang	0	100	50	100	100
		9) Tawau	0	100	0	-	100
		10) Kg. Tajau Laut	0	100	100	100	100
		11) Sandakan Golf Club No.1	50	50	50	-	100
		12) Sandakan Golf Club No.2	50	50	0	-	100
		13) Inanam	0	100	100	-	100
		14) Pulau Manukan	100	100	0	100	100
Sarawak	12	1) Kemuyang no.1	100	100	100	100	100
		2) Kemuyang no.2	0	100	100	100	100
		3) Kabong	100	100	100	100	100
		4) Kuala Lawas no.1	0	100	0	100	100
		5) Kuala Lawas no.2	100	100	100	100	100
		6) Laku	100	100	0	-	100
		7) Kg. Lusut Kiri	0	100	0	-	100
		8) Bau no.1	100	100	100	100	25
		9) Bau no.2	100	100	100	100	25
		10) Bau	25	100	75	100	25
		11) Oya no.1	0	100	100	100	100
		12) Oya no.2	0	100	100	100	100
Terengganu	13	1) Kerteh no.1	0	33	0	100	100
		2) Kerteh no.2	0	100	25	100	100
		3) Telok Kalong no.1	0	100	0	100	100
		4) Telok Kalong no.2	0	100	100	75	100
		5) Kg. Kubang Badak no.1, K.Treg	0	100	0	100	100
		6) Kg. Kubang Badak no.2, K.Treg	0	100	0	100	100
		7) Kg. Merang,Setiu	0	0	0	100	100
		8) Kg. Raja no.1 , Besut	0	33	0	100	100
		9) Kg. Raja no.2, Besut	0	100	67	100	100
		10) Bukit Payung, Marang	0	0	0	100	100
		11) Kg. Alor Peroi no.1	100	100	100	100	100
		12) Kg. Alor Peroi no.2	0	100	100	100	100
		13) Kg. Alor Peroi no.3	0	100	0	100	100

Jadual 4.3 Malaysia: Peratusan yang melebihi NGDWQ mengikut Negeri, 2014

Table 4.3 Malaysia: Percentage of Exceedance NGDWQ by State, 2014

Negeri/ *State*	Bilangan Stesen/ *No. of Station*	Maklumat Stesen/ *Station Description*	Nilai Peratusan yang Melebihi NGDWQ(%)/ *The Percentage of Exceedance NGDWQ (%)*				
Pahang	8	1) Nenasi	100	100	100	100	100
		2) Lepar	0	33	0	100	100
		3) Agrobest no.2, Nenasi	0	67	67	100	100
		4) Agrobest no.3, Nenasi	33	100	100	100	100
		5) Agrobest no.4, Nenasi	100	100	100	100	100
		6) Agrobest no.5, Nenasi	0	100	0	100	100
		7) Agrobest no.6, Nenasi	0	100	100	100	100
		8) Agrobest no.7, Nenasi	100	67	0	100	100
Johor	6	1) Tg. Puteri, Pasir Gudang (MUCC)	0	25	0	100	100
		2) Tg. Puteri, Pasir Gudang	75	100	75	100	100
		3) Kota Tinggi	100	100	100	100	100
		4) Ulu Choh (Pintu)	75	100	100	100	100
		5) Ulu Choh (Kolam)	75	50	100	100	100
		6) Ulu Choh (Sungai)	75	100	100	100	100
Kedah	4	1) Kulim Hi-tech	100	100	100	100	100
		2) Pulau Langkawi no.1	0	0	0	-	100
		3) Pulau Langkawi no.2	100	100	0	-	100
		4) Kepala Batas	0	100	25	100	100
Perlis	3	1) Arau no.1	0	100	0	-	100
		2) Arau no.2	0	50	100	-	100
		3) Padang Besar	0	50	0	-	100
Kelantan	15	1) Eastern Garment MFG no.1	0	100	100	100	100
		2) Eastern Garment MFG no.2	100	100	0	100	100
		3) Panji no.1	0	50	0	100	100
		4) Panji no.2	0	100	0	100	100
		5) Pasir Mas	0	100	100	100	100
		6) Kampong Jembal	25	50	100	100	100
		7) Beris Lalang	0	0	0	100	100
		8) Rantau Panjang no.1	0	0	0	100	100
		9) Rantau Panjang no.2	0	0	0	100	100
		12) Kelab Golf & Desa no.1	100	100	0	100	100
		13) Kelab Golf & Desa no.2	0	100	100	100	100
		10) Kelab Golf DiRaja Kubang Kerian no.1	100	100	100	100	100
		11) Kelab Golf DiRaja Kubang Kerian no.2	0	100	67	100	100
		14) Bachok no.1	0	33	100	100	100
		15) Bachok no.2	100	100	67	100	100
Melaka	1	1) Petronas Sungai Udang	0	0	0	100	-
Perak	3	1) Tambun	100	100	50	100	100
		2) Jalong no.2	0	0	33	100	100
		3) Batu Gajah	100	100	67	100	100

Jadual 4.3 Malaysia: Peratusan Yang Melebihi NGDWQ Mengikut Negeri, 2014

Table 4.3 Malaysia: Percentage of Exceedance NGDWQ by State, 2014

Negeri/ *State*	Bilangan Stesen/ *No. of Station*	Maklumat Stesen/ *Station Description*	Nilai Peratusan yang Melebihi NGDWQ(%)/ *The Percentage of Exceedance NGDWQ (%)*				
Kuala Lumpur	6	1) Jln. Sungai Besi no.1	100	100	100	100	100
		2) Jln. Sungai Besi no.2	100	0	0	100	100
		3) Jln. Sungai Besi no.3	100	0	0	100	100
		4) Taman Beringin no.1	67	67	67	100	33
		5) Taman Beringin no.2	67	50	50	100	33
		6) Royal Selangor Golf Club	0	0	0	100	100
Selangor	8	1) Sek Keb Seksyen 20,Shah Alam	0	100	50	100	100
		2) CIAST no.1, Shah Alam	50	100	100	-	100
		3) CIAST no.2, Shah Alam	100	100	100	-	100
		4) Saujana Golf Resort no.1, Subang	0	0	0	-	100
		5) Saujana Golf Resort no.2, Subang	0	0	0	-	100
		6) Rumah India, Sepang	100	100	50	100	100
		7) TNB Sepang	0	67	33	-	100
		8) Ladang Sepang	0	50	0	-	100
Pulau Pinang	4	1) Mak Mandin no.1	-	-	-	100	100
		2) Mak Mandin no.2	-	-	-	100	100
		3) Bayan Lepas	-	-	-	100	100
		4) Valdor (Kelapa)	-	-	-	100	100
Negeri Sembilan	3	1) Senawang	100	100	0	100	100
		2) Kualiti Alam Sdn. Bhd no.1	0	100	100	-	100
		3) Kualiti Alam Sdn. Bhd no.2	100	100	100	-	100

Jadual 4.3 Malaysia: Peratusan Yang Melebihi NGDWQ Mengikut Negeri, 2014

Table 4.3 Malaysia: Percentage of Exceedance NGDWQ by State, 2014

Stesen Pengawasan Kualiti Air Tanah di Yong's Farm, Tawau (guna tanah pertanian)

Groundwater Monitoring Station at Yong's Farm, Tawau (for agriculture land use)

Bab 5
Chapter 5

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

Bab 5 / Chapter 5

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

KUALITI AIR MARIN DAN PULAU-PULAU
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PENGAWASAN KUALITI AIR MARIN

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

Dalam tahun 2014, sebanyak 150 stesen pantai, 76 stesen kuala dan 89 stesen pulau telah dipantau. Sebanyak 590 sampel di kawasan pantai, 401 di kuala dan 353 di pulau telah diambil untuk dianalisisdan hasilnya dilaporkan berdasarkan Indeks Kualiti Air Marin (IKAM)(Annex).

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

IKAM yang berskala 0 hingga 100 akan menentukan kategori kualiti air marin daripada "Terbaik" hingga "Tercemar" **(Jadual 5.1)**.

MARINE WATER QUALITY MONITORING

The Department of Environment (DOE) continues to monitor the marine water quality since 1978 in Peninsular Malaysia and 1985 in Sabah and Sarawak with the main aim to identify the marine water quality status and to determine the degree of pollution from both the land-based sources as well as the sea. These sources may pose threats to the marine resources and can upset the stability and diversity of the marine ecosystem.

In 2014, about 150 coastal, 76 estuary and 89 island stations were monitored. As many as 590 samples from coastal, 401 samples from estuary and 353 samples from island monitoring stations were collected for analyses and reported based on the Marine Water Quality Index (MWQI)(ANNEX).

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

The resulting MWQI with scales between 0 to 100 will determine the category of the marine water quality, ranging from "Excellent" to "Poor" ***(Table 5.1)****.*

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

Jadual 5.1: Klasifikasi Indeks Kualiti Air Marin

Table 5.1: Marine Water Quality Index Classification

PARAMETER/ *PARAMETER*	KELAS 1/ *CLASS 1*	KELAS 2/ *CLASS 2*	KELAS 3/ *CLASS 3*	KELAS E/ *CLASS E*
KEGUNAAN/ *USES*	Pemeliharaan, Kawasan Dilindungi,Taman Laut/ *Preservation, Marine Protected areas, Marine Parks*	Kehidupan Laut, Perikanan, Terumbu Karang, Rekreasi dan Marikultur/ *Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture*	Pelabuhan, Lapangan Minyak dan Gas/ *Ports, Oil & Gas Fields*	Paya Bakau & Muara Sungai/ *Mangroves Estuarine & River-mouth Water*
Suhu (°C)/ *Temperature (°C)*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*	≤ 2°C peningkatan terhadap ambien maksimum *≤ 2°C increase over maximum ambient*
Oksigen Terlarut (mg/L)/ *Dissolved Oxygen (mg/L)*	>80% tepu *>80% saturation*	5	3	4
Jumlah Pepejal Terampai* (mg/L)/ *Total suspended solid (mg/L)*	25 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah / *25 mg/L or ≤ 10% increase in seasonal average, whichever is lower*	50mg/L (25 mg/L) atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah / *50mg/L (25 mg/L) or ≤ 10% increase in seasonal average, whichever is lower*	100 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah / *100 mg/L or ≤ 10% increase in seasonal average, whichever is lower*	100 mg/L atau ≤ 30 % peningkatan dalam purata bermusim, yang mana lebih rendah/ *100 mg/L or ≤ 30 % increase in seasonal average, whichever is lower*
Minyak dan Geris (mg/L)/ *Oil and grease (mg/L)*	0.01	0.14	5	0.14
Raksa* (µg/L)/ *Mercury* (µg/L)*	0.04	0.16 (0.04)	50	0.5
Kadmium* (µg/L)/ *Cadmium* (µg/L)*	0.5	2 (3)	10	2
Kromium (VI) (µg/L)/ *Chromium (VI) (µg/L)*	5	10	48	10
Kuprum (µg/L)/ *Copper (µg/L)*	1.3	2.9	10	2.9
Arsenik (III)* (µg/L)/ *Arsenic (III)* (µg/L)*	3	20(3)	50	20 (3)
Plumbum (µg/L)/ *Lead (µg/L)*	4.4	8.5	50	8.5

Jadual 5.2: Standard dan Kriteria Kualiti Air Marin

Table 5.2: Malaysia Marine Water Quality Criteria and Standards

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

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

Jadual 5.2: Standard dan Kriteria Kualiti Air Marin

Table 5.2: Malaysia Marine Water Quality Criteria and Standards

STATUS KUALITI AIR MARIN PANTAI

Dalam tahun 2014, sebanyak 150 stesen pantai telah dipantau dan dianalisis serta dilaporkan dalam Indeks Kualiti Air Marin. Hasil pengawasan menunjukkan 30 stesen (20%) dikategorikan sebagai Terbaik, 45 stesen (30%) sebagai Baik dan 75 stesen (50%) sebagai Sederhana. **(Jadual 5.3)**.

COASTAL WATER QUALITY STATUS

*In 2014, a total of 150 coastal stations were monitored and analyzed and reported in term of the Marine Water Quality Index. The monitoring results indicated that 30 stations (20%) as Excellent, 45 stations (30%) as Good and 75 stations (50%) as Moderate.**(Table 5.3)**.*

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen/ *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Kedah	Pantai / *Coastal*	Pantai Merdeka	5603905	71.62	59.92	65.63	Sederhana / *Moderate*
		Langkawi Island Resort	6399914	73.60	60.61	80.51	Baik / *Good*
		Pantai Kok	6397922	60.45	69.04	82.15	Baik / *Good*
		Pantai Kuah	6398925	74.13	62.02	80.37	Baik / *Good*
		Pantai Pasir Tengkorak	6499701	72.87	84.28	82.05	Baik / *Good*
		Pantai Teluk Burau	6396923	56.11	81.59	88.36	Baik / *Good*
		Pantai Teluk Nibong	6497915	54.93	74.92	79.68	Sederhana / *Moderate*
		Pantai Tengah	6297903	-	69.04	70.21	Sederhana / *Moderate*
Pulau Pinang	Pantai / *Coastal*	Gertak Sanggul	5201919	58.29	56.60	55.64	Sederhana / *Moderate*
		Kawasan Perindustrian Bayan Lepas I	5303932	61.00	50.26	55.34	Sederhana / *Moderate*
		Kawasan Perindustrian Bayan Lepas II	5303933	62.33	51.17	54.71	Sederhana / *Moderate*
		Kawasan Perindustrian Bayan Lepas III	5302939	55.65	49.12	54.46	Sederhana / *Moderate*
		Pantai Bersih	5403906	52.38	61.81	61.22	Sederhana / *Moderate*
		Pantai Miami	5502901	65.52	50.22	65.47	Sederhana / *Moderate*
		Pantai Pasir Panjang	5201938	63.02	58.66	66.81	Sederhana / *Moderate*
		Batu Feringgi (Casuarina)	5402904	81.13	53.81	69.22	Sederhana / *Moderate*
		Luar Pantai Teluk Bahang	5402930	68.52	74.79	66.54	Sederhana / *Moderate*
		Persiaran Gurney	5403902	68.05	51.75	66.86	Sederhana / *Moderate*
		Rumah Pam Baru Perai	5304927	50.48	50.53	55.45	Sederhana / *Moderate*
		Rumah Pam Lama Perai	5303926	61.60	51.02	59.73	Sederhana / *Moderate*
		Selat PP Selatan (Jelutong)	5303911	58.13	60.52	51.73	Sederhana / *Moderate*

Jadual 5.3 Malaysia:Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen/ *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
		Tanjung Bungah	5402937	51.98	51.91	67.36	Sederhana / *Moderate*
		Teluk Tempoyak	5202923	77.99	57.00	61.87	Sederhana / *Moderate*
		Batu Maung	5202901	-	72.34	57.26	Sederhana / *Moderate*
Perak	Pantai / *Coastal*	Pantai Pasir Bogak	4205908	55.69	51.75	80.41	Baik / *Good*
		Pantai Teluk Dalam	4205928	39.94	65.64	70.01	Sederhana / *Moderate*
		Pantai Teluk Batik	4205932	60.35	63.86	71.11	Sederhana / *Moderate*
		Pantai Tanjung Batu	4406927	40.32	56.32	84.07	Baik / *Good*
		Pantai Pasir Panjang	4205924	63.16	64.09	85.58	Baik / *Good*
Selangor	Pantai / *Coastal*	Pantai Bagan Lalang	2616927	90.57	86.08	85.49	Baik / *Good*
		Pantai Morib	2712902	75.03	53.76	87.97	Baik / *Good*
		Selat Pulau Babi	3012929	90.98	65.21	93.51	Terbaik / *Excellent*
		Selat Klang Utara	3013908	89.14	64.28	94.96	Terbaik / *Excellent*
Negeri Sembilan	Pantai / *Coastal*	Bagan Pinang	2518915	72.47	67.90	92.75	Terbaik / *Excellent*
		Telok Sinting	2419908	65.90	72.29	88.84	Baik / *Good*
		Port Dickson Bandar	2517907	66.45	75.97	70.39	Sederhana / *Moderate*
		Port Dickson Batu 4	2518937	-	68.60	93.92	Terbaik / *Excellent*
		Port Dickson Batu 5	2418906	81.60	68.41	67.31	Sederhana / *Moderate*
		Port Dickson Batu 6	2418916	89.61	73.31	81.68	Baik / *Good*
		Port Dickson Batu 7	2418905	64.49	71.36	90.13	Terbaik / *Excellent*
		Port Dickson Batu 8	2418912	75.72	94.06	93.86	Terbaik / *Excellent*
		Port Dickson Batu 10	2418914	66.34	94.40	90.10	Terbaik / *Excellent*
		Port Dickson Janakuasa TNB	2517909	66.19	74.92	91.99	Terbaik / *Excellent*
		Telok Pelanduk	2419917	80.93	91.62	91.50	Terbaik / *Excellent*
		Pantai Cermin	2416918	89.19	92.36	88.47	Baik / *Good*
Melaka	Pantai / *Coastal*	Pantai Rombang	2221916	66.36	45.21	55.15	Sederhana / *Moderate*
		Pantai Kundur	2221908	79.71	46.15	55.51	Sederhana / *Moderate*
		Pantai Tanjung Bidara	2320909	76.56	44.08	52.04	Sederhana / *Moderate*

Jadual 5.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen/ *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Melaka	Pantai / *Coastal*	Teluk Gong	2320902	79.24	45.18	51.58	Sederhana / *Moderate*
		Pulau Melaka Point A(i)	2121915	50.24	42.39	-	-
		Pulau Melaka Point A(ii)	2121915	49.15	40.67	-	-
		Pulau Melaka Point B(i)	2121916	48.31	41.95	-	-
		Pulau Melaka Point B(ii)	2121916	49.61	42.32	-	-
Johor	Pantai / *Coastal*	Tanjung Bin	1336975	88.98	88.26	90.21	Terbaik / *Excellent*
		Pelabuhan Tanjung Pelepas	1438943	86.35	85.67	85.79	Baik / *Good*
		Hadapan Jabatan Laut	1438918	66.86	78.90	87.11	Baik / *Good*
		Pantai Stulang Laut	1437951	61.36	61.19	61.00	Sederhana / *Moderate*
		Jeti Teluk Jawa	1438918	62.37	65.03	84.28	Baik / *Good*
		Pelabuhan Pasir Gudang	1428939	61.48	63.94	64.62	Sederhana / *Moderate*
		Hadapan HSAJB	1437920	54.37	63.48	55.74	Sederhana / *Moderate*
		Pantai Lido	1437921	55.94	64.32	63.25	Sederhana / *Moderate*
		Pantai Teluk Mahkota	1841911	78.57	82.96	85.51	Baik/*Good*
		Pantai Tanjung Leman	2140694	78.72	83.06	87.85	Baik / *Good*
		Pantai Sri Pantai	2339960	80.02	59.57	87.81	Baik / *Good*
		Tanjung Merak	1441968	82.82	49.56	61.98	Sederhana / *Moderate*
		Tanjung Pengelih	1441967	83.31	76.20	85.38	Baik / *Good*
		Pantai Tanjong Stapa	1341961	81.10	57.47	57.22	Sederhana / *Moderate*
		Pantai Teluk Gorek	2538958	84.07	60.72	79.89	Sederhana / *Moderate*
		Pantai Air Papan	2538959	82.50	79.08	86.86	Baik / *Good*
		Jeti Kukup	1334925	86.43	58.52	64.52	Sederhana / *Moderate*
		Jeti Tanjong Belungkor	1440963	84.21	80.31	87.92	Baik / *Good*
		Pasir Gogok	1441966	83.94	71.97	79.73	Sederhana / *Moderate*
		Tanjung Buai	1340973	84.61	60.45	89.89	Baik / *Good*
		Pantai Desaru	1542914	85.33	82.91	71.54	Sederhana / *Moderate*
		Tanjung Sepang	1443969	84.86	81.78	83.51	Baik / *Good*
		Tanjung Penyusup	1444920	82.21	82.02	77.08	Sederhana / *Moderate*
		Pantai Sungai Lurus	1730962	81.76	64.81	86.68	Baik / *Good*
		Punggur	1531974	68.18	49.47	52.74	Sederhana / *Moderate*

Jadual 5.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen/ *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Pahang	Pantai / *Coastal*	Pantai Cherating (Club Med)	4133903 (A)	70.48	73.92	91.11	Terbaik / *Excellent*
		Pantai Cherating (Club Med)	4133903 (B)	70.48	73.83	94.11	Terbaik / *Excellent*
		Pantai Cherating (Legend)	4133942 (A)	70.02	73.76	67.36	Sederhana / *Moderate*
		Pantai Cherating (Legend)	4133942 (B)	70.87	73.96	92.74	Terbaik / *Excellent*
		Pantai Muhibbah Balok	3933901 (A)	51.16	72.82	87.45	Baik / *Good*
		Pantai Muhibbah Balok	3933901 (B)	51.04	71.03	86.44	Baik / *Good*
		Pantai Batu Hitam	3833915 (A)	69.36	73.09	93.94	Terbaik / *Excellent*
		Pantai Batu Hitam	3833915 (B)	71.08	73.87	91.21	Terbaik / *Excellent*
		Pantai Berserah	3933941 (A)	70.90	73.62	93.92	Terbaik / *Excellent*
		Pantai Berserah	3933941 (B)	55.11	73.84	71.49	Sederhana / *Moderate*
		Pantai Teluk Cempedak	3833910 (A)	64.29	73.96	93.36	Terbaik/*Excellent*
		Pantai Teluk Cempedak	3833910 (B)	46.56	73.89	94.29	Terbaik / *Excellent*
		Pantai Teluk Gelora	3833909 (A)	50.21	55.80	71.47	Sederhana / *Moderate*
		Pantai Teluk Gelora	3833909 (B)	50.49	61.48	78.43	Sederhana / *Moderate*
		Pantai Sepat	3737915	70.11	73.52	93.66	Terbaik / *Excellent*
		Pantai Sepat (B)	3633916	73.64	73.89	94.29	Terbaik / *Excellent*
		Pantai Legenda (A)	3534943 (A)	70.92	73.62	94.25	Terbaik / *Excellent*
		Pantai Legenda (B)	3534943 (B)	70.97	73.62	94.20	Terbaik / *Excellent*
		Pantai Kuala Api-Api	3235917	70.71	72.90	93.21	Terbaik/*Excellent*
		Pantai Tanjung Batu	3334915	70.50	72.65	93.03	Terbaik / *Excellent*
Terengganu	Pantai / Coastal	Pantai Batu Buruk	5331935	57.66	66.87	66.63	Sederhana / *Moderate*
		Pantai Bukit Keluang	5825903	70.00	63.44	69.87	Sederhana / *Moderate*
		Pantai Chendering	5231934	51.76	66.03	69.84	Sederhana / *Moderate*
		Pantai Rantau Abang	4833917	70.11	68.06	70.35	Sederhana / *Moderate*
		KIPC Utara	4634954	50.19	65.02	62.22	Sederhana / *Moderate*
		KIPC Tengah	4534955	63.65	64.23	63.60	Sederhana / *Moderate*
		KIPC Selatan	4534956	51.70	69.81	66.53	Sederhana / *Moderate*

Jadual 5.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

Negeri / State	Klassifikasi Stesen / Station Classification	Kawasan / Area	Nombor Stesen/ Station Number	Nilai IKAM / MWQI Value			Kategori (2014) / Category (2014)
				2012	2013	2014	
Kelantan	Pantai / *Coastal*	Pantai Seri Tujuh	6221910	65.76	66.22	71.10	Sederhana/ *Moderate*
		Pantai Cahaya Bulan	6122903	61.83	66.00	74.47	Sederhana/ *Moderate*
		Pantai Sabak	6123909	63.46	58.87	72.13	Sederhana/ *Moderate*
		Pantai Irama Bachok	6024908	70.50	56.77	69.29	Sederhana/ *Moderate*
		Pantai Bisikan Bayu	5825905	62.00	50.28	67.44	Sederhana/ *Moderate*
Sarawak	Pantai / *Coastal*	Pantai Sematan	1898902	67.79	59.58	91.47	Terbaik/*Excellent*
		Pantai Pandan	1824918	60.43	57.94	94.47	Terbaik/*Excellent*
		Pantai Pasir Putih	1604910	69.60	44.04	67.36	Sederhana/ *Moderate*
		Pantai Bako	1704906	73.63	69.65	94.29	Terbaik/*Excellent*
		Pantai Damai	1702904	70.20	58.34	91.29	Terbaik/*Excellent*
		Pantai Tanjung Kembang	1810923	70.40	69.32	73.99	Sederhana/ *Moderate*
		Pantai Harmoni Mukah	2920921	69.90	53.42	53.87	Sederhana/ *Moderate*
		Pantai Tanjung Batu	3132602	34.98	62.49	70.29	Sederhana/ *Moderate*
		Pantai Likau	3230915	48.22	51.99	63.19	Sederhana/ *Moderate*
		Pantai Emas	3331903	34.98	63.45	63.77	Sederhana/ *Moderate*
		Pantai Piasau	4539918	66.78	54.53	88.55	Baik/*Good*
		Pantai Brighton	4449917	52.45	54.84	91.43	Terbaik/*Excellent*
Sarawak	Pantai / *Coastal*	Pantai Esplaned	4339920	53.47	54.97	89.63	Baik/*Good*
		Pantai Beraya	4238921	72.00	70.12	89.42	Baik/*Good*
		Pantai Bungai	4137922	72.35	53.41	91.11	Terbaik/*Excellent*
		Pantai Belawai	2212913	52.44	76.91	65.92	Sederhana/ *Moderate*
Sabah	Pantai / *Coastal*	Pantai Teluk Brunei 1	5053901	72.36	71.27	80.05	Baik/*Good*
		Pantai Teluk Brunei 2	5053902	64.45	70.87	79.10	Sederhana/ *Moderate*
		Pantai Teluk Brunei 3	5053903	72.95	69.26	73.19	Sederhana/ *Moderate*
		Pantai Teluk Brunei 4	5053904	73.71	73.17	75.80	Sederhana/ *Moderate*
		Pantai Teluk Brunei 5	5053905	75.38	73.94	71.05	Sederhana/ *Moderate*
		Pantai Teluk Brunei 6	5053906	66.58	74.56	80.37	Baik/*Good*
		Borneo Golf Seawater	5355901	73.39	79.01	80.38	Baik/*Good*
		Pantai Manis Papar	5555901	85.29	81.64	81.01	Baik/*Good*

Jadual 5.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

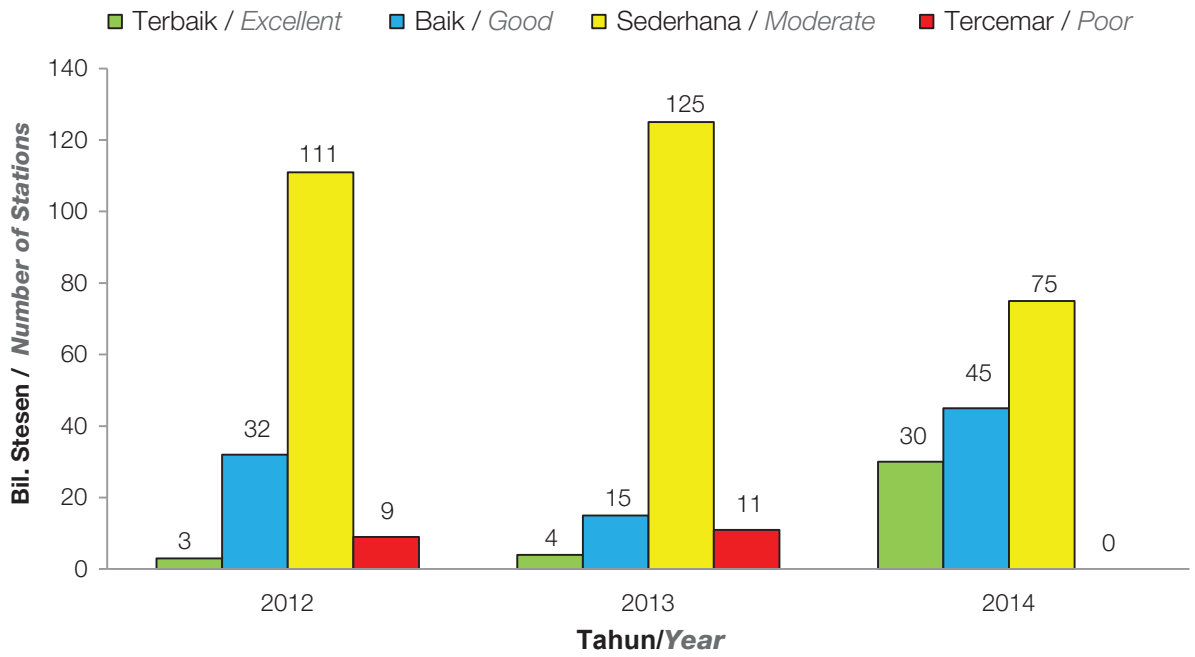
Negeri / State	Klassifikasi Stesen / Station Classification	Kawasan / Area	Nombor Stesen/ Station Number	Nilai IKAM / MWQI Value			Kategori (2014) / Category (2014)
				2012	2013	2014	
		Pantai Melinsung	5565902	84.09	78.52	77.45	Sederhana / *Moderate*
		Pantai Tanjung Aru (Roll Skating)	5656902	74.49	76.46	70.13	Sederhana / *Moderate*
		Pantai Tanjung Aru (No. 3)	5656903	69.93	65.33	67.59	Sederhana / *Moderate*
		Pantai Lok Kawi	5656904	64.61	67.48	59.14	Sederhana / *Moderate*
		Pantai Dalit Tuaran	6161901	86.22	70.89	85.15	Baik / *Good*
		Mangrove Paradise	6161902	68.82	77.51	86.21	Baik / *Good*
		Pantai Sabandar	6161903	80.54	72.57	83.07	Baik / *Good*
		Pantai Bak-Bak Kudat	6665901	89.28	81.06	85.11	Baik / *Good*
		Pasir Putih Sandakan	5580901	85.12	73.89	83.49	Baik / *Good*
		Pantai TLDM	5580902	56.26	75.20	81.66	Baik / *Good*
		Pantai Batu Sapi	5580903	89.99	74.90	83.05	Baik / *Good*
		Pantai Ulu Tungku	5085901	88.17	72.82	83.94	Baik / *Good*
		Pantai Sarina Kunak	4481901	89.32	72.77	83.69	Baik / *Good*
		Pantai Kg. Lamak	4581902	89.01	71.67	-	-
		Pantai Tinagat	4473901	91.28	74.51	83.50	Baik / *Good*
Labuan	Pantai / *Coastal*	Pulau Papan	5151905	65.11	65.92	51.08	Sederhana / *Moderate*
		Kiamsam	5151906	66.37	61.69	67.74	Sederhana / *Moderate*
		Sungai Pagar	5151907	66.10	63.05	79.75	Sederhana / *Moderate*
		Layang-Layangan	5251902	68.15	62.22	79.49	Sederhana / *Moderate*
		Tanjung Aru	5251903	65.93	66.59	75.93	Sederhana / *Moderate*

Jadual 5.3 Malaysia: Status Kualiti Air Marin Kawasan Pantai

Table 5.3 Malaysia: Marine Water Quality Status for Coastal

Tren Indeks Kualiti Air Marin (IKAM) mulai tahun 2012 hingga 2014 adalah seperti yang ditunjuk dalam **Rajah 5.1**. Bilangan stesen Terbaik dan Baik menunjukkan peningkatan, manakala bagi stesen Sederhana dan Tercemar menunjukkan penurunan.

*The trend in terms of Marine Water Quality Index (MWQI) from 2012 to 2014 is as shown in **Figure 5.1**. The numbers of Excellent and Good water quality stations showed an increase for Moderate and Poor stations showed a decrease.*



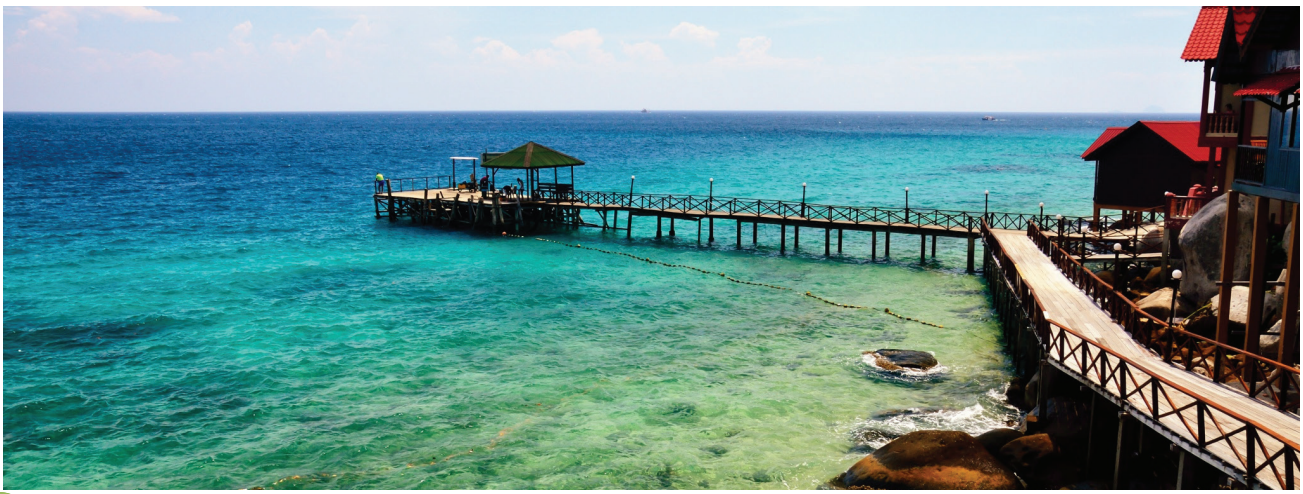
Rajah 5.1 Malaysia: Tren Status Kualiti Air Marin Kawasan Pantai di Malaysia, 2012-2014
Figure 5.1 Malaysia: The trend of Marine Water Status for Coastal Area in Malaysia, 2012-2014

STATUS KUALITI AIR KUALA

Dalam tahun 2014, sebanyak 76 stesen Kuala telah dipantau dan dianalisa serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil program pengawasan yang telah dilakukan menunjukkan 7 stesen (9.2%) dikategorikan sebagai Terbaik, 8 stesen (10.5%) sebagai Baik dan 61 stesen (80.3%) sebagai Sederhana. **(Jadual 5.4)**

ESTUARY WATER QUALITY STATUS

*In 2014, 76 estuary stations were monitored and analysed and reported as Marine Water Quality Index. The results from the monitoring programme indicated that 7 stations (9.2%) as Excellent, 8 stations (10.5%) as Good and 61 stations (80.3%) as Moderate.**(Table 5.4)***



Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Perlis	Kuala / *Estuary*	Kuala Sungai Baru	6201902	52.61	55.87	76.48	Sederhana / *Moderate*
		Kuala Sungai Perlis	6401901	54.66	48.76	59.25	Sederhana / *Moderate*
Kedah	Kuala / *Estuary*	Kuala Kedah	6102908	65.38	84.21	53.46	Sederhana / *Moderate*
		Kuala Jerlun	6302925	65.38	74.29	65.21	Sederhana / *Moderate*
Pulau Pinang	Kuala / *Estuary*	Kuala Sungai Jawi	5204901	61.04	50.49	58.35	Sederhana / *Moderate*
		Kuala Sungai Juru	5303904	60.11	49.72	63.62	Sederhana / *Moderate*
		Kuala Sungai Kerian	5104901	60.42	80.43	61.57	Sederhana / *Moderate*
		Kuala Sungai Pinang	5403934	60.49	50.97	50.66	Sederhana / *Moderate*
		Kuala Sungai Perai	5303908	55.11	61.88	53.06	Sederhana / *Moderate*
		Kuala Sungai Tengah	5204935	81.36	63.34	60.95	Sederhana / *Moderate*
		Kuala Sungai Pinang (Balik Pulau)	5202929	48.51	37.63	67.78	Sederhana / *Moderate*
Perak	Kuala / *Estuary*	Kuala Sungai Manjung	4205930	33.36	60.32	70.13	Sederhana / *Moderate*
		Kuala Sungai Gula	4906926	35.12	50.92	68.90	Sederhana / *Moderate*
		Kuala Sungai Kurau	4994919	41.58	67.63	56.98	Sederhana / *Moderate*
		Kuala Sungai Tanjung Piandang	5003921	38.67	52.25	75.74	Sederhana / *Moderate*
		Kuala Sungai Sepetang	4806925	23.55	32.33	53.51	Sederhana / *Moderate*
		Kuala Sungai Perak	4007901	46.34	66.08	62.01	Sederhana / *Moderate*
Selangor	Kuala / *Estuary*	Kuala Sungai Sepang	2517922	87.09	88.35	71.62	Sederhana / *Moderate*
		Kuala Sungai Sepang (Kecil)	2612928	90.46	89.61	68.14	Sederhana / *Moderate*
		Kuala Sungai Sepang (Kawalan)	2616926	89.35	72.81	81.15	Baik/*Good*
		Kuala Sungai Langat (Jugra)	2814925	73.81	53.62	69.84	Sederhana / *Moderate*
		Kuala Sungai Klang	3013909	75.12	50.83	95.64	Terbaik / *Excellent*
		Kuala Sungai Langat (Lumut)	2913903	75.03	61.85	93.71	Terbaik / *Excellent*
		Kuala Sungai Buloh	3212930	74.69	53.82	64.43	Sederhana / *Moderate*
		Kuala Sungai Selangor	3312915	87.24	51.01	90.87	Terbaik / *Excellent*
		Kuala Sungai Tengi	3311931	74.03	47.95	68.06	Sederhana / *Moderate*
		Kuala Sungai Bernam	3808924	88.52	70.11	67.16	Sederhana / *Moderate*

Jadual 5.4 Malaysia: Status Kualiti Air Marin di Kawasan Kuala

Table 5.4 Malaysia: Marine Water Quality Status for Estuary

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Negeri Sembilan	Kuala / *Estuary*	Kuala Sungai Linggi	2319901	64.27	75.46	93.77	Terbaik / *Excellent*
		Kuala Sungai Lukut	2517910	67.94	66.78	91.78	Terbaik / *Excellent*
Melaka	Kuala / *Estuary*	Kuala Sungai Melaka	2123903	56.78	35.12	59.64	Sederhana / *Moderate*
		Kuala Sungai Sri Melaka	2121914	56.51	34.00	59.55	Sederhana / *Moderate*
		Kuala Sungai Merlimau	2124912	47.57	35.41	62.57	Sederhana / *Moderate*
		Kuala Sungai Kesang	2186905	61.71	45.29	68.74	Sederhana / *Moderate*
		Kuala Sungai Sebatu	2186904	54.16	45.37	61.48	Sederhana / *Moderate*
Johor	Kuala / *Estuary*	Kuala Sungai Segget	1437919	57.21	61.50	61.62	Sederhana / *Moderate*
		Kuala Sungai Skudai	1437922	61.32	60.73	58.88	Sederhana / *Moderate*
		Kuala Sungai Melayu	1437946	63.94	63.73	75.12	Sederhana / *Moderate*
		Kuala Sungai Tebrau	1438943	61.54	59.46	61.58	Sederhana / *Moderate*
		Kuala Sungai Kim-Kim	1439965	60.34	66.47	64.21	Sederhana / *Moderate*
		Kuala Sungai Johor	1440916	59.45	83.38	82.71	Baik / *Good*
		Kuala Sungai Batu Pahat	1729930	82.33	59.89	51.23	Sederhana / *Moderate*
		Kuala Sungai Muar	2024932	82.37	49.41	64.89	Sederhana / *Moderate*
		Kuala Sungai Mersing	2438905	82.88	75.62	64.89	Sederhana / *Moderate*
Terengganu	Kuala / *Estuary*	Kuala Sungai Besut	5825902	61.22	61.30	70.72	Sederhana / *Moderate*
		Kuala Sungai Dungun	4734918	51.70	49.72	54.17	Sederhana / *Moderate*
		Kuala Sungai Ibai	5231949	52.08	51.26	70.65	Sederhana / *Moderate*
		Kuala Sungai Kerteh	4534922	57.50	52.34	58.43	Sederhana / *Moderate*
		Kuala Sungai Marang	5232911	57.59	70.04	67.68	Sederhana / *Moderate*
Terengganu	Kuala / *Estuary*	Kuala Sungai Paka	4634920	62.71	59.15	66.24	Sederhana / *Moderate*
		Kuala Sungai Setiu	5627953	56.41	61.10	70.04	Sederhana / *Moderate*
		Kuala Sungai Terengganu	5331907	51.06	63.64	57.95	Sederhana / *Moderate*
		Kuala Sungai Kemaman/Chukai	4234929	49.76	49.06	59.64	Sederhana / *Moderate*
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	4234950	70.52	64.84	66.36	Sederhana / *Moderate*
		Tioxide Tengah (Pupuk Semangat, Kijal)	4234951	70.32	66.61	70.08	Sederhana / *Moderate*
		Tioxide Selatan (KSB, T. Kalong)	4234952	69.60	66.52	69.01	Sederhana / *Moderate*
		Pulau Duyung	5231908	50.15	64.80	50.09	Sederhana / *Moderate*

Jadual 5.4 Malaysia: Status Kualiti Air Marin di Kawasan Kuala

Table 5.4 Malaysia: Marine Water Quality Status for Estuary

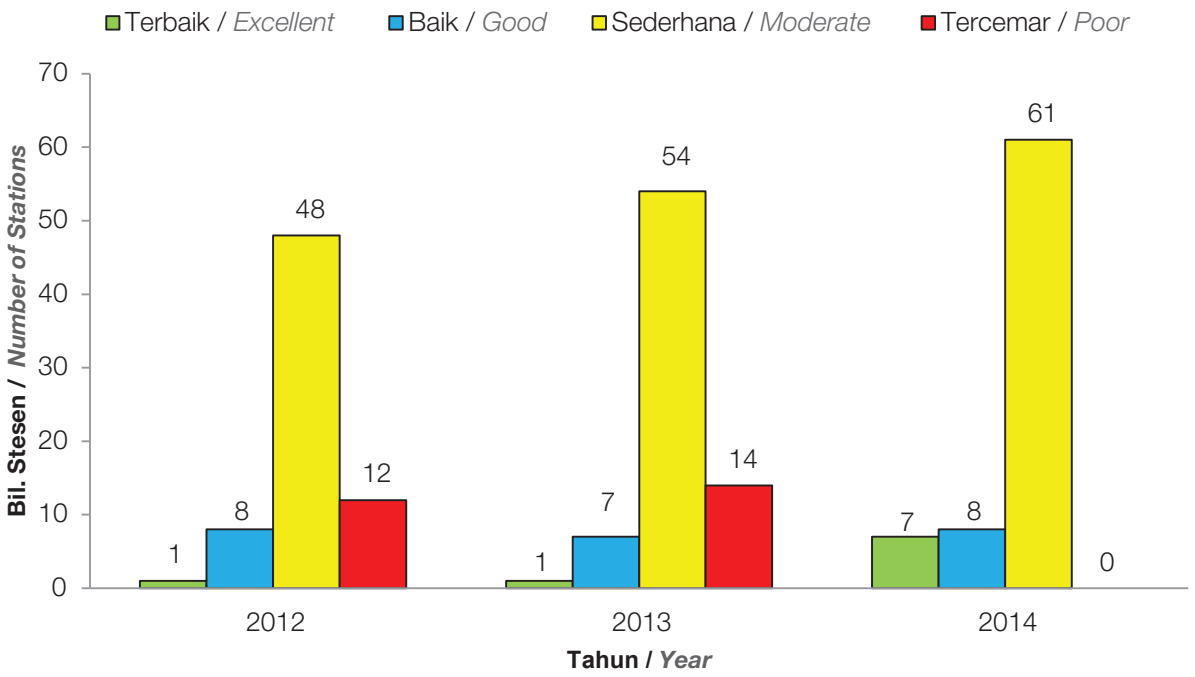
Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Kelantan	Kuala / *Estuary*	Kuala Sungai Golok	6220911	56.01	64.02	52.34	Sederhana / *Moderate*
		Kuala Sungai Kelantan	6222901	45.08	53.90	51.26	Sederhana / *Moderate*
		Kuala Sungai Pengkalan Chepa	6223912	48.16	54.67	54.89	Sederhana / *Moderate*
		Kuala Sungai Pengkalan Datu	6123913	59.05	51.07	60.40	Sederhana / *Moderate*
		Kuala Sungai Kemasin	5824914	59.36	50.90	67.15	Sederhana / *Moderate*
Sarawak	Kuala / *Estuary*	Kuala Sungai Semantan	1898901	72.01	55.06	95.23	Terbaik / *Excellent*
		Kuala Sungai Sarawak	1604907	67.11	51.47	80.57	Baik / *Good*
		Kuala Sungai Bako	1704905	55.69	53.91	65.94	Sederhana / *Moderate*
		Kuala Sungai Santubong	1702903	70.00	66.57	75.42	Sederhana / *Moderate*
		Kuala Batang Krian (Kabong)	1710922	70.39	53.09	79.26	Sederhana / *Moderate*
		Kuala Batang Rejang	2111909	70.81	86.75	82.83	Baik / *Good*
		Kuala Mukah	2920920	59.31	34.57	51.26	Sederhana / *Moderate*
		Kuala Batang Kemena	3130911	56.56	63.94	64.20	Sederhana / *Moderate*
		Kuala Tanjung Similajau	3431903	41.75	63.98	85.68	Baik / *Good*
		Kuala Sungai Panipah	3332904	-	88.78	89.47	Baik / *Good*
Sarawak	Kuala / *Estuary*	Kuala Pantai Nyalau	3431903	-	90.10	55.67	Sederhana / *Moderate*
		Kuala Sungai Baram	4539919	-	64.13	96.20	Terbaik / *Excellent*
		Kuala Sungai Miri	4349915	-	64.63	84.73	Baik / *Good*
Sabah	Kuala / *Estuary*	Kuala Penyu	5453901	55.42	77.68	82.00	Baik / *Good*
		Muara Sungai Inanam	5050905	58.76	59.15	60.16	Sederhana / *Moderate*

Jadual 5.4 Malaysia: Status Kualiti Air Marin di Kawasan Kuala

Table 5.4 Malaysia: Marine Water Quality Status for Estuary

Berdasarkan Indeks Kualiti Air Marin (IKAM), kualiti air di kawasan kuala menunjukkan peningkatan bagi kategori Terbaik iaitu daripada 1.3.% (2013) kepada 9.2% bagi tahun 2014. Tiada bilangan stesen kategori Tercemar dicatatkan dalam tahun 2014 berbanding sebanyak 14 stesen dalam tahun 2013. Bagi kategori stesen Baik, bilangan stesen meningkat daripada 7 stesen (2013) kepada 8 stesen pada tahun 2014. Bagi kategori stesen Sederhana pula, bilangan stesen meningkat daripada 54 (2013) kepada 61 stesen dalam tahun 2014. Tren ini ditunjukkan dalam **Rajah 5.2**.

The estuarine water quality in terms of Marine Water Quality Index (MWQI), showed an increase in the Excellent category from 1.3% in 2013 to 9.2% in 2014. None of the stations recorded as Poor category in 2014 compared to 14 stations recorded in 2013. For the Good category, the number of stations slightly increased from 7 stations (2013) to 8 stations in 2014. Meanwhile, for the Moderate category, the number of stations increased from 54 stations (2013) to 61 stations in 2014. These trends are shown in ***Figure 5.2***.



Rajah 5.2 Malaysia: Tren Status Kualiti Air Marin Bagi Kawasan Kuala, 2012-2014

Figure 5.2 Malaysia: The Trend Of Marine Water Quality Status for Estuary, 2012-2014

KUALITI AIR MARIN PULAU

Senarai stesen Pulau berdasarkan kategori stesen seperti yang ditunjukkan dalam **Jadual 5.5**.

ISLAND MARINE WATER QUALITY

*The list of island stations by island category is as shown in **Table 5.5**.*

Negeri *State*	Bil. Pulau *No. Of Island*	Bil. Stesen *No. Of Station*	Pulau *Island*	No. Stesen *Station No*	Kategori *Category*
KEDAH	5	4	LANGKAWI (PANTAI KUAH)	7KD07	PEMBANGUNAN / *DEVELOPMENT*
			LANGKAWI (TELUK EWA)	7KD08	PEMBANGUNAN / *DEVELOPMENT*
			LANGKAWI (PANTAI CHENANG)	7KD09	PEMBANGUNAN / *DEVELOPMENT*
			LANGKAWI (TANJUNG RHU)	7KD10	PEMBANGUNAN / *DEVELOPMENT*
		1	SINGA BESAR	7KR01	PERANGINAN / *RESORT*
		1	DAYANG BUNTING	7KR02	PERANGINAN / *RESORT*
		1	PAYAR	7KM03	TAMAN LAUT / *MARINE PARK*
		1	KACA	7KM04	TAMAN LAUT / *MARINE PARK*

Jadual 5.5 Malaysia: Stesen-Stesen Pulau, 2014

Table 5.5 Malaysia: Island Stations, 2014

Negeri *State*	Bil. Pulau *No. Of Island*	Bil. Stesen *No. Of Station*	Pulau *Island*	No. Stesen *Station No*	Kategori *Category*
KEDAH	2	1	LEMBU	7KM05	TAMAN LAUT / *MARINE PARK*
		1	SIGANTANG	7KM06	TAMAN LAUT / *MARINE PARK*
PULAU PINANG	6	3	PULAU PINANG (BATU MAUNG)	7PD01	PEMBANGUNAN / *DEVELOPMENT*
			PULAU PINANG (TELUK BAHANG)	7PD03	PEMBANGUNAN / *DEVELOPMENT*
			PULAU PINANG (PADANG KOTA)	7PD04	PEMBANGUNAN / *DEVELOPMENT*
		1	AMAN	7PR05	PERANGINAN / *RESORT*
		1	JEREJAK	7PR06	PERANGINAN / *RESORT*
		1	KENDI	7PR07	PERANGINAN / *RESORT*
		1	RIMAU	7PR08	PERANGINAN / *RESORT*
		1	GEDONG	7PR09	PERANGINAN / *RESORT*
PERAK	4	2	PANGKOR (TELOK GEDONG)	7AR01	PERANGINAN / *RESORT*
			PANGKOR (PANTAI PUTERI DEWI)	7AR02	PERANGINAN / *RESORT*
		1	PANGKOR LAUT	7AR03	PERANGINAN / *RESORT*
		1	SEMBILAN	7AR04	PERANGINAN / *RESORT*
		1	TUKUN PERAK	7AP05	DILINDUNGI / *PROTECTED*
SELANGOR	3	1	KETAM	7BR01	PERANGINAN / *RESORT*
		1	ANGSA	7BR02	PERANGINAN / *RESORT*
		1	LUMUT	7BR03	PERANGINAN / *RESORT*
NEGERI SEMBILAN	1	1	ARANG	7NP01	DILINDUNGI / *PROTECTED*
MELAKA	2	2	BESAR (A)	7MR01	PERANGINAN / *RESORT*
			BESAR (B)	7MR01	PERANGINAN / *RESORT*
		2	UPEH (A)	7MR02	PERANGINAN / *RESORT*

Jadual 5.5 Malaysia: Stesen-Stesen Pulau, 2014

Table 5.5 Malaysia: Island Stations, 2014

Negeri *State*	Bil. Pulau *No. Of Island*	Bil. Stesen *No. Of Station*	Pulau *Island*	No. Stesen *Station No*	Kategori *Category*
MELAKA	1	2	UPEH (B)	7MR02	PERANGINAN / *RESORT*
			UNDAN (A)	7MR03	PERANGINAN / *RESORT*
			UNDAN (B)	7MR03	PERANGINAN / *RESORT*
JOHOR	8	1	SETINDAN	7JR01	PERANGINAN / *RESORT*
		1	BABI TENGAH	7JR02	PERANGINAN / *RESORT*
		1	DAYANG	7JM03	TAMAN LAUT / *MARINE PARK*
		1	NANGA BESAR	7JM08	TAMAN LAUT / *MARINE PARK*
		1	SIBU TENGAH	7JM11	TAMAN LAUT / *MARINE PARK*
		1	PEMANGGIL	7JM15	TAMAN LAUT / *MARINE PARK*
		1	KUKUP	7JP17	DILINDUNGI / *PROTECTED*
		1	PISANG	7JP18	DILINDUNGI / *PROTECTED*
PAHANG	8	2	TIOMAN (KG. NIPAH)	7CM01	TAMAN LAUT / *MARINE PARK*
			TIOMAN (TELOK SALANG)	7CM02	TAMAN LAUT / *MARINE PARK*
		1	SERI BUAT	7CM03	TAMAN LAUT / *MARINE PARK*
		1	CEBEH	7CM04	TAMAN LAUT / *MARINE PARK*
		1	TULAI	7CM05	TAMAN LAUT / *MARINE PARK*
		1	SEPUI	7CM06	TAMAN LAUT / *MARINE PARK*
		1	LABAS	7CM07	TAMAN LAUT / *MARINE PARK*
		1	SEMBILANG	7CM08	TAMAN LAUT / *MARINE PARK*
		1	TOKONG BAHARA	7CM09	TAMAN LAUT / *MARINE PARK*
TERENGGANU	1	2	PERHENTIAN BESAR (SOUTH)	7TM04	TAMAN LAUT / *MARINE PARK*
			PERHENTIAN BESAR (WEST)	7TM05	TAMAN LAUT / *MARINE PARK*

Jadual 5.5 Malaysia: Stesen-Stesen Pulau, 2014

Table 5.5 Malaysia: Island Stations, 2014

Negeri *State*	Bil. Pulau *No. Of Island*	Bil. Stesen *No. Of Station*	Pulau *Island*	No. Stesen *Station No*	Kategori *Category*
TERENGGANU	8	1	PERHENTIAN KECIL	7TM06	TAMAN LAUT / *MARINE PARK*
		2	REDANG (NORTH)	7TM07	TAMAN LAUT / *MARINE PARK*
			REDANG (SOUTH)	7TM08	TAMAN LAUT / *MARINE PARK*
		1	KAPAS	7TM09	TAMAN LAUT / *MARINE PARK*
		1	LANG TENGAH	7TM11	TAMAN LAUT / *MARINE PARK*
		1	PINANG	7TM12	TAMAN LAUT / *MARINE PARK*
		1	EKOR TEBU	7TM13	TAMAN LAUT / *MARINE PARK*
		1	LIMA	7TM14	TAMAN LAUT / *MARINE PARK*
		1	GUMIA	7TR01	PERANGINAN / *RESORT*
KELANTAN	2	1	PANJANG	7DP01	DILINDUNGI / *PROTECTED*
		1	KUNDUR	7DP02	DILINDUNGI / *PROTECTED*
SARAWAK	3	1	SATANG	7QP01	DILINDUNGI / *PROTECTED*
		1	TALANG-TALANG KECIL	7QP02	DILINDUNGI / *PROTECTED*
		1	TALANG-TALANG BESAR	7QP03	DILINDUNGI / *PROTECTED*
SABAH	7	1	GAYA	7SR01	PERANGINAN / *RESORT*
		1	MABUL	7SR03	PERANGINAN / *RESORT*
		2	SIPADAN (NORTH)	7SR04	PERANGINAN / *RESORT*
			SIPADAN (WEST)	7SR05	PERANGINAN / *RESORT*
		1	SAPI	7SM08	TAMAN LAUT / *MARINE PARK*
		1	MANUKAN	7SR09	PERANGINAN / *RESORT*
		1	TIGA	7SR10	PERANGINAN / *RESORT*
		1	KALAMPUNIAN BESAR	7SM11	TAMAN LAUT / *MARINE PARK*

Jadual 5.5 Malaysia: Stesen-Stesen Pulau, 2014

Table 5.5 Malaysia: Island Stations, 2014

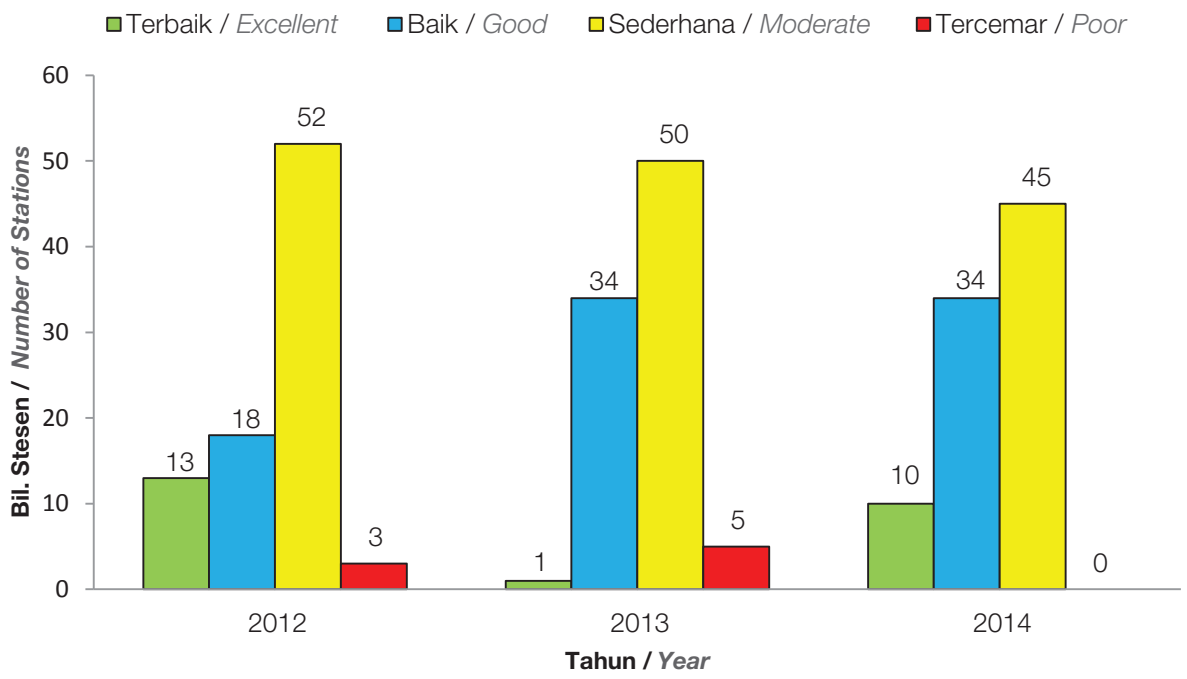
Negeri *State*	Bil. Pulau *No. Of Island*	Bil. Stesen *No. Of Station*	Pulau *Island*	No. Stesen *Station No*	Kategori *Category*
SABAH	10	1	KAPALAI	7SR12	PERANGINAN / *RESORT*
		1	LIGITAN	7SR13	PERANGINAN / *RESORT*
		1	MOLLEANGAN BESAR	7SR14	PERANGINAN / *RESORT*
		1	BANGGI	7SR15	PERANGINAN / *RESORT*
		1	BALAMBANGAN	7SR16	PERANGINAN / *RESORT*
		1	SILINGAN	7SP17	DILINDUNGI / *PROTECTED*
		1	GULISAN	7SP18	DILINDUNGI / *PROTECTED*
		1	BAKUNGAN KECIL	7SP19	DILINDUNGI / *PROTECTED*
		1	BANGGI	7SR20	PERANGINAN / *RESORT*
		1	MANTANANI BESAR	7SR21	PERANGINAN / *RESORT*
LABUAN	4	4	LABUAN (POHON BATU)	7LD01	PEMBANGUNAN / *DEVELOPMENT*
			LABUAN (WATER FRONT)	7LD02	PEMBANGUNAN / *DEVELOPMENT*
			LABUAN (LUBUK TEMIANG)	7LD03	PEMBANGUNAN / *DEVELOPMENT*
			LABUAN (RANCHA-RANCHA)	7LD04	PEMBANGUNAN / *DEVELOPMENT*
		1	KURAMAN	7LM05	TAMAN LAUT / *MARINE PARK*
		1	RUSUKAN BESAR	7LM06	TAMAN LAUT / *MARINE PARK*
		1	RUSUKAN KECIL	7LM07	TAMAN LAUT / *MARINE PARK*

Jadual 5.5 Malaysia: Stesen-Stesen Pulau, 2014

Table 5.5 Malaysia: Island Stations, 2014

Perairan di sekelliling 74 buah pulau telah dipantau dalam tahun 2014. Pulau-pulau ini termasuk Pulau Pembangunan (3 buah pulau), Pulau Peranginan (30 buah pulau), Pulau Taman Laut (29 buah pulau) and Pulau Dilindungi (12 buah pulau). Sebanyak 89 stesen telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil analisis menunjukkan 10 stsesen (11.2%) dikategorikan sebagai Terbaik, 34 stesen (38.2%) dikategorikan sebagai Baik, 45 stesen (50.6%) dikategorikan sebagai Sederhana dan tiada stesen dikategorikan sebagai Tercemar.**(Rajah 5.3)**

The waters around 74 islands were monitored in 2014. These islands include Development Islands (3 islands), Resort Islands (30 islands), Marine Park Islands (29 islands) and Protected Islands (12 islands). A total of 89 island stations were monitored, analysed and reported as Marine Water Quality Index. The result indicated that 10 stations (11.2%) as Excellent, 34 stations (38.2%) as Good, 45 stations (50.6%) as Moderate and none of the stations categorized as Poor. ***(Figure 5.3)***



Rajah 5.3 Malaysia: Tren Status Kualiti Air Marin bagi Pulau, 2012-2014

Figure 5.3: Malaysia: The Trend of Marine Water Quality Status for Island, 2012-2014

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
Kedah	Pulau / *Island*	Singa Besar	7KR01	79.56	74.45	83.28	Baik / *Good*
		Dayang Bunting	7KR02	27.51	75.91	89.65	Baik / *Good*
		Payar	7KM03	81.67	83.73	79.74	Sederhana / *Moderate*
		Kaca	7KM04	81.67	85.84	82.98	Baik / *Good*
		Pantai Kuah	7KD07	73.88	74.45	75.11	Sederhana / *Moderate*
		Pantai Chenang	7KD08	87.61	83.07	86.55	Baik / *Good*
		Tanjung Rhu	7KD09	94.68	69.05	86.38	Baik / *Good*
		Teluk Ewa	7KD10	73.36	81.15	67.38	Sederhana / *Moderate*
		Segantang	7KR01	-	84.69	84.43	Baik / *Good*
		Dayang Bunting	7KR02	27.51	75.91	89.65	Baik / *Good*
Pulau Pinang	Pulau / *Island*	Batu Maung	7PD01	76.78	49.71	70.40	Sederhana / *Moderate*
		Padang Kota	7PD04	54.29	50.50	51.21	Sederhana / *Moderate*
		Aman	7PR05	63.01	83.95	61.84	Sederhana / *Moderate*
		Jerejak	7PR06	64.88	75.63	54.80	Sederhana / *Moderate*

Jadual 5.6 Malaysia: Status Kualiti Air Marin bagi Pulau

Table 5.6 Malaysia: Marine Water Quality Status for Island

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
		Kendi	7PR07	86.35	73.86	67.01	Sederhana / *Moderate*
		Rimau	7PR08	89.88	85.96	61.24	Sederhana / *Moderate*
		Teluk Bahang	7PD03	-	51.06	-	
		Gedong	7PR09	67.21	84.97	57.46	Sederhana / *Moderate*
Perak	Pulau / *Island*	Pantai Teluk Gedong	7AR01	73.35	54.52	70.80	Sederhana / *Moderate*
		Pantai Puteri Dewi	7AR02	83.00	74.58	50.44	Sederhana / *Moderate*
		Pangkor Laut	7AR03	68.44	72.07	66.78	Sederhana/*Moderate*
		Sembilan	7AR04	69.63	80.45	70.30	Sederhana / *Moderate*
		Tukun Perak	7AP05	68.69	82.35	73.17	Sederhana / *Moderate*
Selangor	Pulau / *Island*	Ketam	7BR01	88.92	87.70	93.63	Terbaik / *Excellent*
		Angsa	7BR02	84.89	92.07	93.08	Terbaik / *Excellent*
		Lumut	7BR03	84.89	56.73	61.03	Sederhana / *Moderate*
Negeri Sembilan	Pulau / *Island*	Arang	7NP01	81.24	68.56	92.86	Terbaik / *Excellent*
Melaka	Pulau / *Island*	Upeh (Point A)	7MR02	38.05	43.76	60.28	Sederhana / *Moderate*
		Upeh (Point B)	7MR02	54.88	41.08	57.20	Sederhana / *Moderate*
		Besar (Point A)	7MR01	72.07	56.27	64.11	Sederhana / *Moderate*
		Besar (Point B)	7MR01	66.67	46.81	58.73	Sederhana / *Moderate*
		Undan (Point A)	7MP03	80.44	47.02	58.74	Sederhana / *Moderate*
		Undan (Point B)	7MP03	68.95	55.18	71.01	Sederhana / *Moderate*
Johor	Pulau / *Island*	Setindan	7JR01	96.10	85.80	88.51	Baik / *Good*
		Babi Tengah	7JR02	96.20	86.92	89.74	Baik / *Good*
		Dayang	7JM03	95.98	87.03	88.76	Baik / *Good*
		Nanga Besar	7JM08	95.80	86.64	87.65	Baik / *Good*
		Sibu Tengah	7JM11	94.85	86.35	88.92	Baik / *Good*
		Pemanggil	7JM15	96.63	85.95	88.68	Baik / *Good*
		Kukup	7JP17	90.43	82.27	81.08	Baik / *Good*
		Pisang	7JP18	93.45	84.29	87.52	Baik / *Good*
Pahang	Pulau / *Island*	Tioman (Teluk Salang)	7CM01	61.15	71.84	85.77	Baik / *Good*
		Tioman (Kg. Nipah)	7CM01	61.35	73.89	85.52	Baik / *Good*
		Tulai	7CM05	61.52	73.99	84.52	Baik / *Good*
		Labas	7CM07	61.64	73.88	86.44	Baik / *Good*

Jadual 5.6 Malaysia: Status Kualiti Air Marin bagi Pulau

Table 5.6 Malaysia: Marine Water Quality Status for Island

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
		Cebeh	7CM04	53.38	73.90	85.27	Baik / *Good*
		Sepui	7CM08	58.86	73.90	85.63	Baik / *Good*
		Sembilang	7CM08	55.26	73.91	85.76	Baik / *Good*
		Seri Buat	7CM03	56.05	73.89	86.56	Baik / *Good*
		Tokong Bahara	7CM09	50.12	74.00	85.71	Baik / *Good*
Terengganu	Pulau / *Island*	Gemia	7TR01	77.43	61.96	66.94	Sederhana / *Moderate*
		Perhentian Besar (South)	7TM04	68.70	69.03	69.42	Sederhana / *Moderate*
		Perhentian Besar (West)	7TM05	71.08	67.88	69.18	Sederhana / *Moderate*
		Perhentian Kecil	7TM06	71.68	64.88	70.52	Sederhana / *Moderate*
		Redang (North)	7TM06	66.91	66.65	72.94	Sederhana / *Moderate*
		Redang (South)	7TM08	65.48	68.87	72.14	Sederhana / *Moderate*
		Lang Tengah	7TM11	70.44	65.89	69.79	Sederhana / *Moderate*
		Pinang	7TM12	62.99	68.11	71.15	Sederhana / *Moderate*
		Ekor Tebu	7TM13	62.83	67.51	69.21	Sederhana / *Moderate*
		Lima	7TM14	69.85	66.19	73.52	Sederhana / *Moderate*
		Kapas	7TP16	68.50	67.89	67.29	Sederhana / *Moderate*
Kelantan	Pulau / *Island*	Panjang	7DP01	62.79	65.20	67.07	Sederhana / *Moderate*
		Kundur	7DP02	61.16	69.22	70.43	Sederhana / *Moderate*
Sarawak	Pulau / *Island*	Satang	7QP01	92.00	58.98	83.36	Baik / *Good*
		Talang-Talang Kecil	7QP02	92.17	70.35	84.70	Baik / *Good*
		Talang-Talang Besar	7QP03	92.58	70.87	84.50	Baik / *Good*
Sabah	Pulau / *Island*	Gaya	7SR01	80.56	67.05	81.83	Baik / *Good*
		Mabul	7SR03	70.17	82.35	53.86	Sederhana / *Moderate*
		Sipadan (N)	7SR04	66.01	81.39	58.91	Sederhana / *Moderate*
		Sipadan (W)	7SR05	70.55	67.73	79.41	Sederhana / *Moderate*
		Sapi	7SM08	81.51	69.67	81.27	Baik / *Good*
		Manukan	7SM09	76.35	69.13	80.44	Baik / *Good*
		Tiga	7SR10	69.73	77.13	81.80	Baik / *Good*
		Kalampunian Besar	7SM11	64.74	66.79	84.67	Baik / *Good*
		Kapalai	7SR12	69.74	81.32	81.22	Baik / *Good*
		Molleangan Besar	7SR14	54.93	86.61	79.48	Sederhana / *Moderate*

Jadual 5.6 Malaysia: Status Kualiti Air Marin bagi Pulau

Table 5.6 Malaysia: Marine Water Quality Status for Island

Negeri / *State*	Klassifikasi Stesen / *Station Classification*	Kawasan / *Area*	Nombor Stesen / *Station Number*	Nilai IKAM / *MWQI Value*			Kategori (2014) / *Category (2014)*
				2012	2013	2014	
		Banggi (South)	7SR15	60.59	84.16	76.84	Sederhana / *Moderate*
		Banggi (East)	7SR20	55.57	85.67	79.39	Sederhana / *Moderate*
		Balambangan	7SR16	80.08	84.95	77.52	Sederhana / *Moderate*
		Selingan	7SP17	64.77	68.34	55.98	Sederhana / *Moderate*
		Gulisan	7SP18	67.76	81.40	59.89	Sederhana / *Moderate*
		Bakungan Kecil	7SP19	64.19	84.07	54.40	Sederhana / *Moderate*
		Mantanani Besar	7SR21	-	83.41	83.08	Baik / *Good*
Labuan	Pulau / *Island*	Kuraman	7LM05	83.10	81.63	97.79	Terbaik / *Excellent*
		Rusukan Besar	7LM07	85.26	84.15	94.87	Terbaik / *Excellent*
		Rusukan Kecil	7LM06	86.21	81.68	93.58	Terbaik/*Excellent*
		Pohon Batu	7LD01	90.71	78.08	97.94	Terbaik / *Excellent*
		Water Front	7LD02	71.80	72.81	97.65	Terbaik / *Excellent*
		Lubuk Temiang	7LD03	86.23	79.85	97.79	Terbaik / *Excellent*
		Ranca-Ranca	7LD04	86.19	88.04	91.44	Terbaik / *Excellent*

Jadual 5.6 Malaysia: Status Kualiti Air Marin bagi Pulau

Table 5.6 Malaysia: Marine Water Quality Status for Island

STATUS STESEN-STESEN KUALITI AIR MARIN

Jadual 5.7 dan Jadual **5.8** menunjukkan senarai stesen Pantai dan Kuala yang mencapai kategori Terbaik bagi tahun 2014.

STATUS OF MARINE WATER QUALITY STATIONS

Table 5.7 *and* ***Table 5.8*** *show the list of coastal and estuaries stations that achieved the Excellent Category for 2014.*

Bil. / *No.*	Negeri / *State*	Lokasi / *Location*
1	Selangor	Kuala Sungai Klang
2	Selangor	Kuala Sungai Langat (Lumut)
3	Selangor	Kuala Sungai Selangor
4	Negeri Sembilan	Kuala Sungai Linggi
5	Negeri Sembilan	Kuala Sungai Lukut
6	Sarawak	Kuala Sungai Semantan
7	Sarawak	Kuala Sungai Baram

Jadual 5.7 Malaysia: Senarai Kuala Kategori Terbaik, 2014

Table 5.7 Malaysia: List Of Excellent Estuaries, 2014

Bil. / *No.*	Negeri / *State*	Lokasi / *Location*
1	Selangor	Selat Pulau Babi
2	Selangor	Selat Klang Utara
3	Negeri Sembilan	Bagan Pinang
4	Negeri Sembilan	Port Dickson Batu 4
5	Negeri Sembilan	Port Dickson Batu 7
6	Negeri Sembilan	Port Dickson Batu 8
7	Negeri Sembilan	Port Dickson Batu 10
8	Negeri Sembilan	Port Dickson Janakuasa TNB
9	Negeri Sembilan	Telok Pelanduk
10	Johor	Tanjung Bin
11	Pahang	Pantai Cherating (Club Med) -A
12	Pahang	Pantai Cherating (Club Med) -B
13	Pahang	Pantai Cherating (Legend) -B
14	Pahang	Pantai Batu Hitam -A
15	Pahang	Pantai Batu Hitam -B
16	Pahang	Pantai Berserah
17	Pahang	Pantai Teluk Cempedak -A
18	Pahang	Pantai Teluk Cempedak -B
19	Pahang	Pantai Sepat
20	Pahang	Pantai Sepat (B)
21	Pahang	Pantai Legenda (A)
22	Pahang	Pantai Legenda (B)
23	Pahang	Pantai Kuala Api-Api
24	Pahang	Pantai Tanjung Batu
25	Sarawak	Pantai Sematan
26	Sarawak	Pantai Pandan
27	Sarawak	Pantai Bako
28	Sarawak	Pantai Damai
29	Sarawak	Pantai Brighton
30	Sarawak	Pantai Bungai

Jadual 5.8 Malaysia: Senarai Pantai Terbaik, 2014

Table 5.8 Malaysia: List Of Excellent Coastal, 2014

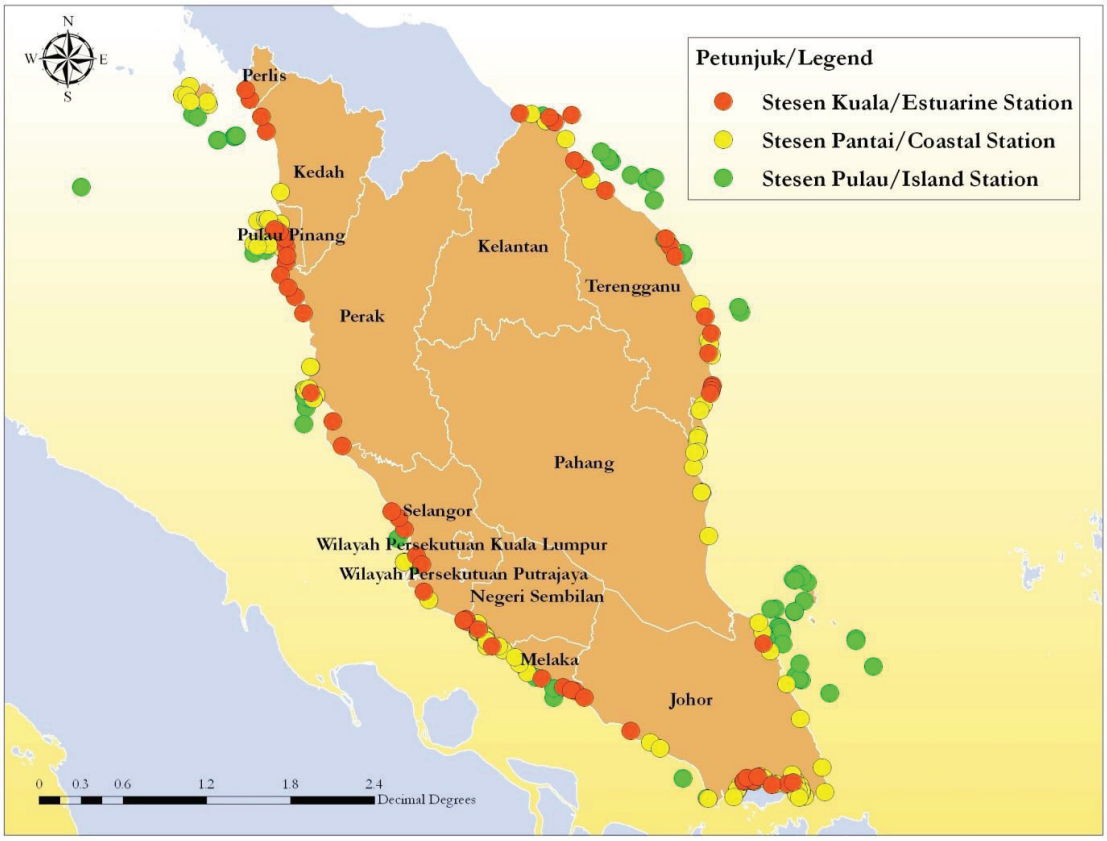
Stesen Pulau yang mencapai Kategori Terbaik bagi tahun 2014 adalah seperti di **Jadual 5.9**.

*The islands that achieved the Excellent Category for Marine Water Quality Index in 2014 are listed in **Table 5.9**.*

Bil. / *No.*	Negeri / *State*	Pulau / *Island*	Kategori Pulau / *Island Category*
1	Selangor	Ketam	Peranginan / *Resort*
2	Selangor	Angsa	Peranginan / *Resort*
3	Negeri Sembilan	Arang	Perlindungan / *Protected*
4	W.P. Labuan	Kuraman	Taman Laut / *Marine Park*
5	W.P. Labuan	Rusukan Besar	Taman Laut / *Marine Park*
6	W.P. Labuan	Rusukan Kecil	Taman Laut / *Marine Park*
7	W.P. Labuan	Pohon Batu	Pembangunan / *Development*
8	W.P. Labuan	Water Front	Pembangunan / *Development*
9	W.P. Labuan	LubukTemiang	Pembangunan / *Development*
10	W.P. Labuan	Ranca-Ranca	Pembangunan / *Development*

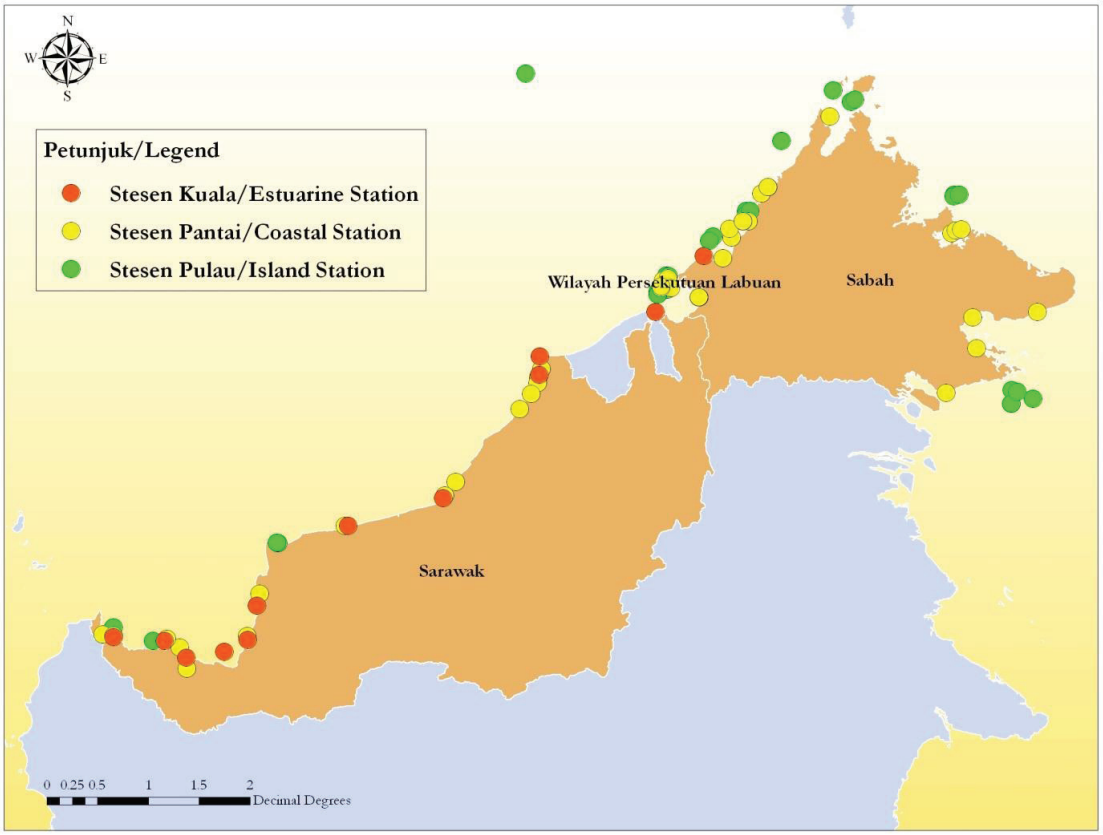
Jadual 5.9 Malaysia: Senarai Pulau Terbaik, 2014

Table 5.9 Malaysia: List of Excellent Islands, 2014



Peta: Semenanjung Malaysia: Lokasi Stesen Pengawasan Kualiti Air Marin

Map: Peninsular Malaysia: Location of Marine Water Quality Stations



Peta: Sabah & Sarawak: Lokasi Stesen Pengawasan Kualiti Air Marin

Map: Sabah & Sarawak: Location of Marine Water Quality Stations

Bab 6
Chapter 6

INVENTORI PUNCA-PUNCA PENCEMARAN /
POLLUTION SOURCES INVENTORY

Bab 6 / Chapter 6

INVENTORI PUNCA-PUNCA PENCEMARAN
POLLUTION SOURCES INVENTORY

INVENTORI PUNCA-PUNCA PENCEMARAN
POLLUTION SOURCES INVENTORY

PUNCA PENCEMARAN AIR

Punca punca pencemaran air terdiri dari punca-punca tetap dan punca-punca tidak tetap. Punca-punca pencemaran tetap adalah merujuk kepada pelepasan buangan cecair ke dalam sesuatu badan air di lokasi-lokasi tertentu melalui paip-paip atau pelepasan-pelepasan tertentu. Punca-punca tetap ini merangkumi pelepasan-pelepasan dari industri, loji pengolahan kumbahan dan ladang-ladang ternakan. Punca tidak tetap merupakan punca-punca yang berselerak dan tidak mempunyai takat pelepasan buangan yang tetap seperti aktiviti-aktiviti pertanian dan air larian dari pembukaan tanah.

Dalam tahun 2014, sebanyak 1,488,848 punca-punca pencemaran air telah dikenalpasti. Ianya terdiri dari 3,355 industri pembuatan, 10,795 loji kumbahan, 1,276,195 tangki septik individu (IST), 3,628 tangki septik berpusat (CST), 755 ladang ternakan (ladang babi), 531 industri berasaskan pertanian, 879 pasar basah dan 192,710 perkhidmatan penyediaan makanan. **(Jadual 6.1)**

WATER POLLUTION SOURCES

The sources of water pollution can be categorized into point and non point sources. Point sources are referred to sources with discharges entering the body of water at specific location such as from pipes or outfalls. Point sources include the discharges from industries, sewage treatment plants and animal farms. Non point sources are derived from diffuse sources that do not have specific discharge point examples of which are from agricultural activities and surface run-off.

In 2014, 1,488,848 water pollution sources were identified. These sources include pollution from 3,355 manufacturing industries, 10,795 sewage treatment plants, 1,276,195 Individual Septic Tank (IST), 3,628 Communal Septic Tank (CST), 755 animal farm (pig farming), 531 agro-based industries, 879 wet markets and 192,710 food services establishments. ***(Table 6.1)***

Bil. *No*	Jenis Punca *Type of sources*	Bilangan punca *No. of sources*
1	Industri pembuatan / *Manufacturing Industries*	3,355
2	Industri berasaskan pertanian / *Agro-based Industries*	
	a) Kilang getah / *Rubber Mill*	80
	b) Kilang kelapa sawit / *Palm Oil Mill*	451
3	Ladang ternakan (ladang babi) / *Animal farm (Pig farming)*^	755
4	Logi Pengolahan kumbahan / *Sewage treatment plant*@	
	• Awam / *Public*	6,201
	• Swasta / *Private*	4,594
	• Tangki septik individu / *Individual Septic Tank (IST)*	1,276,195
	• Tangki septik Berpusat / *Communal Septic Tank (CST)*	3,628
5	Perkhidmatan penyediaan makanan / *Food Services Establishments**	192,710
6	Pasar basah / *Wet markets"*	879
	Jumlah / *Total*	**1,488,848**

Punca-punca maklumat / Sources of information:-

* Jabatan Perangkaan Malaysia (anggaran data berdasarkan data pada 2010/ Department of Statistos Malaysia (estimated data based on 2010 data)

@ Indah Water Konsortium

" Jabatan Kerajaan Tempatan / Local Government Department

^ Jabatan Perkhidmatan Veterinar / Department of Veterinary Services

Jadual 6.1 Malaysia: Pecahan Punca-Punca Pencemaran Mengikut Sektor, 2014

Table 6.1 Malaysia: Composition of Water Pollution Sources by Sector, 2014

BEBAN PENCEMARAN

Tiga (3) parameter utama pencemaran yang mempunyai kesan singnifikan kepada kualiti air sungai seperti Keperluan Oksigen Biokimikal (BOD_5), Pepejal Terampai (SS) dan Ammoniakal Nitrogen (AN). Punca-punca beban pencemaran BOD_5, SS dan AN dihuraikan seperti di bawah.

BEBAN KEPERLUAN OKSIGEN BIOKIMIKAL

Anggaran beban Keperluan Oksigen Biokimikal (BOD_5), yang dijana atau dilepaskan dalam tahun 2014 adalah sebanyak 762 ton / hari dimana telah bertambah sebanyak 0.5% dibandingkan pada tahun 2013 (758 ton / hari). Beban BOD_5 dari dari kumbahan pada tahun 2014 adalah berdasarkan kepada pelepasan yang sebenarnya, ia masih

POLLUTION LOAD

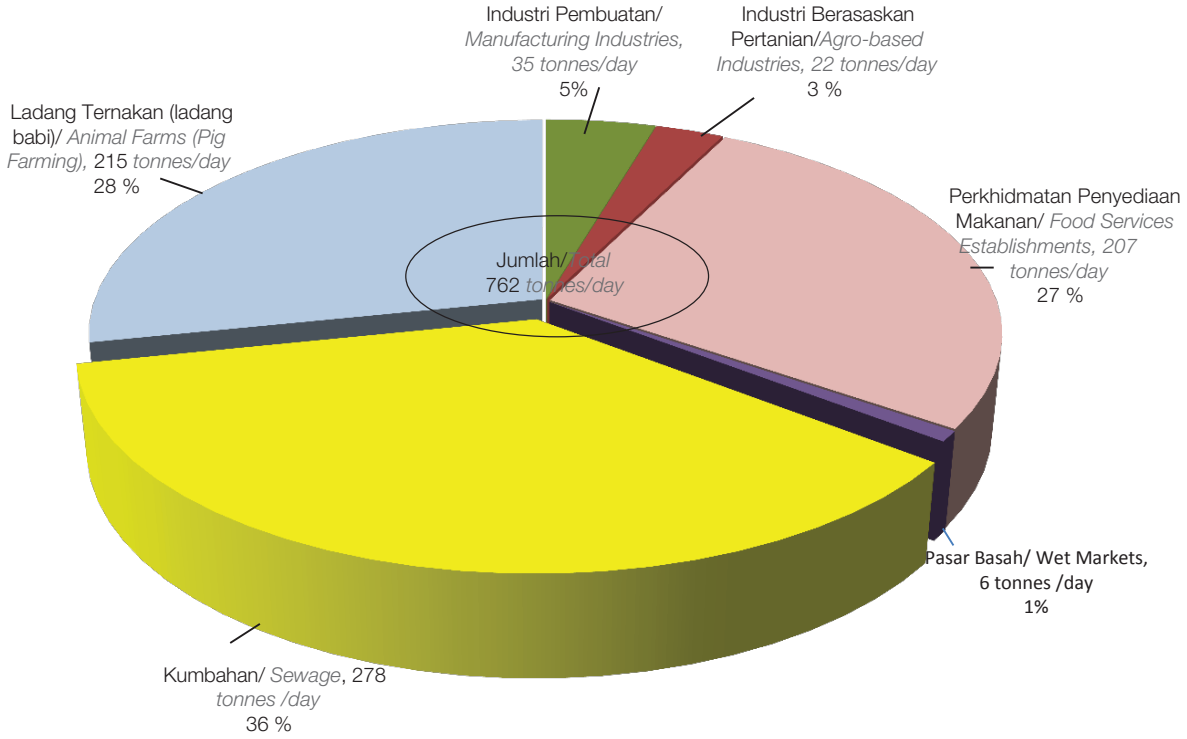
The three (3) main parameters of pollutants that have significantly affected the quality of river water are Biochemical Oxygen Demand (BOD_5) Suspended Solids (SS) and Ammoniacal Nitrogen (AN). The BOD_5, SS and AN loadings are as described below.

BIOCHEMICAL OXYGEN DEMAND LOAD

The estimated Biochemical Oxygen Demand (BOD_5) load in 2014 was 762 tonnes / day which was an increase of 0.5% as compared to 2013 (758 tonnes/ day). The number of BOD_5 load for sewage in the year 2014 was based on actual discharges. Sewage remained the largest contributor with a total load of 278 tonnes / day (36%), followed by animal

lagi merupakan penyumbang terbesar beban pencemaran ini dengan kadar sebanyak 278 ton / hari (36%), diikuti oleh ladang ternakan (ladang babi) 215 ton / hari (28%), perkhidmatan penyediaan makanan 207 ton / hari (27%), industri pembuatan 35 ton / hari (5%), industri berasaskan pertanian 22 ton / hari (3%) dan pasar basah 6 ton/ hari (1%) seperti ditunjukan dalam **Rajah 6.1**.

farm (pig farming) which produced 215 tonnes / day (28%), food services establishments 207 tonnes / day (27%), manufacturing industries 35 tonnes / day (5%) agro-based industries 22 tonnes / day (3%) and wet markets 6 tonnes / day (1%) as shown in ***Figure 6.1****.*



Rajah 6.1 Malaysia: Beban BOD_5 Mengikut Punca Pencemaran Air, 2014

Figure 6.1 Malaysia: BOD_5 Loading by Water Pollution Sources, 2014

BEBAN PEPEJAL TERAMPAI

Anggaran Beban Pepejal Terampai (SS) dalam tahun 2014 adalah sebanyak 1,170 ton / hari di mana ladang ternakan (ladang babi) merupakan penyumbang terbesar beban pencemaran ini dengan kadar sebanyak 446 ton / hari (38%), diikuti oleh kumbahan 354 ton / hari (30%), perkhidmatan penyediaan makanan 247 ton / hari (21%), industri pembuatan 70 ton / hari (6%), industri berasaskan pertanian 45 ton / hari (4%),dan pasar basah 8 ton / hari (1%) seperti ditunjukan dalam **Rajah 6.2**.

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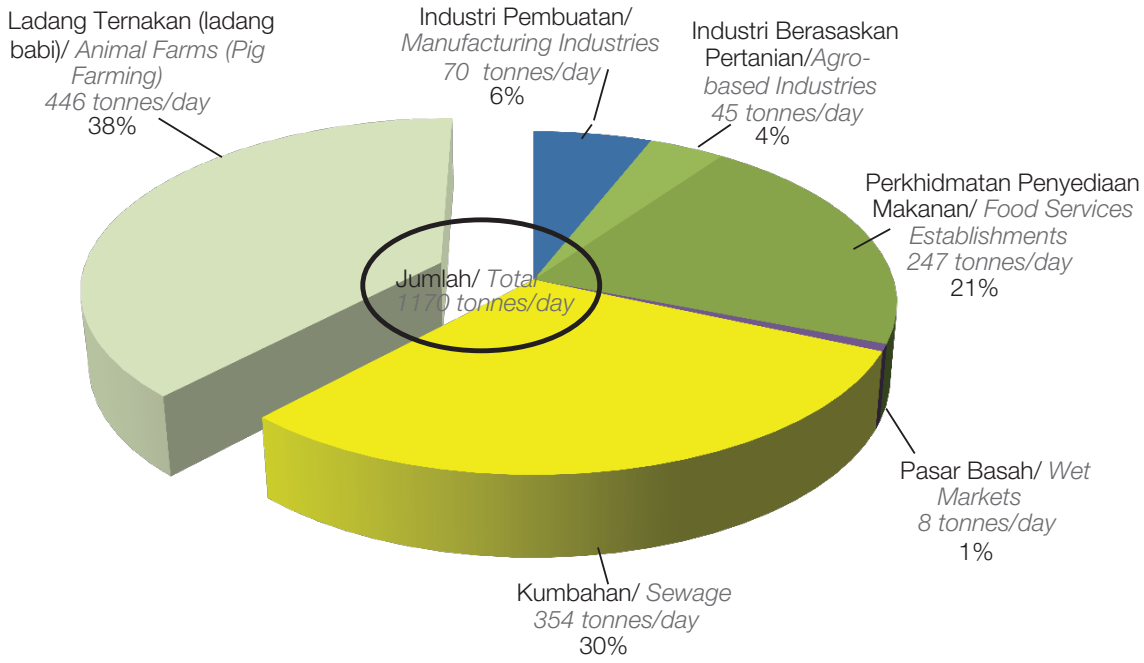
SUSPENDED SOLIDS LOAD

The estimated Suspended Solids (SS) load in 2014 was 1,170 tonnes / day, animal farm (pig farming) being the largest contributor with a total load of 446 tonnes / day (38%), followed by sewage 354 tonnes / day (30%), food services establishments 247 tonnes / day (21%), manufacturing Industries 70 tonnes / day (6%) agro-based industries 45 tonnes / day (4%) and wet market 8 tonnes / day (1%) as shown in ***Figure 6.2****.*



Rajah 6.2 Malaysia: Beban SS Mengikut Punca Pencemaran Air, 2014

Figure 6.2 Malaysia: SS Loading by Water Pollution Sources, 2014

BEBAN AMMONIKAL NITROGEN

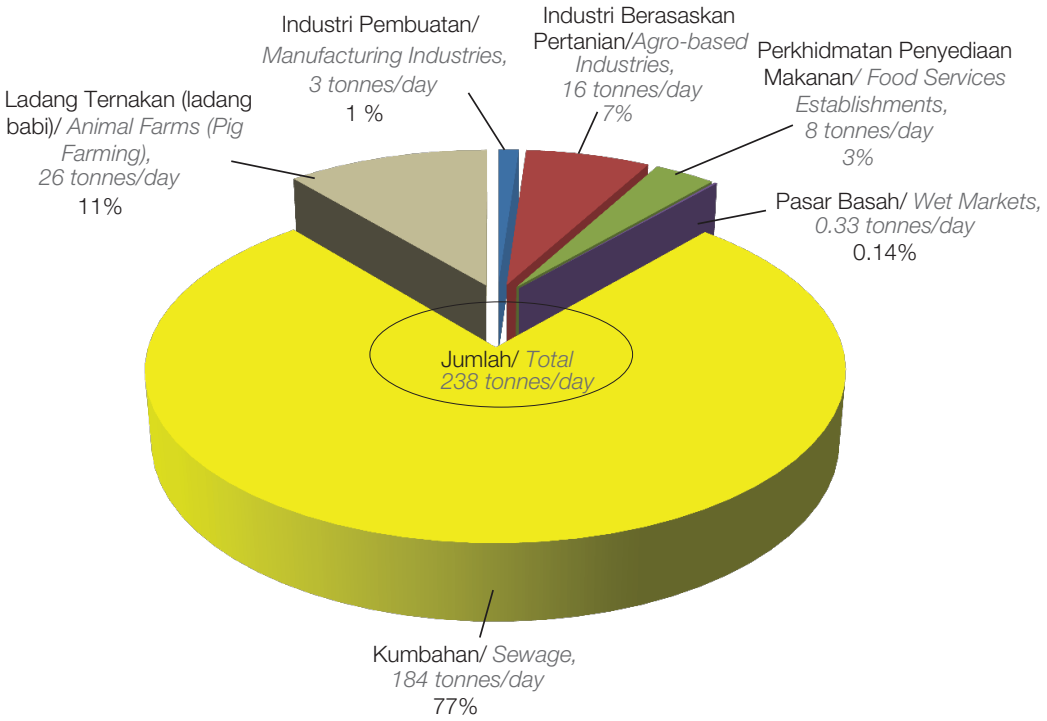
Anggaran beban Ammoniakal Nitrogen (AN) dalam tahun 2014 adalah sebanyak 238 ton / hari dimana kumbahan merupakan penyumbang terbesar beban pencemaran ini dengan kadar 184 ton / hari (77%), diikuti oleh ladang ternakan babi sebanyak 26 ton / hari (11%), industri berasaskan pertanian sebanyak 16 ton / hari (7%), perkhidmatan penyediaan makanan 8 ton / hari (3%), industri pembuatan 3 ton / hari (1%) dan pasar basah 0.33 ton / hari (0.14%) seperti ditunjukan dalam **Rajah 6.3**.

Melalui perbandingan dengan lembangan lembangan yang ada di negara ini, Lembangan Klang (Kuala Lumpur dan Selangor) merupakan lembangan yang tertinggi telah menerima beban BOD_5 (139 ton / hari), diikuti Lembangan Perak (Perak) 90 ton / hari, Lembangan Langat (Selangor dan Negeri Sembilan) 33 ton / hari, Lembangan Jawi (Pulau Pinang) 31 ton / hari, dan Lembangan Perai (Pulau Pinang) 27 ton / hari. Beban BOD_5 untuk 10 lembangan tertinggi ditunjukkan di dalam **Rajah 6.4**. Beban BOD_5 untuk lain-lain lembangan adalah dianggarkan kurang dari 26 ton / hari.

AMMONIACAL NITROGEN LOAD

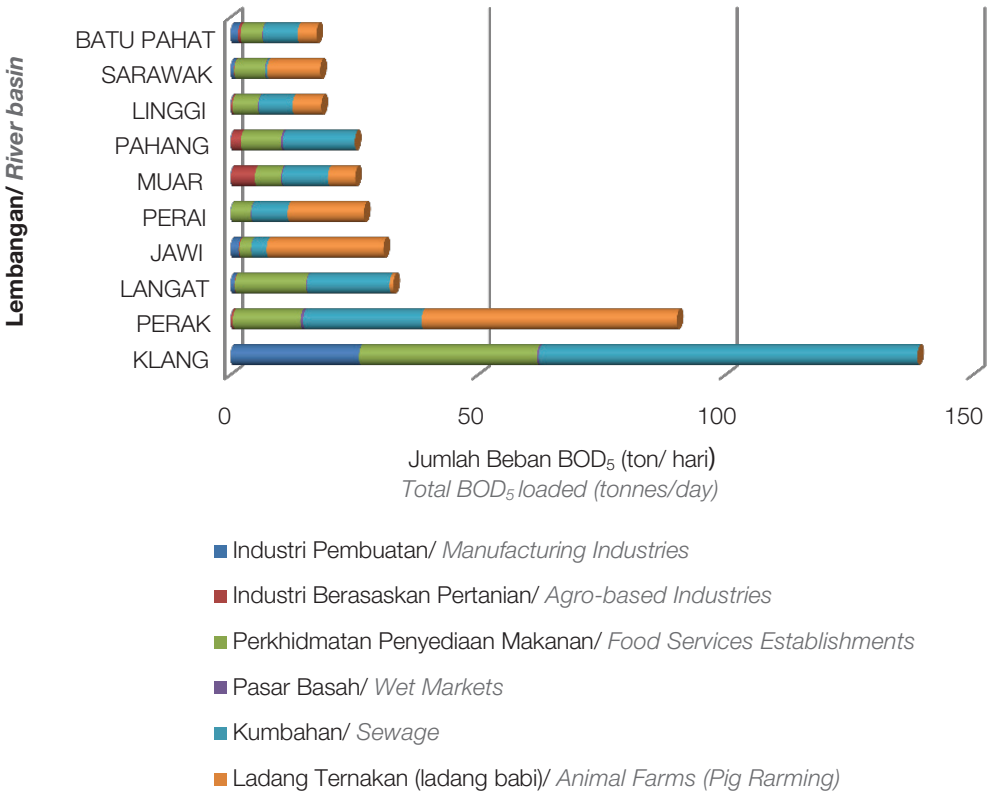
The estimated total of Ammoniacal Nitrogen (AN) load in 2014 was 238 tonnes / day sewage being the largest contributor with a total load of 184 tonnes / day (77%), followed by animal farm (pig farming) 26 tonnes/day (11%), agro-based industries 16 tonnes / day (7%), food services establishments 8 tonnes / day (3%), manufacturing industries 3 tonnes / day (1%) and wet market 0.33 tonne/day (0.14%) as shown in ***Figure 6.3****.*

In comparison to the other river basins in the country, Klang River Basin (Kuala Lumpur and Selangor) received the highest BOD_5 Load (139 tonnes / day), followed by Perak River Basin (Perak) 90 tonnes / day, Langat River Basin (Selangor and Negeri Sembilan) 33 tonnes / day, Jawi River Basin (Pulau Pinang) 31 tonnes / day and Perai River Basin (Pulau Pinang) 27 tonnes / day. The BOD_5 loading of top 10 river basins is as shown in ***Figure 6.4****. The BOD_5 load for the rest of the river basins was estimated to be less than 26 tonnes / day.*



Rajah 6.3 Malaysia: Beban AN Mengikut Punca Pencemaran Air, 2014

Figure 6.3 Malaysia: AN Loading by Water Pollution Sources, 2014

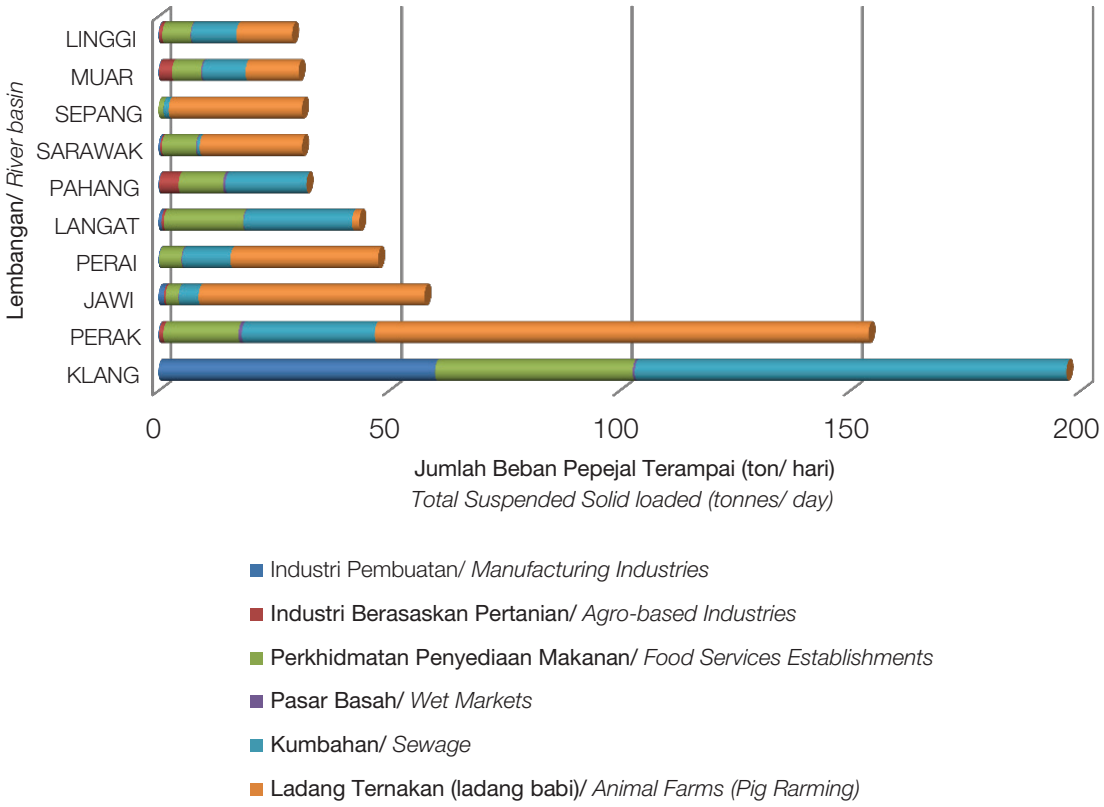


Rajah 6.4 Malaysia: Taburan Beban BOD_5 ke Dalam Lembangan dan Punca Punca Pencemaran Air, 2014

Figure 6.4 Malaysia: Distribution of BOD_5 Load By River Basin and Water Pollution Sources, 2014

Lembangan Klang telah menerima Beban SS yang tertinggi (197 ton / hari), diikuti Lembangan Perak 154 ton / hari, Lembangan Jawi 58 ton / hari, Lembangan Perai 48 ton / hari dan Lembangan Langat 44 ton / hari. Beban SS untuk 10 lembangan tertinggi ditunjukkan di dalam **Rajah 6.5**. Beban SS untuk lain-lain lembangan adalah dianggarkan kurang dari 43 ton / hari.

*The Klang River Basin continued to receive the highest SS Load (197 tonnes / day), followed by Perak River Basin 154 tonnes / day, Jawi River Basin 58 tonnes/ day, Perai River Basin 48 tonnes / day and Langat River Basin 44 tonnes / day. The SS loading for the highest 10 river basins is as shown in **Figure 6.5**. The SS load for the rest of the river basins was estimated to be less than 43 tonnes / day.*



Rajah 6.5 Malaysia : Taburan Beban SS ke Dalam Lembangan dan Punca-Punca Pencemaran Air, 2014

Figure 6.5 Malaysia : Distribution of SS Load By River Basin and Water Pollution Sources, 2014

Lembangan Klang telah menerima beban AN yang tertinggi (49 ton / hari), diikuti Lembangan Perak 22 ton / hari, Lembangan Langat 14 ton / hari, Lembangan Pahang (Pahang & Negeri Sembilan) 10 ton / hari dan Lembangan Muar, 7.2 ton / hari. Beban AN untuk 10 lembangan tertinggi ditunjukkan di dalam **Rajah 6.6**. Beban AN untuk lain-lain lembangan adalah dianggarkan kurang dari 7.2 ton / hari.

*The Klang River Basin received the highest AN Load (49 tonnes / day), followed by Perak River Basin 22 tonnes / day, Langat River Basin 14 tonnes / day, Pahangt River Basin (Pahang & Negeri Sembilan) 10 tonnes / day and Muar River Basin, 7.2 tonnes / day. The AN loading for the same 10 river basins is as shown in **Figure 6.6**. The AN load for the rest of the river basins was estimated to be less than 7.2 tonnes / day.*

Rajah 6.6 Malaysia: Taburan Beban AN ke Dalam Lembangan dan Punca Punca Pencemaran Air, 2014

Figure 6.6 Malaysia: Distribution of AN Load by River Basin and Water Pollution Sources, 2014

PUNCA-PUNCA PENCEMARAN UDARA

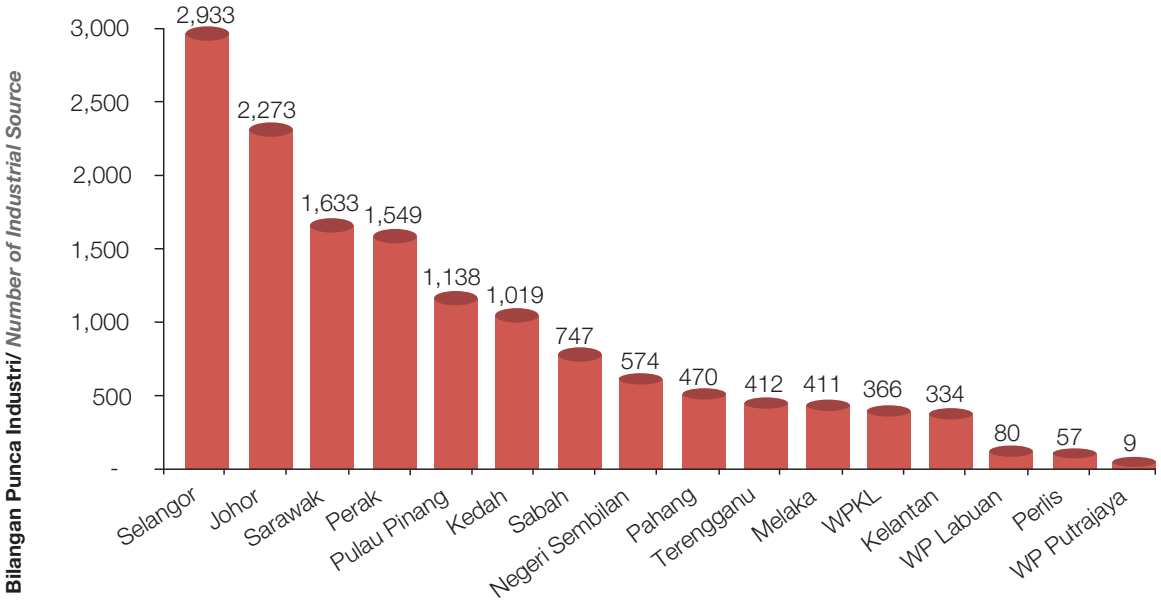
Punca utama pencemaran udara di negara ini adalah dari aktiviti perindustrian, pelepasan asap, kenderaan bermotor dan aktiviti pembakaran terbuka.

Sehingga bulan Disember 2014, jumlah punca industri yang tertakluk di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 2014 adalah sebanyak 14,005. Jumlah ini berkurangan sebanyak enam (6) punca berbanding pada tahun 2013. Pecahan punca industri berdasarkan negeri adalah seperti **Rajah 6.7**. Bilangan punca pencemar yang tertinggi adalah di negeri Selangor (2,933: 20.9%) diikuti negeri Johor (2,273:16.2%) dan negeri Sarawak (1,633:11.7%)

SOURCES OF AIR POLLUTION

Industries including power plants, emission from motor vehicles and open burning activities are still the major sources of air pollution in the country.

*As of December 2014, a total of 14,005 industrial sources were recorded to be subjected to the Environmental Quality (Clean Air) Regulations, 1978, declining by six (6) sources as compared to 2013. The distribution of industrial sources by states is as shown in **Figure 6.7**. The highest number of stationary pollution sources was in Selangor (2,933: 20.9%) followed by Johor (2,273: 16.2%) and Sarawak (1,633: 11.7 %).*

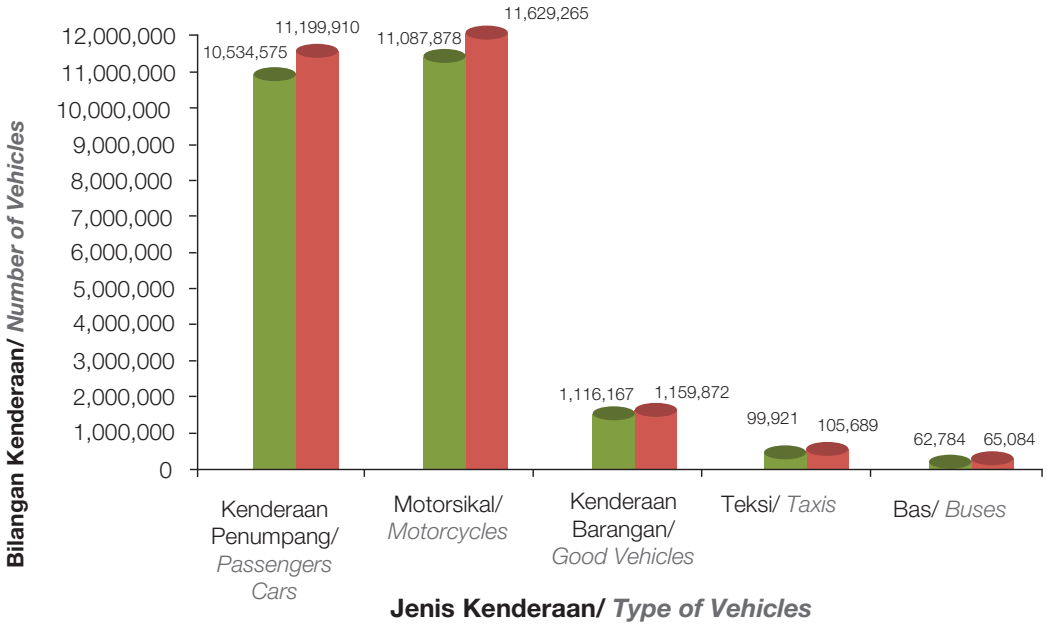


(Sumber: Sistem Inventori Pencemaran Alam Sekitar (SIMPAS), Jabatan Alam Sekitar)
(Sources: Environmental Pollution Inventory System (SIMPAS), Department of Environment, 2014)

Rajah 6.7 Malaysia: Punca Pencemaran Udara Mengikut Negeri, 2014
Figure 6.7 Malaysia: Industrial Air Pollution Sources by State, 2014

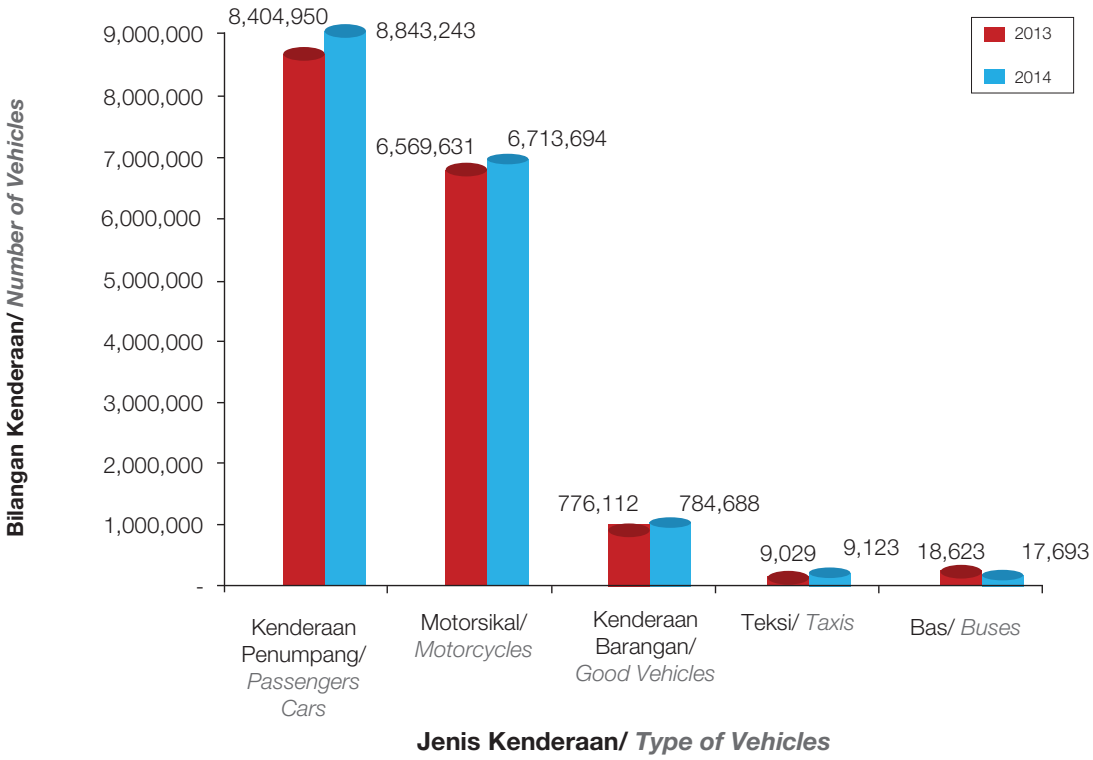
Seperti tahun-tahun yang lepas, pelepasan asap dari kenderaan bermotor merupakan punca utama yang menyumbang kepada pencemaran udara terutamanya di kawasan bandar. Pada tahun 2014, terdapat peningkatan bagi jumlah keseluruhan kenderaan bermotor yang didaftarkan. Bilangan pendaftaran yang direkodkan bagi kenderaan penumpang meningkat sebanyak 6.32%, motosikal 4.88%, kenderaan barangan 3.92%, teksi 5.77% dan bas 3.60% berbanding pada tahun 2013. Pendaftaran kenderaan bermotor yang direkodkan oleh Jabatan Pengangkutan Jalan pada tahun 2013 dan 2014 adalah seperti yang ditunjukkan dalam **Rajah 6.8**. Bilangan bagi kenderaan yang sedang digunakan dan yang masih aktif juga menunjukkan tren peningkatan, di mana bilangan bagi kenderaan penumpang meningkat sebanyak 5.21%, motosikal sebanyak 2.1%, kenderaan barangan sebanyak 1.1 % dan teksi sebanyak 1.04% jika dibandingkan dengan tahun 2013 **(Rajah 6.9)**. Manakala, bagi bas, ianya masih menunjukkan penurunan sebanyak 4.99% berbanding tahun 2013.

Like the past years, emission from motor vehicles remained the major source of air pollution especially in urban areas. In 2014, there was an overall increase in the number of motor vehicles registered. The number of registered passenger cars increased by 6.32%, motorcycles 4.88%, goods vehicles 3.92%, taxi 5.77% and buses 3.60% compared to 2013. The number of registered vehicles in Malaysia as reported by the Road Transport Department for 2013 and 2014 is shown in ***Figure 6.8****. The number of in use vehicles or active on the road also has shown an ascending trend in which the number of passenger vehicles has increased by 5.21%, motorcycles increased 2.1%, goods vehicles increased 1.1% and taxis increased 1.04% compared to 2013* ***(Figure 6.9)****. Meanwhile for the buses, it is still a descending trend of 4.99% compared to 2013.*



(Sumber: Jabatan Pengangkutan Jalan, Malaysia 2014)
(Source: Road Transport Department, Malaysia, 2014)

Rajah 6.8 Malaysia: Bilangan Kenderaan Berdaftar Tahun 2013-2014
Figure 6.8 Malaysia: Number of Registered Vehicles in 2013-2014



(Sumber: Jabatan Pengangkutan Jalan , Malaysia 2014)
(Source: Road Transport Department, Malaysia, 2014)

Rajah 6.9 Malaysia: Bilangan Kenderaan Yang Digunakan Tahun 2013-2014
Figure 6.9 Malaysia: Number of in Use Vehicles in 2013-2014

BEBAN PENCEMARAN PENCEMAR UDARA

Beban Pencemaran Secara Menyeluruh

Dianggarkan pada tahun 2014, keseluruhan beban pencemaran yang terkumpul bagi pencemar karbon monoksida (CO) adalah 1,941,039 metrik tan; 836,708 metrik tan bagi nitrogen dioksida (NO_2); 221,471 metrik tan bagi sulfur dioksida (SO_2) dan 25,673 metrik tan bagi jirim zarahan (PM). Perbezaan keseluruhan beban pencemaran bagi tahun 2013 dan 2014 adalah ditunjukkan dalam **Rajah 6.10**.

Beban pencemaran bagi NO_2 adalah berkurangan pada tahun 2014 berbanding dengan tahun 2013 disebabkan pengurangan penggunaan bahan api dalam aktiviti pertanian. Peningkatan sebanyak 4.0% beban pencemaran CO, 11.3% bagi beban

AIR POLLUTANT EMISSION LOAD

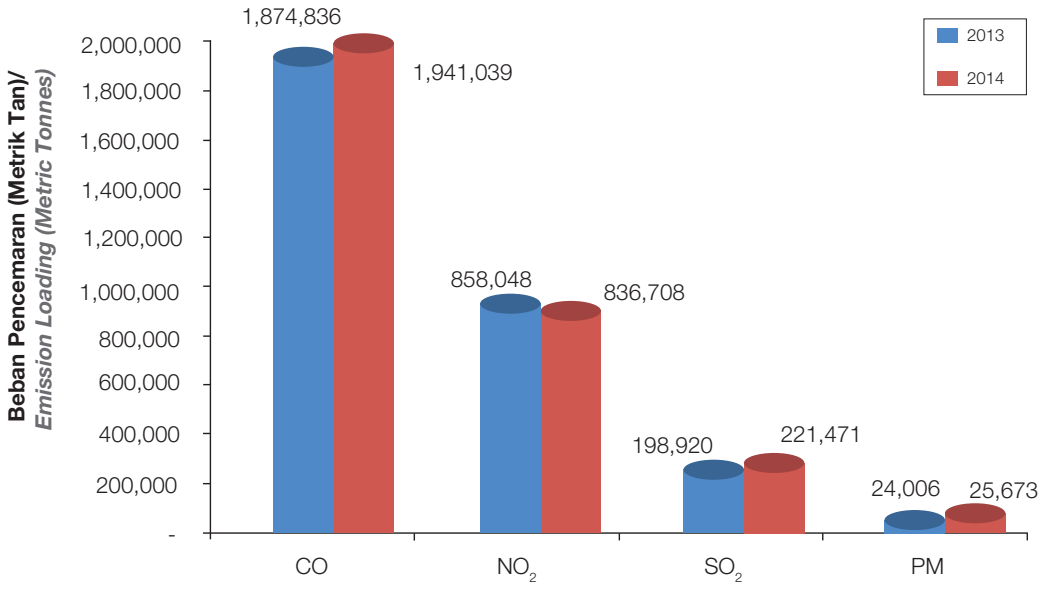
Overall Emission Load

*It was estimated that in 2014 the combined air pollutant emission load accumulated to 1,941,039 metric tonnes of carbon monoxide (CO); 836,708 metric tonnes of nitrogen oxides (NO_2); 221,471 metric tonnes of sulphur dioxide (SO_2) and 25,673 metric tonnes of particulate matter (PM). A comparison of the combined air pollutant emission load in 2013 and 2014 is shown in **Figure 6.10**.*

Emission load for NO_2 had decreased in 2014 compared to 2013 due to the decreased of fuel consumption in agricultural activities. The increase of 4.0% in CO emission load, 11.3% in SO_2 emission load and 6.9% in PM emission load compared to

pencemar SO_2 dan 6.9% bagi beban pencemar PM berbandingkan dengan tahun 2013 adalah disebabkan peningkatan penggunaan bahan api minyak dan arang batu sebagai bahan api dalam dalam industri dan loji janakuasa (Sumber: National Energy Balance, 2014)

2013 could be due to high consumptions of fuel oil and coke which was used as fuel in industries and, power and heat generation plants. (Sources: National Energy Balance 2014).



(Sumber: Dari National Energy Balance 2014)
(Sources: From National Energy Balance 2014)

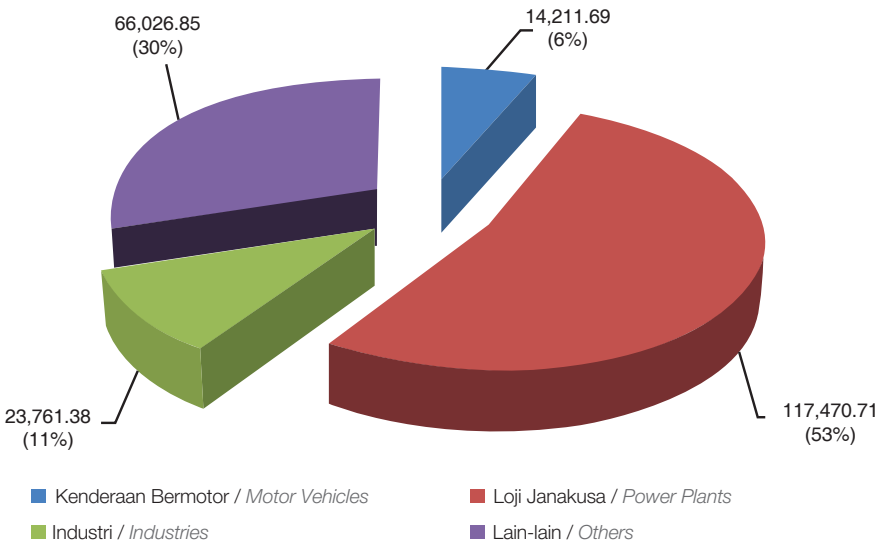
Rajah 6.10 Malaysia: Beban Pencemaran Bahan Pencemar Udara Dari Semua Punca, 2013-2014
Figure 6.10 Malaysia: Air Pollutant Emission Load from All Sources, 2013-2014

Punca Beban Pencemaran

Loji janakuasa merupakan penyumbang utama kepada beban pencemar SO_2 (53%), diikuti dengan lain-lain kategori (30%), industri (11%) dan kenderaan bermotor (6%) **(Rajah 6.11)**. Bagi beban pencemar PM pula, penyumbang terbesar adalah daripada industri (35%), diikuti oleh loji janakuasa (30%), lain-lain kategori (18%) dan kenderaan bermotor (17%) (**Rajah 6.12)**. Seperti yang ditunjukkan dalam **Rajah 6.13**, penyumbang terbesar bagi NO_2 adalah daripada loji janakuasa (65%) diikuti kenderaan bermotor (27%), lain-lain kategori (7%) dan industri (1%). Walau bagaimanapun, kenderaan bermotor masih merupakan penyumbang terbesar kepada CO (95.3%) **(Rajah 6.14)**.

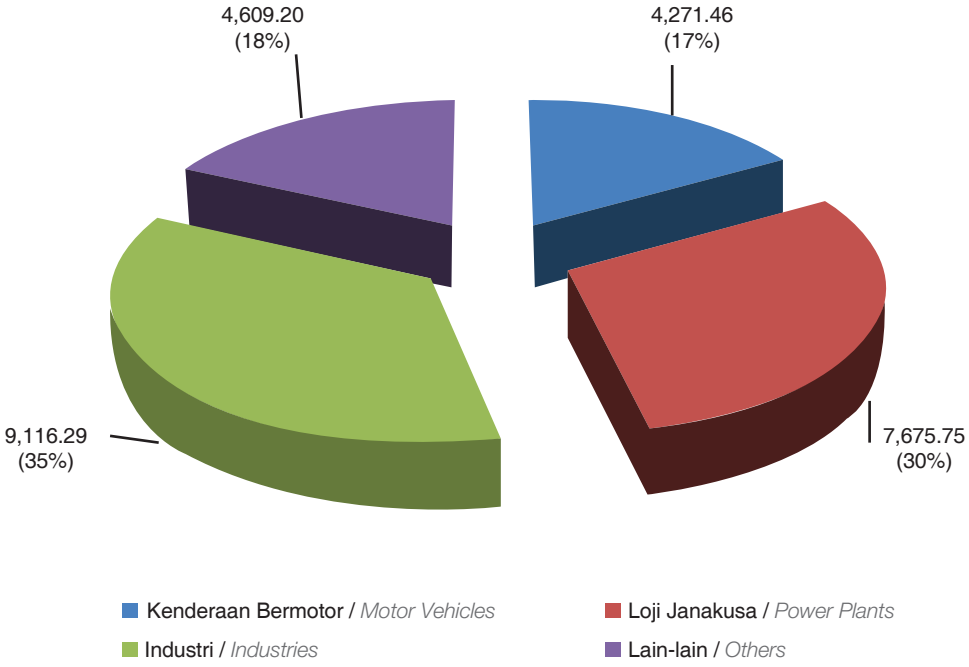
Emission Load by Sources

*Power plants contributed the highest SO_2 emission load (53%), followed by others (30%), industries (11%) and motor vehicles (6%) **(Figure 6.11)**. As to PM the highest contributor was industries (35 %) followed by power plants (30%), others (18%) and motor vehicles (17%) **(Figure 6.12)**. As shown in **Figure 6.13** the highest contributor of NO_2 was power plants (65%) followed by motor vehicles (27%), others (7%) and industries (1%). However, motor vehicles remain the highest contributor of CO (95.3 %) **(Figure 6.14)**.*



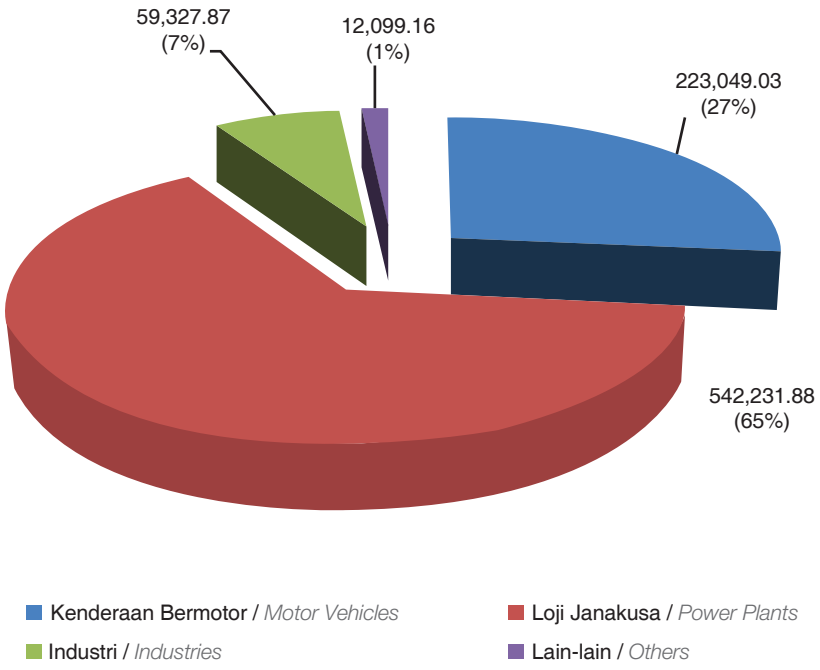
Rajah 6.11 Malaysia: Punca Pecemaran SO_2 (Metrik Tan), 2014

Figure 6.11 Malaysia: SO_2 Emission by Sources (Metric Tonnes), 2014



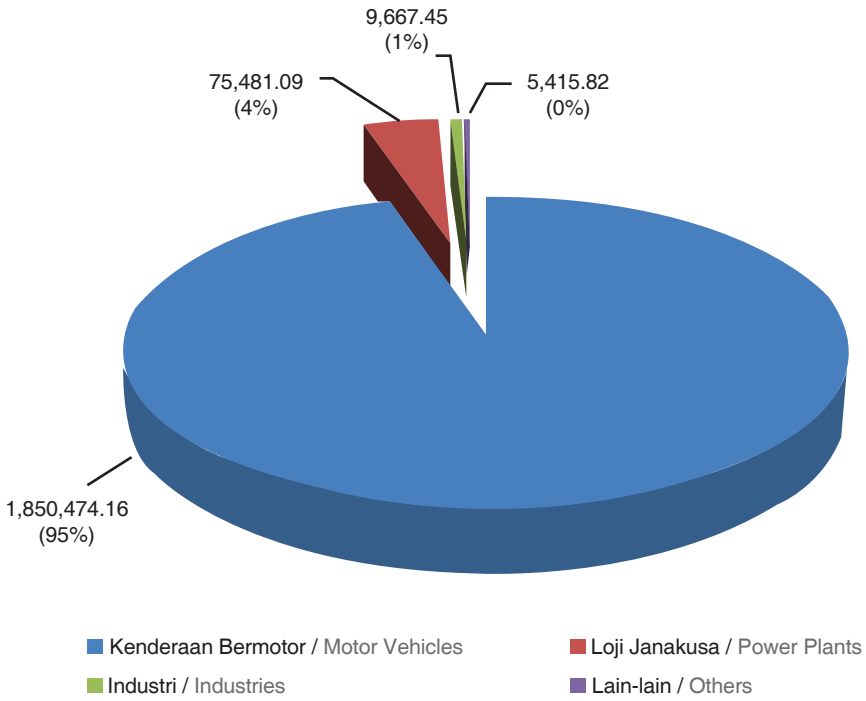
Rajah 6.12 Malaysia: Punca Beban Pencemaran Jirim Zarahan (PM) (Metrik Tan), 2014

Figure 6.12 Malaysia: Particulate Matter (PM) Emission Load by Sources (Metric Tonnes), 2014



Rajah 6.13 Malaysia: Punca Pencemaran NO_2 (Metrik Tan), 2014

Figure 6.13 Malaysia: NO_2 Emission by Sources (Metric Tonnes), 2014

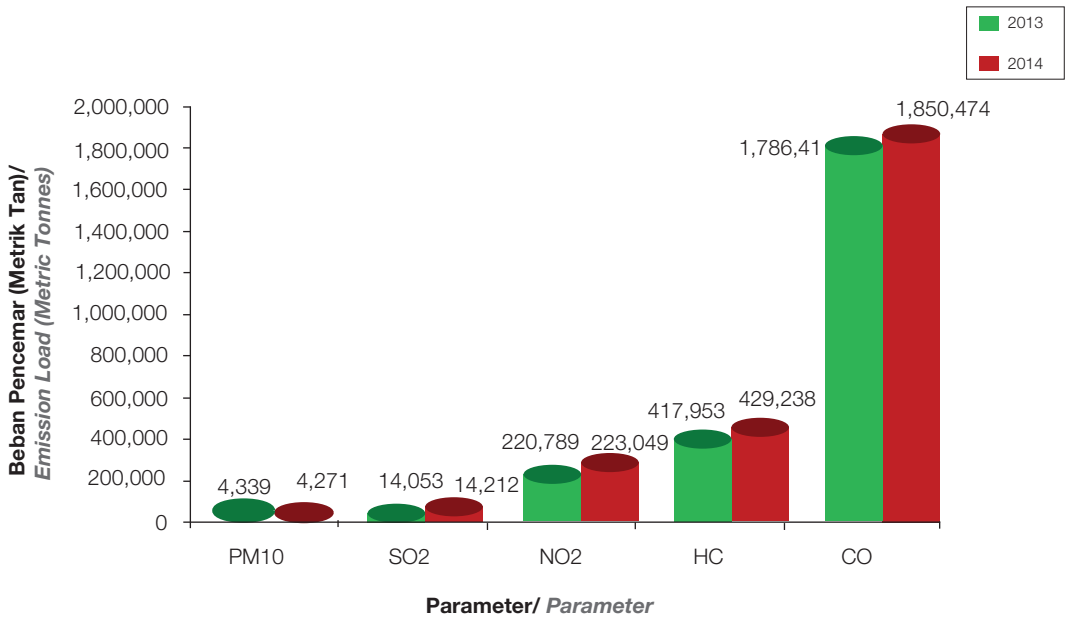


Rajah 6.14 Malaysia: Punca Pencemaran CO (Metrik Tan), 2014

Figure 5.14 Malaysia: CO Emission by Sources (Metric Tonnes), 2014

Anggaran pencemaran yang dihasilkan oleh beban pencemar udara iaitu HC, CO, PM, NO_2 dan CO_2 daripada kenderaan bermotor pada tahun 2013 dan 2014 ditunjukkan dalam **Rajah 6.15**. Pada tahun 2014, beban pencemaran bagi pencemar HC dan CO dianggarkan 429,238 metrik tan dan 1,850,474 metrik tan masing-masing. Terdapat peningkatan sebanyak 3.59% bagi beban pencemaran CO jika dibandingkan dengan tahun 2013. Tren peningkatan yang sama juga dilihat bagi beban pencemaran yang dihasilkan oleh SO_2, NO_2, dan HC daripada kenderaan bermotor pada tahun 2013. SO_2 sebanyak 14,212 metrik tan pada tahun 2014 berbanding pada 14,053 metrik tan pada tahun 2013 (peningkatan sebanyak 1.13%) dan NO_2 sebanyak 223,049 metrik tan berbanding 220,789 metrik tan pada 2013 (meningkat sebanyak 1.02%) manakala HC adalah 429,238 metrik tan (meningkat sebanyak 2.7%). Peningkatan beban pencemar dari kenderaan bermotor ini adalah berkait rapat dengan peningkatan bilangan kenderaan bermotor pada tahun 2014. Walau bagaimanapun, beban pencemaran bagi PM berkurangan sebanyak 1.56% pada tahun 2014.

*The estimated annual air pollutant emission load of HC, CO, PM, NO_2 and SO_2 from motor vehicles for 2013 and 2014 is shown in **Figure 6.15**. In 2014, the emission load of HC and CO was estimated to be 429,238 metric tonnes and 1,850,474 metric tonnes respectively. There was an increase of 3.59% of CO emission load compared to 2013. A similar increasing trend was also observed for the emission load of SO_2, NO_2 and PM from motor vehicles in 2014. SO_2 was 14,212 metric tonnes in 2014 as compared to 14,053 metric tonnes in 2013 (1.13% increased); and NO_2 was 223,049 metric tonnes as compared to 220,789 metric tonnes in 2013 (1.02% increase). However, for the emission load of HC, 429,238 metric tonnes (increase by 2.70%) in 2014. Emission load of PM was 4,271 metric tonnes in 2014 as compared to 4,339 metric tonnes in 2013 (1.56% decrease).*



Rajah 6.15 Malaysia: Beban Pencemaran Pencemar Udara Dari Kenderaan Bermotor, 2013-2014

Figure 6.15 Malaysia: Air Pollutant Emission Load from Motor Vehicles, 2013-2014

INVENTORI BUANGAN TERJADUAL

Pada tahun 2014, sebanyak 2,541,762.34 tan metrik buangan terjadual telah dihasilkan. Ini mewakili penurunan keseluruhan sebanyak 14.29% berbanding 2,965,611.65 tan metrik yang dilaporkan pada 2013. Buangan gipsum, enapcemar logam berat, dros / sanga / klinker / abu, asid terpakai, dan buangan pelarut organik bukan terhalogen merupakan kategori utama dalam kategori buangan yang dihasilkan **(Jadual 6.2)**. Merujuk kepada **Rajah 6.16**, Negeri Terengganu menjana jumlah terbesar buangan terjadual (23.88%), diikuti oleh Negeri Selangor (13.99%), Johor (13.79%), Perak (13.05%), Pulau Pinang (9.59%), manakala 10 negeri-negeri yang lain menghasilkan sebanyak 25.70%.

Sebanyak 649,496.69 tan metrik (25.55%) daripada jumlah buangan yang dihasilkan diperoleh kembali di dalam dan luar negara. Ini menunjukkan kenaikan sebanyak 13.90% berbanding 570,214.58 tan metrik pada tahun 2013. Daripada jumlah itu, 640,071.69 tan metrik (25.18%) daripada buangan terjadual yang diperoleh kembali di kemudahan pemerolehan kembali luar tapak tempatan dan 9,425.00 tan metrik (0.37%) telah dieksport untuk pemerolehan kembali di kemudahan di luar negara.

Sebanyak 134,822.99 tan metrik (5.30%) daripada jumlah buangan terjadual yang dihasilkan, dirawat dan dilupuskan untuk pelupusan akhir, iaitu di Kualiti Alam Sdn. Bhd (115,420.99 MT), Trienekens (Sarawak) Sdn. Bhd (19,402.00 MT) dan 21,975.32 tan metrik (0.86%) daripada buangan klinikal telah dibakar di kemudahan luar tapak yang dilesenkan **(Jadual 6.3)**. Jumlah ini menunjukkan kenaikan sebanyak 4.96% daripada sejumlah 149,391.25 tan metrik sisa berjadual dilupuskan pada tahun 2013.

Sebanyak 807,309.42 tan metrik (31.76%) daripada buangan terjadual terhasil telah diolah di tapak; manakala 51,742.48 tan metrik (2.04%) telah distor di premis pengeluar buangan **(Jadual 6.4)**. Dua (2) kemudahan pengolahan di atas tanah dan lima belas

SCHEDULED WASTES INVENTORY

*In 2014, a total of 2,541,762.34 metric tonnes of scheduled wastes were generated. This represents an overall decrease of 14.29% as compared to 2,965,611.65 metric tonnes reported in 2013. Of the total waste generated, gypsum, heavy metal sludge, dross /slag /clinker / ash, spent acid, and waste of non-halogenated solvent were the main categories **(Table 6.2)**. Referring to **Figure 6.16,** the state of Terengganu generated the largest amount of scheduled wastes (23.88%), followed by Selangor (13.99%), Johor (13.79%), Perak (13.05%), Pulau Pinang (9.59%), whilst the other 10 states generated a total of 25.70%.*

A total of 649,496.69 metric tonnes (25.55%) of waste were being recovered locally and abroad. This showed a increase of 13.90% as compared to 570,214.58 metric tonnes in 2013. From the total, 640,071.69 metric tonnes (25.18%) of scheduled wastes were recovered at local off-site facilities and 9,425.00 metric tonnes (0.37%) were exported for recovery at foreign facilities abroad.

*A total of 134,822.99 metric tonnes (5.30%) of waste were treated and disposed for final disposal, at Kualiti Alam Sdn. Bhd. (115,420.99 MT), Trienekens (Sarawak) Sdn. Bhd. (19,402.00 MT) and 21,975.32 metric tonnes (0.86%) of clinical wastes were incinerated at licensed off-site facilities **(Table 6.3)**. The amount showed an increase of 4.96% from a total of 149,391.25 metric tonnes of scheduled waste disposed in 2013.*

*A sum of 807,309.42 metric tonnes (31.76%) of scheduled waste were treated on-site; while 51,742.48 metric tonnes (2.04%) were stored on-site at waste generators' premises **(Table 6.4)**. Two (2) land farms and fifteen (15) on-site waste*

(15) insinerator dalam tapak telah dilesenkan oleh Jabatan Alam Sekitar bagi membolehkan rawatan dan pembakaran dalam tapak.

Daripada jumlah buangan terjadual yang dihasilkan pada tahun 2014, 876,415.44 tan metrik (34.48%) telah diberi kelulusan bersyarat di bawah pengurusan khas seperti yang ditetapkan di bawah Peraturan 7, Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005 **(Jadual 6.5)**. Jumlah ini merupakan penurunan sebanyak 44.32% berbanding 1,574,041.95 tan metrik pada tahun 2013. Kebanyakan buangan dihasilkan dari loji jana kuasa arang batu (76.56%), enap cemar daripada kemudahan rawatan air minuman (8.39%) dan lain-lain (15.05%).

incinerators has been licensed by DOE to allow for on-site treatment and incineration respectively.

Of the total wastes produced in 2014, 876,415.44 metric tonnes (34.48%) were granted conditional approval to be managed under special management as stipulated under Regulation 7, Environmental Quality (Scheduled Wastes) Regulations, 2005 ***(Table 6.5)****. The amount represented a decrease of 44.32% as compared to 1,574,041.95 metric tonnes in 2013. These waste streams are mostly generated from coal-fired power plant (76.56%), sludges from drinking water treatment facilities (8.39%) and others (15.05%).*

No	Nama Buangan/ *Name of Waste*	Kod Buangan/ *Waste Code/*	Kuantiti Buangan/ *Quantity of Waste*	
			(MT/Tahun)/ (MT/Year)	Peratusan (%) *Percentage (%)*
1	Gipsum / *Gypsum*	SW 205	655,131.23	39.34
2	Enap cemar logam berat / *Heavy Metal Sludges*	SW 204	213,392.79	12.81
3	Dros / sanga / klinker / abu *Dross / Slag / Clinker /Ash*	SW 104	155,235.53	9.32
4	Asid Terpakai/ *Spent Acids*	SW 206	65,614.66	3.94
5	Buangan pelarut organic bukan terhalogen / *Waste of Non-Halogenated Solvent*	SW 322	57,309.36	3.44
6	Buangan elektronik / *E-Waste*	SW 110	57,103.40	3.43
7	Minyak Pelincir Terpakai / *Spent Lubricating oil*	SW 305	49,460.28	2.97
8	Bekas tercemar/ *Contaminated Container*	SW 409	49,152.02	2.95
9	Campuran buangan terjadual dan buangan tidak terjadual / *Mixture of Scheduled Waste & Non-Scheduled Waste*	SW 422	42,103.45	2.53
10	Kain buruk, plastik, kertas atau turas tercemar / *Rags / Plastics / Papers contaminated with Scheduled Waste*	SW 410	38,571.81	2.32
11	Buangan dakwat dan cat / *Waste of Inks & Paints*	SW 417	38,439.02	2.31
12	Buangan getah atau lateks yang mengandungi logam berat / *Rubber / Latex Waste Containing Heavy Metal*	SW 321	31,189.15	1.87

Jadual 6.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2014
Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2014

13	Produk dakwat, cat, pigmen atau lakuer yang tidak mengikut spesifikasi / *Discarded of Ink, Paint, Pigment, Lacquer Containing Organic Solvent*	SW 418	28,256.43	1.70
14	Enap cemar mineral / *Mineral Sludges*	SW 427	25,277.80	1.52
15	Buangan patogenik / klinikal*Pathogenics Clinical Waste*	SW 404	21,976.12	1.32
16	Emulsi minyak mineral-air terpakai / *Spent mineral oil-water emulsion*	SW 307	19,193.46	1.15
17	Enap cemar dakwat dan cat / *Ink & Paints Sludges*	SW 416	14,563.64	0.87
18	Minyak hidraulik terpakai / *Spent Hydraulic oil*	SW 306	14,117.97	0.85
19	Alkali terpakai / *Spent Alkalis*	SW 401	9,082.88	0.55
20	Campuran buangan terjadual / *Mixture of Scheduled Waste*	SW 421	8,802.58	0.53
21	Tanah/puing tercemar / *Contaminated Land/Soil*	SW 408	8,724.24	0.52
22	Sisa dari pengolahan atau pemerolehan kembali buangan terjadual / *Residue From Recovery of Scheduled Waste*	SW 501	7,976.26	0.48
23	Buangan kimia / *Lab Waste*	SW 429	6,693.80	0.40
24	Enap cemar yang mengandungi fluorida / *Sludge Containing Flouride*	SW 207	6,456.82	0.39
25	Campuran minyak-air / *Oil-Water mixture*	SW 309	5,605.06	0.34
26	Buangan minyak atau enap cemar berminyak / *Waste oil / Oily sludges*	SW 311	4,364.37	0.26
27	Buangan mangkin / *Waste Catalyst*	SW 202	3,961.05	0.24
28	Buangan bateri asid plumbum / *Waste of acid plumbum baterries*	SW 102	3,825.44	0.23
29	Alkali terpakai dengan pH ≥ 11.5 / *Spent Alkalis With PH > 11.5*	SW 402	3,543.83	0.21
30	Buangan pelarut organik terhalogen / *Waste Of Halogenated Solvents*	SW 323	2,269.49	0.14
31	Buangan cecair terma / *Waste Of Thermal Fluids*	SW 327	2,232.68	0.13
32	Klinker, sanga dan abu dari penunu buangan terjadual / *Clinker / Slag / Ashes From Incinerator*	SW 406	2,091.65	0.13
33	Buangan resin yang mengandungi pelarut organik / *Waste of Resin Containing Organic*	SW 325	1,928.48	0.12
34	Buangan bateri yang mengandungi cadmium dan nikel/ *Waste Of Bateries Containing Kadmium/Hg / Litium*	SW 103	1,828.74	0.11

Jadual 6.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2014

Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2014

35	Karbon teraktif terpakai / *Contaminated Active Carbon*	SW 411	1,212.274	0.07
36	Buangan sisa penyulingan tidak berair terhalogen atau bukan / *Waste both Halogenated or Non Halogenated From Recovery*	SW 324	848.42	0.05
37	Buangan mengandungi merkuri / *Waste contaning Mercury Compound*	SW 109	813.58	0.05
38	Garam terpakai yang mengandungi sianida / *Spent salt containing Cyanide*	SW 413	738.64	0.04
39	Larutan alkali berair terpakai yang mengandungi sianida / *Spent Aqueous alkaline Containing Cyanide*	SW 414	731.62	0.04
40	Buangan pelekat / glu yang mengandungi pelarut organik / *Adhesive/Glue Contaning Organic Solvent*	SW 303	669.09	0.04
41	Enap cemar dari tangki penyimpanan minyak mineral / *Sludges from mineral oil storage tank*	SW 310	649.00	0.04
42	Asid organik terpakai / *Spent Organic Acids*	SW 301	513.24	0.03
43	Buangan fotografi / *Photographic Waste*	SW 423	505.40	0.03
44	Dadah terbuang / *Expired Drug*	SW 403	447.97	0.03
45	Sisa berminyak dari bengkel automotif / *Oily Residue from Workshop*	SW 312	386.35	0.02
46	Enap cemar yang distabilkan / *Stabilized Sludges*	SW 203	314.95	0.02
47	Diisosianat terpakai/ *Spent di-Isocyanates*	SW 419	244.00	0.01
48	Buangan mengandungi formaldehid / *Waste Containing Formaldehyde*	SW 320	243.77	0.01
49	Minyak/Enapcemar daripada loji penapisan minyak / *Oil / Sludges from Oil Refinery*	SW 314	203.96	0.01
50	Tanah yang dicemari dengan minyak daripada penapisan / *Contaminated Oil from re-refining / used lubricating Oil/*	SW 313	200.38	0.01
51	Buangan makmal / *Chemical Waste*	SW 430	184.05	0.01
52	Buangan daripada opearsi pengawetan kayu / *Waste From Wood Containing Heavy Metals*	SW 428	184.05	0.01
53	Petrochemical Plant / Tar atau sisa bertar dari loji penapisan minyak / *Tar Residue From Oil Refinery*	SW 315	155.34	0.01

Jadual 6.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2014

Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2014

54	Enap cemar asid / *Acid Sludges*	SW 316	135.22	0.01
55	Buangan asbestos / *Asbestos*	SW 201	130.86	0.01
56	Buangan farmaseutikal / *Discarded Drug*	SW 405	110.59	0.01
57	Buangan fluks / *Flux Waste*	SW 302	57.10	0.00
58	Buangan racun perosak / *Pesticide*	SW 425	47.92	0.00
59	Buangan fenol/ *Waste Of Phenols/Its Compound*	SW 319	37.71	0.00
60	Buangan sebatian fosforus organik / *Waste of Organic phosphorus compound*	SW 326	33.14	0.00
61	Buangan dari pengilangan bahan letupan/ *Waste From Manufacturing / Processing or use of explosive*	SW 431	31.22	0.00
62	Produk racun perosak yang tidak mengikut spesifikasi/ *Used Pesticide / Herbicides/Biocides*	SW 426	14.35	0.00
63	Buangan yang mengandungi peroksida / *Waste Containing Peroxides*	SW 432	12.07	0.00
64	Agen pengoksidaan terpakai / *Spent Oxidizing Agent*	SW 424	9.08	0.00
65	Sisa dari pemprosesan zink / *Zink Residue*	SW 108	1.42	0.00
66	Buangan yang mengandungi BFT dan TFT / *Waste containing PCB or PCT*	SW 318	1.37	0.00
67	Enap cemar dari tangki minyak / *Oil tankers sludges*	SW 308	1.15	0.00
68	Buangan yang mengandungi arsenik / *Waste containing arsenic*	SW 101	0.64	0.00
69	Enap cemar yang mengandungi sianida / *Sludges Contaning Cyanide*	SW 412	0.63	0.00
70	Sanga kuprum / *Slag of Copper*	SW 107	0.27	0.00
71	Minyak pelindapan terpakai mengandungi sianida / *Spent quenching Oil Containing Cyanide*	SW 415	0.10	0.00
72	Enap cemar galvani / *Galvanic sludges*	SW 105	-	0.00
73	Kek tekan daripada pra pengolahan lai sabun gliserol / *Cake From Glycerol Soap Iye*	SW 304	-	0.00
74	Sebatian organologam terpakai / *Spent Of Organometallic compound*	SW 317	-	0.00
75	Buangan mengandungi dioksin atau furan / *Waste Containing Dioxins or Furans*	SW 407	-	0.00

Jadual 6.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2014
Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2014

76	Larutan resap dari tapak pelupusan buangan terjadual / *Leachate From Scheduled Waste Landfill*	SW 420	-	0.00
77	Sisa dari pemerolehan kembali likuor penjerukan asid / *Residue from Recovery of Acid Pickling Liquor*	SW 106		0.00
	JUMLAH/ *TOTAL*		**1,665,346.90**	100.00

Jadual 6.2 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Kod Buangan Terjadual, 2014
Table 6.2 Malaysia: Quantity of Scheduled Wastes Generated by Scheduled Waste Code, 2014

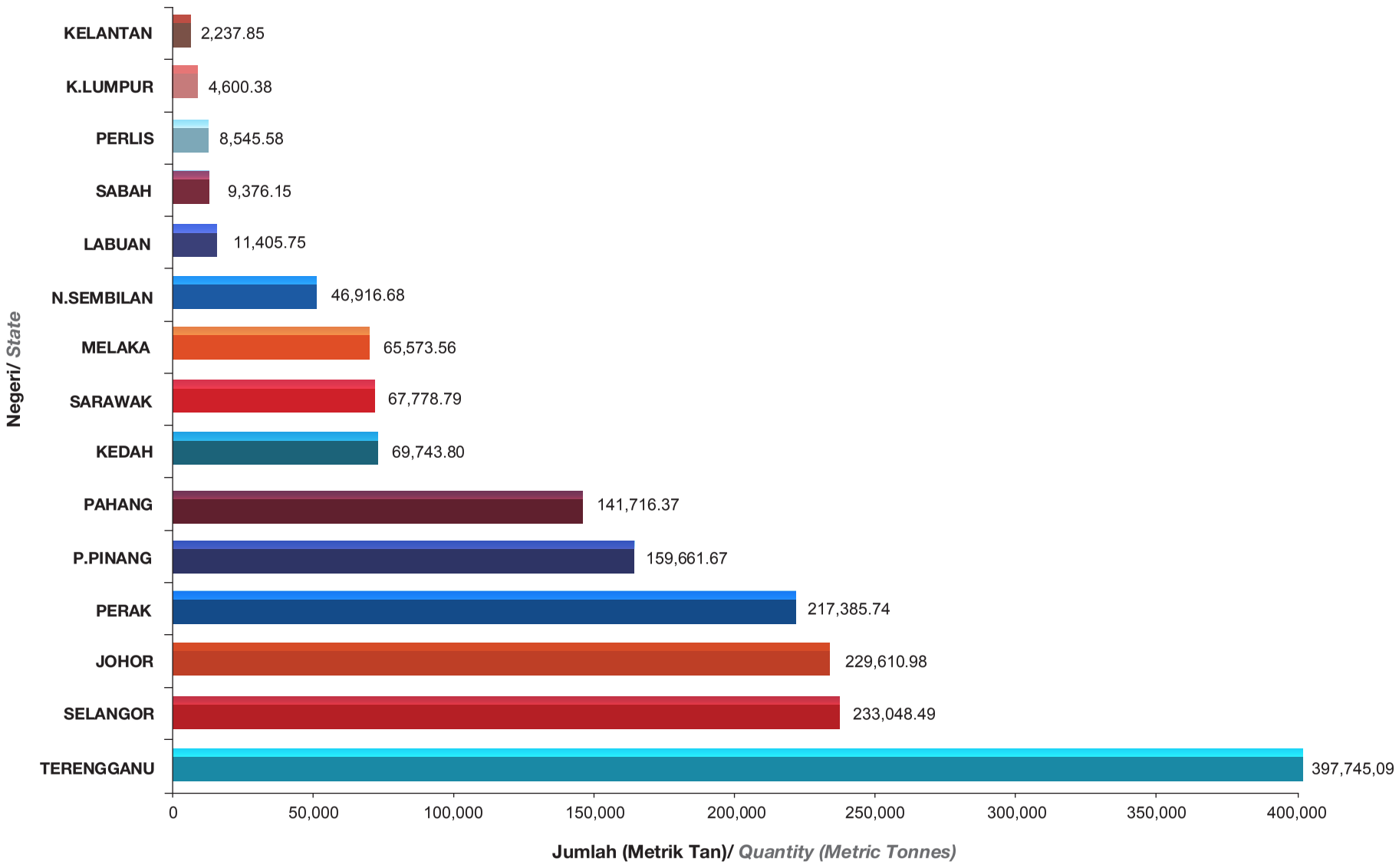
No	Jenis Industri/ *Type Of Industry*	Jumlah Buangan/ *Quantity of Waste*	
		(MT/Tahun) (MT/Year)	Percentage (%) Percentage (%)
1	Premis Buangan Terjadual (PYDT) / *Recovery Facilities*	414,461.90	24.89
2	Industri Kimia / *Chemical Industry*	344,660.43	20.70
3	Pengilangan Logam / *Metal Refinery*	172,264.15	10.34
4	Elektrik Dan Elektronik / *Electric And Electronic*	155,454.76	9.33
5	Penyudahan Logam Dan Sadur Elektrik / *Metal Finishing and Coating*	70,463.20	4.23
6	Kertas / *Paper*	59,915.87	3.60
7	Galian Bukan Logam / *Excavation Non Metal*	52,379.55	3.15
8	Fabrikasi Logam / *Metal Fabrication*	45,695.05	2.74
9	Bengkel / *Workshop*	42,793.99	2.57
10	Kenderaan / *Vehicle*	40,708.73	2.44
11	Penapisan Petroleum / *Petroleum Refinery*	35,757.82	2.15
12	Jentera / *Machinery*	29,735.56	1.79
13	Berasaskan Getah / *Rubber Base*	28,961.38	1.74
14	Makanan & Minuman / *Food & Drink*	24,355.78	1.46
15	Loji Janakuasa / *Power Plant*	24,041.55	1.44
16	Loji Rawatan Air / *Water Treatment Plant*	22,215.23	1.33
17	Perubatan / *Health Care Services*	21,976.12	1.32
18	Plastik / *Plastic*	12,966.49	0.78
19	Percetakan / *Printing*	10,775.16	0.65
20	Pertanian / *Agriculture*	10,239.08	0.61
21	Lain-lain / *Others*	8,682.00	0.52
22	Kilang Kelapa Sawit (PYDT) / *Palm Oil Mill*	7,660.60	0.46
23	Berasaskan Kayu / *Wood Base*	6,171.42	0.37
24	Penapisan Minyak Makan / *Edible Oil Refinery*	4,918.46	0.30
25	Gudang / *Warehouse*	4,162.84	0.25
26	Perlombongan / *Mining*	3,735.02	0.22
27	Kilang Getah (PYDT) / *Rubber Factory*	3,154.48	0.19
28	Tekstil / *Textiles*	2,482.80	0.15
29	Kuari / *Quarry*	1,403.59	0.08

Jadual 6.3 Malaysia : Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2014
Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2014

30	Simen / *Cement*	930.69	0.06
31	Perkhidmatan / *Services*	506.11	0.03
32	Kulit / *Leather*	470.08	0.03
33	Peralatan Sukan Dan Permainan / *Sports Equipment and Games*	445.96	0.03
34	*Office Supplies and Stationery /* Peralatan Pejabat dan Alat Tulis	401.81	0.02
35	Rokok Dan Tembakau / *Cigarettes and Tobacco*	270.00	0.02
36	Loji Pengolahan Kumbahan Persendirian / *Waste Water Treatment Plant*	129.25	0.01
	JUMLAH / *TOTAL*	1,665,346.90	100.0000

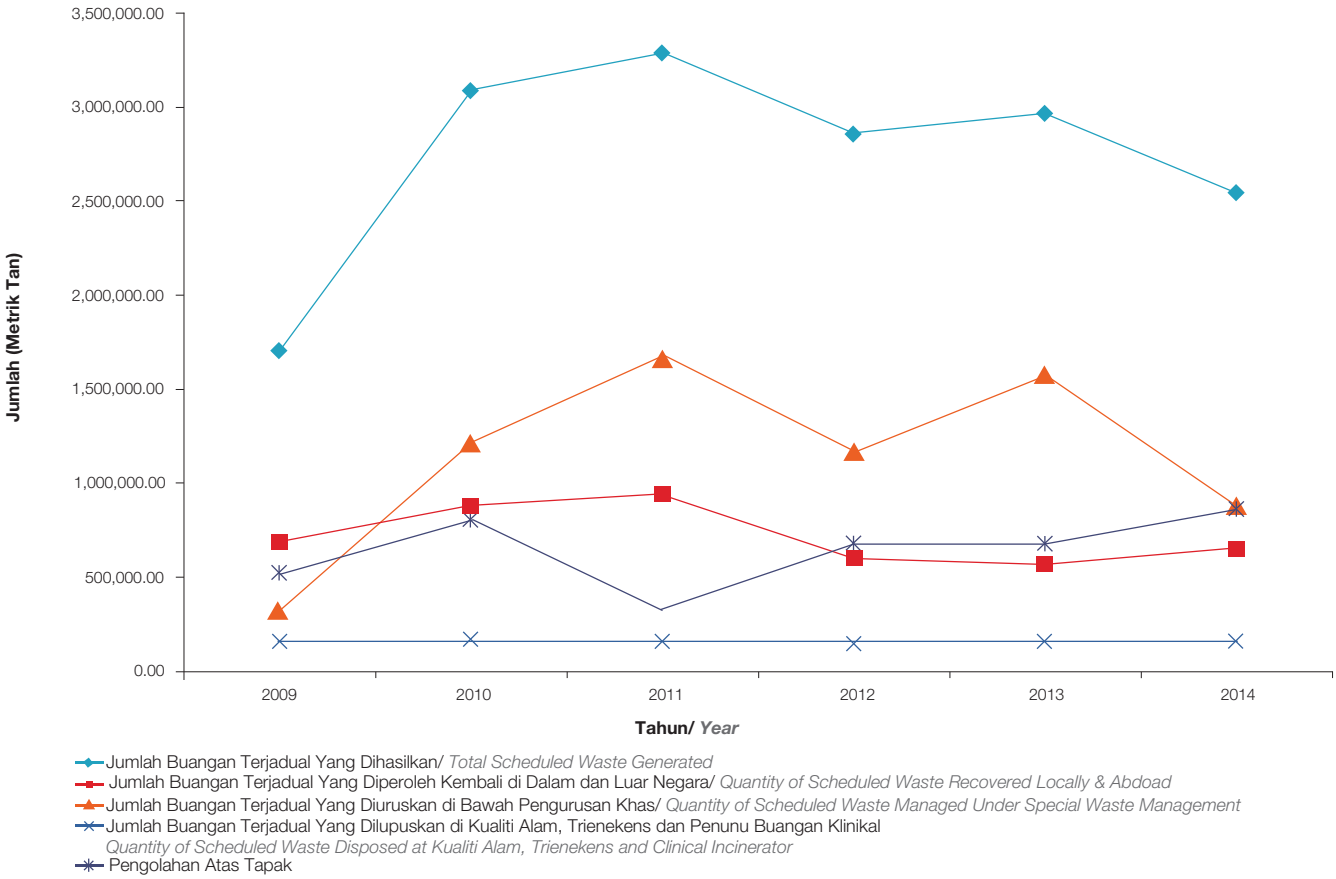
Jadual 6.3 Malaysia: Jumlah Buangan Terjadual Yang Dihasilkan Mengikut Jenis Industri, 2014

Table 6.3 Malaysia: Quantity of Scheduled Wastes Generated by Industry, 2014



Rajah 6.16 Malaysia: Penghasilan Buangan Terjadual mengikut Negeri, 2014

Figure 6.16 Malaysia: Distribution Of Scheduled Waste Generated by State, 2014



Rajah 6.17 Malaysia: *Trend* Pengurusan Buangan Terjadual 2009 - 2014

Figure 6.17 Malaysia: The Trend of Scheduled Waste Management from 2009 - 2014

No	Kemudahan/ *Facility*	Metrik Tan *Metric Tonnes*	Peratusan (%) *Percentage (%)*
1	Pengurusan Khas / *Special Waste Management*	876,415.44	34.48
2	Kemudahan Pemerolehan Kembali Luar Tapak Tempatan / *Local Off-site Recovery Facilities*	640,071.69	25.18
3	Pengolahan DalamTapak / *On-Site Treatment*	807,309.42	31.76
4	Kualiti Alam Sdn Bhd / *Kualiti Alam Sdn Bhd*	115,420.99	4.54
5	Penstoran Dalam Tapak / *On-Site Storage*	51,742.48	2.04
6	Penunu Buangan Klinikal / *Off-site Clinical Waste Incinerators*	21,975.32	0.86
7	*Trienekens (Sarawak) Sdn Bhd* / Trienekens (Sarawak) Sdn Bhd	19,402.00	0.76
8	Kemudahan Luar Negara (Export) / *Foreign Facilities (Export)*	9,425.00	0.37
	JUMLAH / *TOTAL*	**2,541,762.34**	**100**

Jadual 6.4 Malaysia: Kemudahan Yang Mengendalikan Buangan Terjadual, 2014

Table 6.4 Malaysia: Facilities Handling Scheduled Wastes, 2014

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*	73,531.10	8.39	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
			Industri/ *Industry*	83,034.83	9.47	
				13,872.36	1.58	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
2	'Fly Ash' & 'Bottom Ash'/ *Fly Ash & Bottom Ash/*	SW 104	Loji Janakuasa elektrik/ *Coal-Fired Power Plant*	670,986.41	76.56	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
			Industri/ *Industry*	24,413.02	2.79	
3	Gipsum/ *Gypsum*	SW 205	Industri/ *Industry*	177.30	0.02	Tapak Pelupusan Sanitari/ *Sanitary landfill*
				0.60	0.00	Guna semula sebagai bahan mentah pembuatan produk/ *Reuse as raw material for product*
4	Buangan yang mengandungi formaldehid, resin, serbuk epoksi terbuang/ *Waste Containing Formaldehyde, resin, discarded epoxy powder*	SW 320, 325, 418	Industri/ *Industry*	4,363.55	0.50	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
5	Produk farmasi terbuang, Produk terbuang/ *Discarded Pharmaceutical Product, Discarded Product*	SW 405, 429	Industri/ *Industry*	37.70	0.00	Tapak Pelupusan Sanitari/ *Sanitary Landfill*
6	Abu dari enapcemar kertas/ *Ash of Paper Sludge*	SW 406	Industri/ *Industry*	4,464.80	0.51	Tapak Pelupusan Sanitari/ *Sanitary Landfill*

Jadual 6.5 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas

Table 6.5 Malaysia: Generated Scheduled Waste Managed Under Special Management, 2014

No.	Kategori Buangan/ *Waste Category*	Kod Buangan/ *Waste Code*	Sumber/ *Source*	Metrik Tan/ *Tonnes*	Peratus (%)/ *Percent (%)*	Kaedah Pelupusan/ *Method of Disposal*
7	Campuran minyak terpakai/ *Spent Mixed Oil*	SW 421	Industri/ *Industry*	5.80	0.00	Guna semula sebagai agen 'releasing' untuk acuan simen/ *Reuse as releasing agent for mould cement*
8	Enap Cemar Mineral/ *Mineral Sludge*	SW 427	Industri/ *Industry/*	1,527.97	0.17	Gunasemula sebagai agen peneutralan/ *Reuse as neutralizing agent*
	JUMLAH/ *TOTAL*			**876,415.44**	100.00	

Jadual 6.5 Malaysia: Buangan Terjadual Yang Diuruskan Di Bawah Pengurusan Khas
Table 6.5 Malaysia: Generated Scheduled Waste Managed Under Special Management, 2014

Kemudahan yang paling banyak dilesenkan oleh Jabatan ini mengikut kategori buangan terjadual adalah buangan elektrik dan elektronik (134 kemudahan) diikuti dengan enapcemar minyak / mineral / agen penyejuk terpakai (41 kemudahan), dross / abu / sanga / pemangkin (65 kemudahan), enapcemar logam berat / getah (46 kemudahan), bekas terpakai / Buangan yang tercemar / dakwat / cat / lakuer (86 kemudahan), pelarut (49 kemudahan) dan asid / alkali (34 kemudahan), manakala 4 kategori buangan terjadual yang lain berjumlah 62 kemudahan seperti di **Jadual 6.6**.

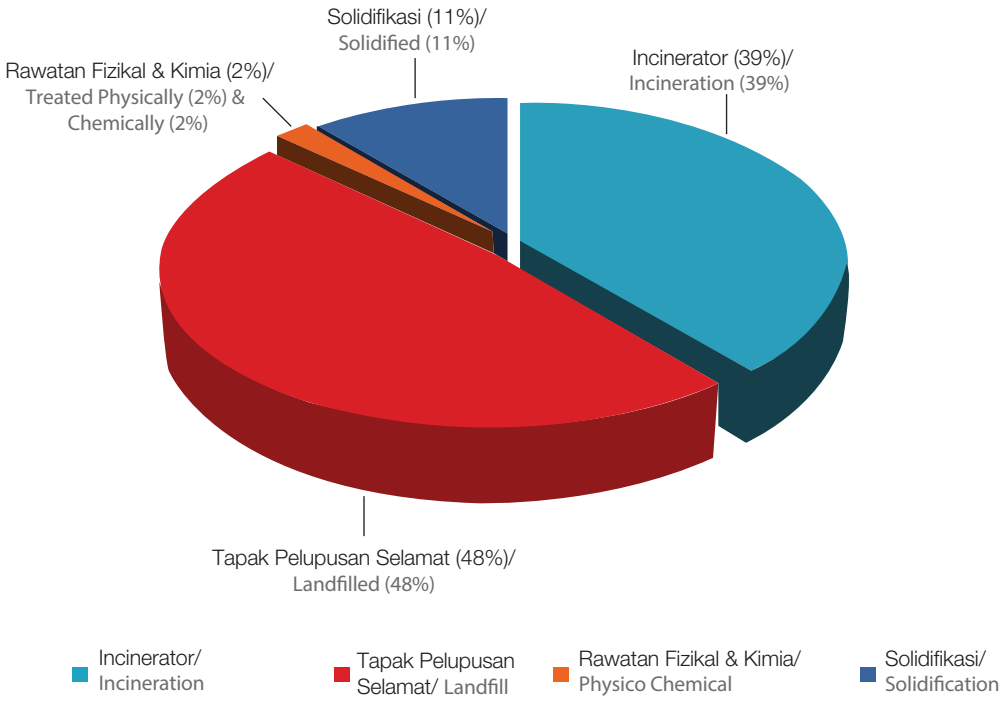
*The most facilities licensed by the department according to categories of waste are electronic and electrical wastes (134 facilities) followed by used container / contaminated waste / ink/ paint / lacquer (86 facilities), dross / ash / slag / catalyst (65 facilities), solvent (49 facilities), heavy metal sludge / rubber (46 facilities), oil / mineral sludge / spent coolant (41 facilities) and phenol / adhesive / resin (37 facilities), whilst 4 other wastes categories totaling of 59 facilities as shown in **Table 6.6**.*

Waste Category	*Recovery Facility*
Buangan Elektrik dan Elektronik / *Electronic and Electrical Wastes*	134
Minyak / Enap Cemar Mineral / Agen Penyejuk Terpakai/ *Oil / Mineral Sludge / Spent Coolant*	41
Dros / Abu / Sanga / Pemangkin/ *Dross / Ash / Slag / Catalyst*	65
Enap Cemar Logam Berat / Getah/ *Heavy Metal Sludge / Rubber*	46
Bekas Terpakai / Buangan tercemar / Dakwat / Cat / Lakuer/ *Used Container / Contaminated Waste / Ink / Paint*	86
Pelarut/ Solvent	49
Asid / Alkali/ *Acid / Alkaline*	34
Fenol / Pelekat / Resin/ *Phenol / Adhesive / Resin*	37
Fotografi / *Photographic*	14
Bateri / *Battery*	6
Gypsum/ *Gipsum*	5

Jadual 6.6 Malaysia: Bilangan Kemudahan Pemerolehan Kembali Luar Tapak, 2014
Table 6.6 Malaysia: Numbers of Off-site Recovery Facilities, 2014

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. Buangan tersebut sama ada dibakar, dirawat secara fizikal dan kimia, distabilkan atau dilupuskan di tapak pelupusan selamat bergantung kepada ciri-ciri tertentu. Seperti yang ditunjukkan dalam **Rajah 6.18**, kebanyakan sisa dihantar ke Kualiti Alam Sdn Bhd dan Trienekens Sdn Bhd adalah ke tapak pelupusan (48%), diikuti dibakar (39%), solidifikasi (11%) dan rawatan secara fizikal dan kimia (2%).

*The categories of wastes sent to the licensed premises (Kualiti Alam Sdn Bhd and Trienekens (Sarawak) Sdn Bhd) for final disposal are sludge containing one or several heavy metals, mixed wastes, dust / slag / dross or ash containing arsenic / mercury and spent inorganic acid. Such wastes were either incinerated, treated physically and chemically, solidified or disposed off in secured landfill depending on their characteristics. As shown in **Figure 6.18**, most wastes sent to Kualiti Alam Sdn Bhd and Trienekens Sdn Bhd were landfilled (48%), followed by incinerated (39%), solidified (11%) and treated physically and chemically (2%).*



Rajah 6.18 Kualiti Alam dan Trienekens: Jenis Rawatan dan Pelupusan Buangan Terjadual, 2014

Figure 6.18 Kualiti Alam and Trienekens: Types of Treatment and Disposal of Waste, 2014

Annex

Annex

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT			CLASS		
		I	IIA/IIB	III#	IV	V
Al	mg/l		-	(0.06)	0.5	
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr (IV)	mg/l		0.05	1.4 (0.05)	0.1	
Cr (III)	mg/l		-	2.5	-	
Cu	mg/l		0.02	-	0.2	
Hardness	mg/l		250	-	-	
Ca	mg/l		-	-	-	
Mg	mg/l		-	-	-	
Na	mg/l		-	-	3 SAR	
K	mg/l		-	-	-	
Fe	mg/l		1	1	1 (Leaf) 5 (Others)	
Pb	mg/l		0.05	0.02* (0.01)	5	
Mn	mg/l		0.1	0.1	0.2	
Hg	mg/l		0.001	0.004 (0.0001)	0.002	
Ni	mg/l		0.05	0.9*	0.2	
Se	mg/l		0.01	0.25 (0.04)	0.02	
Ag	mg/l		0.05	0.0002	-	
Sn	mg/l		-	0.004	-	
U	mg/l		-	-	-	
Zn	mg/l		5	0.4*	2	
B	mg/l		1	(3.4)	0.8	
Cl	mg/l		200	-	80	
Cl_2	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO_2	mg/l		0.4	0.4 (0.03)	-	
NO_3	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Silica	mg/l		50	-	-	
SO_4	mg/l		250	-	-	
S	mg/l		0.05	(0.001)	-	
CO_2	mg/l		-	-	-	
Gross-α	Bq/l		0.1	-	-	
Gross-β	Bq/l		1	-	-	
Ra-226	Bq/l		< 0.1	-	-	
Sr-90	Bq/l		< 1	-	-	
CCE	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	-	-

NATURAL LEVELS OR ABSENT

LEVELS ABOVE IV

Notes :
* = At hardness 50 mg/l $CaCO_3$
# = Maximum (unbracketed) and 24-hour average (bracketed) concentrations
N = Free from visible film sheen, discolouration and deposits

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Dissolved Oxygen	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5 - 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	mS/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 &	INDEX RANGE		
WATER QUALITY INDEX	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 $x > 5$

Subindex for COD

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

Subindex for NH_3-N

SIAN = 100.5 - 105x	for $x \leq 0.3$
SIAN = 94 * exp(-0.573x) - 5 * | x – 2 |	for $0.3 < x < 4$
SIAN = 0	for $x \geq 4$

Subindex for SS

SISS = 97.5 * exp(-0.00676x) + 0.05x	for $x \leq 100$
SISS = 71 * exp(-0.0061x) - 0.015x	for $100 < x < 1000$
SISS = 0	for $x \geq 1000$

Subindex for pH

$SIpH = 17.2 - 17.2x + 5.02x^2$	for $x < 5.5$
$SIpH = -242 + 95.5x - 6.67x^2$	for $5.5 \leq x < 7$
$SIpH = -181 + 82.4x - 6.05x^2$	for $7 \leq x < 8.75$
$SIpH = 536 - 77.0x + 2.76x^2$	for $x \geq 8.75$

Note:
* means multiply with

MWQI FORMULA AND CALCULATION

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

where;

SIDO = Subindex Dissolved Oxygen
$SINH_3$ = Subindex Unionized Ammonia
SIFC = Subindex Faecal Coliform
SITSS = Subindex Total Suspended Solids
SIO&G = Subindex Oil and Grease
$SINO_3$ = Subindex Nitrate
$SIPO_4$ = Subindex Phosphate
$0 \leq MWQI \geq 100$

BEST FIT EQUATIONS FOR THE ESTIMATION OF VARIOUS SUBINDEX VALUES

Dissolved Oxygen (DO) in mg/L For DO between 3 and 7 $SI(DO) = -85.816 + 55.476(DO) - 4.142(DO)^2$ *If DO is less than 3, or more than 10, SI = 10%*
Ammonia (Unionized) (NH_3) in mg-N/L* $SI(NH_3) = 100exp^{-4.6(NH3)}$ * If Ammoniacal Nitrogen (NH_3^+-N) is measured, convert the value into unionized ammonia.
Faecal Coliform (FC) in MPN/100ml $SI(FC) = 100exp^{-0.005(FC)}$ *If FC ≥ 500 MPN, SI = 8%*
Total Suspended Solids (TSS) in mg/L $SI(TSS) = 95.8exp^{-0.0043(TSS)}$ *If TSS > 100 mg/L, SI = 20%*
Oil & Grease (OG) in mg/L $SI(OG) = 98exp^{-0.21(OG)}$
Nitrate (NO_3) in mg-N/L $SI(NO_3) = 94.83exp^{-0.35(NO3)}$
Phosphate (PO_4) in mg-P/L $SI(PO_4) = 95.2exp^{-0.002(PO4*1000)}$

UNIONIZED AMMONIA CALCULATION

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

a. Calculation of Ionic Strength (IS)

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

Salinity in part per thousand (ppt)

b. Calculation of PKa

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

Temperature in °C

c. Calculation of working pH

pH_{sw} = pH – (0.0007 x IS) – 0.131

d. Calculation of mole fraction for unionized ammonia

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

Equation:

Unionized ammonia = Total ammoniacal nitrogen x mole fraction

Total ammoniacal nitrogen should be measured in mg/l

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