JABATAN PERDANA MENTERI
JABATAN PERANGKAAN MALAYSIA

STATISTIK ALAM SEKITAR

ENVIRONMENT STATISTICS

SABAH
2021

Pemakluman / *Announcement*:

Jabatan Perangkaan Malaysia sedang menjalankan Survei Pendapatan, Perbelanjaan Isi Rumah dan Kemudahan Asas (HIES/BA) 2022 bermula dari 1 Januari 2022 sehingga 31 Disember 2022.

The Department of Statistics Malaysia is conducting the Household Income, Expenditure and Basic Amenities Survey (HIES/BA) 2022 from 1st January 2022 to 31st December 2022.

Dimaklumkan bahawa Kerajaan Malaysia telah mengisytiharkan Hari Statistik Negara (MyStats Day) pada 20 Oktober setiap tahun. Tema sambutan MyStats Day adalah *"Connecting the World with Data We Can Trust"*

Please be informed that the Government of Malaysia has declared National Statistics Day (MyStats Day) on October 20 each year. MyStats Day theme is "Connecting the World with Data We Can Trust"

JABATAN PERANGKAAN MALAYSIA
DEPARTMENT OF STATISTICS MALAYSIA

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KATA PENGANTAR

Statistik Alam Sekitar, 2021 memaparkan statistik alam sekitar negeri Sabah yang meliputi enam komponen iaitu Keadaan dan Kualiti Alam Sekitar; Sumber Alam Sekitar dan Kegunaannya; Sisa; Kejadian Ekstrem dan Bencana; Penempatan Penduduk dan Kesihatan Persekitaran; dan Penglibatan, Pengurusan dan Perlindungan Alam Sekitar. Penyusunan statistik ini meliputi maklumat dan keadaan alam sekitar, impak aktiviti manusia ke atas alam sekitar dan langkah yang diambil bagi mengurangkan impak tersebut.

Statistik alam sekitar ini boleh digunakan oleh agensi kerajaan negeri, sektor swasta, ahli akademik serta individu sebagai rujukan dalam menjalankan penyelidikan dan penganalisisan di peringkat negeri. Rangka kerja yang digunakan dalam penerbitan ini adalah berdasarkan *Framework for the Development of Environment Statistics* (FDES), *United Nations* 2013.

Penerbitan ini mengandungi enam bahagian. Bahagian pertama membentangkan infografik statistik alam sekitar, diikuti dengan ringkasan penemuan mengikut komponen di bahagian kedua serta kotak artikel di bahagian ketiga. Bahagian keempat pula memuatkan jadual terperinci mengenai statistik alam sekitar. Lampiran dan glosari disertakan di bahagian kelima dan keenam bagi membantu pengguna memahami statistik dan terma alam sekitar yang digunakan.

Jabatan merakamkan setinggi-tinggi penghargaan atas kerjasama dan sumbangan yang diberikan oleh semua pihak dalam menjayakan penerbitan ini. Setiap maklum balas dan cadangan untuk penambahbaikan penerbitan ini pada masa akan datang amatlah dihargai.

DATO' SRI DR. MOHD UZIR MAHIDIN
Ketua Perangkawan Malaysia
April 2022

PREFACE

Environment Statistics, 2021 presents the environment statistics of Sabah which covers six components namely Environmental Conditions and Quality; Environmental Resources and their Use; Residuals; Extreme Events and Disasters; Human Settlements and Environmental Health; and Environmental Protection, Management and Engagement. The compilation of these statistics includes environment state and information, impacts of human activities on the environment and actions taken to minimise the impact.

These environment statistics can be used by state government agencies, private sectors, academicians and individuals as a reference to conduct research and analysis at the state level. The framework used in this publication is based on the Framework for the Development of Environment Statistics (FDES) United Nations 2013.

This publication consists of six parts. The first part focused on the infographics of environment statistics, followed by a summary of findings by component in the second part with the articles box at the third part. The fourth part contains detailed tables on environment statistics. Appendices and glossary covered in the fifth and sixth parts are to facilitate users in understanding the statistics and environment terms used.

The Department gratefully acknowledges the co-operation and contribution rendered by all parties in making this publication a success. Every feedback and suggestion towards improving future publications is highly appreciated.

DATO' SRI DR. MOHD UZIR MAHIDIN
Chief Statistician, Malaysia
April 2022

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INFOGRAFIK

INFOGRAPHICS

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STATISTIK ALAM SEKITAR

SABAH

Keluasan tanah (km²)

2021 » 73,620.75
2020 » 73,620.75

Penduduk ('000)

2021e » 3,833.0
2020 » 3,882.8

Kawasan berhutan (hektar)

2018 » 4,767,449
2017 » 4,767,449

Buangan terjadual (tan metrik)

2020 » 460,171
2019 » 89,463

Reka bentuk kapasiti loji rawatan air (JLH)

2020p » 1,490
2019 » 1,499

Pengeluaran air yang dibekalkan (JLH)

2020p » 1,324
2019 » 1,374

Buangan klinikal (tan metrik)

2020 » 2,606
2019 » 1,900

Bekalan air mentah diabstrak dari sungai (JLH)

2020p » 974
2019 » 948

Bekalan air mentah diabstrak dari empangan (JLH)

2020p » 390
2019 » 396

Bekalan air mentah diabstrak dari air bawah tanah (JLH)

2020 » 28
2019 » 40

Kejadian banjir

2020 » 44
2019 » 39

Hakisan pantai (km)

2020 » 429.3
2019 » 429.3

Kemalangan jalan raya

2020 » 12,906
2019 » 17,902

Bilangan demam denggi (kes)

2020 » 4,057
2019 » 5,451

Kejadian kebakaran (kes)

2020 » 2,927
2019 » 4,534

Nota:
JLH: Juta liter sehari e: anggaran p: awalan

Sumber: Statistik Alam Sekitar, Sabah, 2021
Jabatan Perangkaan Malaysia

ENVIRONMENT STATISTICS

SABAH

Land areas (km²)

2021 73,620.75
2020 73,620.75

Population ('000)

2021e 3,833.0
2020 3,882.8

Forested areas (hectares)

2018 4,767,449
2017 4,767,449

Scheduled wastes (metric tonnes)

2020 460,171
2019 89,463

Water treatment plants design capacity (MLD)

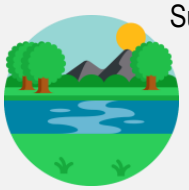
2020p 1,490
2019 1,499

Production of water supplied (MLD)

2020p 1,324
2019 1,374

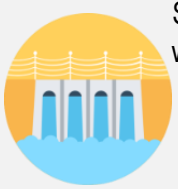
Clinical wastes (metric tonnes)

2020 2,606
2019 1900



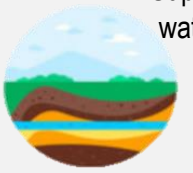
Supply of abstracted raw water from rivers (MLD)

2020p 974
2019 948



Supply of abstracted raw water from storage dams (MLD)

2020p 390
2019 396



Supply of abstracted raw water from groundwater (MLD)

2020 28
2019 40

Flood incidents

2020 44
2019 39

Coastal erosion (km)

2020 429.3
2019 429.3

Road accidents

2020 12,906
2019 17,902

Number of dengue fever (cases)

2020 4,057
2019 5,451

Fire Incidents (cases)

2020 2,927
2019 4,534

Notes:
MLD: Million litres per day e: estimate p: preliminary

Source: Environment Statistics, Sabah, 2021
Department of Statistics Malaysia

RINGKASAN PENEMUAN

SUMMARY OF FINDINGS

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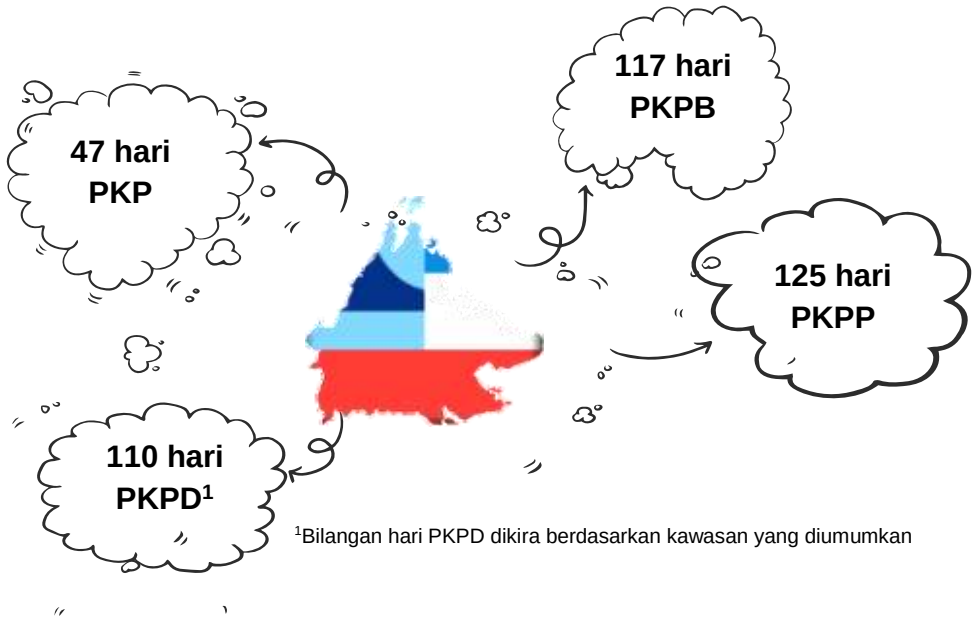
Pengenalan

Pandemik COVID-19 telah mengubah landskap sosio-ekonomi dunia secara keseluruhan sejak virus ini dikesan pada penghujung 2019. Negeri Sabah juga tidak terkecuali dari menerima impak pandemik ini. Sehubungan itu, bagi mengawal penularan pandemik ini, Kerajaan mengambil langkah dengan melaksanakan Perintah Kawalan Pergerakan (PKP) pada Mac 2020. Apabila kes jangkitan menunjukkan penurunan, Kerajaan telah melaksanakan Perintah Kawalan Pergerakan Pemulihan (PKPP) dengan membenarkan perjalanan rentas negeri dan daerah sehingga Disember 2020. Namun perjalanan rentas sempadan negeri dan daerah adalah dilarang bagi kawasan yang diisytiharkan Perintah Kawalan Pergerakan Diperketatkan (PKPD) dan Perintah Kawalan Pergerakan Bersyarat (PKPB).



[1]Bilangan hari PKPD dikira berdasarkan kawasan yang diumumkan

Pelaksanaan PKP ini sedikit sebanyak telah memberi kesan kepada pertumbuhan ekonomi Sabah di mana pada tahun 2020 Keluaran Dalam Negara Kasar (KDNK) pada harga malar 2015 merekodkan RM77.5 bilion (2019: RM85.6 bilion) menyusut 9.5 peratus. KDNK Sabah menyumbang 5.8 peratus kepada KDNK Malaysia. Manakala KDNK per kapita adalah RM21,484 (2019: RM25,375). Ini berikutan pelaksanaan sekatan keseluruhan PKP di mana hanya sektor perkhidmatan perlu yang dibenarkan beroperasi selama 47 hari berkuat kuasa 18 Mac 2020 hingga 3 Mei 2020.

Dari perspektif lain, PKP bukan sahaja membantu mengekang penularan COVID-19, tetapi memberi kesan positif kepada alam sekitar. Kesan positif ini boleh dilihat pada Indeks Pencemaran Udara (IPU), kadar kemalangan jalan raya serta kualiti air sungai.

A. Kualiti Alam Sekitar

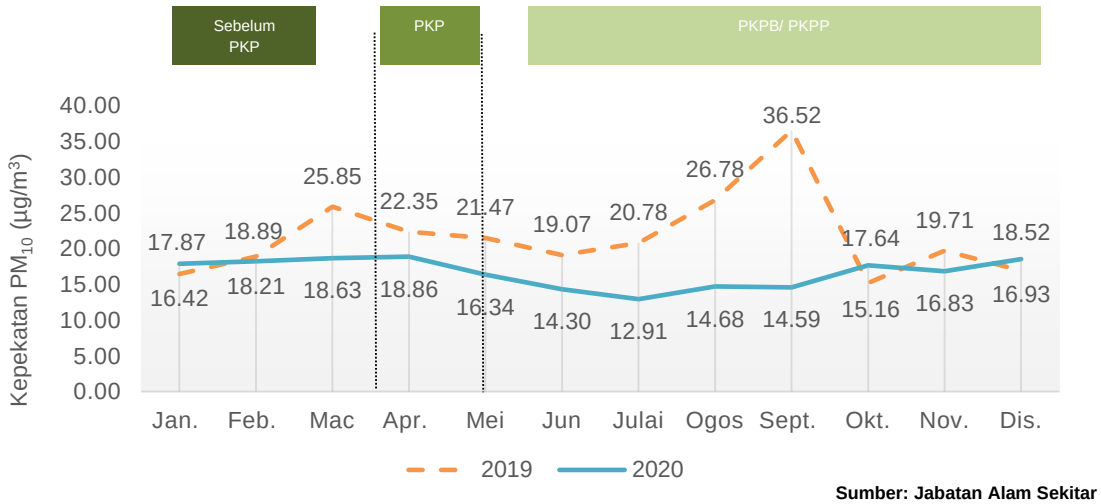
Bahan pencemar udara merupakan bahan kimia di udara yang boleh membahayakan manusia dan alam sekitar. Bahan pencemar boleh berbentuk zarah pepejal, titisan cecair atau gas. Terdapat enam (6) bahan pencemar udara utama iaitu Ozon Permukaan Bumi (O_3), Karbon Monoksida (CO), Sulfur Dioksida (SO_2), Nitrogen Dioksida (NO_2) dan Habuk Halus (PM_{10} & $PM_{2.5}$). Pencemaran udara berlaku apabila bahan pencemar ini hadir di atmosfera. Punca dan kesan bahan pencemar udara ditunjukkan seperti di **Lampiran 3.**

Habuk Halus (PM_{10} & $PM_{2.5}$)

Habuk Halus (PM_{10} & $PM_{2.5}$) adalah istilah yang digunakan bagi zarah terampai berukuran kurang daripada diameter 10 dan 2.5 mikron. Zarah boleh berbentuk pepejal atau cecair dan ia termasuk aerosol, debu, asap dan debunga. Pembebasan PM_{10} dari ekzos kenderaan bermotor, penjanaan kuasa dan haba, proses perindustrian dan aktiviti pembakaran terbuka yang akan membawa kepada pencemaran udara serta mengancam kesihatan manusia dan tumbuhan.

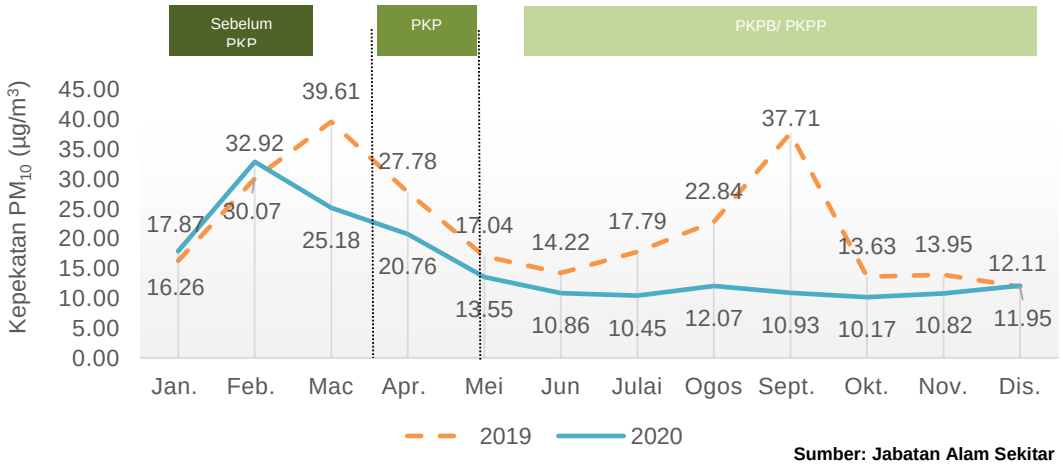
Trend purata bulanan kepekatan PM_{10} dalam udara di Sabah sepanjang pelaksanaan PKP yang berkuatkuasa 18 Mac 2020 hingga 3 Mei 2020 (47 hari), PKPB (117 hari) dan PKPP (125 hari) menunjukkan paras terendah berbanding 2019. Semua stesen di Sabah menunjukkan penurunan PM_{10} kecuali pada bulan Disember 2020 (Kimanis dan Kota Kinabalu); Oktober dan Disember 2020 (Keningau); Mei hingga Jun, Ogos, Oktober hingga Disember 2020 (Tawau).

Carta 1.1: Purata bulanan kepekatan PM_{10} di udara, stesen Keningau, Sabah, 2019 dan 2020



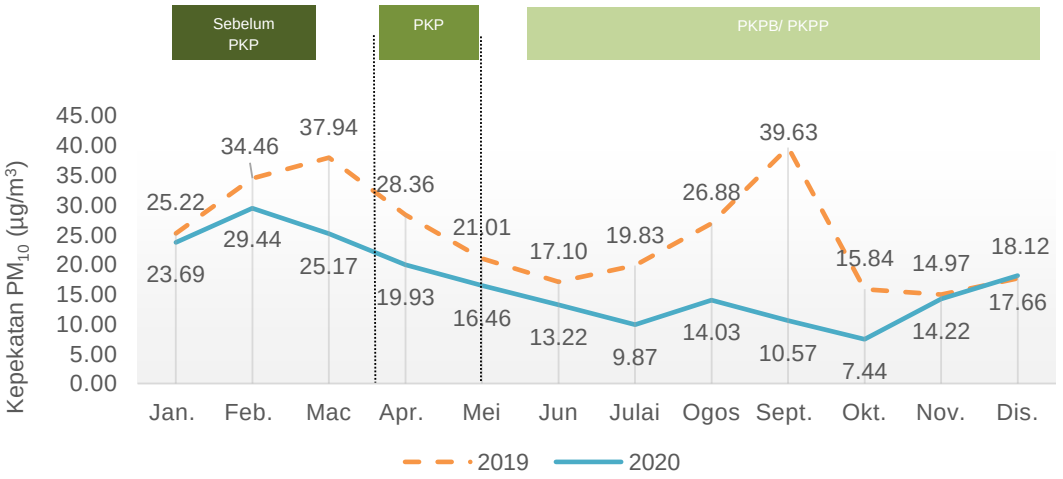
Sumber: Jabatan Alam Sekitar

Carta 1.2: Purata bulanan kepekatan PM_{10} di udara, stesen Kimanis, Sabah, 2019 dan 2020



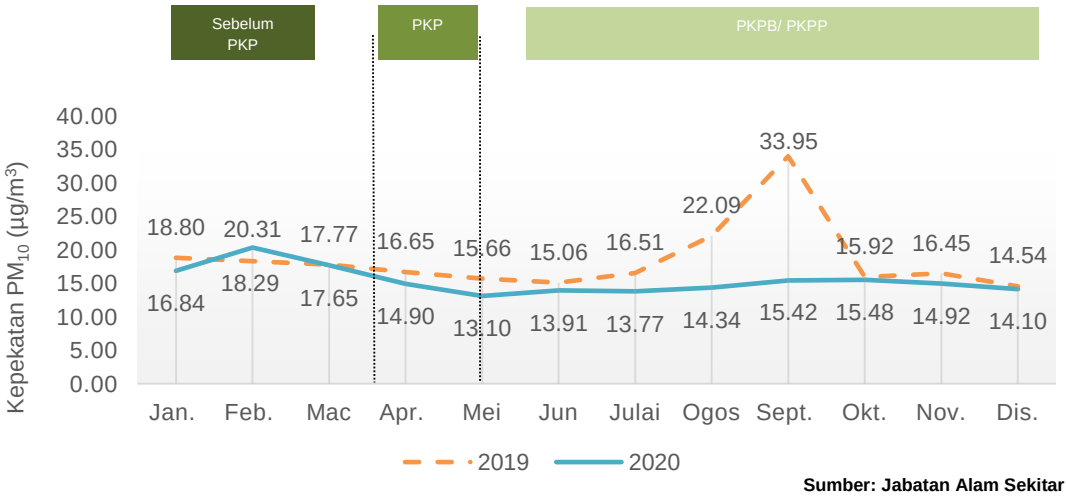
Sumber: Jabatan Alam Sekitar

Carta 1.3: Purata bulanan kepekatan PM_{10} di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



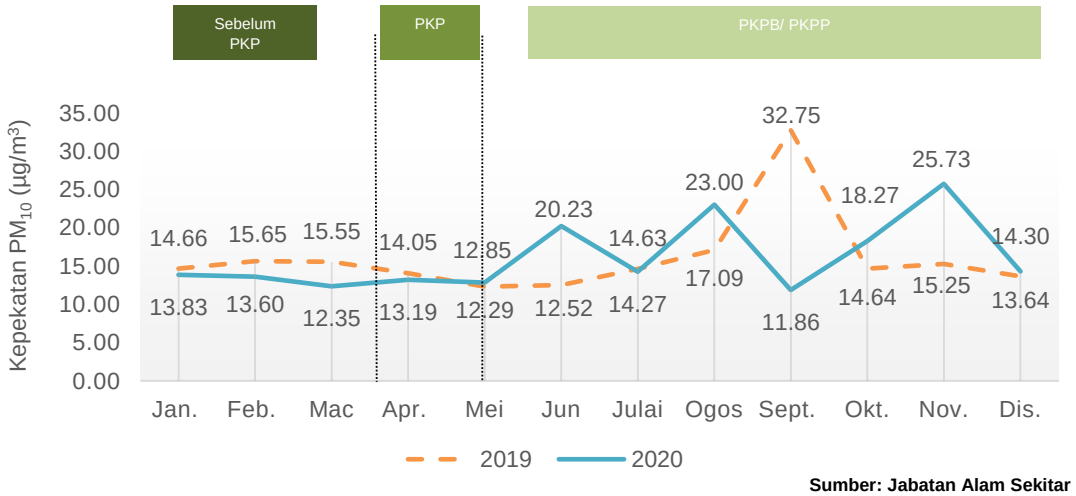
Sumber: Jabatan Alam Sekitar

Carta 1.4: Purata bulanan kepekatan PM_{10} di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

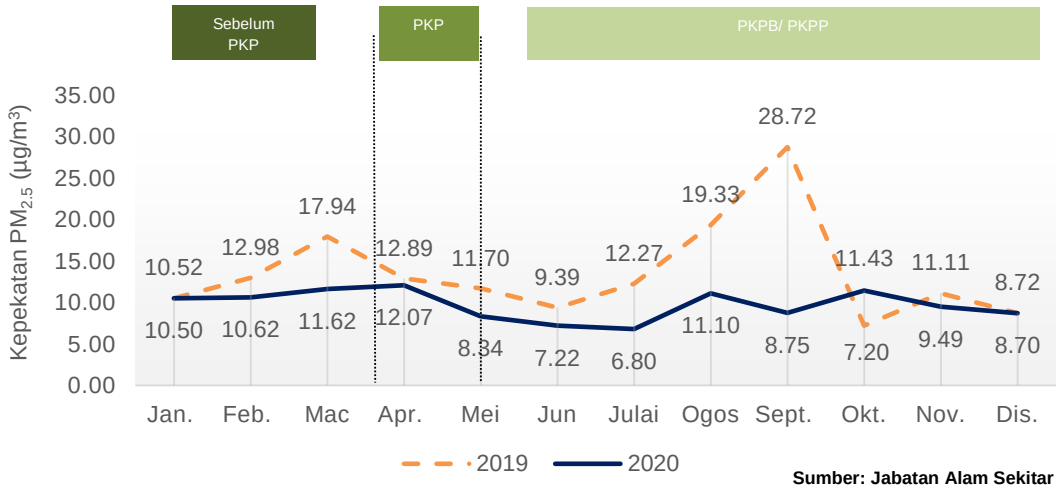
Carta 1.5: Purata bulanan kepekatan PM_{10} di udara, stesen Tawau, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

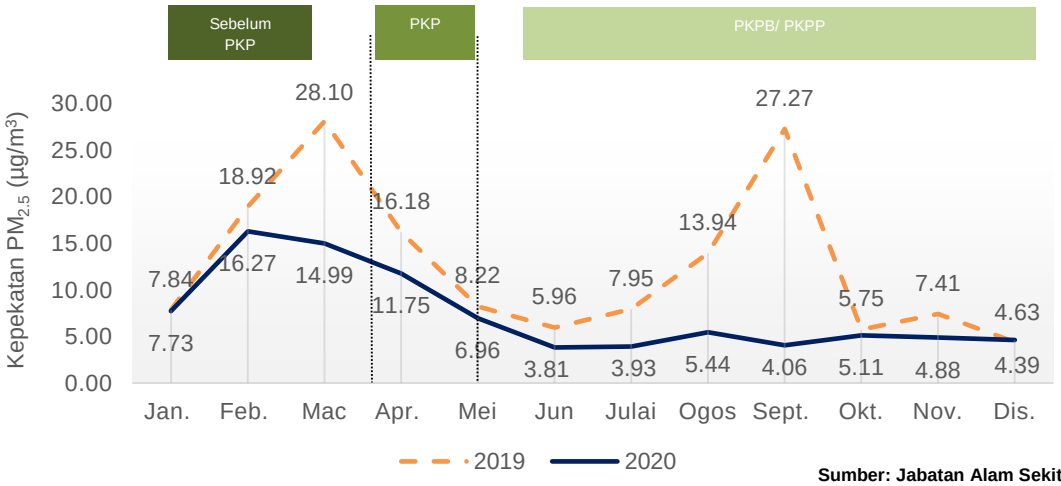
Pelaksanaan PKP turut memberi kesan yang positif kepada trend purata bulanan kepekatan $PM_{2.5}$ dalam udara di Sabah pada 2020 di mana $PM_{2.5}$ mencatatkan paras terendah semasa PKP berbanding 2019 kecuali pada bulan Oktober 2020 (Keningau); Disember 2020 (Kimanis); April dan Disember 2020 (Sandakan); Jun dan Disember 2020 (Tawau).

Carta 1.6: Purata bulanan kepekatan $PM_{2.5}$ di udara, stesen Keningau, Sabah, 2019 dan 2020



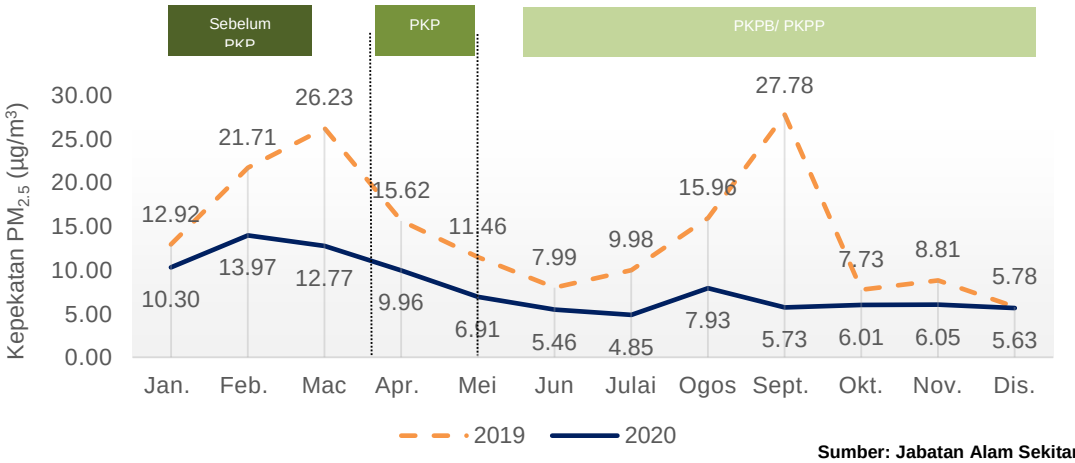
Sumber: Jabatan Alam Sekitar

Carta 1.7: Purata bulanan kepekatan $PM_{2.5}$ di udara, stesen Kimanis, Sabah, 2019 dan 2020



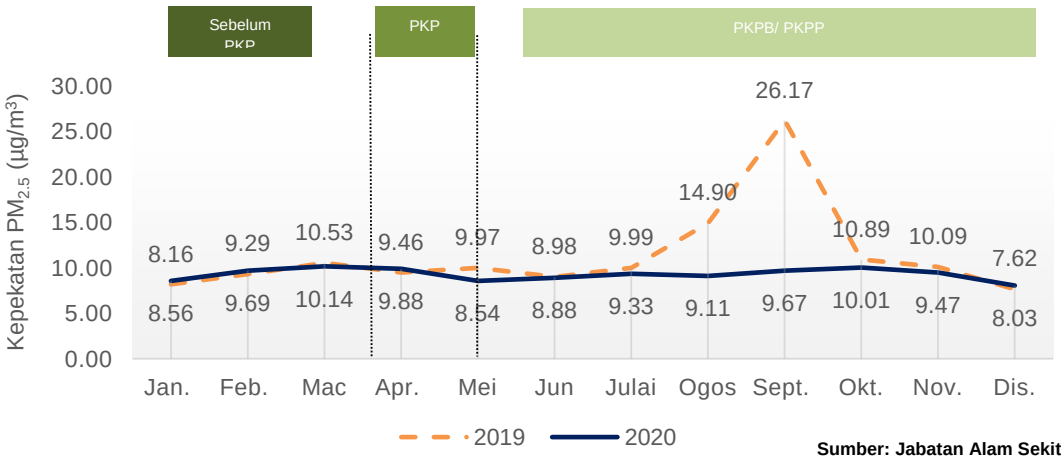
Sumber: Jabatan Alam Sekitar

Carta 1.8: Purata bulanan kepekatan $PM_{2.5}$ di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



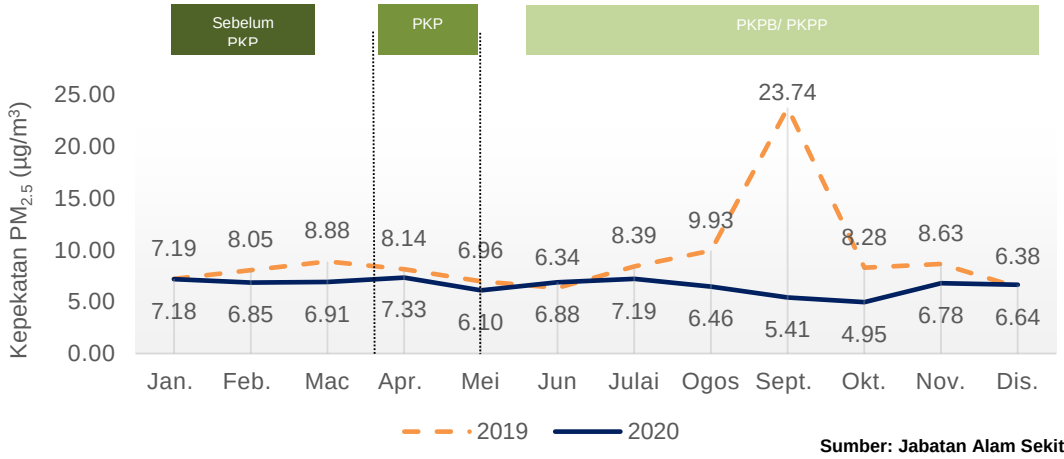
Sumber: Jabatan Alam Sekitar

Carta 1.9: Purata bulanan kepekatan $PM_{2.5}$ di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

Carta 1.10: Purata bulanan kepekatan $PM_{2.5}$ di udara, stesen Tawau, Sabah, 2019 dan 2020



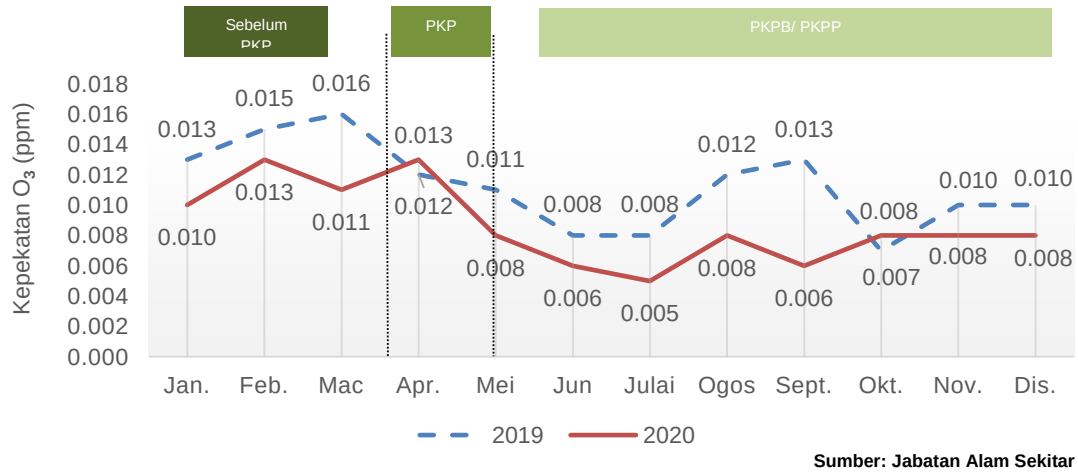
Sumber: Jabatan Alam Sekitar

Ozon permukaan bumi (O_3)

O_3 adalah bahan pencemar yang terjadi akibat daripada reaksi kimia dalam udara di antara sebatian organik meruap (VOC) dan nitrogen oksida (NO_x). VOC dan NO_x ini dihasilkan oleh punca kenderaan bermotor dan industri.

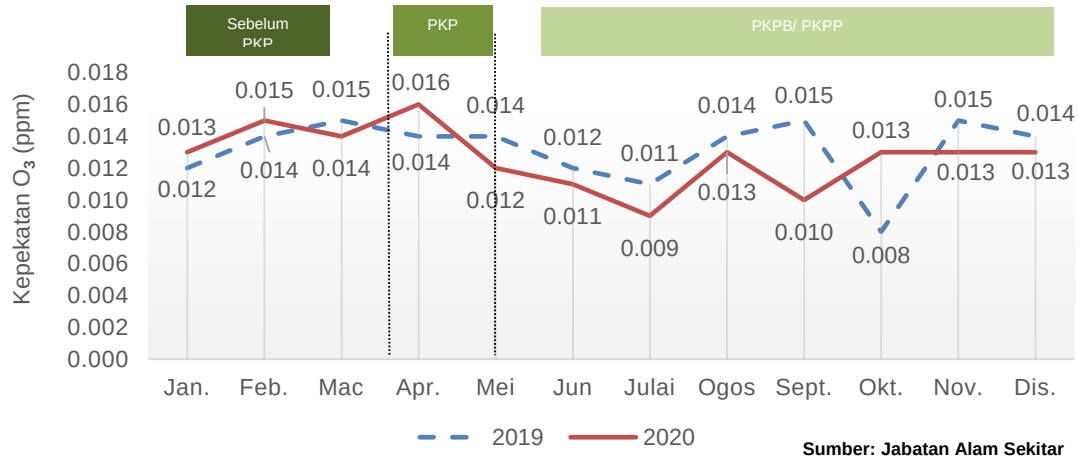
Trend purata bulanan kepekatan O_3 dalam udara menurun sepanjang pelaksanaan PKP. Secara amnya bacaan O_3 pada tahun 2020 adalah lebih rendah berbanding tahun 2019 kecuali pada bulan April dan Oktober 2020. Ini disebabkan pembukaan sektor ekonomi serta kelonggaran pergerakan rentas negeri semasa PKPB/PKPP telah meningkatkan pencemaran O_3.

Carta 1.11: Purata bulanan kepekatan O_3 di udara, stesen Keningau, Sabah, 2019 dan 2020



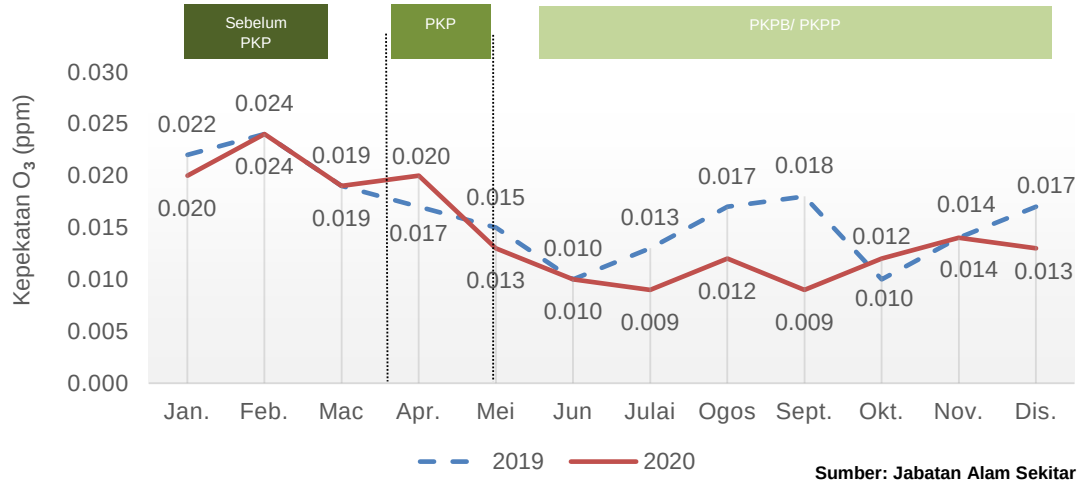
Sumber: Jabatan Alam Sekitar

Carta 1.12: Purata bulanan kepekatan O_3 di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



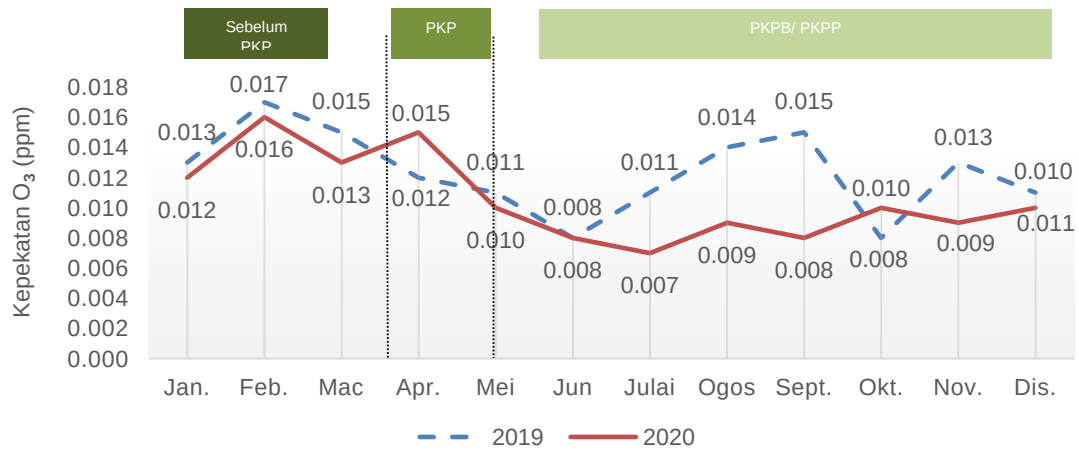
Sumber: Jabatan Alam Sekitar

Carta 1.13: Purata bulanan kepekatan O_3 di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

Carta 1.14: Purata bulanan kepekatan O_3 di udara, stesen Tawau, Sabah, 2019 dan 2020



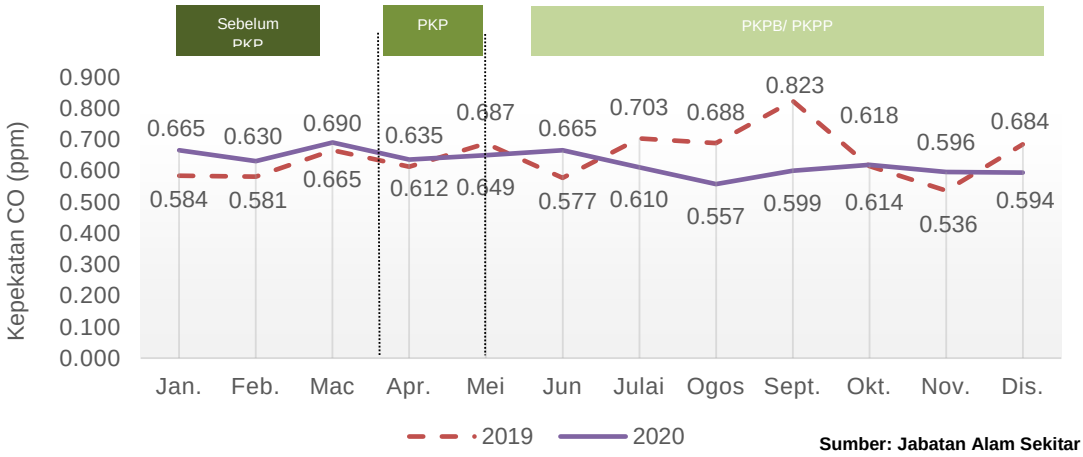
Sumber: Jabatan Alam Sekitar

Karbon Monoksida (CO)

CO merupakan gas yang tidak berwarna, tidak berbau dan beracun yang dihasilkan dari punca pembakaran bahan bakar fosil seperti asap kenderaan, proses perindustrian dan aktiviti pembakaran terbuka.

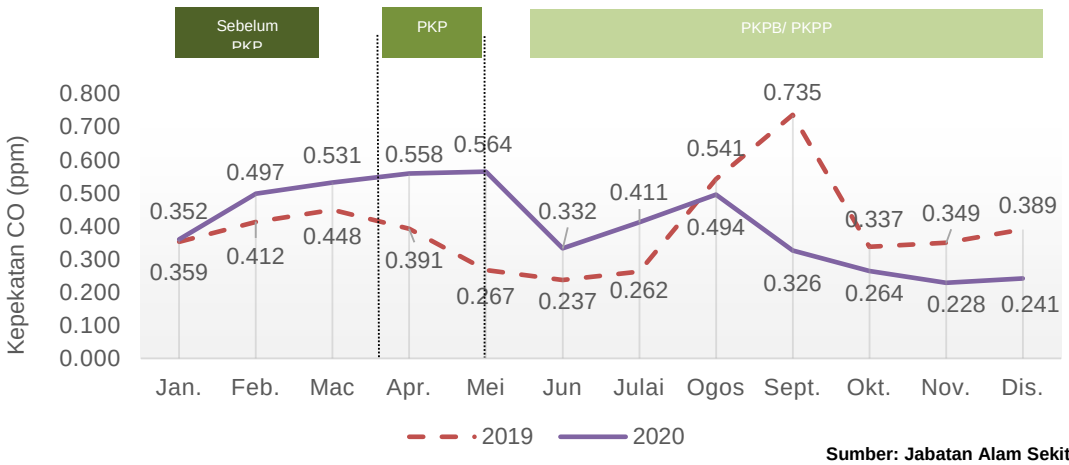
Trend purata bulanan kepekatan CO dalam udara sepanjang pelaksanaan PKP menunjukkan paras terendah di semua stesen berbanding 2019 disebabkan kawalan pengerakan rentas negeri dan bekerja dari rumah dengan secara tidak langsung mengurangkan penggunaan kenderaan. Namun begitu, pembukaan sektor ekonomi serta kebenaran rentas negeri menyebabkan peningkatan kepekatan CO terutama pada bulan April, Jun, Oktober dan November 2020 (Keningau); April hingga Julai 2020 (Kota Kinabalu); Jun hingga Ogos dan Oktober hingga Disember 2020 (Sandakan); Julai, Ogos dan Disember 2020 (Tawau).

Carta 1.15: Purata bulanan kepekatan CO di udara, stesen Keningau, Sabah, 2019 dan 2020



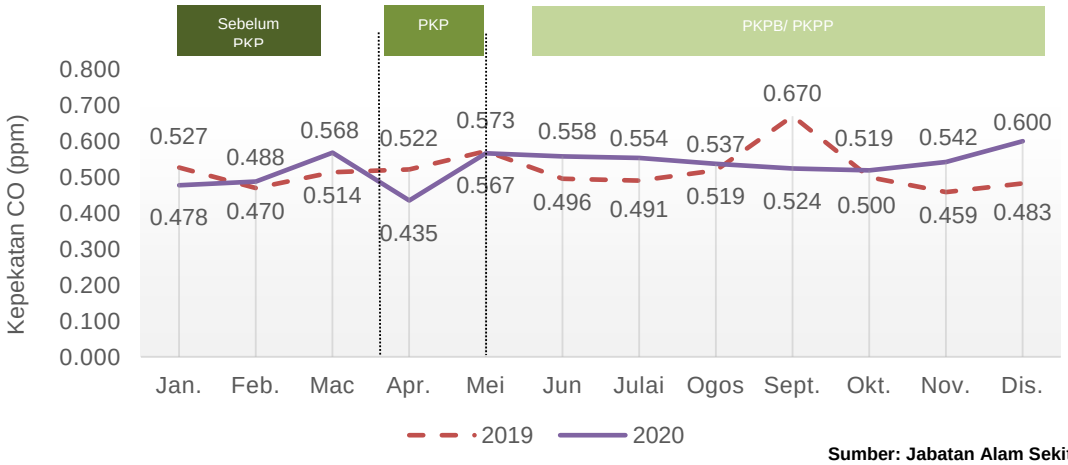
Sumber: Jabatan Alam Sekitar

Carta 1.16: Purata bulanan kepekatan CO di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



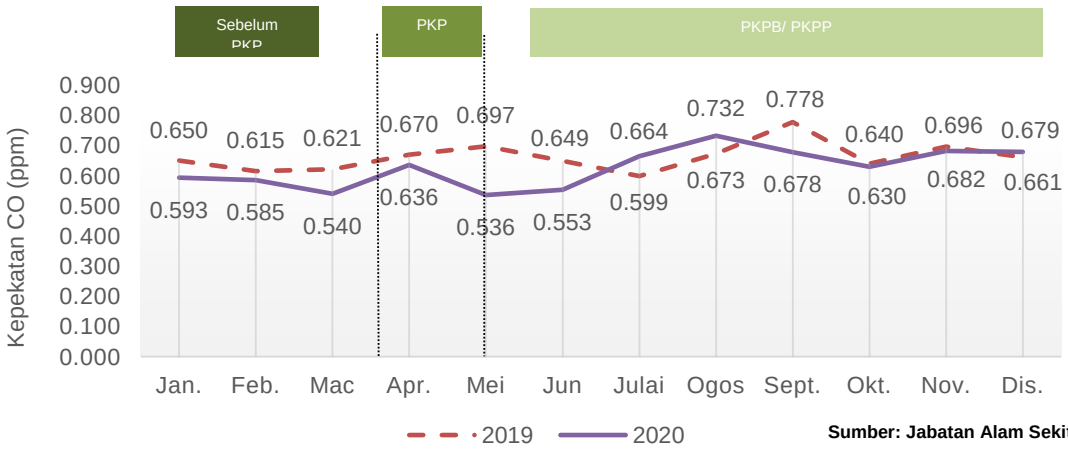
Sumber: Jabatan Alam Sekitar

Carta 1.17: Purata bulanan kepekatan CO di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

Carta 1.18: Purata bulanan kepekatan CO di udara, stesen Tawau, Sabah, 2019 dan 2020



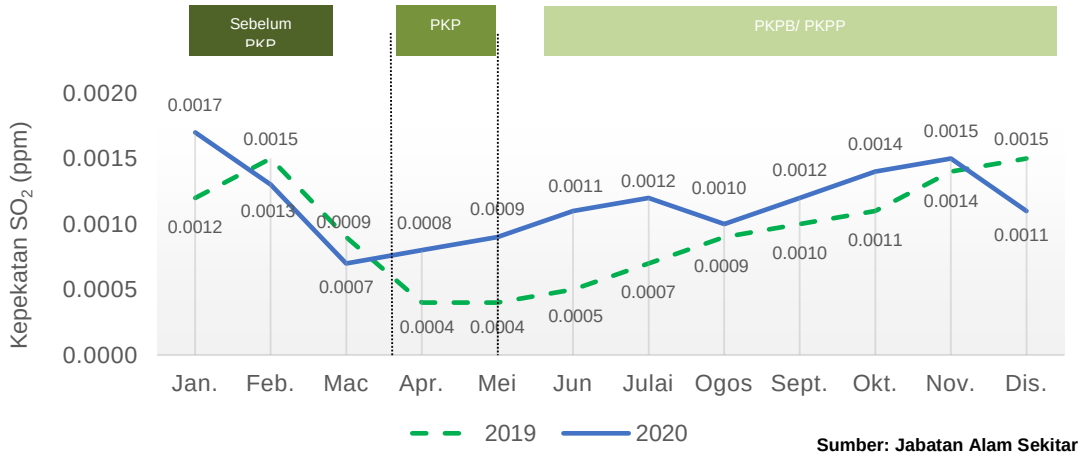
Sumber: Jabatan Alam Sekitar

Sulfur Dioksida (SO_2)

SO_2 adalah sejenis gas reaktif yang mudah larut dalam air, tidak berwarna dan mempunyai bau yang tidak menyenangkan. Pendedahan yang berlebihan terhadap kepekatan tinggi SO_2 di udara menyebabkan kerosakan sistem pernafasan dan masalah komplikasi kardiovaskular.

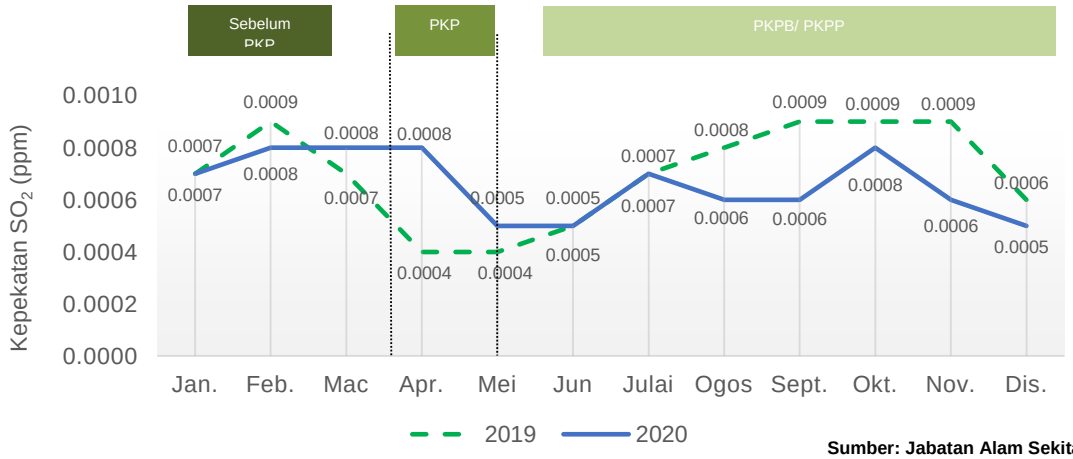
Trend purata bulanan kepekatan SO_2 dalam udara sepanjang pelaksanaan PKP pada 2020 menurun berbanding 2019 kecuali pada bulan April hingga November 2020 (Keningau); April hingga Mei 2020 (Kimanis); April hingga Julai dan November 2020 (Sandakan); Ogos hingga Oktober 2020 (Tawau); dan Disember 2020 (Kota Kinabalu).

Carta 1.19: Purata bulanan kepekatan SO_2 di udara, stesen Keningau, Sabah, 2019 dan 2020



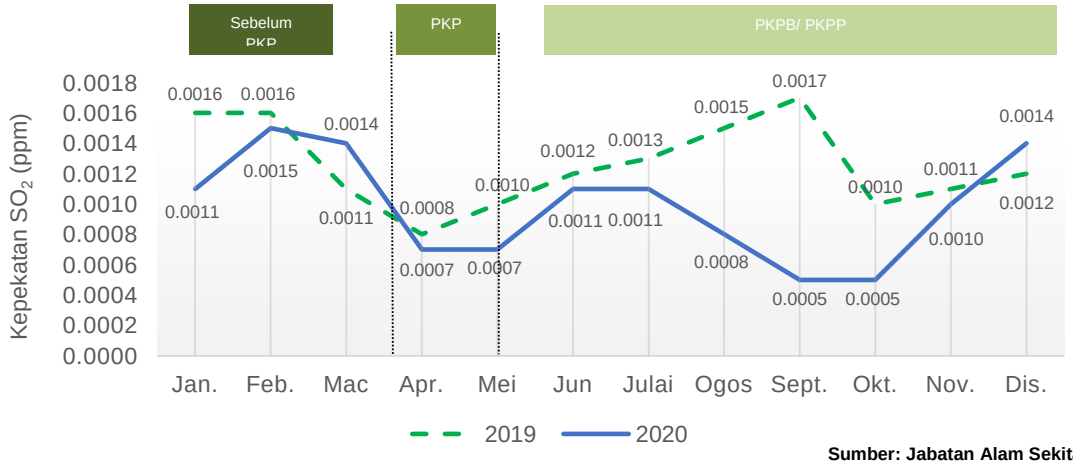
Sumber: Jabatan Alam Sekitar

Carta 1.20: Purata bulanan kepekatan SO_2 di udara, stesen Kimanis, Sabah, 2019 dan 2020



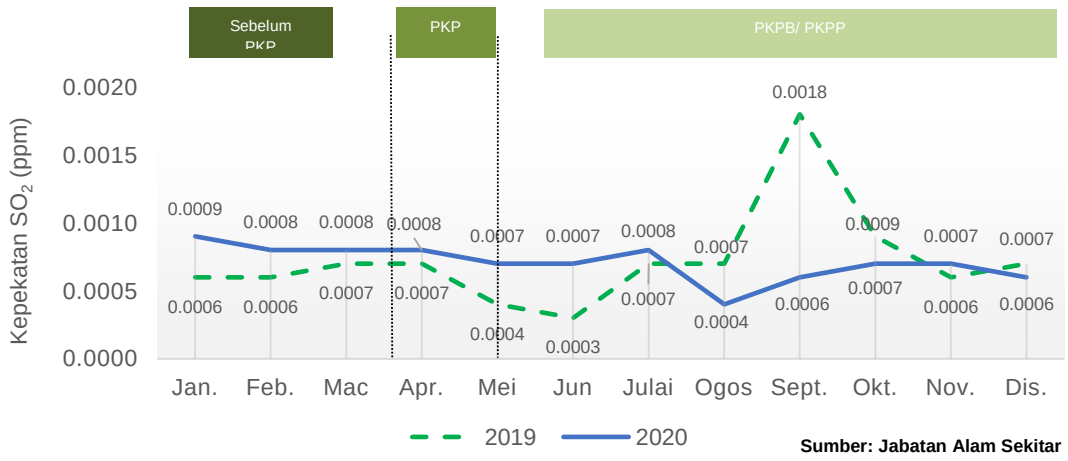
Sumber: Jabatan Alam Sekitar

Carta 1.21: Purata bulanan kepekatan SO_2 di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



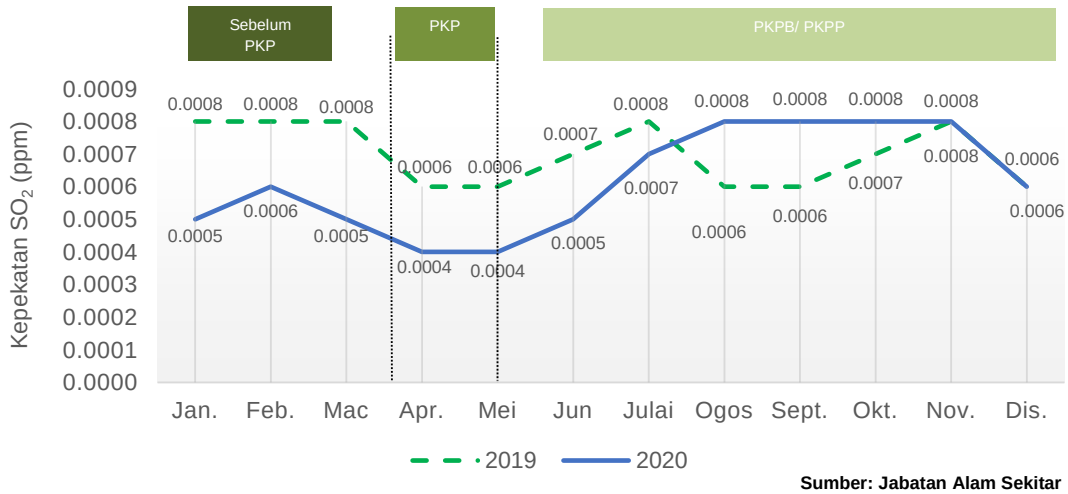
Sumber: Jabatan Alam Sekitar

Carta 1.22: Purata bulanan kepekatan SO_2 di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

Carta 1.23: Purata bulanan kepekatan SO_2 di udara, stesen Tawau, Sabah, 2019 dan 2020



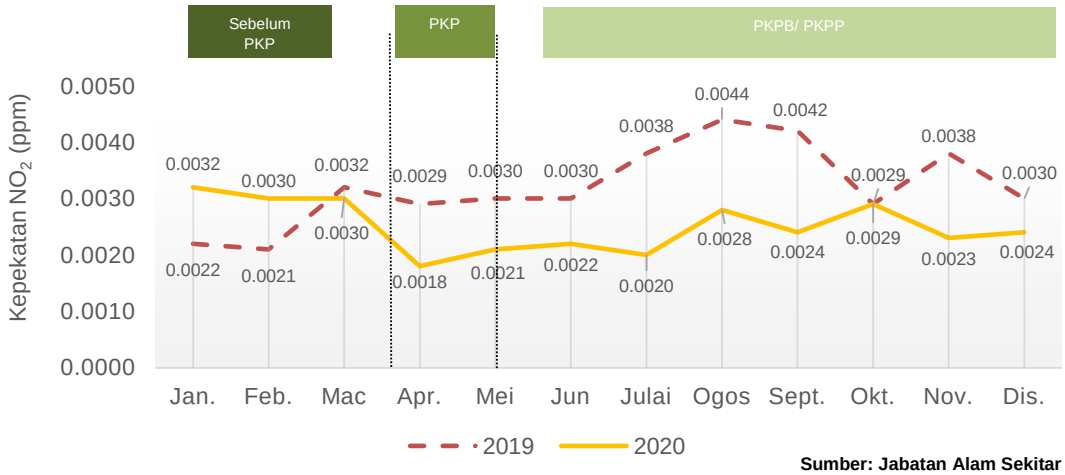
Sumber: Jabatan Alam Sekitar

Nitrogen Dioksida (NO_2)

NO_2 terbentuk di persekitaran udara melalui pengoksidaan Nitrogen Monoksida (NO). Gas bertoksik ini berwarna merah keperangan dan mempunyai bau yang kuat dan tajam.

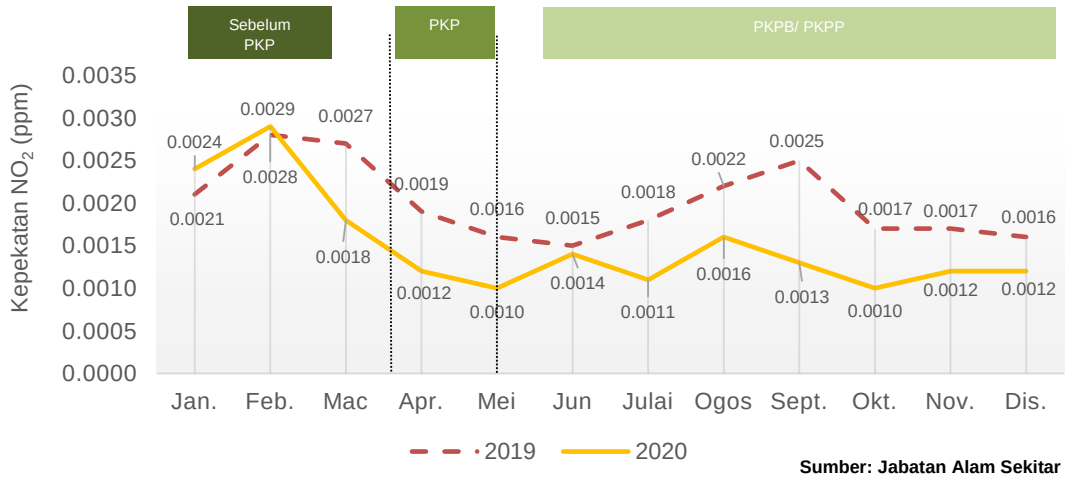
Trend purata bulanan kepekatan NO_2 dalam udara pada tahun 2020 menunjukkan penurunan berbanding 2019 disebabkan pelaksanaan PKP kecuali pada bulan Jun hingga Ogos 2020 (Tawau).

Carta 1.24: Purata bulanan kepekatan NO_2 di udara, stesen Keningau, Sabah, 2019 dan 2020



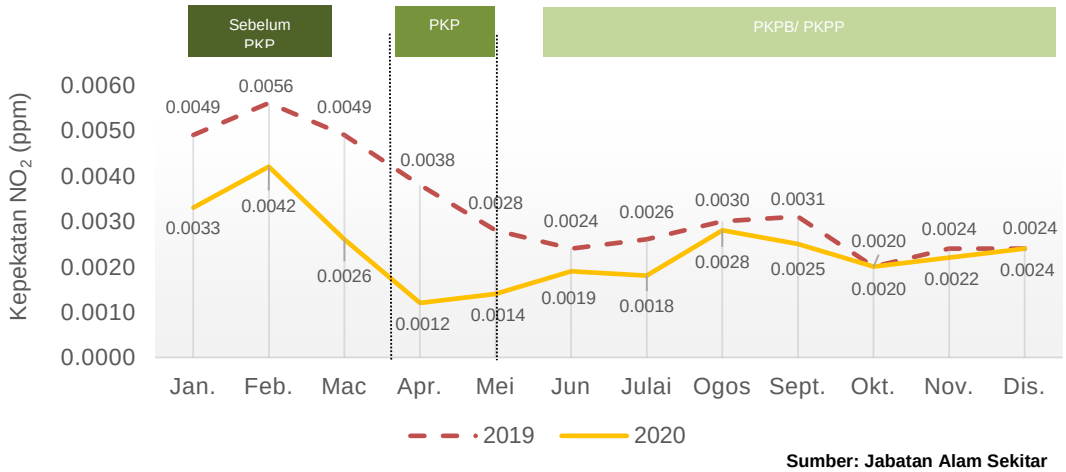
Sumber: Jabatan Alam Sekitar

Carta 1.25: Purata bulanan kepekatan NO_2 di udara, stesen Kimanis, Sabah, 2019 dan 2020



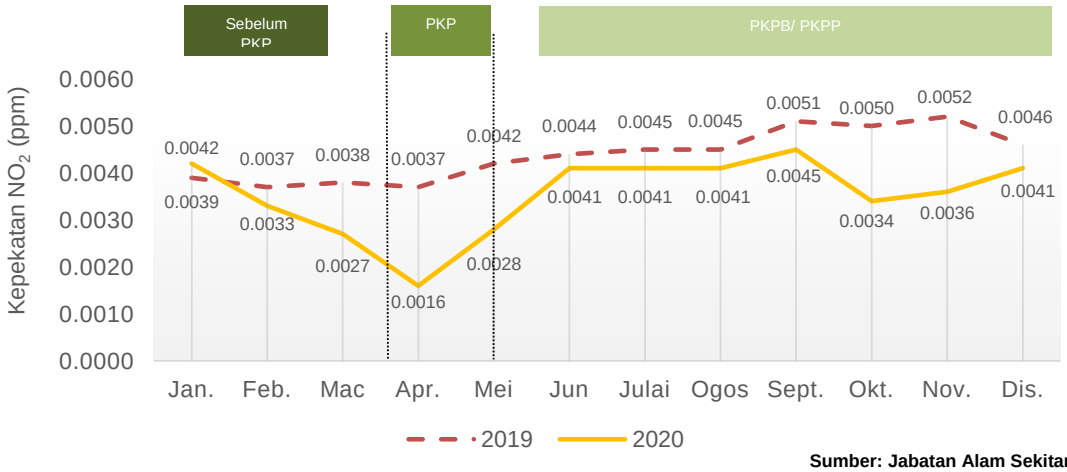
Sumber: Jabatan Alam Sekitar

Carta 1.26: Purata bulanan kepekatan NO_2 di udara, stesen Kota Kinabalu, Sabah, 2019 dan 2020



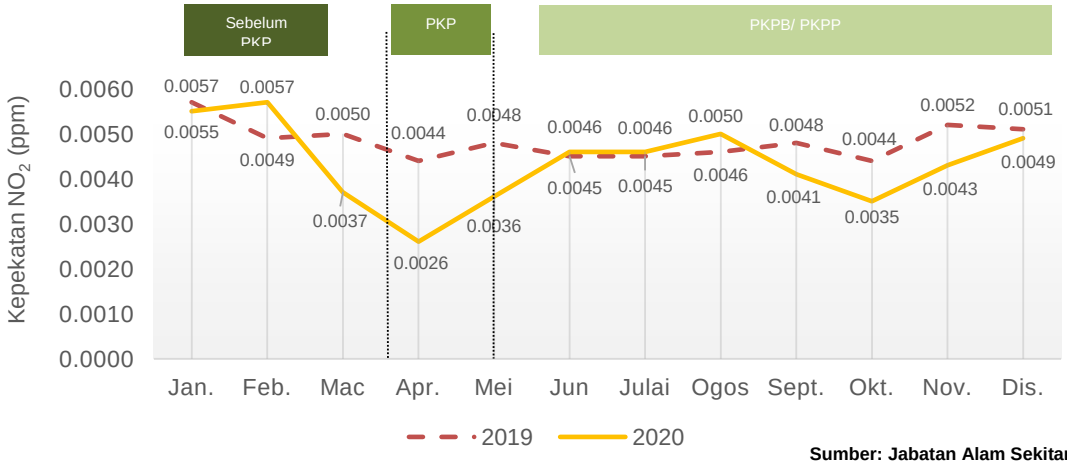
Sumber: Jabatan Alam Sekitar

Carta 1.27: Purata bulanan kepekatan NO_2 di udara, stesen Sandakan, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

Carta 1.28: Purata bulanan kepekatan NO_2 di udara, stesen Tawau, Sabah, 2019 dan 2020



Sumber: Jabatan Alam Sekitar

B. Purata suhu, hujan dan purata kelembapan relatif

Iklim Malaysia dikategorikan sebagai iklim khatulistiwa yang mempunyai suhu seragam, hujan yang banyak dan lembap sepanjang tahun. Iklim ini dipengaruhi oleh monsun Timur Laut yang bertiup dari bulan November hingga Mac dan monsun Barat Daya dari Mei hingga September. Pantai timur Semenanjung Malaysia dan kawasan pesisiran pantai Sabah dan Sarawak amat dipengaruhi oleh musim monsun Timur Laut. Manakala, pantai barat Semenanjung Malaysia tidak dipengaruhi kerana dilindungi oleh banjaran gunung yang tinggi.

Sabah mempunyai enam stesen meteorologi untuk memantau keadaan cuaca secara berterusan dan menyediakan data meteorologi untuk kegunaan ramalan cuaca. Stesen-stesen tersebut adalah Keningau, Kota Kinabalu, Kudat, Ranau, Sandakan dan Tawau.

Purata suhu

Stesen Kota Kinabalu mencatatkan purata suhu tertinggi iaitu 32.8°C dan menurun 0.6°C pada 2020 iaitu 32.2°C. Stesen Ranau pula merekodkan purata suhu terendah iaitu 20.6°C, berbanding yang direkodkan pada 2020 iaitu 20.9°C. **[Paparan 1.1]**

Paparan 1.1: Purata suhu di stesen meteorologi, Sabah, 2019 dan 2020

2019		Stesen meteorologi	2020	
Maks.	Min.		Maks.	Min.
32.6°C	22.2°C	Keningau	32.0°C	22.6°C
32.8°C	24.5°C	Kota Kinabalu	32.2°C	24.3°C
31.2°C	24.4°C	Kudat	31.0°C	24.6°C
30.3°C	20.6°C	Ranau	30.1°C	20.9°C
31.7°C	24.5°C	Sandakan	31.4°C	24.9°C
32.1°C	23.7°C	Tawau	31.8°C	23.8°C

Sumber: Jabatan Meteorologi Malaysia

Taburan hujan

Stesen Kota Kinabalu merekodkan hujan tahunan tertinggi pada 2020 iaitu 3,456.6 mm berbanding tahun sebelumnya (2,535.2 mm). Stesen Keningau pula mencatatkan hujan tahunan terendah iaitu 612.0 mm pada 2019 berbanding tahun 2020 iaitu 1,691.8 mm. **[Paparan 1.2]**

Paparan 1.2: Jumlah dan bilangan hari hujan di stesen meteorologi, Sabah, 2019 dan 2020

2019		Stesen meteorologi	2020	
Jumlah (mm)	Bilangan hari		Jumlah (mm)	Bilangan hari
612.0	167	Keningau	1,691.8	189
2,535.2	152	Kota Kinabalu	3,456.6	208
1,977.5	141	Kudat	2,238.4	165
870.6	203	Ranau	2,521.4	227
2,912.7	163	Sandakan	2,380.3	168
1,590.4	148	Tawau	1,947.8	185

Sumber: Jabatan Meteorologi Malaysia

Purata kelembapan relatif

Purata kelembapan relatif di Sabah adalah antara 81.7 peratus (Keningau) dan 85.0 peratus (Tawau) pada 2020. Walau bagaimanapun, bacaan ini meningkat berbanding pada 2019 iaitu 78.7 peratus (Kota Kinabalu) dan 82.0 peratus (Tawau). **[Paparan 1.3]**

Paparan 1.3: Purata kelembapan relatif di stesen meteorologi, Sabah, 2019 dan 2020

2019	Stesen meteorologi	2020
Peratus (%)		Peratus (%)
80.2	Keningau	81.7
78.7	Kota Kinabalu	82.4
81.2	Kudat	82.9
80.3	Ranau	82.3
80.9	Sandakan	82.3
82.0	Tawau	85.0

Sumber: Jabatan Meteorologi Malaysia

C. Status kualiti udara

Udara merupakan campuran beberapa gas yang membentuk atmosfera bumi. Ia terhasil terutamanya daripada nitrogen (lebih kurang 78.0%), oksigen (lebih kurang 21.0%) dan gas-gas lain (lebih kurang 1.0%). Udara amat penting dalam kehidupan di mana kita menggunakannya untuk pembakaran bahan api bagi tujuan pemanasan, pengangkutan, penjanaan kuasa dan lain-lain.

Indeks Pencemaran Udara

Jabatan Alam Sekitar (JAS) memantau kualiti udara negara melalui 65 stesen pengawasan yang ditempatkan di seluruh negara bagi mengawasi dan mengesan sebarang perubahan kualiti udara yang boleh memberi kesan negatif kepada kesihatan manusia dan alam sekitar.

Status kualiti udara di Malaysia dilaporkan dalam Indeks Pencemaran Udara (IPU). Bahan pencemar udara yang digunakan untuk mengira IPU adalah Ozon (O_3), Karbon Monoksida (CO), Nitrogen Dioksida (NO_2), Sulfur Dioksida (SO_2) dan Habuk Halus bersaiz kurang dari 10 mikron (PM_{10}) dan bersaiz kurang dari 2.5 mikron ($PM_{2.5}$).

Status Indeks Pencemaran Udara (IPU)

IPU	Status IPU
0-50	Baik
51-100	Sederhana
101-200	Tidak Sihat
201-300	Sangat Tidak Sihat
>300	Berbahaya

Sepanjang pelaksanaan PKP, Sabah secara keseluruhannya merekodkan kualiti udara berstatus “baik” dan “sederhana” bagi tahun 2020. Stesen Tawau mencatatkan bilangan hari tertinggi (358 hari) kualiti udara berstatus “baik” pada 2020 berbanding 316 hari tahun sebelumnya. Bacaan IPU menunjukkan penurunan paras pencemar udara, khususnya di bandar-bandar utama di seluruh negeri disebabkan pelepasan bahan pencemar ke udara yang lebih rendah seperti asap kenderaan bermotor, pelepasan asap cerobong industri dan aktiviti pembakaran terbuka. **[Paparan 1.4]**

Paparan 1.4: Status kualiti udara[1] mengikut stesen, Sabah, 2019 dan 2020

Bilangan hari

Stesen	Tahun	Baik (0-50)	Sederhana (51-100)	Tidak Sihat (101-200)	Sangat Tidak Sihat (201-300)	Berbahaya (>300)
Sabah						
Keningau	2020	229	137	-	-	-
	2019	161	204	-	-	-
Kimanis	2020	296	70	-	-	-
	2019	227	137	1	-	-
Kota Kinabalu	2020	270	96	-	-	-
	2019	159	203	-	2	-
Sandakan	2020	292	74	-	-	-
	2019	236	126	3	-	-
Tawau	2020	358	7	-	-	-
	2019	316	46	3	-	-

[1]Bacaan status kualiti udara berdasarkan bacaan maksimum harian

Sumber: Jabatan Alam Sekitar

D. Sumber air

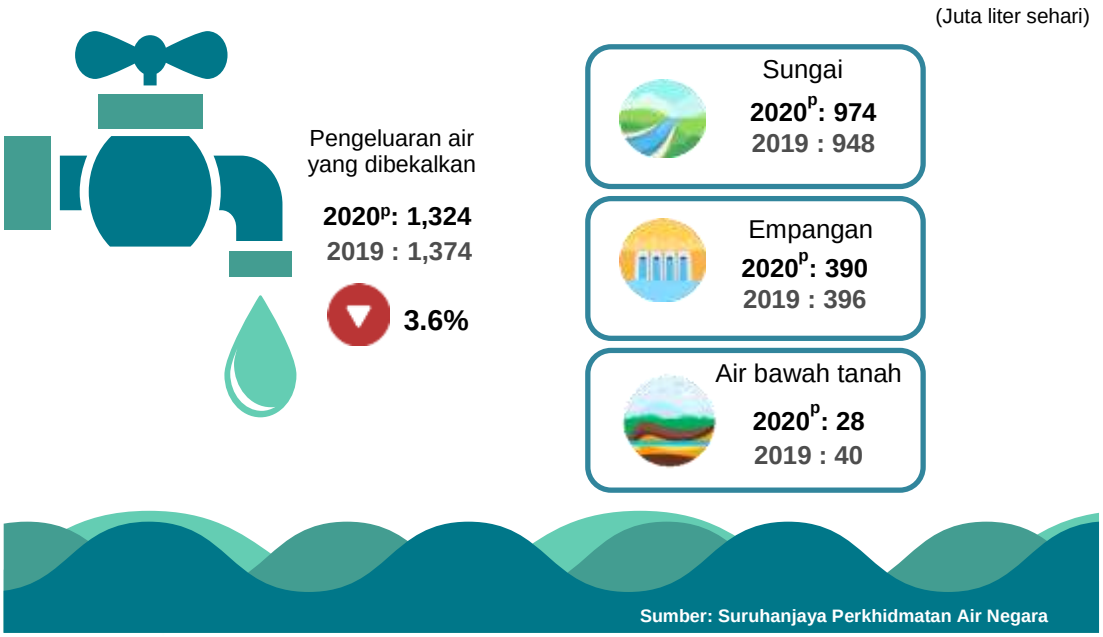
Air merupakan sumber asas utama yang penting kepada kehidupan manusia, aktiviti sosio ekonomi seperti aktiviti perindustrian, akuakultur, pengangkutan, pertanian serta penjanaan kuasa. Malaysia memiliki taburan hujan yang banyak serta jaringan sungai yang meluas sebagai sumber air negara. Permintaan terhadap air telah meningkat seiring dengan pertumbuhan penduduk dan peningkatan taraf hidup. Masalah kekurangan air perlu diatasi memandangkan ia boleh menjejaskan aktiviti manusia dan ekonomi. Oleh itu, pengurusan sumber air hendaklah diberi perhatian supaya dapat memenuhi permintaan pengguna yang semakin meningkat.

Sumber air didefinisikan sebagai sumber yang boleh diperoleh untuk kegunaan manusia dan alam sekitar merangkumi sungai, tasik, air bawah tanah, air laut dan sumber air yang lain.

Di Malaysia, 97.0 peratus bekalan air adalah daripada air permukaan manakala selebihnya daripada air bawah tanah. Air bawah tanah berperanan sebagai sumber air alternatif terutama di kawasan tiada bekalan air atau bekalan air tidak mencukupi.

Sumber bekalan air mentah di Sabah adalah diabstrak dari sungai, empangan dan air bawah tanah. Pada 2020, jumlah bekalan air mentah yang diabstrak adalah sebanyak 1,392 juta liter sehari (JLH) di mana sungai menyumbang 70.0 peratus, empangan menyumbang 28.0 peratus manakala selebihnya daripada air bawah tanah. Pengeluaran air yang dibekalkan di Sabah adalah sebanyak 1,324 JLH pada 2020, menurun 3.6 peratus berbanding 1,374 JLH yang dicatatkan pada 2019. **[Paparan 1.5]**

Paparan 1.5: Pengeluaran air yang dibekalkan dan bekalan air mentah diabstrak mengikut sumber, Sabah, 2019 dan 2020

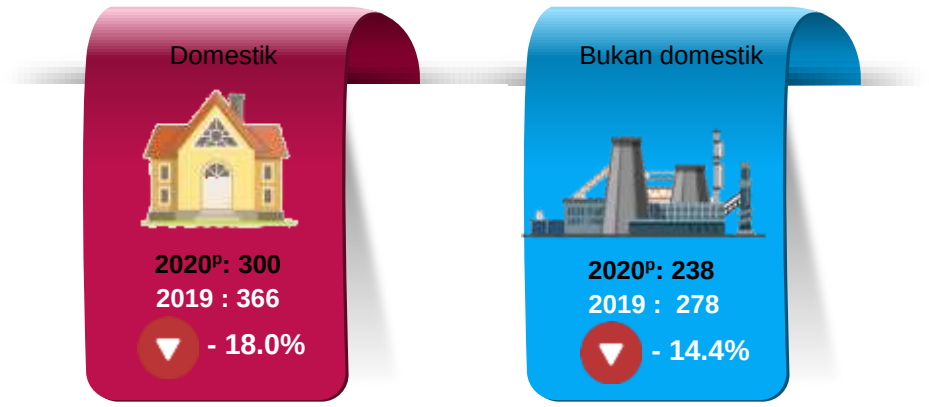


Sektor domestik merujuk kepada air yang digunakan oleh isi rumah untuk menjalankan aktiviti harian seperti membasuh pinggan mangkuk, memasak, mencuci pakaian, mandi, menyiram tanaman dan lain-lain. Manakala, sektor bukan domestik pula merujuk kepada air yang digunakan untuk tujuan komersil, perindustrian, penggunaan awam pertanian dan penternakan.

Penggunaan air bagi sektor domestik di Malaysia meningkat seiring dengan pelaksanaan PKP pada 2020 memandangkan lebih ramai penduduk Malaysia telah bekerja dari rumah. Sementara itu, penggunaan air bermeter bagi sektor domestik negeri Sabah juga menunjukkan penurunan sebanyak 18.0 peratus dan sektor bukan domestik menurun sebanyak 14.4 peratus pada 2020 berbanding 2019. **[Paparan 1.6]**

Paparan 1.6: Penggunaan air bermeter mengikut sektor, Sabah, 2019 dan 2020

(Juta liter sehari)



Sumber: Suruhanjaya Perkhidmatan Air Negara

E. Buangan klinikal

Buangan klinikal merujuk kepada buangan yang terdiri daripada keseluruhan atau sebahagian tisu manusia, darah atau bendalir badan, bahan kumuh, ubat-ubatan, produk farmaseutikal dan lain-lain. Ia diklasifikasikan sebagai buangan terjadual di bawah Jadual Pertama Peraturan Kualiti Alam Sekeliling (Buangan Terjadual), 2005.

Pandemik COVID-19 memberi kesan secara langsung ke atas buangan klinikal disebabkan penggunaan peralatan perlindungan diri (PPE) dan peralatan ujian COVID-19 dalam pengendalian pesakit COVID-19 di kemudahan kesihatan dan pusat kuarantin. Sabah mencatatkan 2,606.0 tan metrik buangan klinikal pada 2020 berbanding 1,900.0 tan metrik yang direkodkan pada 2019. **[Paparan 1.7]**

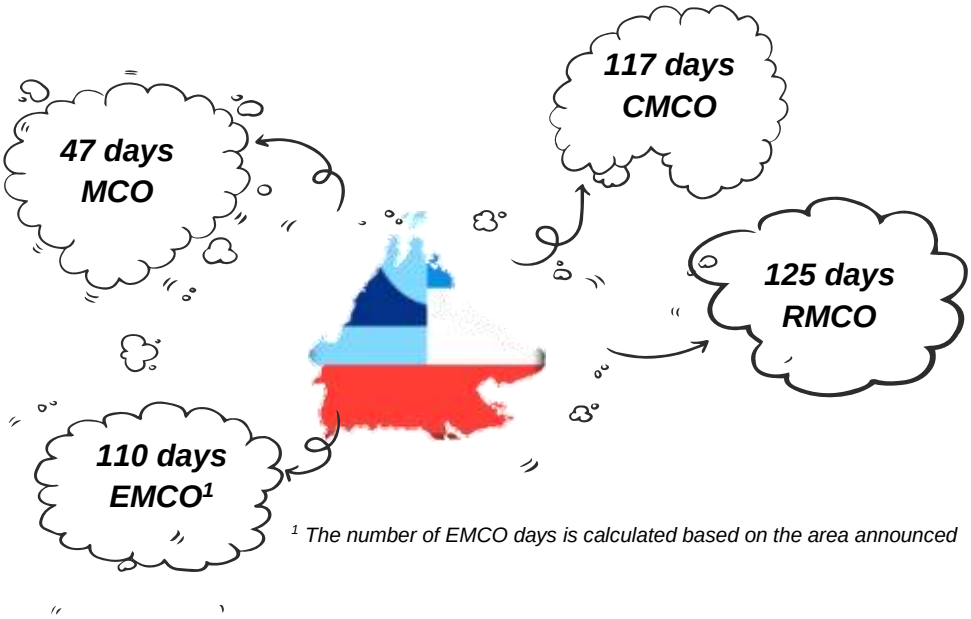
Paparan 1.7: Kuantiti buangan klinikal, Sabah, 2019 dan 2020

(Tan metrik)

Sumber: Jabatan Alam Sekitar

Introduction

COVID-19 pandemic has changed the world socioeconomic landscape as a whole since the virus was detected in late 2019. Sabah also experienced the effects of this pandemic. Therefore, to control the spread of the pandemic, the government had taken measures by implementing the Movement Control Order (MCO) in March 2020. When cases of infection showed a decline, the government has implemented the Recovery Movement Control Order (RMCO) by allowing cross-country travel and districts until December 2020. However, travel across states and districts for areas under Enhanced Movement Control Order (EMCO) and the Conditional Movement Control Order (CMCO) were prohibited.



[1] *The number of EMCO days is calculated based on the area announced*

The implementation of the MCO has affected Sabah's economic growth whereby in 2020 Gross Domestic Product (GDP) at a constant 2015 price recorded at RM77.5 billion (2019: RM85.6 billion) decline 9.5 per cent. Sabah's GDP contributes 5.8 per cent to Malaysia's GDP. Meanwhile, the GDP per capita was RM21,484 (2019: RM25,375). This was due to the implementation of total lockdown whereby only essential sectors were allowed to operate throughout the MCO which applied for 47 days since 18th March 2020 to 3rd May 2020.

From another perspective, MCO had not only curbed the spread of COVID-19, but had a positive impact on the environment. The positive effect can be seen in the Air Pollution Index (API), road accident rate and river water quality.

A. Environmental Quality

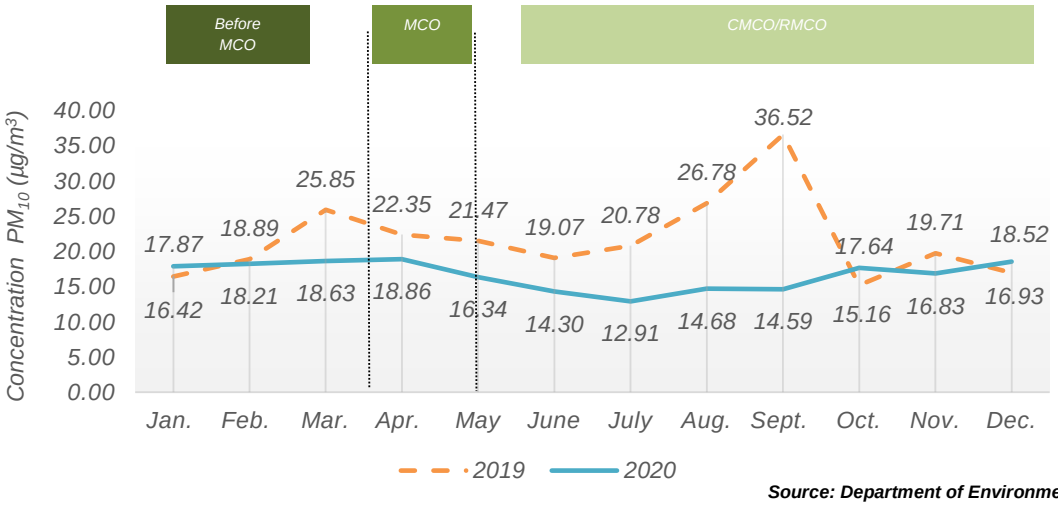
Air pollutants are chemical substances in the air that can be harmful to human beings and the environment. Pollutants can be in the form of solid particles, liquid droplets or gases. There are six (6) primary pollutants namely Ground Level Ozone (O^3), Carbon Monoxide (CO), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10} & $PM_{2.5}$). Air pollution occurs when these pollutants are present in the atmosphere. The sources and effects of air pollutants are shown in ***Appendix 3****.*

Particulate Matter (PM_{10} & $PM_{2.5}$)

Particulate Matter (PM_{10} & $PM_{2.5}$) is the term used to describe respirable particles of less than 10 and 2.5 micron in diameter. Particles may be solid or liquid and includes aerosol, dust, smoke and pollen. Emission of PM_{10} from motor vehicle exhausts, heat and power generation, industrial processes and open burning activities will lead to air pollution and endangered human health and plants.

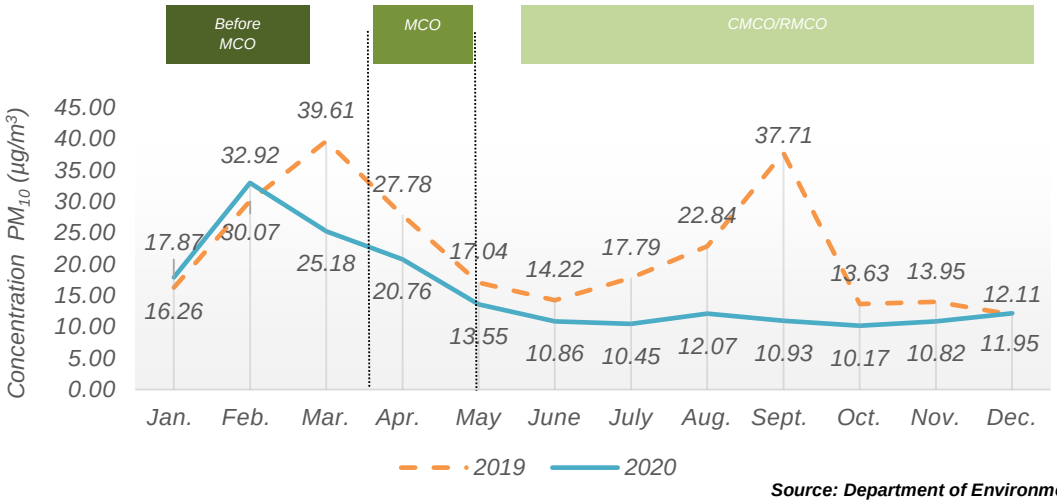
The monthly average trend concentration of PM_{10} in the air declined during the implementation of MCO effective 18th March 2020 to 3rd May 2020 (47 days), CMCO (117 days) and RMCO (125 days) showed its lowest at all stations as compared to 2019. All stations in Sabah showed a decrease in PM_{10} except in December 2020 (Kimanis and Kota Kinabalu); October and December 2020 (Keningau); May to Jun, August, October to December 2020 (Tawau).

Chart 1.1: Monthly average concentration of PM_{10} in the air, Keningau station, Sabah, 2019 and 2020



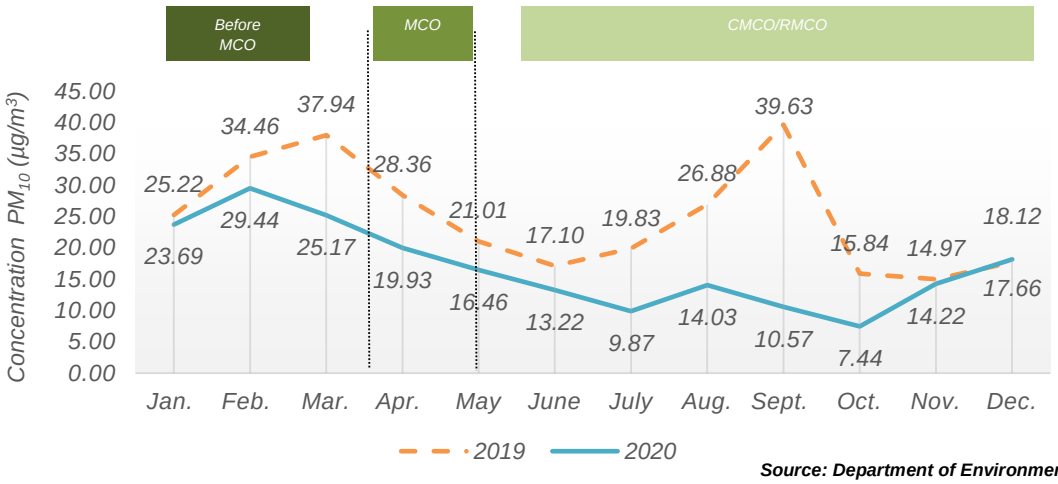
Source: Department of Environment

Chart 1.2: Monthly average concentration of PM_{10} in the air, Kimanis station, Sabah, 2019 and 2020



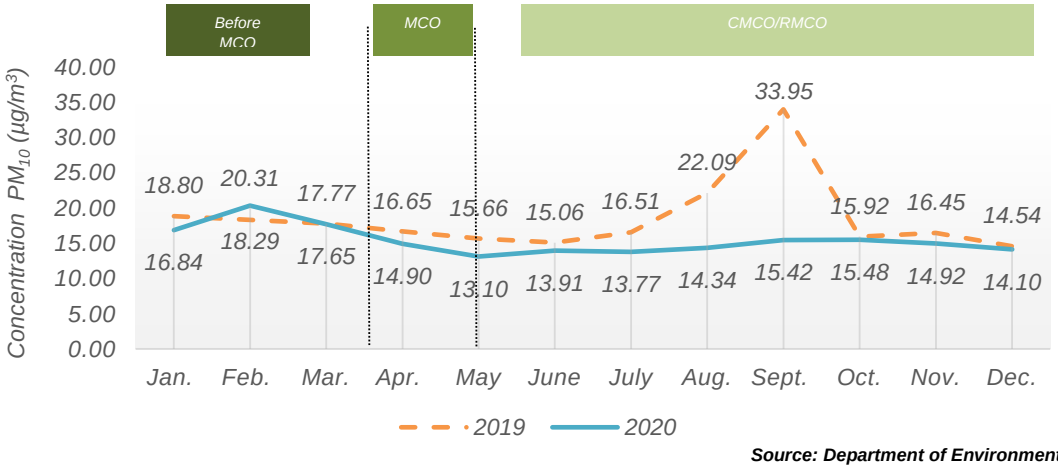
Source: Department of Environment

Chart 1.3: Monthly average concentration of PM_{10} in the air, Kota Kinabalu station, Sabah, 2019 and 2020



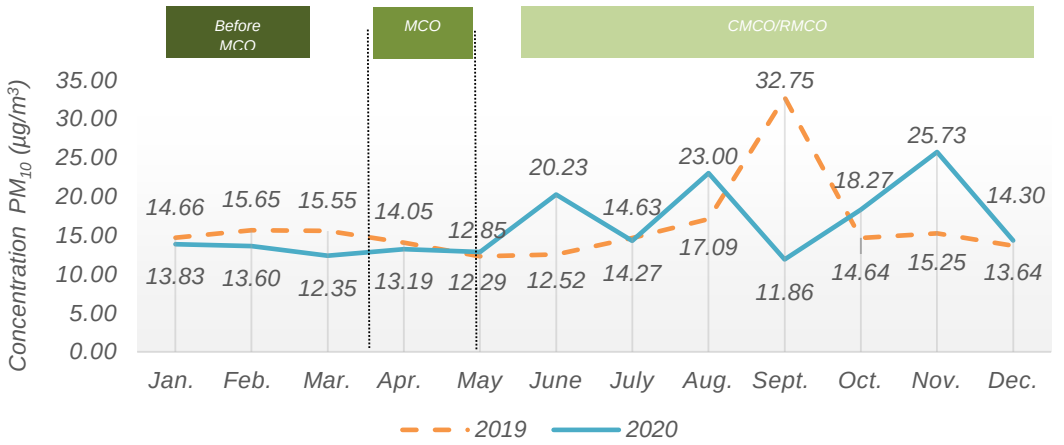
Source: Department of Environment

Chart 1.4: Monthly average concentration of PM_{10} in the air, Sandakan station, Sabah, 2019 and 2020



Source: Department of Environment

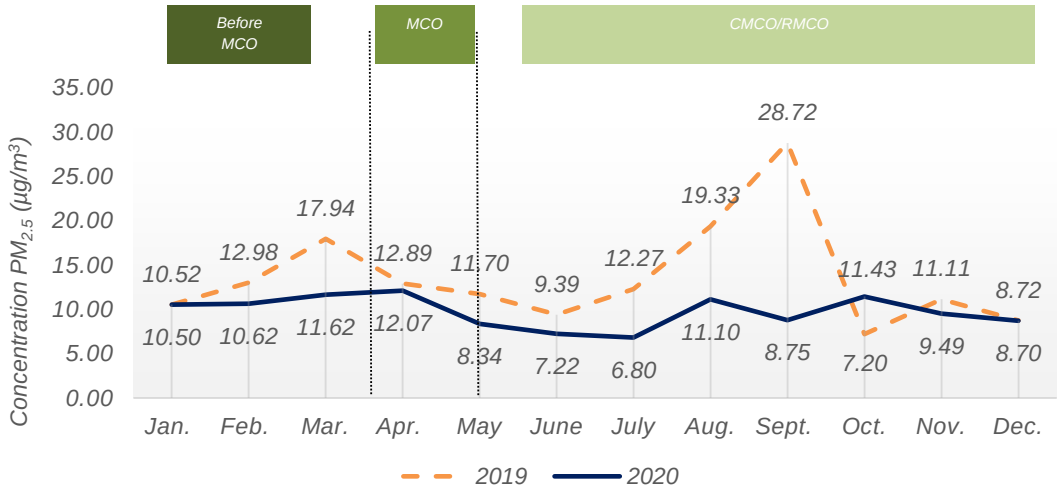
Chart 1.5: Monthly average concentration of PM_{10} in the air, Tawau station, Sabah, 2019 and 2020



Source: Department of Environment

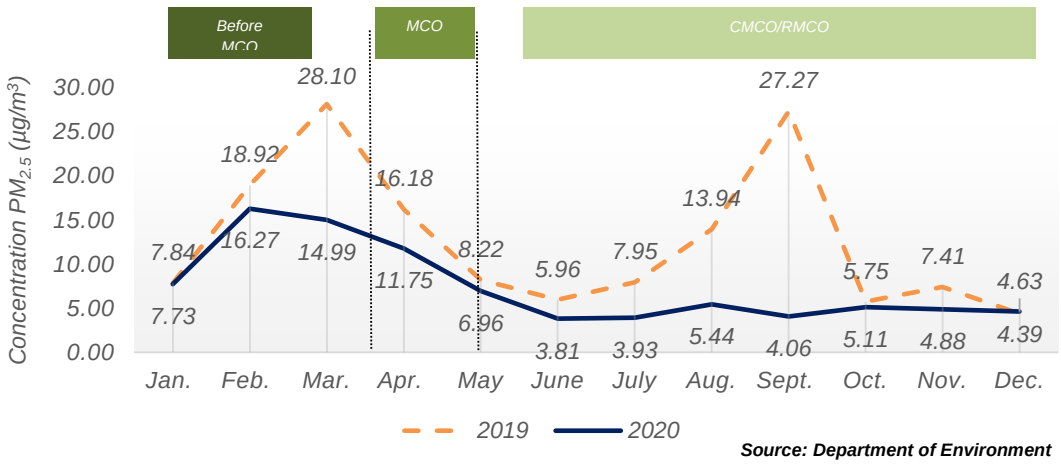
The implementation of MCO also had a positive impact on the monthly average trend of $PM_{2.5}$ concentration in the air in Sabah in 2020 where $PM_{2.5}$ recorded the lowest level during MCO as compared to 2019 except in October 2020 (Keningau); December 2020 (Kimanis); April and December 2020 (Sandakan); June and December 2020 (Tawau).

Chart 1.6: Monthly average concentration of $PM_{2.5}$ in the air, Keningau station, Sabah, 2019 and 2020



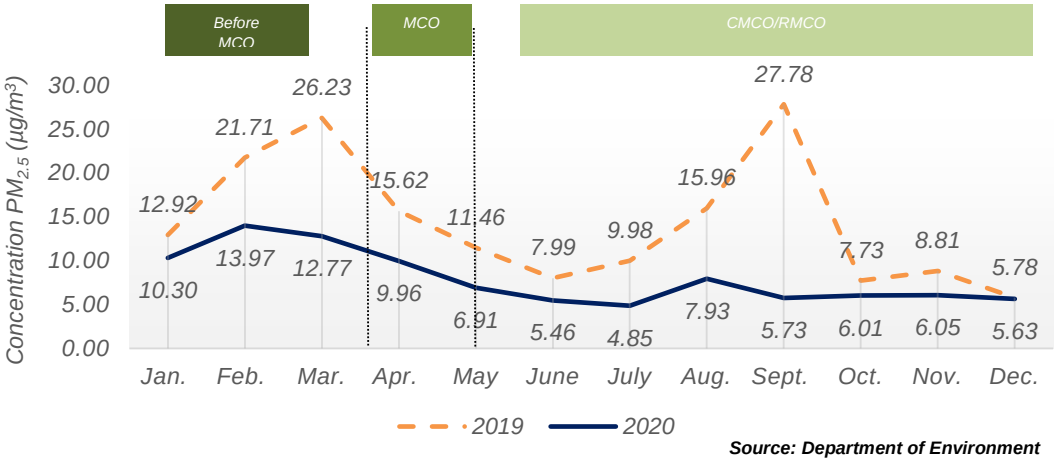
Source: Department of Environment

Chart 1.7: Monthly average concentration of $PM_{2.5}$ in the air, Kimanis station, Sabah, 2019 and 2020



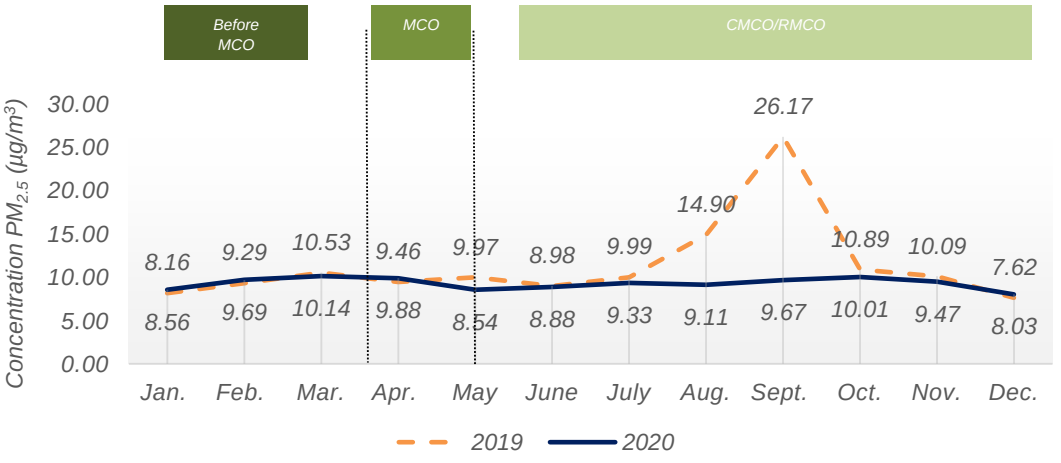
Source: Department of Environment

Chart 1.8: Monthly average concentration of $PM_{2.5}$ in the air, Kota Kinabalu station, Sabah, 2019 and 2020



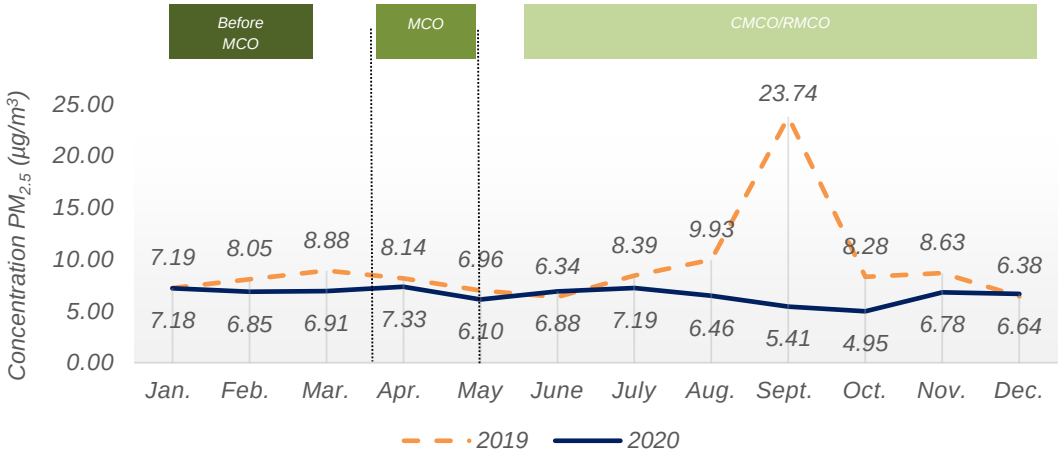
Source: Department of Environment

Chart 1.9: Monthly average concentration of $PM_{2.5}$ in the air, Sandakan station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.10: Monthly average concentration of $PM_{2.5}$ in the air, Tawau station, Sabah, 2019 and 2020



Source: Department of Environment

Ground level ozone (O_3)

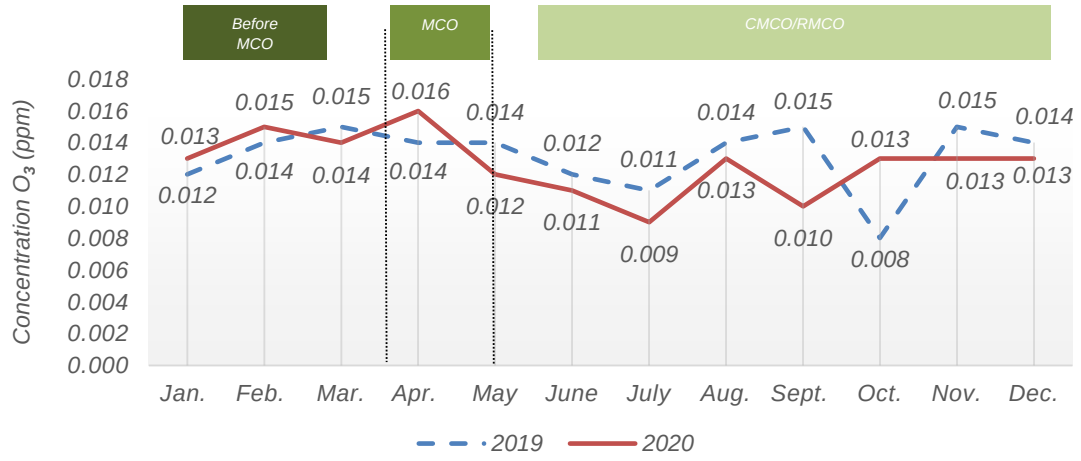
O_3 is a pollutant formed by the chemical reaction in the air between volatile organic compounds (VOCs) and nitrogen oxide (NOx). These VOCs and NOx are produced by motor vehicles and industrial sources.

The monthly average trend of O_3 concentration in air declined throughout the implementation of MCO. In general, the O_3 reading in 2020 is lower than in 2019 except in April dan October 2020. This is due to the opening of the economic sector as well as the relaxation of cross-state movements during CMCO/RMCO causing an increase pollution in O_3.

Chart 1.11: Monthly average concentration of O_3 in the air, Keningau station, Sabah, 2019 and 2020

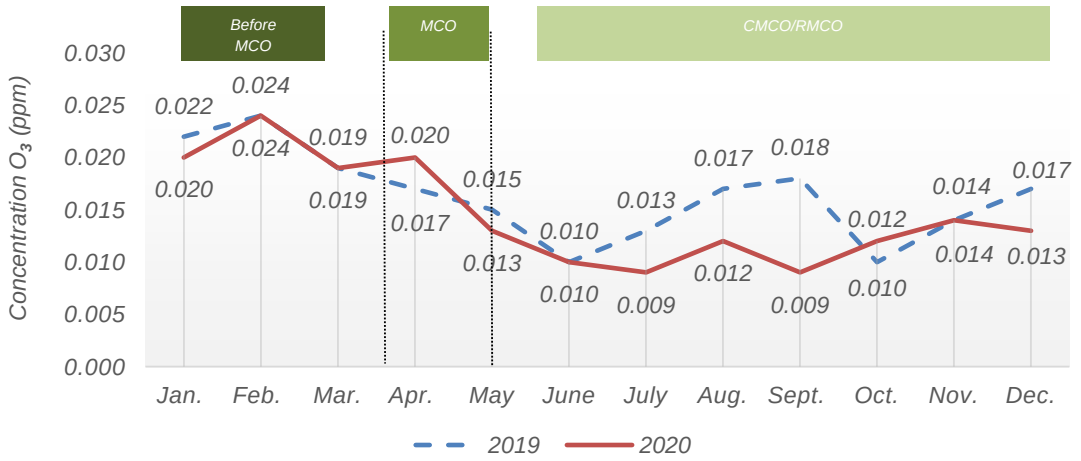
Source: Department of Environment

Chart 1.12: Monthly average concentration of O_3 in the air, Kota Kinabalu station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.13: Monthly average concentration of O_3 in the air, Sandakan station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.14: Monthly average concentration of O_3 in the air, Tawau station, Sabah, 2019 and 2020

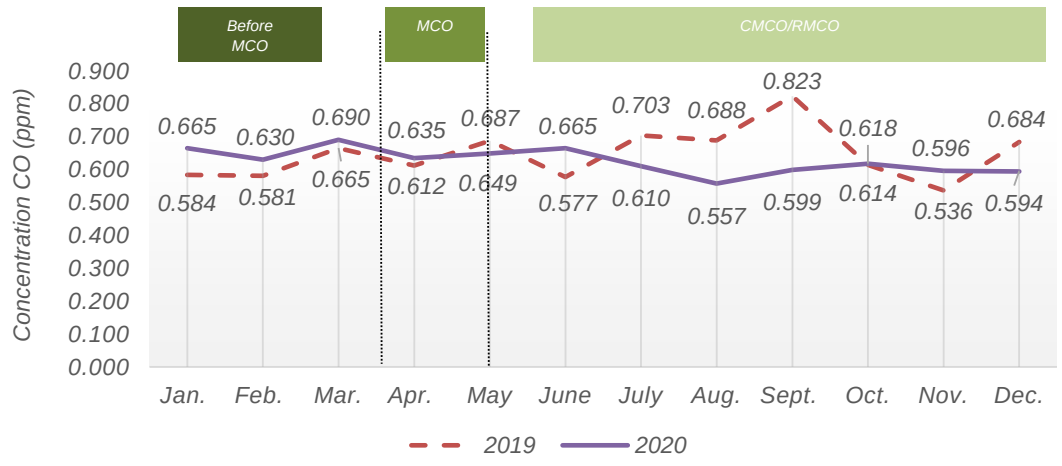
Source: Department of Environment

Carbon Monoxide (CO)

CO is a colourless, odourless and toxic gas produced from fossil fuel combustion sources such as vehicle exhaust, industrial processes and open burning activities.

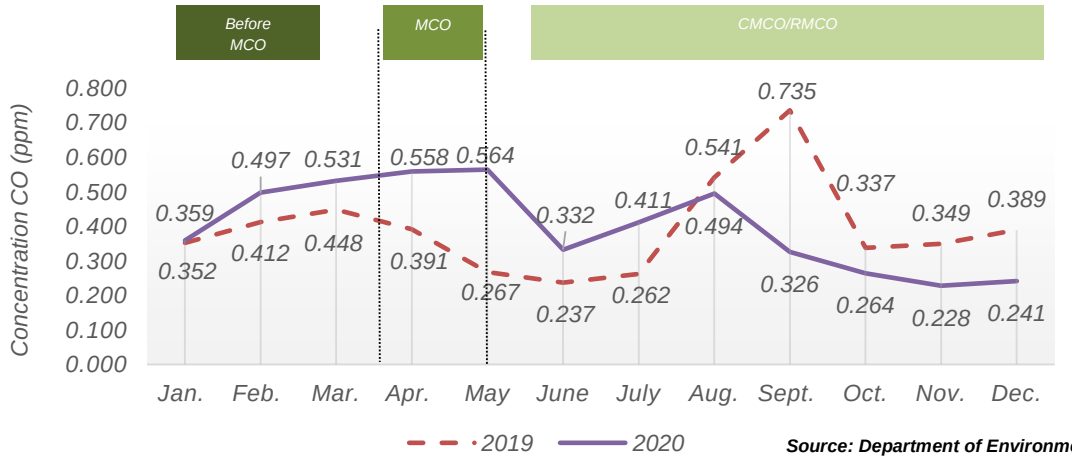
The monthly average trend of CO concentration in the air throughout MCO implementation showed the lowest level at all stations as compared to 2019 due to cross-state mobility control and working from home by indirectly reducing vehicle usage. However, the opening up of the economic sector as well as cross-state permits led to an increase in CO concentrations especially in April, June, October and November 2020 (Keningau); April to July 2020 (Kota Kinabalu); Jun to August and October to December 2020 (Sandakan); July, August and December 2020 (Tawau).

Chart 1.15: Monthly average concentration of CO in the air, Keningau station, Sabah, 2019 and 2020



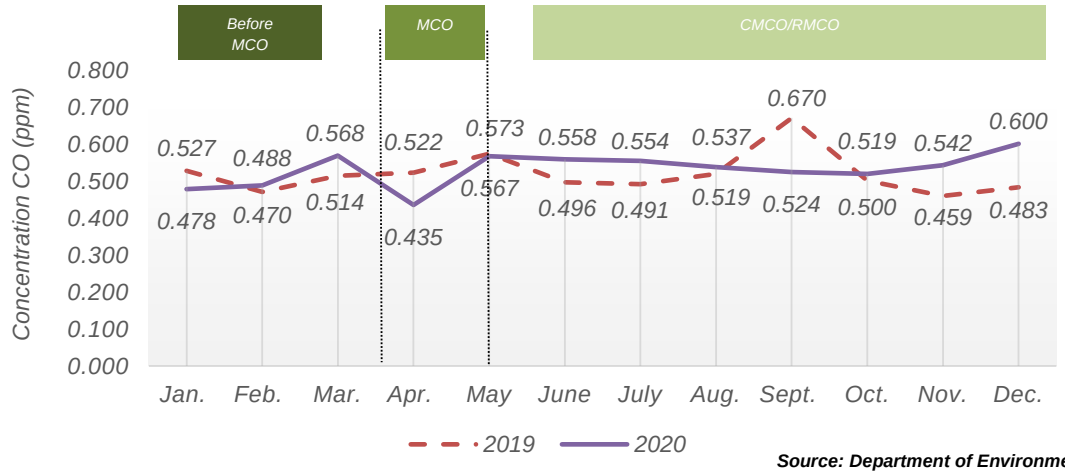
Source: Department of Environment

Chart 1.16: Monthly average concentration of CO in the air, Kota Kinabalu station, Sabah, 2019 and 2020



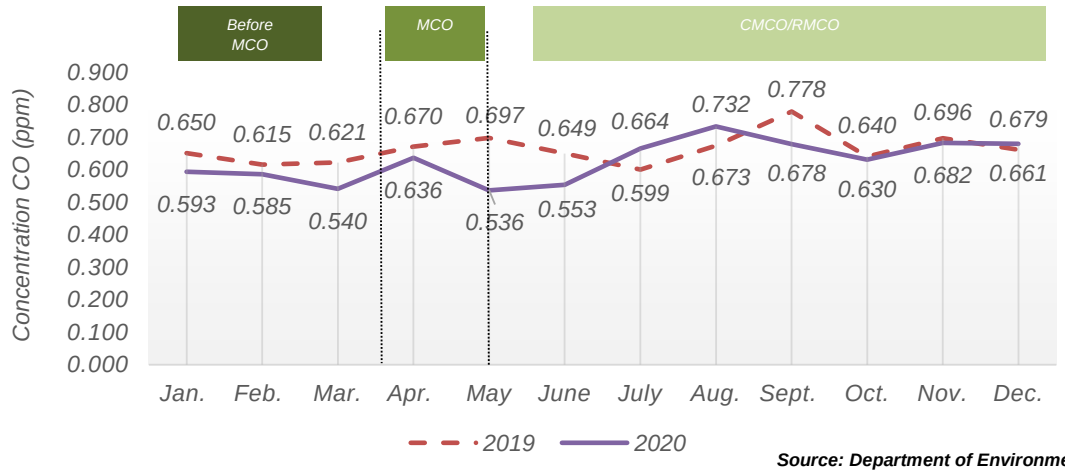
Source: Department of Environment

Chart 1.17: Monthly average concentration of CO in the air, Sandakan station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.18: Monthly average concentration of CO in the air, Tawau station, Sabah, 2019 and 2020



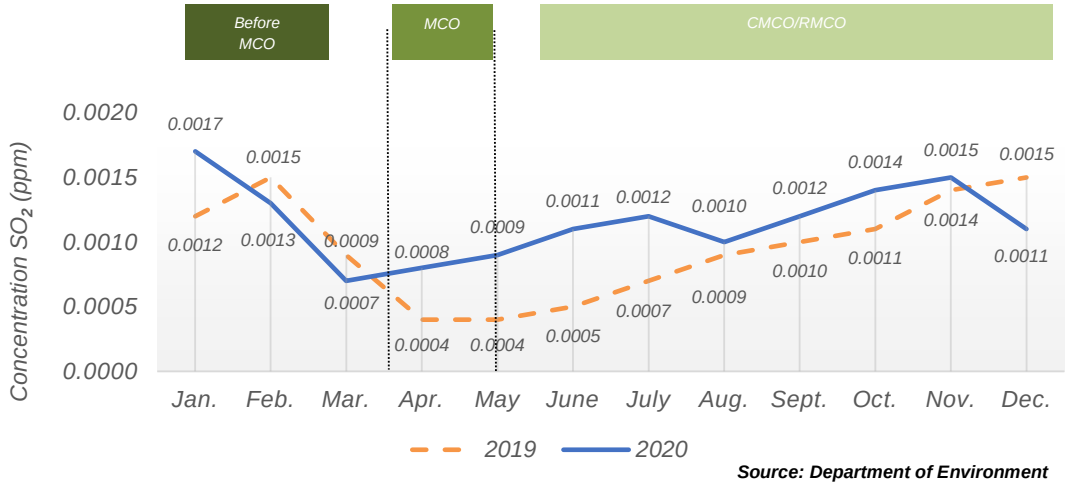
Source: Department of Environment

Sulphur Dioxide (SO_2)

SO_2 is colourless, water-soluble reactive gas with an irritating odour. Excessive exposure to high concentration of SO_2 in the atmosphere causes respiratory illnesses and complications to existing cardiovascular problems.

The monthly average trend concentration of SO_2 in the air during the implementation of MCO in 2020 declined as compared to 2019 except in April to November 2020 (Keningau); April to May 2020 (Kimanis); April to July and November 2020 (Sandakan); August to October 2020 (Tawau); and December 2020 (Kota Kinabalu).

Chart 1.19: Monthly average concentration of SO_2 in the air, Keningau station, Sabah, 2019 and 2020

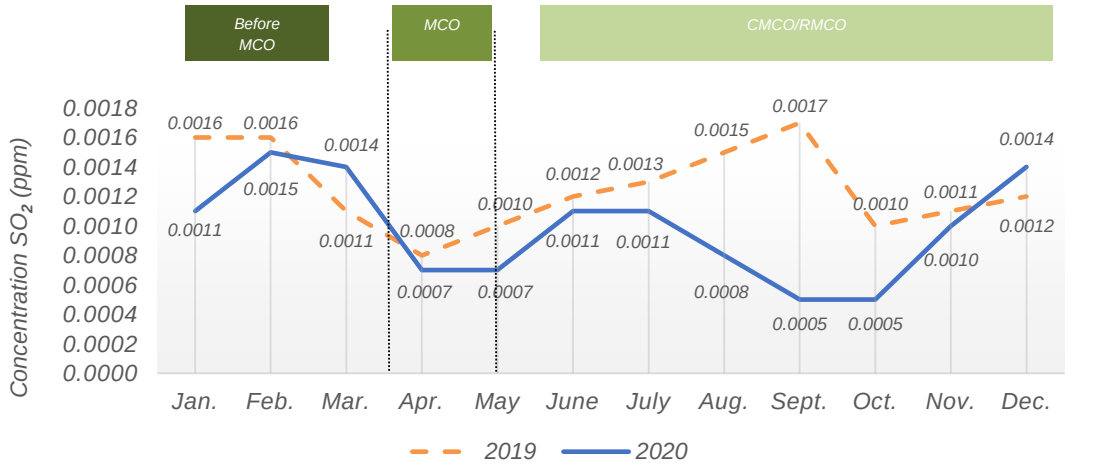


Source: Department of Environment

Chart 1.20: Monthly average concentration of SO_2 in the air, Kimanis station, Sabah, 2019 and 2020

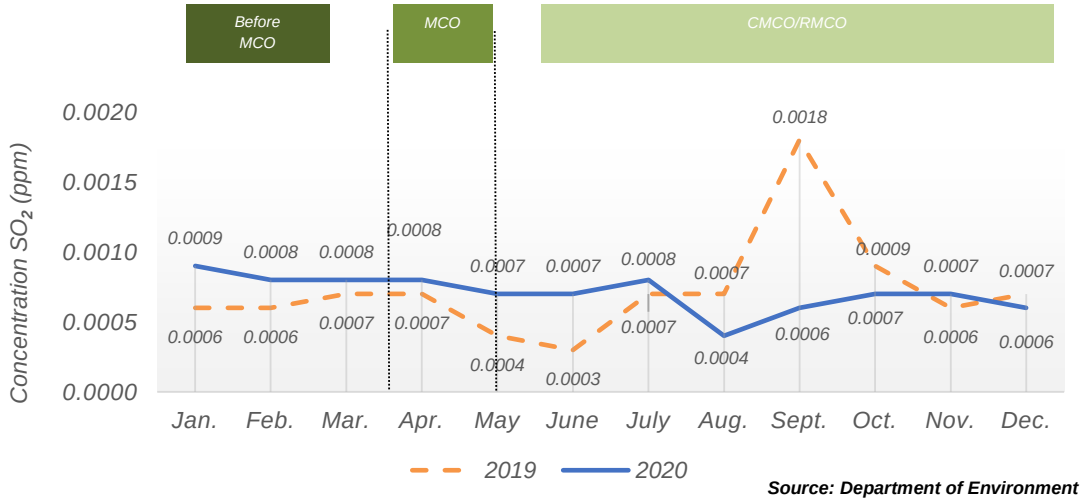
Source: Department of Environment

Chart 1.21: Monthly average concentration of SO_2 in the air, Kota Kinabalu station, Sabah, 2019 and 2020



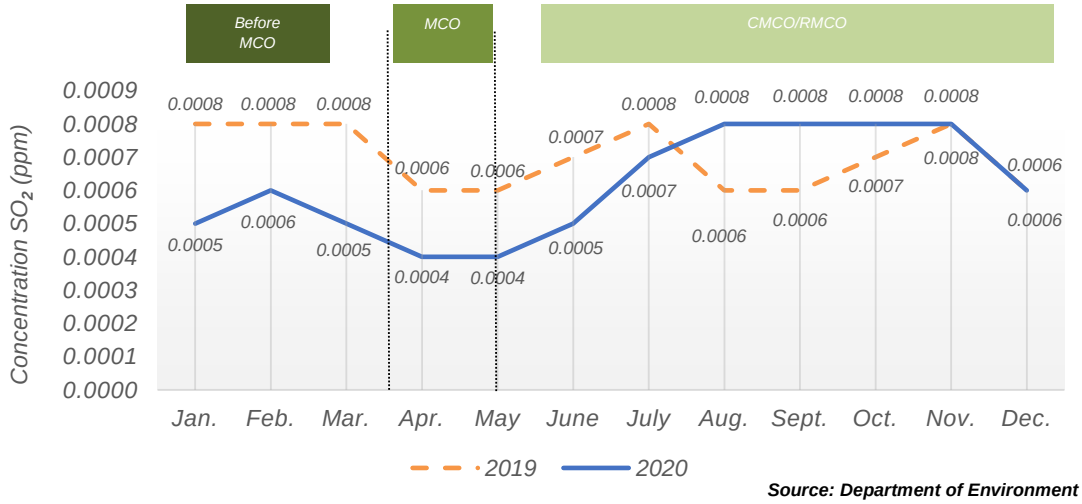
Source: Department of Environment

Chart 1.22: Monthly average concentration of SO_2 in the air, Sandakan station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.23: Monthly average concentration of SO_2 in the air, Tawau station, Sabah, 2019 and 2020



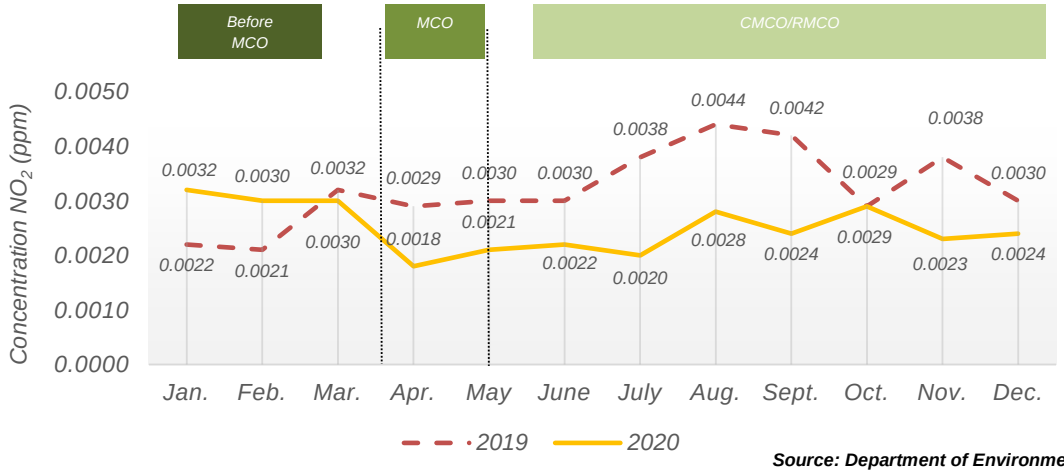
Source: Department of Environment

Nitrogen Dioxide (NO_2)

NO_2 is formed in the ambient air through the oxidation of Nitrogen Monoxide (NO). This reddish brown toxic gas has a sharp and pungent odour.

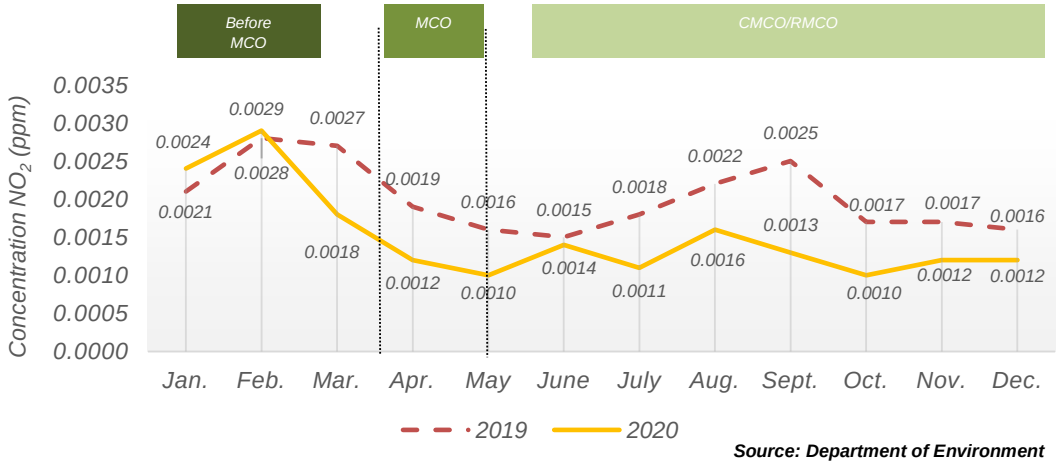
The monthly average trend of NO_2 concentration in the air in 2020 showed a decrease compared to 2019 due to the implementation of MCO except in June to August 2020 (Tawau).

Chart 1.24: Monthly average concentration of NO_2 in the air, Keningau station, Sabah, 2019 and 2020



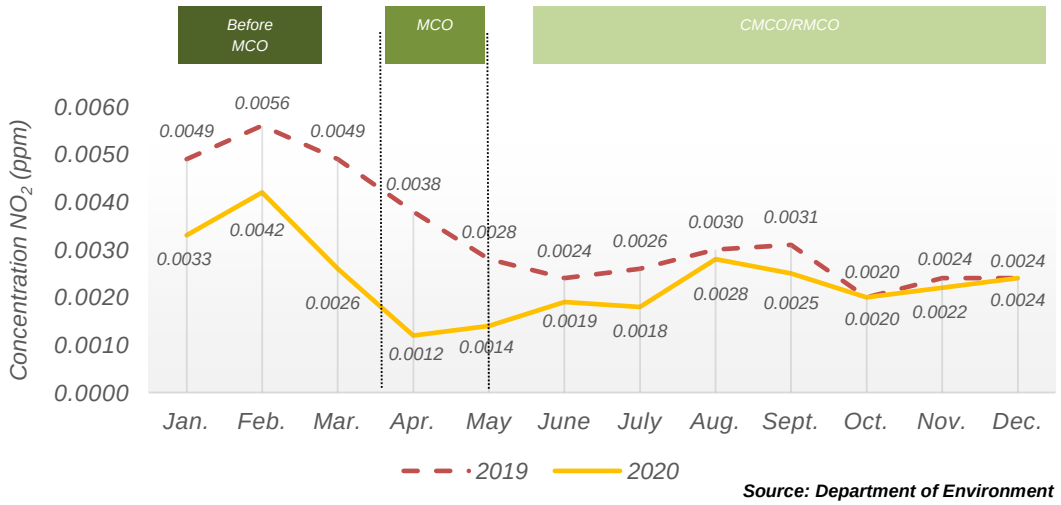
Source: Department of Environment

Chart 1.25: Monthly average concentration of NO_2 in the air, Kimanis station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.26: Monthly average concentration of NO_2 in the air, Kota Kinabalu station, Sabah, 2019 and 2020



Source: Department of Environment

Chart 1.27: Monthly average concentration of NO_2 in the air, Sandakan station, Sabah, 2019 and 2020

Source: Department of Environment

Chart 1.28: Monthly average concentration of NO_2 in the air, Tawau station, Sabah, 2019 and 2020

Source: Department of Environment

B. Mean temperature, rainfall and mean relative humidity

Malaysia's climate is categorised as equatorial, has a uniform temperature, copious rainfall and humid throughout the year. This climate is influenced by the Northeast monsoon blows from November to March and the Southwest monsoon from May to September. The east coast of Peninsular Malaysia and the coastal areas of Sabah and Sarawak are strongly influenced by the Northeast monsoon season. However, the west coast of Peninsular Malaysia is not affected because it is protected by the soaring mountain ranges.

Sabah has six meteorological stations to monitor the weather conditions continuously and provide meteorological data which are used in weather forecasting. The stations are Keningau, Kota Kinabalu, Kudat, Ranau, Sandakan and Tawau.

Mean temperature

Kota Kinabalu station recorded the highest average temperature of 32.8°C, and decreased 0.5°C to 32.2°C in 2020. Ranau station recorded the lowest average temperature of 20.6°C, as compared to 20.9°C recorded in 2020. ***[Exhibit 1.1]***

Exhibit 1.1: Mean temperature at meteorological stations, Sabah, 2019 and 2020

2019		Meteorological stations	2020	
Max.	Min.		Max.	Min.
32.6°C	22.2°C	Keningau	32.0°C	22.6°C
32.8°C	24.5°C	Kota Kinabalu	32.2°C	24.3°C
31.2°C	24.4°C	Kudat	31.0°C	24.6°C
30.3°C	20.6°C	Ranau	30.1°C	20.9°C
31.7°C	24.5°C	Sandakan	31.4°C	24.9°C
32.1°C	23.7°C	Tawau	31.8°C	23.8°C

Source: Malaysia Meteorological Department

Rainfall distribution

Kota Kinabalu station recorded the highest annual rainfall in 2020 at 3,456.6 mm as compared to the previous year (2,535.2 mm). Keningau station recorded the lowest annual rainfall of 612.0 mm in 2019 as compared to 1,691.8 mm in 2020. ***[Exhibit 1.2]***

Exhibit 1.2: Total and number of rainfall days at meteorological stations, Sabah, 2019 and 2020

2019		Meteorological stations	2020	
Total (mm)	No. of days		Total (mm)	No. of days
612.0	167	Keningau	1,691.8	189
2,535.2	152	Kota Kinabalu	3,456.6	208
1,977.5	141	Kudat	2,238.4	165
870.6	203	Ranau	2,521.4	227
2,912.7	163	Sandakan	2,380.3	168
1,590.4	148	Tawau	1,947.8	185

Source: Malaysia Meteorological Department

Mean relative humidity

The mean relative humidity in Sabah was 81.7 per cent (Keningau) and 85.0 per cent (Tawau) in 2020. However, this reading increased as compared to 2019 which is 78.7 per cent (Kota Kinabalu) and 82.0 per cent (Tawau). ***[Exhibit 1.3]***

Exhibit 1.3: Mean relative humidity at meteorological stations, Sabah, 2019 and 2020

2019	Meteorological stations	2020
Percentage (%)		Percentage (%)
80.2	Keningau	81.7
78.7	Kota Kinabalu	82.4
81.2	Kudat	82.9
80.3	Ranau	82.3
80.9	Sandakan	82.3
82.0	Tawau	85.0

Source: Malaysia Meteorological Department

C. Air quality status

Air is the mixture of gases which make up the earth's atmosphere. It is mainly composed of nitrogen (about 78.0%), oxygen (about 21.0%) and other gases (about 1.0 5%). Air is essential for life as we use it to burn fuels for heating, transportation, power generation and others.

Air Pollution Index

The Department of Environment (DOE) monitors the country's ambient air quality through 65 monitoring stations that are located throughout the country to monitor and to detect any significant change in the air quality that can contribute to the negative impact to human health and the environment.

The status of air quality in Malaysia is reported as the Air Pollutant Index (API). The air pollutants used in computing the API are Ozone (O_3), Carbon Monoxide (CO), Nitrogen Dioxide (NO_2) Sulphur Dioxide (SO), Particulate Matter of less than 10 microns in size (PM_{10}) and Particulate Matter of less than 2.5 microns in size ($PM_{2.5}$).

Status of Air Pollution Index (API)

API	API Status
0-50	Good
51-100	Moderate
101-200	Unhealthy
201-300	Very Unhealthy
>300	Hazardous

During the implementation of the MCO, Sabah in overall recorded a "good" and "moderate" air quality status for 2020. Tawau station recorded the highest number of days (358 days) with "good" air quality in 2020 as compared to 316 days in the previous year. API reading showed a decrease in the air pollutants levels, especially in major cities across the state due to lower air pollutant emissions such as motor vehicles smoke, industrial chimney emissions and open burning activities. ***[Exhibit 1.4]***

Exhibit 1.4: Status of air quality[1] by station, Sabah, 2019 and 2020

Number of days

Station	Year	Good (0-50)	Moderate (51-100)	Unhealthy (101-200)	Very Unhealthy (201-300)	Hazardous (>300)
Sabah						
Keningau	2020	229	137	-	-	-
	2019	161	204	-	-	-
Kimanis	2020	296	70	-	-	-
	2019	227	137	1	-	-
Kota Kinabalu	2020	270	96	-	-	-
	2019	159	203	-	2	-
Sandakan	2020	292	74	-	-	-
	2019	236	126	3	-	-
Tawau	2020	358	7	-	-	-
	2019	316	46	3	-	-

[1]*Air quality status readings are based on daily maximum readings*

Source: Department of Environment

D. Water resources

Water is very essential to human beings, socioeconomic activities such as industrial activities, aquaculture, transportation, agriculture and generation of energy. Malaysia has an abundant rainfall and extensive river system as national water resources. The water demand has increased as the population grows and improvement in the standard of living. Water shortage should be overcome since it would affect human and economic activities. As such, the management of water resources should be addressed in order to meet the increasing demand.

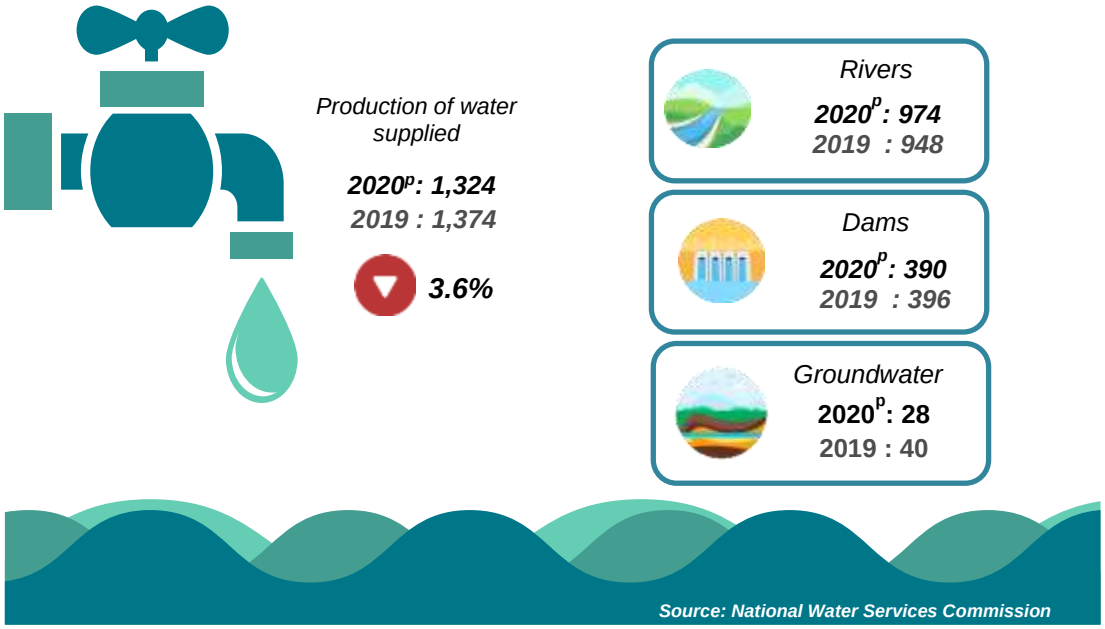
Water resources are resources acquired for human consumption and the environment comprising rivers, lakes, groundwater, seawater and other sources.

In Malaysia, 97.0 per cent of water supply is from surface water while the remaining is from groundwater. Groundwater is an alternative source of water, especially in areas where surface water supply is inadequate or unavailable.

The sources of abstracted raw water supply in Sabah are from rivers, dams and groundwater. In 2020, the total of abstracted raw water supply is 1,392 million litres per day (MLD) where rivers account for 70.0 per cent, dams account for 28.0 per cent while the rest is from groundwater. Volume production of water supplied in Sabah was 1,324 MLD in 2020, a decrease of 3.6 per cent as compared to 1,374 MLD recorded in 2019. ***[Exhibit 1.5]***

Exhibit 1.5: Production of water supplied and supply of abstracted raw water by source, Sabah, 2019 and 2020

(Million litres per day)

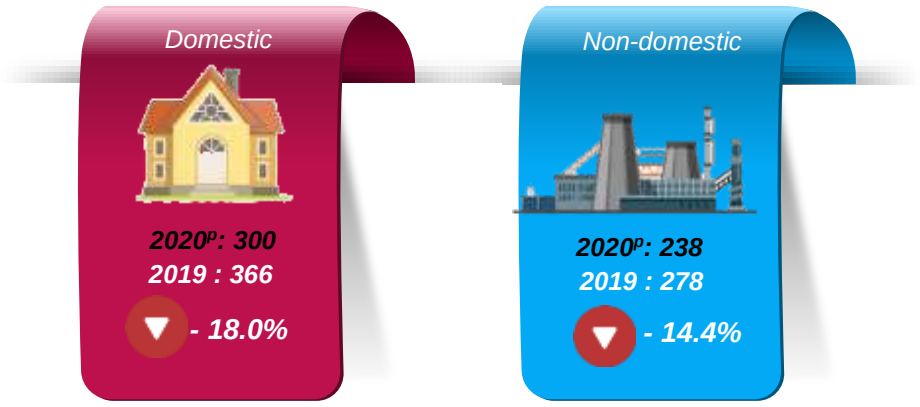


The domestic sector refers to water used by households to carry out daily activities such as washing dishes, cooking, washing clothes, bathing, watering plants and others. Meanwhile, the non-domestic sector refers to water used for commercial, industrial and general use in agriculture and livestock.

The increase in water consumption for the domestic sector in Malaysia is in line with the implementation of the MCO in 2020 as more Malaysians worked from home. Meantime, metered water consumption for the domestic category in Sabah also showed a decrease of 18.0 per cent and non-domestic decreased by 14.4 per cent in 2020 as compared to 2019. ***[Exhibit 1.6]***

Exhibit 1.6: Metered water consumption by sector, Sabah, 2019 and 2020

(*Million litres per day*)



Source: National Water Services Commission

E. Clinical waste

Clinical waste refers to any waste which consists wholly or partly of human tissues, blood or body fluids, excretions, drugs or pharmaceutical products and others. It is classified as scheduled waste under the First Schedule Environmental Quality (Scheduled Wastes) Regulations, 2005.

The COVID-19 pandemic had a direct impact on clinical waste due to the use of personal protective equipment (PPE) and COVID-19 test equipment in the handling of COVID-19 patients in health facilities and quarantine centers. Sabah recorded 2,606.0 metric tonnes of clinical waste in 2020 as compared to 1,900.0 metric tonnes recorded in 2019. ***[Exhibit 1.7]***

Exhibit 1.7: Quantity of clinical waste, Sabah, 2019 and 2020

(Metric tonnes)

Source: Department of Environment

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Taburan hujan di Sabah, 1995-2020

Pengenalan

Perubahan iklim dunia mutakhir ini banyak mempengaruhi corak dan taburan hujan sama ada pada skala tempatan mahupun global. *Intergovernmental Panel on Climate Change* (IPCC) pada tahun 2007 melaporkan bahawa telah berlaku peningkatan terhadap jumlah hujan di bahagian atau kawasan yang terletak di latitud 30º U dari tahun 1900 hingga 2005. Sementara itu, berlaku pula pengurangan terhadap jumlah hujan yang turun di kawasan tropika sejak tahun 1970-an.

Iklim Malaysia

Malaysia terletak di zon khatulistiwa dan mengalami iklim panas dan lembap. Pada amnya, ia mempunyai suhu seragam, kelembapan tinggi dan hujan yang banyak. Walaupun tiupan angin di Malaysia pada amnya lemah dan terdapat perubahan bertempoh dalam corak tiupan angin. Berdasarkan kepada perubahan ini, empat musim boleh dibezakan iaitu monsun Timur Laut (November-Mac), monsun Barat Daya (Mei-September) dan dua musim peralihan monsun (Mac-Mei & Oktober-November) yang lebih pendek[1].

Taburan Hujan

Corak tiupan angin bermusim bersama sifat topografi lokal menentukan corak taburan hujan di Malaysia. Semasa musim timur laut, kawasan yang terdedah seperti kawasan Pantai Timur Semenanjung Malaysia, kawasan Barat Sarawak dan kawasan Pantai Timur Laut Sabah mengalami beberapa tempoh hujan lebat. Sebaliknya, kawasan pendalaman atau kawasan yang dilindungi banjaran gunung adalah secara relatifnya bebas dari pengaruh ini.

Penemuan

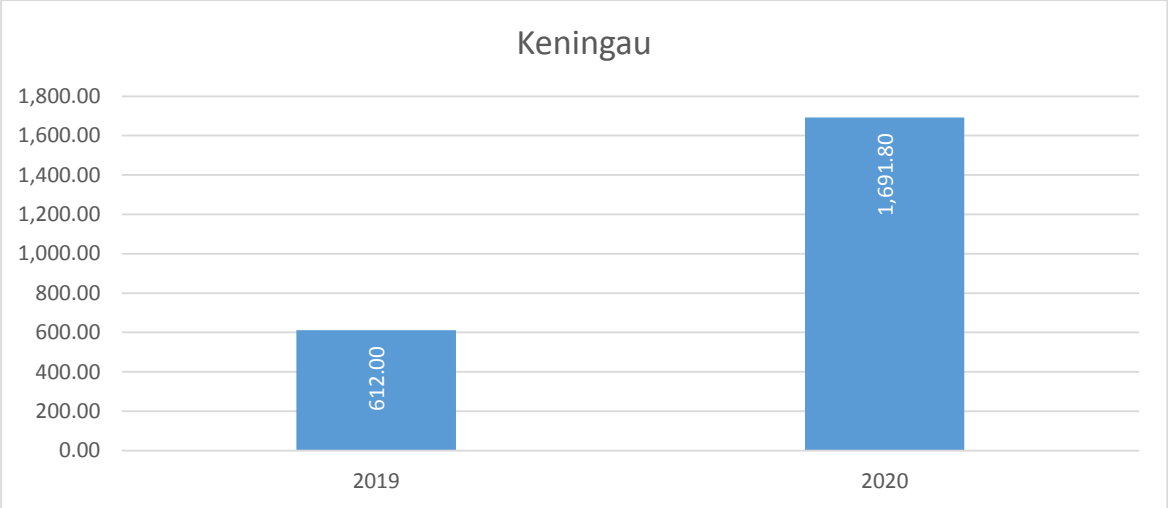
Kajian dan analisis taburan hujan tahunan adalah bertujuan untuk melihat trend taburan hujan berdasarkan perubahan iklim dan musim di negeri Sabah. Selain itu, hasil kajian boleh digunakan dalam merangka pengurusan kepada penggunaan air di Sabah bagi mengenalpasti sumber air dan kitarannya. Sabah mempunyai enam stesen meteorologi berperanan untuk mengawasi keadaan cuaca secara berterusan dan menyediakan data

[1] Portal Jabatan Meteorologi Malaysia, www.met.gov.my

meteorologi untuk kegunaan ramalan cuaca. Stesen-stesen tersebut adalah Keningau, Kota Kinabalu, Kudat, Ranau, Sandakan dan Tawau. Rekod taburan hujan kawasan kajian daripada empat buah stesen Jabatan Meteorologi Malaysia selama 26 tahun (1995 hingga 2020) manakala dua stesen selama 2 tahun (2019 hingga 2020) telah dikumpulkan dan dianalisis mengikut jumlah hujan tahunan seperti yang ditunjukkan dalam Carta 1.1 hingga 1.6. Berdasarkan kajian, perubahan peratusan tahunan taburan hujan semua stesen menunjukkan trend peningkatan tertinggi dicatatkan di stesen Ranau (189.6%) diikuti stesen Keningau (176.4%), Kota Kinabalu (8.2%), Sandakan (8.1%) dan Kudat (4.3%) manakala penurunan dicatatkan di stesen Tawau (-10.9%).

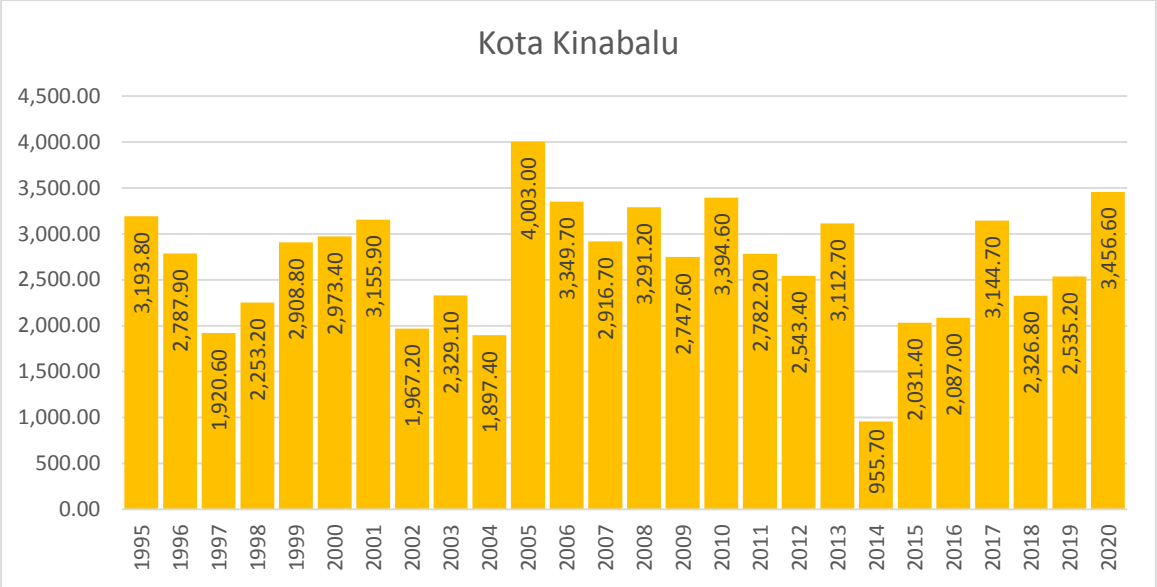
Jumlah hujan tahunan di stesen meteorologi Keningau dari tahun 2019 hingga 2020 ditunjukkan dalam Carta 1.1. Jumlah hujan tahunan terendah direkodkan pada tahun 2019 iaitu 612.00 mm dan tertinggi pada tahun 2020 iaitu 1,691.80 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 1,151.90 mm. Rekod juga menunjukkan jumlah hujan pada kedua-dua tahun tersebut tidak melebihi 2000 mm setiap tahun.

Carta1.1: Taburan hujan di stesen meteorologi Keningau, Sabah, 2019 dan 2020



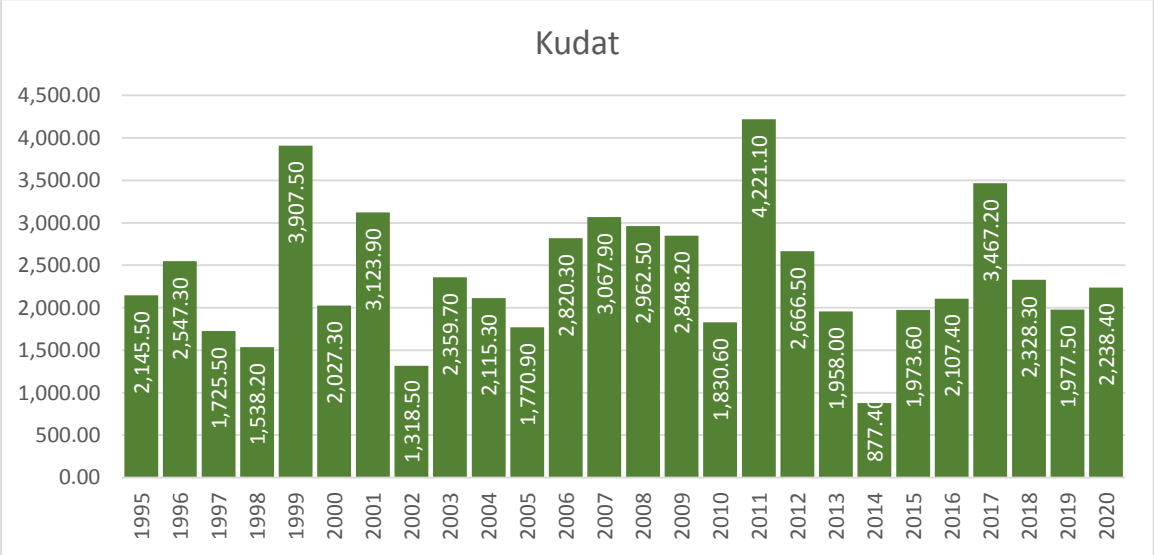
Jumlah hujan tahunan di stesen meteorologi Kota Kinabalu dari tahun 1995 hingga 2020 ditunjukkan dalam Carta 1.2. Jumlah hujan tahunan terendah direkodkan pada tahun 2014 iaitu 955.70 mm dan tertinggi pada tahun 2005 iaitu 4,003.00 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 2,694.84 mm. Rekod juga menunjukkan 84.62 peratus (22 tahun) jumlah hujan yang sentiasa melebihi 2000 mm setiap tahun kecuali tahun 1997 (1,920.60 mm), 2002 (1,967.20 mm), 2004 (1,897.40 mm) dan 2014 (955.70 mm).

Carta1.2: Taburan hujan di stesen meteorologi Kota Kinabalu, Sabah, 1995-2020



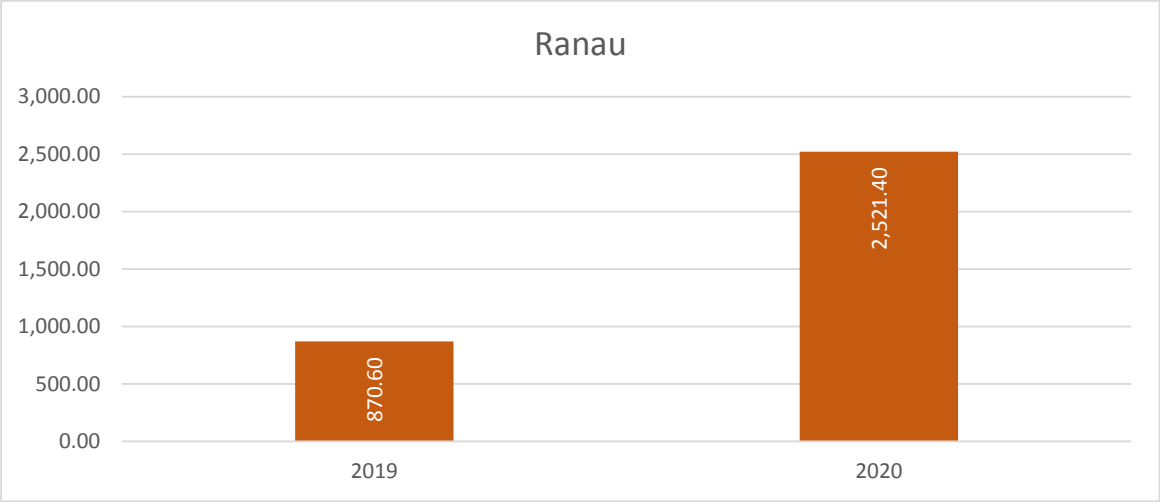
Jumlah hujan tahunan di stesen meteorologi Kudat dari tahun 1995 hingga 2020 ditunjukkan dalam Carta 1.3. Jumlah hujan tahunan terendah direkodkan pada tahun 2014 iaitu 877.40 mm dan tertinggi pada tahun 2011 iaitu 4,221.10 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 2,381.71 mm. Rekod juga menunjukkan 65.38 peratus (17 tahun) jumlah hujan yang sentiasa melebihi 2,000 mm setiap tahun kecuali tahun 1997 (1,725.50 mm), 1998 (1,538.20 mm), 2002 (1,318.50 mm), 2005 (1,770.90 mm), 2010 (1,830.60 mm), 2013 (1,958.00 mm), 2014 (877.40 mm), 2015 (1,973.60 mm) dan 2019 (1,977.50 mm).

Carta 1.3: Taburan hujan di stesen meteorologi Kudat, Sabah, 1995-2020



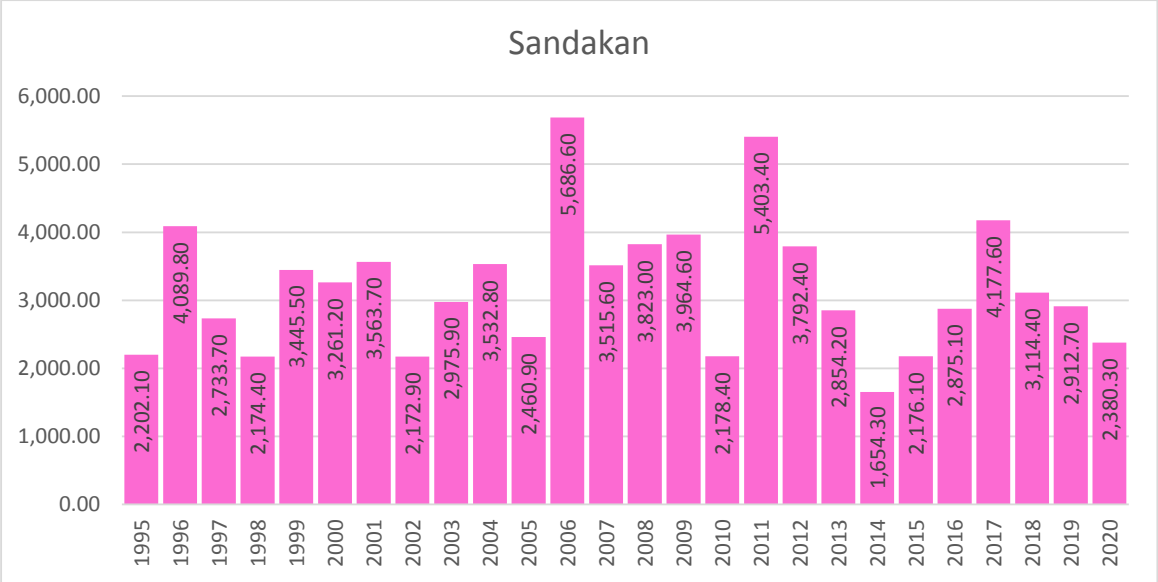
Jumlah hujan tahunan di stesen meteorologi Ranau dari tahun 2019 hingga 2020 ditunjukkan dalam Carta 1.4. Jumlah hujan tahunan terendah direkodkan pada tahun 2019 iaitu 870.60 mm dan tertinggi pada tahun 2020 iaitu 2,521.40 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 1,696.00 mm. Rekod juga menunjukkan 50.0 peratus (1 tahun) jumlah hujan yang melebihi 2,000 mm kecuali tahun 2019 (870.60 mm).

Carta1.4: Taburan hujan di stesen meteorologi Ranau, Sabah, 2019 dan 2020



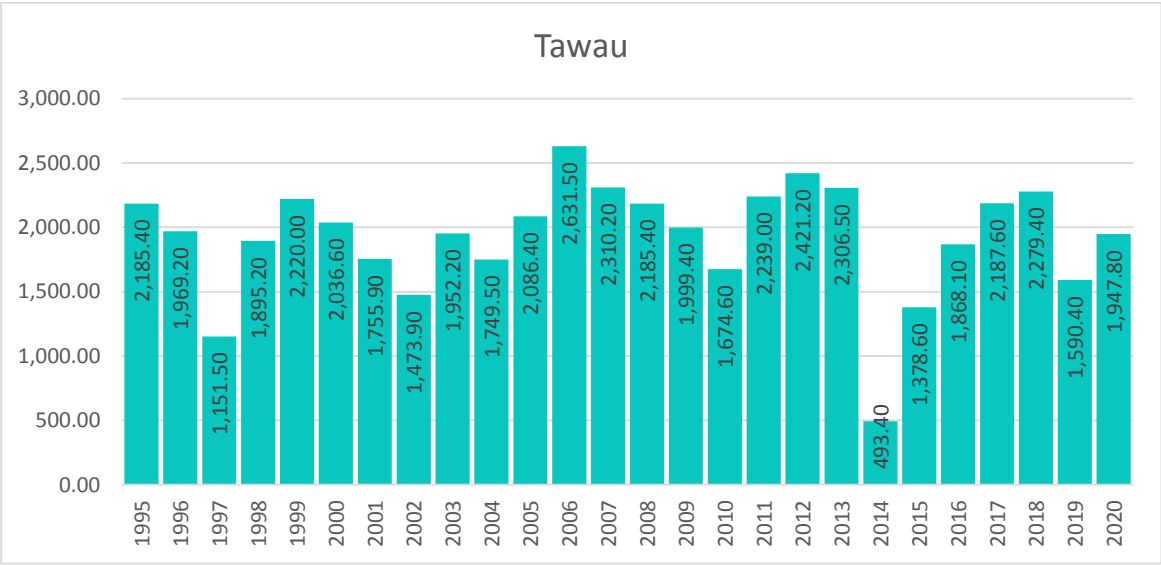
Jumlah hujan tahunan di stesen meteorologi Sandakan dari tahun 1995 hingga 2020 ditunjukkan dalam Carta 1.5. Jumlah hujan tahunan terendah direkodkan pada tahun 2014 iaitu 1,654.30 mm dan tertinggi pada tahun 2006 iaitu 5,686.60 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 3,196.98 mm. Rekod juga menunjukkan 96.15 peratus (25 tahun) jumlah hujan yang sentiasa melebihi 2,000 mm setiap tahun kecuali tahun 2014 (1,654.30 mm).

Carta1.5: Taburan hujan di stesen meteorologi Sandakan, Sabah, 1995-2020



Jumlah hujan tahunan di stesen meteorologi Tawau dari tahun 1995 hingga 2020 ditunjukkan dalam Carta 1.6. Jumlah hujan tahunan terendah direkodkan pada tahun 2014 iaitu 493.40 mm dan tertinggi pada tahun 2006 iaitu 2,631.50 mm. Purata hujan tahunan di stesen berkenaan untuk jangka masa tersebut adalah 1,922.65 mm. Rekod juga menunjukkan 46.15 peratus (12 tahun) jumlah hujan yang sentiasa melebihi 2,000 mm setiap tahun kecuali tahun 1996 (1,969.20 mm), 1997 (1,151.50 mm), 1998 (1,895.20 mm), 2001 (1,755.90 mm), 2002 (1,473.90 mm), 2003 (1,952.20 mm), 2004 (1,749.50 mm), 2009 (1,999.40 mm), 2010 (1,674.60 mm), 2014 (493.40 mm), 2015 (1,378.60 mm), 2016 (1,868.10 mm), 2019 (1,590.40 mm) dan 2020 (1,947.80 mm).

Carta1.6: Taburan hujan di stesen meteorologi Tawau, Sabah, 1995-2020



Kesimpulan

Penelitian terhadap trend hujan dalam tempoh masa tertentu adalah penting dan relevan dalam kajian hidrologi khususnya sebagai alat untuk mengesan dan mengenal pasti perubahan yang berlaku ke atas pelbagai sumber air untuk perancangan dan pengurusan (Xia et al., 2004). Maklumat berkaitan trend hujan yang jelas boleh dijadikan satu indikator peramalan dalam perancangan mengatasi masalah banjir besar atau masalah kekurangan hujan yang dikaitkan dengan kejadian kemarau. Perubahan corak taburan hujan yang berlaku pada skala tempatan dan global serta tahap kepentingan yang tinggi diperlukan untuk menilai trend taburan hujan bagi tujuan tertentu. Ini menunjukkan bahawa sifat dan ciri-ciri iklim di sesuatu kawasan adalah berbeza daripada kawasan lain kerana perbezaan aspek geografi. Selain itu, aspek masa juga mempengaruhi sifat dan ciri-ciri iklim sesuatu kawasan yang turut dikaitkan dengan perubahan global dan tindakan manusia.

Malaysia ialah negara yang dikurniakan taburan jumlah hujan yang banyak, mencapai sehingga 970 bilion meter padu setahun. Peningkatan terhadap permintaan air, khususnya pada musim kering atau kemarau menyebabkan gangguan bekalan air terawat sering berlaku. Isu ini boleh membangkitkan risiko terhadap pembangunan negara, kelestarian air dan kualiti hidup rakyat. Bagi mengatasi masalah tersebut, selain pada masa yang sama mengurangkan kebergantungan kepada bekalan air domestik, Kementerian Alam Sekitar dan Air (KASA) melalui Pelan Pelestarian Alam Sekitar di Malaysia 2020-2030 menetapkan sasaran secara progresif bermula 2021 untuk mencapai 100 juta liter sehari (JLH) penuaian air hujan dan 3,000 JLH takungan air bawah tanah pada 2030. Sasaran ini akan dicapai melalui pembangunan mekanisme simpanan air hujan sebagai air minuman dan kegunaan domestik, selain pembangunan kemudahan simpanan air bawah tanah untuk pertanian dan industri.[2]

[2] Bersama Memakmur Bumi (penerbitan oleh KASA)

Rainfall distribution in Sabah, 1995-2020

Introduction

Recently global climate change has significantly affected the patterns and distribution of rainfall both locally and globally. The Intergovernmental Panel on Climate Change (IPCC) in 2007 reported that there had been an increase in rainfall in parts or areas located at latitude 30º N from 1900 to 2005. Meanwhile, there had been a decrease in rainfall in the tropics since the 1970s.

Climate of Malaysia

Malaysia is located in the equatorial zone and experiences a hot and humid climate. In general, it has a uniform temperature, high humidity and abundant rainfall. Although wind gusts in Malaysia are generally weak and there are periodic changes in wind gust patterns. Based on these changes, four seasons can be distinguished namely Northeast monsoon (November-March), Southwest monsoon (May-September) and two shorter monsoon transition seasons (March-May & October-November)[1].

Rainfall

Seasonal wind patterns together with the nature of the local topography determine the pattern of rainfall distribution in Malaysia. During the northeast season, exposed areas such as the East Coast of Peninsular Malaysia, West Sarawak and the Northeast coast of Sabah experience several periods of heavy rainfall. In contrast, inland areas or mountain range protected areas are relatively free from this influence.

Discovery

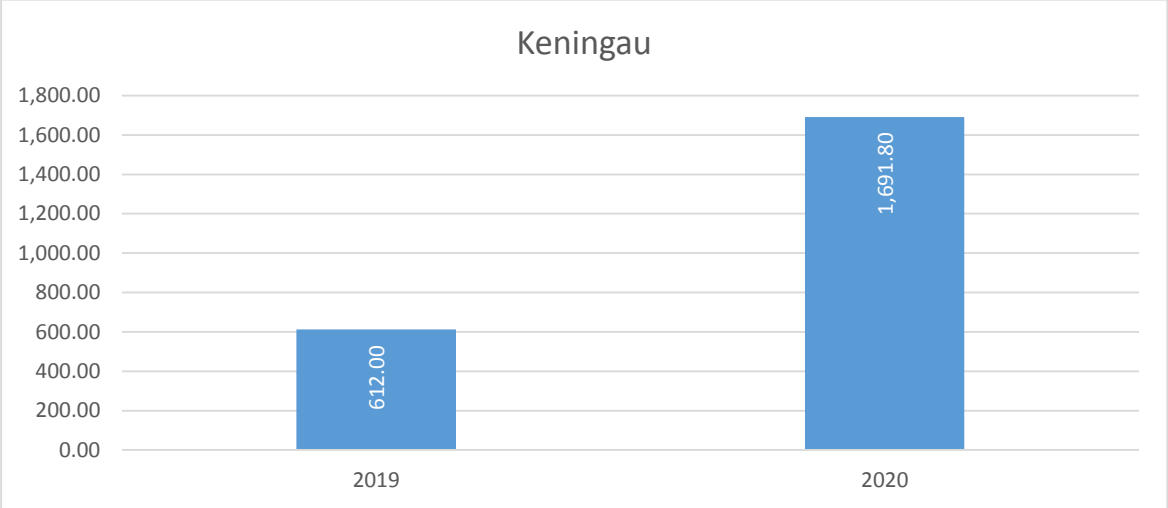
The study and analysis of annual rainfall distribution aims to see the trend of rainfall distribution based on climate change and seasons in the state of Sabah. In addition, the results of the study can be used in formulating management of water use in Sabah to identify water resources and its cycle. Sabah has six meteorological stations that monitoring the weather conditions continuously and provide meteorological data for weather forecast use.

[1] *Malaysian Meteorological Department Portal, www.met.gov.my*

The stations are Keningau, Kota Kinabalu, Kudat, Ranau, Sandakan and Tawau. Rainfall distribution records of the study area from four stations of the Malaysian Meteorological Department for 26 years (1995 to 2020) while the other two stations for 2 years (2019 to 2020) were collected and analyzed according to the annual rainfall as shown in Chart 1.1 to 1.6. Based on the study, the change in the annual percentage of rainfall distribution at Ranau station was 189.6 per cent followed by Keningau station 176.4 per cent, Kota Kinabalu station 8.2 per cent, Sandakan 8.1 per cent and Kudat 4.3 per cent while Tawau station registered a decrease of 19.9 per cent.

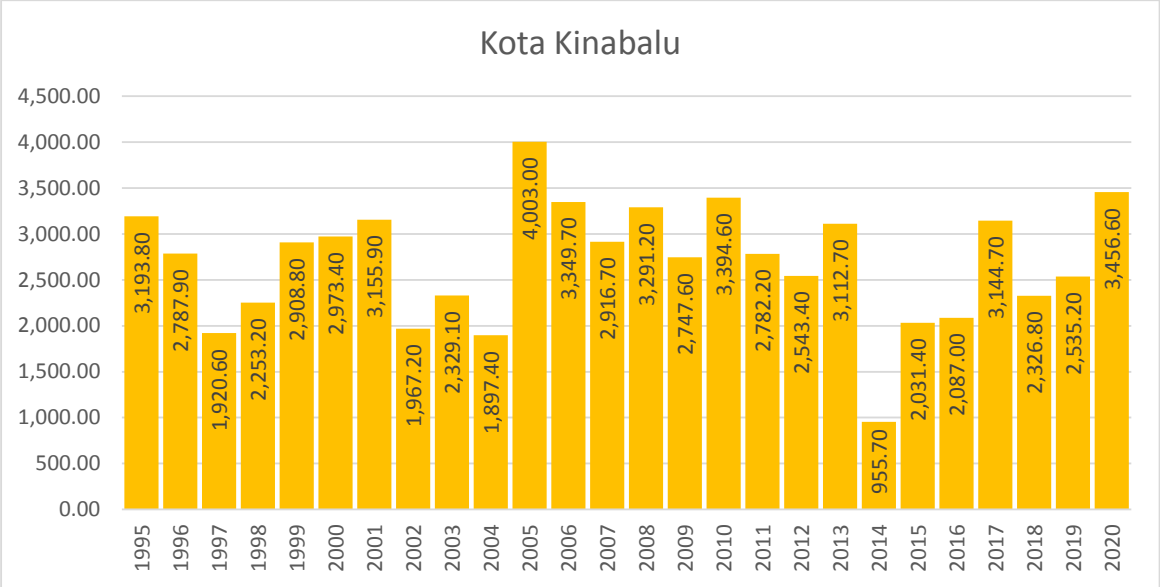
The total annual rainfall at the Keningau meteorological station from 2019 to 2020 is shown in Chart 1.1. The lowest annual rainfall was recorded in 2019 at 612.00 mm and the highest was in 2020 at 1,691.80 mm. The average annual rainfall at the station for the period was 1,151.90 mm. Records also showed total rainfall during both years did not exceeded 2,000 mm.

Chart 1.1: Rainfall distribution at Keningau meteorological station, Sabah, 2019 and 2020



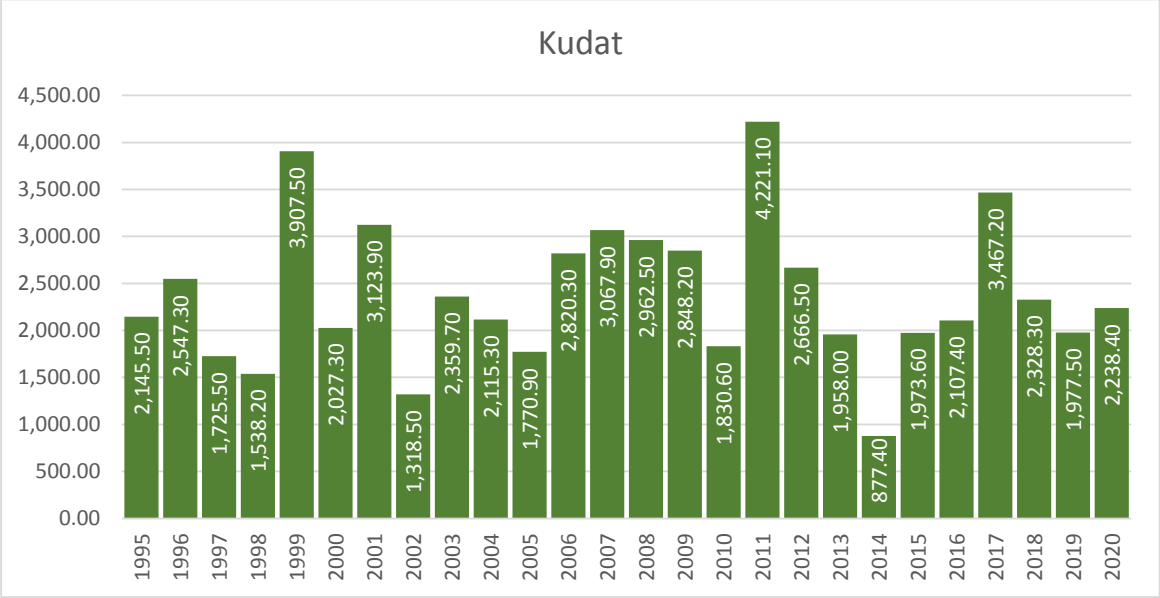
The total annual rainfall at the Kota Kinabalu meteorological station from 1995 to 2020 is shown in Chart 1.2. The lowest annual rainfall recorded in 2014 at 955.70 mm and the highest was in 2005 at 4,003.00 mm. The average annual rainfall at the station for the period was 2,694.84 mm. Records also showed 84.62 per cent (22 years) of total rainfall which always exceeded 2,000 mm per year except 1997 (1,920.60 mm), 2002 (1,967.20 mm), 2004 (1,897.40 mm) and 2014 (955.70 mm).

Chart 1.2: Rainfall distribution at Kota Kinabalu meteorological station, Sabah, 1995-2020



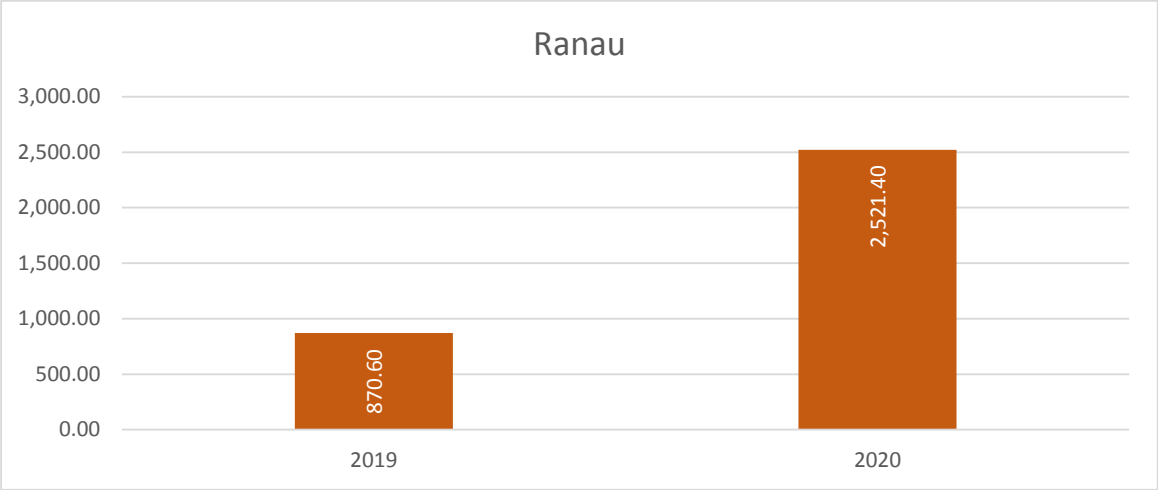
The total annual rainfall at the Kudat meteorological station from 1995 to 2020 is shown in Chart 1.3. The lowest annual rainfall recorded in 2014 at 877.40 mm and the highest was in 2011 at 4,221.10 mm. The average annual rainfall at the station for the period was 2,381.71 mm. Records also showed 65.38 per cent (17 years) of total rainfall always exceeded 2,000 mm per year except 1997 (1,725.50 mm), 1998 (1,538.20 mm), 2002 (1,318.50 mm), 2005 (1,770.90 mm), 2010 (1,830.60 mm), 2013 (1,958.00 mm), 2014 (877.40 mm), 2015 (1,973.60 mm) and 2019 (1,977.50 mm).

Chart 1.3: Rainfall distribution at Kudat meteorological station, Sabah, 1995-2020



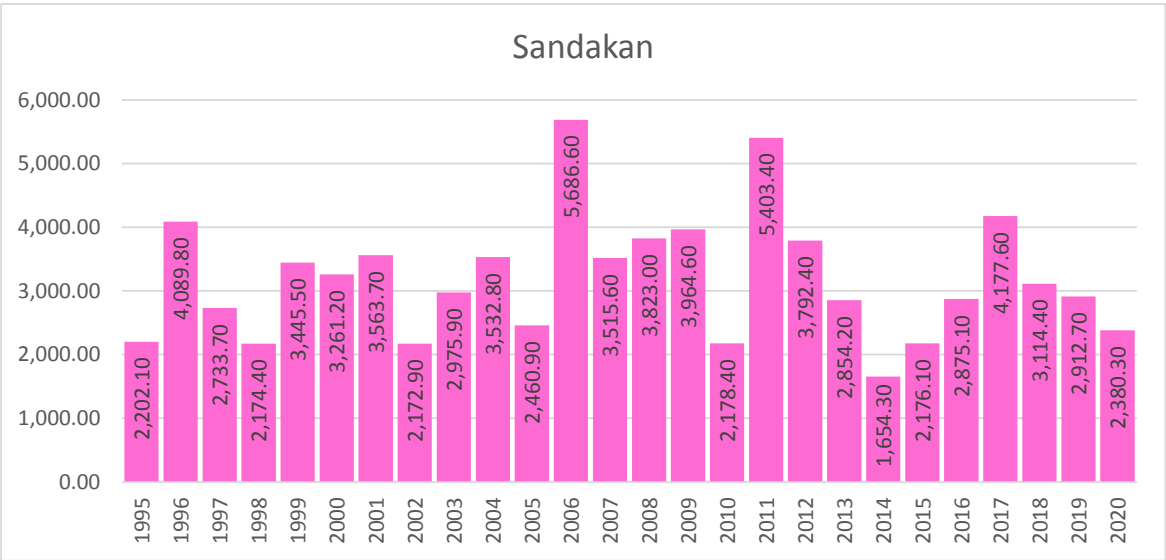
The total annual rainfall at the Ranau meteorological station from 1995 to 2020 is shown in Chart 1.4. The lowest annual rainfall recorded in 2019 at 870.60 mm and the highest was in 2020 at 2,521.40 mm. The average annual rainfall at the station for the period was 1,696.00 mm. Records also showed 50 per cent (1 year) of total rainfall always exceeded 2,000 mm per year except 2019 (870.60 mm).

Chart 1.3: Rainfall distribution at Ranau meteorological station, Sabah, 2019 and 2020



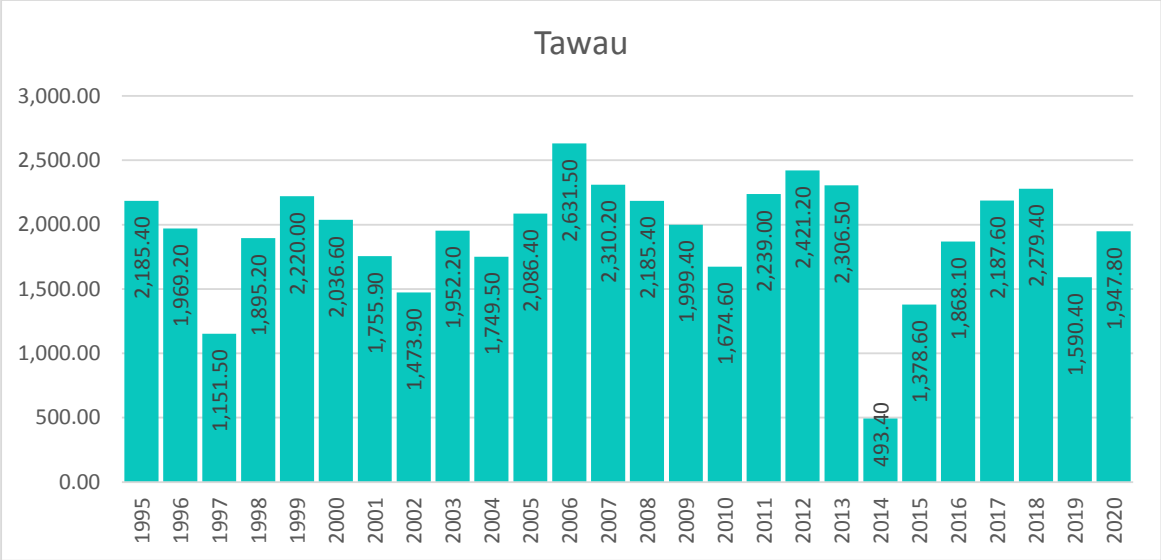
The total annual rainfall at the Sandakan meteorological station from 1995 to 2020 is shown in Chart 1.5. The lowest annual rainfall was recorded in 2014 at 1,654.30 mm and the highest in 2006 at 5,686.60 mm. The average annual rainfall at the station for the period was 3,196.98 mm. Records also showed 96.15 per cent (25 years) of total rainfall always exceeded 2,000 mm per year except 2014 (1,654.30 mm).

Chart 1.5: Rainfall distribution at Sandakan meteorological station, Sabah, 1995-2020



The total annual rainfall at the Tawau meteorological station from 1995 to 2020 is shown in Chart 1.6. The lowest annual rainfall recorded in 2014 at 493.40 mm and the lowest in 2006 at 2,631.50 mm. The average annual rainfall at the station for the period was 1,922.65 mm. Records also showed 46.15 per cent (12 years) of total rainfall that always exceeded 2,000 mm per year except 1996 (1,969.20 mm), 1997 (1,151.50 mm), 1998 (1,895.20 mm), 2001 (1,755.90 mm), 2002 (1,473.90 mm), 2003 (1,952.20 mm), 2004 (1,749.50 mm), 2009 (1,999.40 mm), 2010 (1,674.60 mm), 2014 (493.40 mm), 2015 (1,378.60 mm), 2016 (1,868.10 mm), 2019 (1,590.40 mm) dan 2020 (1,947.80 mm).

Chart 1.6: Rainfall distribution at Tawau meteorological station, Sabah, 1995-2020



Conclusion

The study of rainfall trends in a particular period is important and relevant in hydrological studies especially as a tool to detect and identify changes that occur in various water resources for planning and management (Xia et al., 2004). Information related to clear rainfall trends can be used as a forecasting indicator in planning to overcome major floods or the lack of rainfall associated with droughts. Changes in rainfall patterns that occur on a local and global scale as well as a high level of importance are required to assess rainfall distribution trends for specific purposes. This shows that the nature and characteristics of climate in one area is different from in other places due to differences in geographical aspects. In addition, the aspect of time also influences the nature and characteristics of the climate of an area which is also associated with global change and human action.

Malaysia is a country endowed with a large distribution of rainfall, reaching up to 970 billion cubic meters per year. Increases in water demand, especially during the dry season or drought cause disruption of treated water supply to occur frequently. This issue can pose risks to national development, water sustainability and the quality of life of the people. To overcome the problem, besides at the same time reducing dependence on domestic water supply, the Ministry of Environment and Water (KASA) through the Environmental Conservation Plan in Malaysia 2020-2030 set a target progressively starting 2021 to reach 100 million liters per day (MLD) rainwater harvesting and 3,000 MLD of groundwater reservoirs by 2030. This target will be achieved through the development of rainwater storage mechanisms as drinking water and domestic use, as well as the development of groundwater storage facilities for agriculture and industry[2].

[2] Bersama Memakmur Bumi (publication by KASA)

JADUAL STATISTIK

STATISTICAL TABLES

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Jadual 1.1: Purata suhu, volum hujan dan purata kelembapan relatif, Sabah, 2016-2020
Table 1.1: Mean temperature, rainfall volume and mean relative humidity, Sabah, 2016-2020

Negeri/Stesen meteorologi (ketinggian dari purata paras laut dalam meter) *Meteorological station (height above mean sea level in metres*	Tahun *Year*	Purata suhu (°C) *Mean temperature*		Hujan *Rainfall*		Purata kelembapan relatif *Mean relative humidity* (%)
		Min.	Maks. *Max.*	Jumlah *Total* (mm)	Bil. hari *No. of days*	
Keningau[1] (319.0 m)	2016	-	-	-	-	-
	2017	-	-	-	-	-
	2018	-	-	-	-	-
	2019	22.2	32.6	612.0	167	80.2
	2020	**22.6**	**32.0**	**1,691.8**	**189**	**81.7**
Kota Kinabalu (2.1 m)	2016	24.8	33.2	2,087.0	157	79.2
	2017	24.3	32.1	3,144.7	205	80.8
	2018	24.4	32.9	2,326.8	189	78.8
	2019	24.5	32.8	2,535.2	152	78.7
	2020	**24.3**	**32.2**	**3,456.6**	**208**	**82.4**
Kudat (3.5 m)	2016	24.8	31.6	2,107.4	145	82.2
	2017	24.3	30.7	3,467.2	204	84.4
	2018	24.6	31.2	2,328.3	170	82.7
	2019	24.4	31.2	1,977.5	141	81.2
	2020	**24.6**	**31.0**	**2,238.4**	**165**	**82.9**
Ranau[1] (501.0 m)	2016	-	-	-	-	-
	2017	-	-	-	-	-
	2018	-	-	-	-	-
	2019	20.6	30.3	870.6	203	80.3
	2020	**20.9**	**30.1**	**2,521.4**	**227**	**82.3**
Sandakan (12.1 m)	2016	25.1	32.2	2,875.1	178	82.5
	2017	24.6	30.7	4,177.6	221	83.1
	2018	24.7	31.8	3,114.4	203	82.8
	2019	24.5	31.7	2,912.7	163	80.9
	2020	**24.9**	**31.4**	**2,380.3**	**168**	**82.3**
Tawau (17.5 m)	2016	23.8	31.8	1,868.1	174	82.4
	2017	23.9	31.5	2,187.6	198	85.3
	2018	23.7	31.8	2,279.4	189	84.4
	2019	23.7	32.1	1,590.4	148	82.0
	2020	**23.8**	**31.8**	**1,947.8**	**185**	**85.0**

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Jadual 1.2: Purata bulanan tekanan aras laut, Sabah, 2020
Table 1.2: Monthly mean sea level pressure, Sabah, 2020

hPa

Stesen *Station*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Kota Kinabalu	1,010.0	1,010.9	1,010.3	1,010.1	1,009.4	1,009.6	1,008.8	1,009.3	1,009.3	1,008.9	1,009.3	1,008.4
Kudat	1,011.0	1,012.3	1,011.0	1,010.6	1,009.3	1,009.4	1,008.8	1,009.2	1,009.3	1,008.7	1,009.6	1,008.6
Sandakan	1,010.9	1,012.2	1,010.9	1,010.6	1,009.4	1,009.4	1,008.7	1,009.0	1,009.0	1,008.3	1,009.3	1,008.2
Tawau	1,010.4	1,011.3	1,010.5	1,010.4	1,009.4	1,009.5	1,008.8	1,009.3	1,009.2	1,008.5	1,009.1	1,008.3
Keningau	1,011.9	1,012.8	1,011.7	1,011.4	1,010.5	1,010.8	1,009.8	1,010.2	1,010.3	1,009.8	1,010.3	1,009.4
Ranau	1,012.8	1,013.9	1,012.1	1,011.8	1,010.7	1,010.9	1,010.1	1,010.6	1,010.6	1,009.8	1,010.8	1,009.7

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Jadual 1.3: Purata bulanan kelajuan angin permukaan, Sabah, 2020
Table 1.3: Monthly mean surface wind speed, Sabah, 2020

m/s

Stesen *Station*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Kota Kinabalu	2.0	2.1	2.1	2.3	2.2	2.2	2.3	2.2	2.3	2.5	2.1	2.2
Kudat	2.7	3.4	2.8	2.5	2.1	2.0	2.1	1.9	2.2	2.7	2.0	1.8
Sandakan	2.8	3.9	2.7	2.1	1.8	1.7	1.7	1.8	1.7	1.8	1.8	2.0
Tawau	1.7	2.1	2.0	1.9	1.7	1.4	1.4	1.7	1.6	1.3	1.3	1.2
Keningau	1.0	1.1	1.1	1.0	0.9	0.8	0.9	1.0	1.0	1.0	1.0	0.9
Ranau	1.2	1.5	1.4	1.4	1.0	1.3	1.0	1.0	1.1	1.4	1.0	1.0

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Jadual 1.4: Purata bulanan sinaran global, Sabah, 2020
Table 1.4: Monthly mean global radiation, Sabah, 2020

MJ/m^2

Stesen *Station*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Kota Kinabalu	19.94	22.95	22.80	23.39	21.34	17.45	19.41	19.78	19.10	17.10	18.81	18.72
Sandakan	16.98	20.24	22.54	24.93	22.47	19.44	19.67	20.34	19.35	15.80	17.13	16.63
Tawau	16.50	19.30	19.14	20.52	19.11	15.81	17.77	19.15	18.63	14.91	17.47	16.60
Keningau	17.67	19.64	20.90	22.39	20.25	18.66	20.23	21.30	20.91	17.25	18.46	17.96
Ranau	16.28	18.98	22.10	22.93	20.31	18.28	19.84	18.32	15.65	12.67	14.13	14.37

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Jadual 1.5: Purata bulanan penyejatan, Sabah, 2020
Table 1.5: Monthly mean evaporation, Sabah, 2020

mm

Stesen *Station*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Kota Kinabalu	4.6	5.3	5.0	5.5	4.9	4.9	4.5	4.9	4.4	4.8	4.5	4.4
Kudat	4.3	4.7	5.5	6.0	6.0	4.6	5.1	4.9	4.5	3.5	3.4	3.4
Sandakan	5.0	5.9	6.3	6.2	5.6	5.3	4.1	4.4	4.2	3.8	4.3	3.8
Tawau	4.2	5.4	4.3	4.6	4.2	3.2	3.9	3.9	4.3	3.5	4.2	3.6

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Jadual 1.6: Bacaan maksimum harian Indeks Ultra Ungu (UV), Kota Kinabalu, 2020
Table 1.6: Daily maximum reading of the Ultra Violet (UV) Index, Kota Kinabalu, 2020

Stesen/*Station*	Kota Kinabalu											
Bulan/*Monthly* Hari/*Days*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
1	11 +	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	10
2	7	7	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	11 +
3	10	Def.	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	11 +
4	Def.	Def.	11 +	11 +	11 +	11 +	11 +	11+	11+	7	10	11 +
5	11 +	Def.	11 +	11 +	11 +	11 +	11 +	9	11+	4	9	11 +
6	11 +	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	9	11+	11 +
7	11 +	11 +	11 +	11 +	11 +	9	11 +	11+	11+	11+	11+	11 +
8	10	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	10	11+	11 +
9	11 +	11 +	11 +	11 +	11 +	11 +	11 +	8	11+	11+	10	11 +
10	7	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	6	11 +
11	8	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	11 +
12	9	11 +	11 +	11 +	8	11 +	11 +	11+	11+	11+	11+	11 +
13	5	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	9	11+	11 +
14	11 +	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	10	11+	11 +
15	11 +	11 +	11 +	11 +	11 +	10	11 +	11+	7	11+	11+	11 +
16	Def.	11 +	11 +	11 +	11 +	11 +	11 +	11+	9	8	11+	11 +
17	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	9	Def.	11+	10
18	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	Def.	11 +
19	n.a.	11 +	Def.	11 +	11 +	Def.	11 +	11+	11+	5	11+	10
20	n.a.	11 +	Def.	11 +	11 +	11 +	11 +	11+	11+	9	9	7
21	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	11 +
22	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	Def.	11 +
23	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	6	3	9	9
24	n.a.	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	10	11 +
25	Def.	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	11+	11+	Def.
26	11 +	11 +	11 +	11 +	11 +	11 +	11 +	11+	10	4	2	6
27	11 +	11 +	11 +	11 +	11 +	11 +	11 +	11+	11+	7	10	8
28	11 +	11 +	11 +	11 +	11 +	9	11 +	11+	9	11+	11+	11 +
29	11 +	11 +	11 +	11 +	11 +	7	7	11+	11+	11+	11+	11 +
30	11 +		11 +	Def.	11 +	11 +	11 +	11+	11+	11+	7	9
31	11 +		11 +		11 +		11 +	10		11+		11 +

Nota:
Notes

Def. **Nilai *Defective***
Defective value

Sumber: Jabatan Meteorologi Malaysia
Source: Malaysia Meteorological Department

Status Indeks Ultra Ungu (UV)
Ultra Violet Index (UV) status

0 to 2	Rendah / *Low*
3 to 5	Sederhana / *Moderate*
6 to 7	Tinggi / *High*
8 to 10	Sangat Tinggi / *Very High*
11+	Melampau / *Extreme*

Jadual 1.7: Senarai lembangan sungai utama di Sabah
Table 1.7: List of major river basins in Sabah

Bil. *No.*	Nama Lembangan sungai *River basins name*	Luas (km^2) *Area*	Kategori *Category*	Negeri/Negara *State/Country*
1.	Trusan Kinabatangan	16,072.95	1	Sabah
2.	Sg. Padas	8,822.16	1	Sabah
3.	Sg. Labuk	5,667.59	1	Sabah
4.	Sg. Segama	4,402.69	1	Sabah
5.	Sg. Sugut	3,066.72	1	Sabah
6.	Sg. Kalabakan	1,337.44	1	Sabah
7.	Sg. Kalumpang	1,112.01	1	Sabah
8.	Sg. Tuaran	988.42	1	Sabah
9.	Sg. Abai	861.88	1	Sabah
10.	Sg. Kretam Besar	844.74	1	Sabah
11.	Sg. Maruap	839.31	1	Sabah
12.	Sg. Tuingkayu	789.78	1	Sabah
13.	Sg. Papar	788.03	1	Sabah
14.	Sg. Tandek	703.92	1	Sabah
15.	Sg. Serudong	698.93	1	Sabah
16.	Sg. Paitan	670.48	1	Sabah
17.	Sg. Brantian	599.06	1	Sabah
18.	Sg. Mengalong	587.85	1	Sabah
19.	Sg. Silabukan	525.72	1	Sabah
20.	Sg. Bongon	499.50	1	Sabah
21.	Sg. Klias	479.79	1	Sabah
22.	Sg. Bongaya	444.79	1	Sabah
23.	Sg. Umas Umas	415.37	1	Sabah
24.	Sg. Kaindangan	375.11	1	Sabah
25.	Sg. Tiram	352.46	1	Sabah
26.	Sg. Bukau	349.72	1	Sabah
27.	Sg. Sinsilog	305.16	1	Sabah
28.	Sg. Membakut	292.24	1	Sabah
29.	Sg. Sengarong	278.13	1	Sabah
30.	Sg. Burong	275.99	1	Sabah

Jadual 1.7: Senarai lembangan sungai utama di Sabah (samb.)
Table 1.7: List of major river basins in Sabah (cont'd)

Bil. *No.*	Nama lembangan sungai *River basins name*	Luas (km^2) *Area*	Kategori *Category*	Negeri/Negara *State/Country*
31.	Sg. Monyog	274.26	1	Sabah
32.	Sg. Samawang	260.47	1	Sabah
33.	Sg. Bandau	253.21	1	Sabah
34.	Sg. Ulu Tungku	250.39	1	Sabah
35.	Sg. Segaliud	248.94	1	Sabah
36.	Sg. Kanibongan	227.78	1	Sabah
37.	Sg. Keguraan	226.12	1	Sabah
38.	Sg. Sahabat	225.12	1	Sabah
39.	Sg. K.Klagan	208.46	1	Sabah
40.	Sg. Bongawan	206.81	1	Sabah
41.	Sg. Lakutan	204.39	1	Sabah
42.	Sg. Langkon	202.94	1	Sabah
43.	Sg. Mumiang	198.31	1	Sabah
44.	Sg. Kimanis	190.43	1	Sabah
45.	Sg. Gum-Gum Besar	163.74	1	Sabah
46.	Sg. Binsuluk	160.88	1	Sabah
47.	Sg. Telaga	155.78	1	Sabah
48.	Sg. Mamahat	152.16	1	Sabah
49.	Sg. Sapagaya	127.99	1	Sabah
50.	Sg. Merotai	149.60	1	Sabah
51.	Sg. Jeragan Bistari	148.09	1	Sabah
52.	Sg. Tawau	142.19	1	Sabah
53.	Sg. Pegagau	141.54	1	Sabah
54.	Sg. Sepagaya	127.99	1	Sabah
55.	Sg. Sulaman	127.60	1	Sabah
56.	Sg. Kolapis	121.26	1	Sabah
57.	Sg. Sabahan	120.95	1	Sabah
58.	Sg. Tanjung Labian	116.80	1	Sabah
59.	Sg. Apas	116.04	1	Sabah
60.	Sg. Mengkabong	114.66	1	Sabah

Jadual 1.7: Senarai lembangan sungai utama di Sabah (samb.)
Table 1.7: List of major river basins in Sabah (cont'd)

Bil. *No.*	Nama lembangan sungai *River basins name*	Luas (km^2) *Area*	Kategori *Category*	Negeri/Negara *State/Country*
61.	Sg. Milau	114.38	1	Sabah
62.	Sg. Tempasuk	110.15	1	Sabah
63.	Sg. Sekong Besar	108.15	1	Sabah
64.	Sg. Betotan	107.99	1	Sabah
65.	Sg. Suanlamba Besar	100.86	1	Sabah
66.	Sg. Inanam	95.90	1	Sabah
67.	Sg. Simandalan	93.50	1	Sabah
68.	Sg. Tatulit	90.64	1	Sabah
69.	Sg. Bode Besar	89.86	1	Sabah
70.	Sg. Pimpin	85.73	1	Sabah
71.	Sg. Sibunga Besar	81.89	1	Sabah
72.	Sg. Manalunan	81.37	1	Sabah
73.	Sg. Tegupi	81.35	1	Sabah
74.	Sg. Sibuku	799.45	3	Sabah/Indonesia
75.	Sg. Sembakung	5,467.77	3	Sabah/Indonesia

Sumber: Jabatan Pengairan dan Saliran
Source: Department of Irrigation and Drainage

Nota:
Notes:

Kajian Persempadanan Lembangan Sungai Malaysia Fasa I oleh Bahagian Pengurusan Lembangan Sungai (2009)
River Basin Malaysia Boundary Survey Phase I by the River Management Division (2009)

Kategori 1: Lembangan sungai dalam 1 negeri
Category 1: River basin within the state

Kategori 3: Lembangan sungai melibatkan negara lain
Category 3: River basin shared with other country

Lembangan sungai utama: Lembangan yang berkeluasan melebihi 80 km^2
Main river basins: An area of over 80 km^2

Jadual 1.8: Panjang pesisiran pantai, Sabah, 2020
Table 1.8: Coastal length, Sabah, 2020

Negeri *State*	Panjang pantai (km) *Coastal length*	Peratus *Per cent*
Malaysia	**8,840.0**	**100.0**
Sabah	3,752.9	42.5

Nota: ***National Coastal Erosion Study for Malaysia (2015)***
Notes:

Sumber: Jabatan Pengairan dan Saliran
Source: Department of Irrigation and Drainage

Jadual 1.9: Empangan dan kolam takungan di Sabah
Table 1.9: Dams and reservoirs in Sabah

Bil. *No.*	Nama empangan (Tahun siap dibina) *Name of dam (Year of completion)*	Lokasi (Negeri) *Location (State)*	Empangan *Dams*				Kolam takungan *Reservoirs*			
			Tinggi *Height* (m)	Panjang puncak *Peak length* (m)	Aras puncak *Top peak* (m)	Kawasan tadahan *Catchment area* (km^2)	Kapasiti *Capacity* (Mm^3)	Luahan alur limpah maksimum *Maximum flood flow* (cumecs)	Luas permukaan *Surface area* (km^2)	Aras biasa *Ordinary level* (m)
1.	Tenom (1984)	Sabah	-	-	-	7815.00	4.70	690.00	-	173.90
2.	Babagon (1997)	Sabah	73.00	375.00	133.10	30.00	16.60	2,136.00	0.75	122.00
3.	Pinangsoo (1969)	Sabah	12.00	65.00	18.30	3.37	0.49	84.00	0.50	16.24
4.	Sepagaya (1984)	Sabah	22.86	73.15	82.30	25.90	2.05	70.00	0.28	80.00
5.	Timbangan (1984)	Sabah	15.24	156.00	57.60	21.70	0.81	162.00	0.22	55.5

Sumber: Jabatan Pengairan dan Saliran
Source: Department of Irrigation and Drainage

Jadual 1.10: Keluasan tanah, Sabah, 2021
Table 1.10: Land area, Sabah, 2021

Bil. *No.*	Negeri/ Daerah *State/ Districts*	Keluasan (km^2) *Area*
	MALAYSIA	**330,411.35**
	Sabah	**73,620.75**
1.	Tawau	2,240.35
2.	Lahad Datu	7,443.66
3.	Semporna	1,144.78
4.	Sandakan	2,266.25
5.	Kinabatangan	6,604.50
6.	Labuk Sugut	5,498.36
7.	Kota Kinabalu	350.70
8.	Ranau	3,607.87
9.	Kota Belud	1,385.65
10.	Tuaran	1,165.50
11.	Penampang	424.73
12.	Papar	1,243.20
13.	Kudat	1,287.23
14.	Kota Marudu	1,916.60
15.	Pitas	1,419.32
16.	Beaufort	1,735.30
17.	Kuala Penyu	453.25
18.	Sipitang	2,732.45
19.	Tenom	2,408.70
20.	Pensiangan	6,089.09
21.	Keningau	3,532.76
22.	Tambunan	1,346.80
23.	Kunak	1,134.42
24.	Tongod	10,053.60
25.	Putatan	40.42
26.	Telupid	2,210.25
27.	Kalabakan	3,885.00

Sumber: Jabatan Tanah & Ukur Sabah
Source: Sabah Lands & Surveys Department

Jadual 1.11: Kawasan perlindungan yang digazet, Sabah
Table 1.11: Gazetted protected area, Sabah

Bil. *No.*	Kawasan perlindungan *Protected area*	Keluasan (Hektar) *Area (Hectares)*	Bilangan spesis / *Number of species*			
			Fauna			
			Mamalia *Mammals*	Burung *Birds*	Reptilia *Reptiles*	Amfibia *Amphibians*
	a. Taman *Parks*					
1.	Taman Marin Tun Sakaran	35,000.0	4	-	18	1
2.	Taman Banjaran Crocker	139,919.0	63	254	110	128
3.	Taman Bukit Tawau	27,972.0	78	133	155	68
4.	Taman Kinabalu	75,370.0	146	355	178	137
5.	Taman Pulau Penyu	1,740.0	5	20	7	-
6.	Taman Pulau Tiga	15,864.0	10	44	26	3
7.	Taman Pulau Sipadan	16,860.0	-	50	7	-
8.	Taman Tunku Abdul Rahman	4,929.0	10	32	37	6

Bil. *No.*	Kawasan perlindungan *Protected area*	Bilangan spesis / *Number of species*						
		Fauna				Flora		
		Moluska *Molluscs*	Ikan *Fish*	Cnidarians	Spesis invertebrata yang lain[1] *Other invertebrate species*	Rumpai laut *Seaweeds*	Rumput laut *Sea grass*	Tumbuhan *Plants*
	a. Taman / *Parks*							
1.	Taman Marin Tun Sakaran	-	-	-	299	-	-	220
2.	Taman Banjaran Crocker	28	60	-	623	-	-	1,334
3.	Taman Bukit Tawau	21	38	-	506	-	-	708
4.	Taman Kinabalu	69	71	-	1,798	-	-	4,104
5.	Taman Pulau Penyu	92	125	-	199	22	3	29
6.	Taman Pulau Tiga	11	2	-	231	-	-	125
7.	Taman Pulau Sipadan	3	-	-	191	-	-	20
8.	Taman Tunku Abdul Rahman	1	2	-	179	-	-	145

Jadual 1.11: Kawasan perlindungan yang digazet, Sabah (samb.)
Table 1.11: Gazetted protected area, Sabah (cont'd)

Bil. *No.*	Kawasan perlindungan *Protected area*	Keluasan (Hektar) *Area (Hectares)*	Bilangan spesis / *Number of species*			
			Fauna			
			Mamalia *Mammals*	Burung *Birds*	Reptilia *Reptiles*	Amfibia *Amphibians*
	b. Rizab Hidupan Liar *Wildlife Reserve*					
1.	Rizab Hidupan Liar Kulamba Kinabatangan	20,854.0	8	-	-	-
2.	Hutan Simpan Tabin (Rezab Hidupan Liar Tabin)	120,521.0	71	252	-	-
3.	Sugud Islands Marine Conservation Area (SIMCA)	46,317.0	6	9	3	-
4.	Hutan Simpan Gua Gomantong	3,297.0	2	2	-	-

Bil. *No.*	Kawasan perlindungan *Protected area*	Bilangan spesis / *Number of species*						
		Fauna				Flora		
		Moluska *Molluscs*	Ikan *Fish*	Cnidarians	Spesis invertebrata yang lain[1] *Other invertebrate species*	Rumpai laut *Seaweeds*	Rumput laut *Sea grass*	Tumbuhan *Plants*
	b. Rizab Hidupan Liar *Wildlife Reserve*							
1.	Rizab Hidupan Liar Kulamba Kinabatangan	-	-	-	-	-	-	-
2.	Hutan Simpan Tabin (Rezab Hidupan Liar Tabin)	-	-	-	26	-	-	779
3.	Sugud Islands Marine Conservation Area (SIMCA)	103	510	400	99	7	4	3
4.	Hutan Simpan Gua Gomantong	-	-	-	-	-	-	-

Jadual 1.11: Kawasan perlindungan yang digazet, Sabah (samb.)
Table 1.11: Gazetted protected area, Sabah (cont'd)

Bil. *No.*	Kawasan perlindungan *Protected area*	Keluasan (Hektar) *Area (Hectares)*	Bilangan spesis *Number of species*			
			Fauna			
			Mamalia *Mammals*	Burung *Birds*	Reptilia *Reptiles*	Amfibia *Amphibians*
	c. Santuari Hidupan Liar *Wildlife Sanctuaries*					
1.	Santuari Hidupan Liar Hilir Kinabatangan	26,103.3	11	5	-	-
2.	Santuari Burung Mantanani	61.0	1	4	2	-
3.	Santuari Burung Kota Belud	495.0	-	5	-	-
4.	Santuari Burung Bandaraya Kota Kinabalu	24.0	-	25	97	6
5.	Santuari Hidupan Liar Padang Teratak Beaufort	2,270.0	22	112	4	15
6.	Hutan Simpan Madai Baturong (Kelas VI)	111,971.0	71	252	-	-
7.	Pusat Pemulihan Orang Utan Sepilok	4,294.0	299	321	35	22

Bil. *No.*	Kawasan perlindungan *Protected area*	Bilangan spesis / *Number of species*						
		Fauna				Flora		
		Moluska *Molluscs*	Ikan *Fish*	Cnidarians	Spesis invertebrata yang lain[1] *Other invertebrate species*	Rumpai laut *Seaweeds*	Rumput laut *Sea grass*	Tumbuhan *Plants*
	c. Santuari Hidupan Liar *Wildlife Sanctuaries*							
1.	Santuari Hidupan Liar Hilir Kinabatangan	-	-	-	-	-	-	-
2.	Santuari Burung Mantanani	-	-	-	-	-	-	-
3.	Santuari Burung Kota Belud	-	-	-	-	-	-	-
4.	Santuari Burung Bandaraya Kota Kinabalu Santuari	13	-	-	44	-	-	13
5.	Santuari Hidupan Liar Padang Teratak Beaufort	-	-	-	-	-	-	9
6.	Hutan Simpan Madai Baturong (Kelas VI)	-	-	-	26	-	-	779
7.	Pusat Pemulihan Orang Utan Sepilok	-	202	-	1,001	-	-	10,410

Nota:
Notes:

[1]Lain-lain invertebrata seperti Serangga, Arthropods dan Echinoderms
Other invertebrates like Insects, Arthropods and Echinoderms

Meliputi maklumat daripada Jabatan Hidupan Liar Sabah dan Taman Negara, Jabatan Perikanan Malaysia, Jabatan Perhutanan Sabah, *Sabah Wetland Conservation Society* dan Taman-Taman Sabah
Includes data from Department of Wildlife and National Parks, Department of Fisheries, Sabah Wildlife Department, Sabah Forestry Department, Sabah Wetland Conservation Society and Sabah Parks

- : Tidak diliputi oleh agensi semasa tahun rujukan Banci Kawasan Perlindungan dan Kepelbagaian Biologi 2014
Not covered by the agency during Biodiversity and Protected Areas Census 2014 reference year

Jadual 1.12: Kawasan berhutan dan tidak berhutan, Sabah, 2014-2018
Table 1.12: Forested and non-forested areas, Sabah, 2014-2018

Tahun *Year*	Berhutan *Forested*		Tidak Berhutan *Non-Forested*	
	Hektar *Hectares*	(%)	Hektar *Hectares*	(%)
2014	4,435,990	60.26	2,926,010	39.74
2015	4,558,368	61.92	2,803,632	38.08
2016	4,558,368	61.92	2,803,632	38.08
2017	4,767,449	64.76	2,594,551	35.24
2018	**4,767,449**	**64.76**	**2,594,551**	**35.24**

Sumber: Kementerian Tenaga dan Sumber Asli & Jabatan Perhutanan Sabah
Source: Ministry of Energy and Natural Resources & Sabah Forestry Department

Jadual 1.13: Keluasan hutan simpanan kekal, Sabah, 2014-2018
Table 1.13: Area of permanent reserved forest, Sabah, 2014-2018

Hektar *Hectares*

Tahun *Year*	2014	2015	2016	2017	**2018**
Keluasan *Area*	3,615,066	3,551,247	3,540,274	3,540,749	**3,540,749**

Nota:
Notes:

Sumber: Kementerian Tenaga dan Sumber Asli & Jabatan Perhutanan Sabah
Source: Ministry of Energy and Natural Resources & Sabah Forestry Department

Hutan Simpanan Kekal di Sabah adalah merupakan Hutan Simpan yang diwartakan di bawah Akta Enakmen Hutan 1968 dan Peraturan Hutan 1969 yang terdiri daripada hutan darat, paya gambut, paya laut dan ladang hutan
Permanent Reserved Forest in Sabah reported based on gazetted FR under Forest Enactment 1968 and Forest Rules 1969 consists of Inland forest, peat swamp forest, mangrove forest and forest plantation.

Jadual 1.14: Keluasan hutan paya gambut, Sabah, 2014-2018
Table 1.14: Area of peat swamp forest, Sabah, 2014-2018

Hektar *Hectares*

Tahun *Year*	2014	2015	2016	2017	**2018**
Keluasan *Area*	120,000	77,705	77,705	53,446	**53,446**

Nota:
Notes:

Sumber: Kementerian Tenaga dan Sumber Asli & Jabatan Perhutanan Sabah
Source: Ministry of Energy and Natural Resources & Sabah Forestry Department

Bagi Sabah, laporan merujuk kepada luas kawasan litupan hutan paya gambut di dalam Hutan Simpan dan Tanah Kerajaan
For Sabah, the report refers to the area of peat swamp forests within the Forest Reserves and State Land

Jadual 1.15: Keluasan hutan paya laut, Sabah, 2014-2018
Table 1.15: Area of mangrove forest, Sabah, 2014-2018

Hektar *Hectares*

Negeri *State*	2014	2015	2016	2017	**2018**
Sabah	403,873	385,755	385,755	409,456	**409,456**

Nota:
Notes:

Sumber: Kementerian Tenaga dan Sumber Asli & Jabatan Perhutanan Sabah
Source: Ministry of Energy and Natural Resources & Sabah Forestry Department

Bagi Sabah, laporan merujuk kepada luas kawasan litupan hutan paya laut di dalam Hutan Simpan dan Tanah Kerajaan
For Sabah, the report refers to the area of mangrove forests within the Forest Reserves and State Land

Jadual 1.16: Status kualiti udara mengikut stesen, Sabah, 2019
Table 1.16: Air quality status by station, Sabah, 2019

Bilangan hari
Number of days

Stesen *Station*	Baik *Good* (0-50)	Sederhana *Moderate* (51-100)	Tidak Sihat *Unhealthy* (101-200)	Sangat Tidak Sihat *Very Unhealthy* (201-300)	Berbahaya *Hazardous* (>300)
Keningau	161	204	-	-	-
Kimanis	227	137	1	-	-
Kota Kinabalu	159	203	-	2	-
Sandakan	236	126	3	-	-
Tawau	316	46	3	-	-

Nota: Stesen yang tidak mencukupi 365 hari adalah disebabkan masalah teknikal
Notes: Stations with inadequate 365 days is due to technical problem

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.17: Status kualiti udara mengikut stesen, Sabah, 2020
Table 1.17: Air quality status by station, Sabah, 2020

Bilangan hari
Number of days

Stesen *Station*	Baik *Good* (0-50)	Sederhana *Moderate* (51-100)	Tidak Sihat *Unhealthy* (101-200)	Sangat Tidak Sihat *Very Unhealthy* (201-300)	Berbahaya *Hazardous* (>300)
Keningau	229	137	-	-	-
Kimanis	296	70	-	-	-
Kota Kinabalu	270	96	-	-	-
Sandakan	292	74	-	-	-
Tawau	358	7	-	-	-

Nota: Stesen yang tidak mencukupi 365 hari adalah disebabkan masalah teknikal
Notes: Stations with inadequate 365 days is due to technical problem

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.18: Bacaan minimum dan maksimum bulanan Indeks Pencemaran Udara[1] (IPU), Sabah, 2020
Table 1.18: Monthly minimum and maximum Air Pollutant Index (API), Sabah, 2020

Stesen *Station*	Jan.		Feb.		Mac *Mar.*		Apr.		Mei *May*		Jun *June*	
	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*
Keningau	24	60	21	56	22	57	24	61	16	56	15	55
Kimanis	10	55	19	85	24	69	19	62	11	51	9	29
Kota Kinabalu	12	66	18	77	26	60	22	56	11	56	12	50
Sandakan	21	52	24	52	26	54	21	53	17	54	24	52
Tawau	16	48	18	43	16	52	15	44	12	43	17	47

Stesen *Station*	Julai *July*		Ogos *Aug.*		Sept.		Okt. *Oct.*		Nov.		Dis. *Dec.*	
	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*	Min.	Maks. *Max.*
Keningau	15	54	23	71	19	56	22	60	16	58	19	56
Kimanis	9	38	10	48	10	31	9	44	10	33	11	29
Kota Kinabalu	11	51	11	58	11	54	9	53	11	56	14	53
Sandakan	25	53	24	55	21	55	25	60	24	54	15	55
Tawau	12	53	15	40	12	34	10	33	21	63	16	55

Nota: [1] Bacaan status kualiti udara berdasarkan bacaan maksimum harian
Notes: Air quality status readings are based on daily maximum readings

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Status Indeks Pencemaran Udara (IPU)
Air Pollutant Index (API) status

IPU /*API*	Status IPU / *API 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 1.19: Purata bulanan kepekatan Habuk Halus ($PM_{2.5}$) di udara, Sabah, 2019 dan 2020
Table 1.19: Monthly average concentration of Particulate Matter ($PM_{2.5}$) in the air, Sabah, 2019 and 2020

µg/m³

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	10.52	12.98	17.94	12.89	11.70	9.39	12.27	19.33	28.72	7.20	11.11	8.72
	2020	10.50	10.62	11.62	12.07	8.34	7.22	6.80	11.10	8.75	11.43	9.49	8.70
Kimanis	2019	7.84	18.92	28.10	16.18	8.22	5.96	7.95	13.94	27.27	5.75	7.41	4.39
	2020	7.73	16.27	14.99	11.75	6.96	3.81	3.93	5.44	4.06	5.11	4.88	4.63
Kota Kinabalu	2019	12.92	21.71	26.23	15.62	11.46	7.99	9.98	15.96	27.78	7.73	8.81	5.78
	2020	10.30	13.97	12.77	9.96	6.91	5.46	4.85	7.93	5.73	6.01	6.05	5.63
Sandakan	2019	8.16	9.29	10.53	9.46	9.97	8.98	9.99	14.90	26.17	10.89	10.09	7.62
	2020	8.56	9.69	10.14	9.88	8.54	8.88	9.33	9.11	9.67	10.01	9.47	8.03
Tawau	2019	7.19	8.05	8.88	8.14	6.96	6.34	8.39	9.93	23.74	8.28	8.63	6.38
	2020	7.18	6.85	6.91	7.33	6.10	6.88	7.19	6.46	5.41	4.95	6.78	6.64

Nota: Garis Panduan Kualiti Udara Malaysia: $PM_{2.5}$ tidak melebihi 50 µg/m³
Notes: Malaysian Ambient Air Quality Guidelines: $PM_{2.5}$ not exceeding 50 µg/m³

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.20: Purata bulanan kepekatan Habuk Halus (PM_{10}) di udara, Sabah, 2019 dan 2020
Table 1.20: Monthly average concentration of Particulate Matter (PM_{10}) in the air, Sabah, 2019 and 2020

µg/m³

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	16.42	18.89	25.85	22.35	21.47	19.07	20.78	26.78	36.52	15.16	19.71	16.93
	2020	17.87	18.21	18.63	18.86	16.34	14.30	12.91	14.68	14.59	17.64	16.83	18.52
Kimanis	2019	16.26	30.07	39.61	27.78	17.04	14.22	17.79	22.84	37.71	13.63	13.95	11.95
	2020	17.87	32.92	25.18	20.76	13.55	10.86	10.45	12.07	10.93	10.17	10.82	12.11
Kota Kinabalu	2019	25.22	34.46	37.94	28.36	21.01	17.10	19.83	26.88	39.63	15.84	14.97	17.66
	2020	23.69	29.44	25.17	19.93	16.46	13.22	9.87	14.03	10.57	7.44	14.22	18.12
Sandakan	2019	18.80	18.29	17.77	16.65	15.66	15.06	16.51	22.09	33.95	15.92	16.45	14.54
	2020	16.84	20.31	17.65	14.90	13.10	13.91	13.77	14.34	15.42	15.48	14.92	14.10
Tawau	2019	14.66	15.65	15.55	14.05	12.29	12.52	14.63	17.09	32.75	14.64	15.25	13.64
	2020	13.83	13.60	12.35	13.19	12.85	20.23	14.27	23.00	11.86	18.27	25.73	14.30

Nota: Garis Panduan Kualiti Udara Malaysia: PM_{10} tidak melebihi 120 µg/m³
Notes: Malaysian Ambient Air Quality Guidelines: PM_{10} not exceeding 120 µg/m³

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.21: Purata bulanan kepekatan Ozon Permukaan Bumi (O_3) di udara, Sabah, 2019 dan 2020
Table 1.21: Monthly average concentration of Ground Level Ozone (O_3) in the air, Sabah, 2019 and 2020

ppm

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	0.013	0.015	0.016	0.012	0.011	0.008	0.008	0.012	0.013	0.007	0.010	0.010
	2020	0.010	0.013	0.011	0.013	0.008	0.006	0.005	0.008	0.006	0.008	0.008	0.008
Kota Kinabalu	2019	0.012	0.014	0.015	0.014	0.014	0.012	0.011	0.014	0.015	0.008	0.015	0.014
	2020	0.013	0.015	0.014	0.016	0.012	0.011	0.009	0.013	0.010	0.013	0.013	0.013
Sandakan	2019	0.022	0.024	0.019	0.017	0.015	0.010	0.013	0.017	0.018	0.010	0.014	0.017
	2020	0.020	0.024	0.019	0.020	0.013	0.010	0.009	0.012	0.009	0.012	0.014	0.013
Tawau	2019	0.013	0.017	0.015	0.012	0.011	0.008	0.011	0.014	0.015	0.008	0.013	0.011
	2020	0.012	0.016	0.013	0.015	0.010	0.008	0.007	0.009	0.008	0.010	0.009	0.010

Nota: Garis Panduan Kualiti Udara Malaysia: O_3 tidak melebihi 0.1 ppm
Notes: Malaysian Ambient Air Quality Guidelines: O_3 not exceeding 0.1 ppm

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.22: Purata bulanan kepekatan Karbon Monoksida (CO) di udara, Sabah, 2019 dan 2020
Table 1.22: Monthly average concentration of Carbon Monoxide (CO) in the air, Sabah, 2019 and 2020

ppm

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	0.584	0.581	0.665	0.612	0.687	0.577	0.703	0.688	0.823	0.614	0.536	0.684
	2020	0.665	0.630	0.690	0.635	0.649	0.665	0.610	0.557	0.599	0.618	0.596	0.594
Kota Kinabalu	2019	0.352	0.412	0.448	0.391	0.267	0.237	0.262	0.541	0.735	0.337	0.349	0.389
	2020	0.359	0.497	0.531	0.558	0.564	0.332	0.411	0.494	0.326	0.264	0.228	0.241
Sandakan	2019	0.527	0.470	0.514	0.522	0.573	0.496	0.491	0.519	0.670	0.500	0.459	0.483
	2020	0.478	0.488	0.568	0.435	0.567	0.558	0.554	0.537	0.524	0.519	0.542	0.600
Tawau	2019	0.650	0.615	0.621	0.670	0.697	0.649	0.599	0.673	0.778	0.640	0.696	0.661
	2020	0.593	0.585	0.540	0.636	0.536	0.553	0.664	0.732	0.678	0.630	0.682	0.679

Nota: Garis Panduan Kualiti Udara Malaysia: CO tidak melebihi 9 ppm
Note: Malaysian Ambient Air Quality Guidelines: CO not exceeding 9 ppm

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.23: Purata bulanan kepekatan Sulfur Dioksida (SO_2) di udara, Sabah, 2019 dan 2020
Table 1.23: Monthly average concentration of Sulphur Dioxide (SO_2) in the air, Sabah, 2019 and 2020

ppm

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	0.0012	0.0015	0.0009	0.0004	0.0004	0.0005	0.0007	0.0009	0.0010	0.0011	0.0014	0.0015
	2020	0.0017	0.0013	0.0007	0.0008	0.0009	0.0011	0.0012	0.0010	0.0012	0.0014	0.0015	0.0011
Kimanis	2019	0.0007	0.0009	0.0007	0.0004	0.0004	0.0005	0.0007	0.0008	0.0009	0.0009	0.0009	0.0006
	2020	0.0007	0.0008	0.0008	0.0008	0.0005	0.0005	0.0007	0.0006	0.0006	0.0008	0.0006	0.0005
Kota Kinabalu	2019	0.0016	0.0016	0.0011	0.0008	0.0010	0.0012	0.0013	0.0015	0.0017	0.0010	0.0011	0.0012
	2020	0.0011	0.0015	0.0014	0.0007	0.0007	0.0011	0.0011	0.0008	0.0005	0.0005	0.0010	0.0014
Sandakan	2019	0.0006	0.0006	0.0007	0.0007	0.0004	0.0003	0.0007	0.0007	0.0018	0.0009	0.0006	0.0007
	2020	0.0009	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0004	0.0006	0.0007	0.0007	0.0006
Tawau	2019	0.0008	0.0008	0.0008	0.0006	0.0006	0.0007	0.0008	0.0006	0.0006	0.0007	0.0008	0.0006
	2020	0.0005	0.0006	0.0005	0.0004	0.0004	0.0005	0.0007	0.0008	0.0008	0.0008	0.0008	0.0006

Nota: Garis Panduan Kualiti Udara Malaysia: SO_2 tidak melebihi 0.035 ppm
Notes: Malaysian Ambient Air Quality Guidelines: SO_2 not exceeding 0.035 ppm

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.24: Purata bulanan kepekatan Nitrogen Dioksida (NO_2) di udara, Sabah, 2019 dan 2020
Table 1.24: Monthly average concentration of Nitrogen Dioxide (NO_2) in the air, Sabah, 2019 and 2020

ppm

Stesen *Station*	Tahun *Year*	Jan.	Feb.	Mac *Mar.*	Apr.	Mei *May*	Jun *June*	Julai *July*	Ogos *Aug.*	Sept.	Okt. *Oct.*	Nov.	Dis. *Dec.*
Keningau	2019	0.0022	0.0021	0.0032	0.0029	0.0030	0.0030	0.0038	0.0044	0.0042	0.0029	0.0038	0.0030
	2020	0.0032	0.0030	0.0030	0.0018	0.0021	0.0022	0.0020	0.0028	0.0024	0.0029	0.0023	0.0024
Kimanis	2019	0.0021	0.0028	0.0027	0.0019	0.0016	0.0015	0.0018	0.0022	0.0025	0.0017	0.0017	0.0016
	2020	0.0024	0.0029	0.0018	0.0012	0.0010	0.0014	0.0011	0.0016	0.0013	0.0010	0.0012	0.0012
Kota Kinabalu	2019	0.0049	0.0056	0.0049	0.0038	0.0028	0.0024	0.0026	0.0030	0.0031	0.0020	0.0024	0.0024
	2020	0.0033	0.0042	0.0026	0.0012	0.0014	0.0019	0.0018	0.0028	0.0025	0.0020	0.0022	0.0024
Sandakan	2019	0.0039	0.0037	0.0038	0.0037	0.0042	0.0044	0.0045	0.0045	0.0051	0.0050	0.0052	0.0046
	2020	0.0042	0.0033	0.0027	0.0016	0.0028	0.0041	0.0041	0.0041	0.0045	0.0034	0.0036	0.0041
Tawau	2019	0.0057	0.0049	0.0050	0.0044	0.0048	0.0045	0.0045	0.0046	0.0048	0.0044	0.0052	0.0051
	2020	0.0055	0.0057	0.0037	0.0026	0.0036	0.0046	0.0046	0.0050	0.0041	0.0035	0.0043	0.0049

Nota: Garis Panduan Kualiti Udara Malaysia: NO_2 tidak melebihi 0.16 ppm
Notes: Malaysian Ambient Air Quality Guidelines: NO_2 not exceeding 0.16 ppm

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 1.25: Status kualiti air marin di kawasan pesisiran pantai, muara sungai dan pulau berdasarkan Indeks Kualiti Air Marin, Sabah, 2017-2020

Table 1.25: Status of marine water quality in coastal, estuary and island areas based on Marine Water Quality Index, Sabah, 2017-2020

Bilangan stesen
Number of stations

Kawasan *Areas*	Kategori / *Category*															
	2017				2018				2019				**2020**			
	E	**G**	**M**	**P**	**E**	**G**	**M**	**P**	**E**	**G**	**M**	**P**	**E**	**G**	**M**	**P**
Pantai *Coastal*	-	5	18	1	24	-	-	-	7	11	6	-	**-**	**-**	**24**	**-**
Muara sungai *Estuary*	-	1	1	-	2	-	-	-	-	1	1	-	**-**	**-**	**2**	**-**
Pulau *Island*	-	14	3	-	17	-	-	-	3	9	5	-	**-**	**-**	**17**	**-**

Nota:
Notes:

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Klasifikasi Indeks Kualiti Air Marin:
Marine Water Quality Index Classification:

Kategori *Category*	**Nilai indeks** *Index value*
E	Terbaik/*Excellent* (90 - 100)
G	Baik/*Good* (80 - <90)
M	Sederhana/*Moderate* (50 - <80)
P	Tercemar/*Poor* (0 - <50)

Jadual 2.1: Rizab minyak mentah dan kondensat, Sabah, 2015-2019
Table 2.1: Reserves of crude oil and condensates, Sabah, 2015-2019

Tahun *Year*	2015	2016	2017	2018	**2019[p]**
Rizab (Bilion tong) *Reserves (Billion barrels)*	2.009	1.925	1.767	1.637	**1.497**

Sumber: Suruhanjaya Tenaga
Source: Energy Commission

Jadual 2.2: Rizab gas asli, Sabah, 2015-2019
Table 2.2: Reserves of natural gas, Sabah, 2015-2019

Trilion Kubik Kaki Standard (TSCF)
Trillion Standard Cubic Feet

Jenis *Type*	2015	2016	2017	2018	**2019[p]**
Jumlah *Total*	15.032	13.436	12.547	12.582	**11.665**
Bersekutu *Associated*	3.149	2.521	1.487	2.078	**2.054**
Tidak bersekutu *Non-associated*	11.884	10.915	11.060	10.504	**9.611**

Sumber: Suruhanjaya Tenaga
Source: Energy Commission

Jadual 2.3: Keluasan hutan yang dilesenkan untuk pengusahasilan, Sabah, 2014-2018
Table 2.3: Forest area licensed for harvesting, Sabah, 2014-2018

Hektar
Hectares

Tahun *Year*	2014	2015	2016	2017	**2018**
Keluasan *Area*	100,234	70,484	80,368	171,828	**60,875**

Sumber: Jabatan Perhutanan Sabah
Source: Sabah Forestry Department

Jadual 2.4: Pengeluaran produk kayu-kayan utama, Sabah 2014-2018
Table 2.4: Production of major timber products, Sabah, 2014-2018

Meter padu
Cubic metres

Tahun *Year*	Kayu balak[1] *Logs*	Kayu gergaji *Sawn timber*	Papan lapis *Plywood*	Venir *Veneer*	Kayu kumai *Moulding*
2014	1,829,029	254,332	653,984	156,992	59,836
2015	1,856,451	219,866	654,731	136,433	54,423
2016	2,083,435	241,869	607,438	119,036	47,067
2017	1,375,455	192,023	493,210	92,335	43,176
2018	**1,384,739**	**218,838**	**470,626**	**98,085**	**33,277**

Sumber: Jabatan Perhutanan Sabah
Source: Sabah Forestry Department

Nota:
Notes:

[1] **Tidak termasuk pengeluaran kayu getah, kayu jaras, batang kelapa dan batang kelapa sawit**
Exclude production of hevea logs, poles, coconut trunks and oil palm trunks

***Data merujuk kepada syarikat yang berdaftar dengan Jabatan Perhutanan Sabah sahaja**
Data refers to establishment registered with Sabah Forestry Department only

Jadual 2.5: Pendaratan ikan laut, Sabah, 2016-2020
Table 2.5: Landings of marine fish, Sabah, 2016-2020

Tan metrik ('000)
Metric tonnes

Negeri *State*	2016		2017		2018		2019		**2020**	
	Kuantiti *Quantity*	%	Kuantiti *Quantity*	%	Kuantiti *Quantity*	%	Kuantiti *Quantity*	%	Kuantiti *Quantity*	%
Malaysia	**1,583.8**	**100.0**	**1,465.2**	**100.0**	**1,476.9**	**100.0**	**1,455.4**	**100.0**	**1,383.3**	**100.0**
Sabah	165.6	10.5	162.3	11.1	163.1	11.0	179.7	12.3	**206.7**	**14.9**

Sumber: Jabatan Perikanan Malaysia
Source: Department of Fisheries Malaysia

Jadual 2.6: Bilangan ternakan, Sabah, 2019
Table 2.6: Number of livestock, Sabah, 2019

Bilangan
Number

Negeri *State*	Jenis ternakan *Type of livestock*						
	Kerbau *Buffalo*	Lembu *Cattle*	Kambing *Goat*	Bebiri *Sheep*	Babi *Swine*	Ayam *Chicken*	Itik *Duck*
Jumlah *Total*	47,485	60,930	45,820	1,532	86,732	6,858,731	53,550

Sumber: Jabatan Perkhidmatan Veterinar
Source: Department of Veterinary Services

Jadual 2.7: Anggaran bilangan ternakan, Sabah, 2020
Table 2.7: Estimated number of livestock, Sabah, 2020

Bilangan
Number

Negeri *State*	Jenis ternakan *Type of livestock*						
	Kerbau *Buffalo*	Lembu *Cattle*	Kambing *Goat*	Bebiri *Sheep*	Babi *Swine*	Ayam *Chicken*	Itik *Duck*
Jumlah *Total*	46,530	58,306	44,509	1,551	85,676	7,368,817	54,683

Sumber: Jabatan Perkhidmatan Veterinar
Source: Department of Veterinary Services

Jadual 2.8: Reka bentuk kapasiti loji rawatan air, Sabah, 2016-2020
Table 2.8: Water treatment plants design capacity, Sabah, 2016-2020

Juta liter sehari (JLH)
Million litres per day (MLD)

Tahun *Year*	2016	2017	2018	2019	**2020[p]**
Kapasiti *Capacity*	1,448	1,478	1,481	1,499	**1,490**

Sumber: Kementerian Alam Sekitar dan Air
Source: Ministry of Environment and Water

Jadual 2.9: Pengeluaran air yang dibekalkan Sabah, 2016-2020
Table 2.9: Production of water supplied, Sabah, 2016-2020

Juta liter sehari (JLH)
Million litres per day (MLD)

Tahun *Year*	2016	2017	2018	2019	**2020[p]**
Pengeluaran *Production*	1,223	1,261	1,304	1,374	**1,324**

Sumber: Kementerian Alam Sekitar dan Air
Source: Ministry of Environment and Water

Jadual 2.10: Bekalan air mentah diabstrak dari sungai, empangan dan air bawah tanah, Sabah, 2016-2020
Table 2.10: Supply of abstracted raw water from rivers, storage dams and groundwater, Sabah, 2016-2020

Juta liter sehari (JLH)
Million litres per day (MLD)

Tahun *Year*	2016	2017	2018	2019	**2020[p]**
Sungai *Rivers*	829	873	961	948	**974**
Empangan *Dams*	486	500	391	396	**390**
Air bawah tanah *Groundwater*	14	16	18	40	**28**

Sumber: Kementerian Alam Sekitar dan Air
Source: Ministry of Environment and Water

Jadual 2.11: Penggunaan air bermeter mengikut sektor, Sabah, 2016-2020
Table 2.11: Metered water consumption by sector, Sabah, 2016-2020

Juta liter sehari (JLH)
Million litres per day (MLD)

Sektor *Sector*	Domestik *Domestic*					Bukan domestik *Non-domestic*				
Tahun *Year*	2016	2017	2018	2019	**2020[p]**	2016	2017	2018	2019	**2020[p]**
Penggunaan air bermeter *Metered water consumption*	338	323	341	366	**300**	249	259	275	278[r]	**238**

Sumber: Kementerian Alam Sekitar dan Air
Source: Ministry of Environment and Water

Jadual 3.1: Bilangan kemudahan rawatan dan pelupusan sisa perbandaran, Sabah, 2020
Table 3.1: Number of municipal waste treatment and disposal facilities, Sabah, 2020

Tapak pelupusan di bawah seliaan SWCorp *Disposal site under SWCorp*	Loji rawatan termal *Thermal treatment plant*	Tapak pelupusan bukan di bawah seliaan SWCorp *Disposal site not under SWCorp*
-	-	21

Sumber: Kementerian Perumahan dan Kerajaan Tempatan
Source: Ministry of Housing and Local Government

Jadual 3.2: Buangan terjadual, Sabah, 2016-2020
Table 3.2: Scheduled waste, sabah, 2016-2020

Tan metrik
Tonnes

Tahun *Year*	2016	2017	2018	2019	**2020**
Kuantiti *Quantity*	7,854	16,480	17,267	89,463	**460,171**

Nota: Mulai 2015, statistik ini termasuk buangan terjadual yang diuruskan di bawah pengurusan khas mengikut Peraturan 7, Peraturan-Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005 (Pengurusan Khas)
Notes: Since 2015, these statistics include scheduled wastes managed under special management under Rule 7 of the Rules, the Environmental Quality (Scheduled Wastes 2005 (Special Management)

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 3.3: Kuantiti buangan klinikal, Sabah, 2016-2020
Table 3.3: Quantity of clinical waste, Sabah, 2016-2020

Tan metrik
Tonnes

Tahun *Year*	2016	2017	2018	2019	**2020**
Kuantiti *Quantity*	1,586.4	1,762.6	1,849.3	1,900.0	**2,606.0**

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Jadual 3.4: Bilangan tapak pelupusan sisa pepejal yang beroperasi, Sabah, 2016-2020
Table 3.4: Number of operating solid waste landfills, Sabah, 2016-2020

Tahun *Year*	Sanitari *Sanitary*	Bukan sanitari *Non sanitary*	Lengai *Inert*
2016	1	18	-
2017	1	21	-
2018	1	21	-
2019	1	21	-
2020	**1**	**21**	**-**

Sumber: Kementerian Perumahan dan Kerajaan Tempatan
Source: Ministry of Housing and Local Government

Jadual 4.1: Bilangan kejadian banjir yang dilaporkan, Sabah, 2016-2020
Table 4.1: Number of flood incidents reported, Sabah, 2016-2020

Tahun *Year*	2016	2017	2018	2019	**2020**
Bilangan *Number*	6	28	18	39	**44**

Sumber: Jabatan Pengairan dan Saliran
Source: Department of Irrigation and Drainage

Jadual 4.2: Bilangan kemalangan jalan raya dan kecederaan yang dilaporkan, Sabah, 2016-2020
Table 4.2: Number of road accidents and casualties reported, Sabah, 2016-2020

Tahun *Year*	Kemalangan jalan raya *Road accidents*	Kecederaan *Casualties*		
		Kecederaan[1] *Injury*	Kematian *Death*	Jumlah *Total*
2016	16,527	924	359	1,283
2017	16,583	937	338	1,275
2018	17,401	664	298	962
2019	17,902	632	284	916
2020	**12,906**	**385**	**220**	**605**

[1]Kecederaan merujuk kepada kecederaan ringan dan parah
Injury refer to minor and serious injuries

Sumber: Polis Diraja Malaysia
Source: Royal Malaysia Police

Jadual 4.3: Bilangan kejadian kebakaran, Sabah, 2016-2020
Table 4.3: Number of fire incidents, Sabah, 2016-2020

Tahun *Year*	2016	2017	2018	2019	**2020**
Bilangan *Number*	4,620	1,739	2,475	4,534	**2,927**

Sumber: Kementerian Perumahan dan Kerajaan Tempatan
Source: Ministry of Housing and Local Government

Jadual 4.4: Bilangan kematian, kecederaan dan anggaran kerugian akibat kebakaran yang dilaporkan Sabah, 2016-2020
Table 4.4: Number of deaths, injuries and estimated losses caused by fire reported, Sabah, 2016-2020

Tahun *Year*	Kematian *Death*	Kecederaan *Injury*	Kerugian *Loss* (RM juta/ *millions)*
2016	19	36	509.4
2017	18	27	580.5
2018	14	24	176.6
2019	14	29	374.2
2020	**17**	**44**	**941.9**

Sumber: Kementerian Perumahan dan Kerajaan Tempatan
Source: Ministry of Housing and Local Government

Jadual 4.5: Taburan kawasan hakisan pantai di Sabah, 2020
Table 4.5: Distribution of coastal erosion areas in Sabah, 2020

Negeri *State*	Jumlah (km) *Total*	Pantai yang mengalami hakisan mengikut kategori[e] *Coastal erode by category*						Jumlah hakisan (km) *Total erosion*	%
		Kategori 1 *Category*		Kategori 2 *Category*		Kategori 3 *Category*			
		Bil. kawasan *No. of area*	Panjang agregat (km) *Aggregate length*	Bil. kawasan *No. of area*	Panjang agregat (km) *Aggregate length*	Bil. kawasan *No. of area*	Panjang agregat (km) *Aggregate length*		
Malaysia	**8,840.0**	**44**	**55.4**	**309**	**375.9**	**2,344**	**916.3**	**1,347.6**	**15.2**
Sabah	3,752.9	3	3.0	63	79.1	1,120	347.2	429.3	11.4

Sumber: Jabatan Pengairan dan Saliran
Source: Department of Irrigation and Drainage

Nota:
*Notes***:**

Kategori 1: **Pengunduran garis pantai yang cepat dengan kadar melebihi 4 meter/ tahun umumnya di kawasan dengan penduduk yang agak padat bersama aktiviti komersial/ industri yang mendapat perkhidmatan infrastruktur dan kemudahan awam.**
Category 1: *Fast retreating coastline at the rate of more than 4m/ year with generally fairly dense human settlement, with some commercial/ industrial activities being served by significant public infrastructure and facilities.*

Kategori 2: **Pengunduran garis pantai dengan kadar lebih dari 1 meter/ tahun tetapi kurang dari 4 meter/tahun umumnya di kawasan berpenduduk tidak padat dengan sedikit aktiviti pertanian yang mendapat perkhidmatan infrastruktur dan kemudahan awam yang kurang sempurna.**
Category 2: *Retreating coastline at the rate of between more than 1m/ year but less than 4m/ year with generally sparsely-populated area, with some agricultural activities being served by relatively minor public infrastructure and facilities.*

Kategori 3: **Pengunduran garis pantai dengan kadar kurang dari 1 meter/ tahun umumnya di kawasan tanpa penduduk dengan aktiviti pertanian yang minimum yang tidak mendapat perkhidmatan infrastruktur dan kemudahan awam.**
Category 3: *Slowly retreating coastline of less than 1m/ year with generally no human settlement and minimal agricultural activities, and not served by public infrastructure and facilities.*

Berdasarkan *National Coastal Erosion Study for Malaysia (2015)*
Based on National Coastal Erosion Study for Malaysia (2015)

Jadual 5.1: Anggaran penduduk pertengahan tahun, Sabah, 2017-2021
Table 5.1: Mid-year population estimates, Sabah, 2017-2021

Tahun *Year*	2017	2018	2019	2020	**2021[e]**	Kadar pertumbuhan penduduk tahunan *Annual population growth rate (%)*	
			('000)			**2019/2020**	**2020/2021**
Penduduk *Population*	3,855.9	3,898.4	3,904.4	3,882.8	**3,833.0**	**(0.6)**	**(1.3)**

Nota: Berdasarkan Anggaran Penduduk Pertengahan Tahun berasaskan data Banci Penduduk dan Perumahan 2010 yang disesuaikan
Note: Mid-Year population Estimates based on adjusted Population and Housing Census of Malaysia 2010

Hasil tambah mungkin berbeza kerana pembundaran
The added total may differ due to rounding

Jadual 5.2: Kepadatan penduduk, Sabah, 2017-2021
Table 5.2: Population density, Sabah, 2017-2021

Bilangan orang bagi setiap km^2
Number of persons per km^2

Tahun *Year*	2017	2018	2019	2020	**2021[e]**
Kepadatan penduduk *Population density*	52	53	53	53	**52**

Nota: Berdasarkan Anggaran Penduduk Pertengahan Tahun berasaskan data Banci Penduduk dan Perumahan 2010 yang disesuaikan
Note: Mid-Year population Estimates based on adjusted Population and Housing Census of Malaysia 2010

Jadual 5.3: Penduduk dengan air paip yang dirawat mengikut strata, Sabah, 2016-2019
Table 5.3: Population with treated piped water by strata, Sabah, 2016-2019

Tahun *Year*	2016			2017			2018			**2019[p]**		
Strata *Strata*	Bandar *Urban*	Luar bandar *Rural*	Purata negeri *State average*	Bandar *Urban*	Luar bandar *Rural*	Purata negeri *State average*	Bandar *Urban*	Luar bandar *Rural*	Purata negeri *State average*	Bandar *Urban*	Luar bandar *Rural*	Purata negeri *State average*
Peratus *Per cent*	99.8	79.0	89.4	100.0	78.0	89.0	100.0	78.0	89.0	**100.0**	**79.0**	**89.0**

Sumber: Kementerian Alam Sekitar dan Air
Source: Ministry of Environment and Water

Jadual 5.4: Kadar tarif air bagi domestik, Sabah, 2020
Table 5.4 : Water tariff rates for domestic, Sabah, 2020

RM/m^3

	Semakan tarif terakhir *Last tariff review*	Purata tarif air *Average water tariff*		
		20m^3 pertama *first 20m^3*	30m^3 pertama *first 30m^3*	35m^3 pertama *first 35m^3*
Purata negara *National average*		**0.52**	**0.65**	**0.69**
Sabah	2015	0.45	0.67	0.73

Sumber: Kementerian Alam Sekitar
Source: Ministry of Environment and Water

Jadual 5.5: Kadar tarif air bagi industri, Sabah, 2020
Table 5.5 : Water tariff rates for industry, Sabah, 2020

RM/m^3

	Semakan tarif terakhir *Last tariff review*	Purata tarif air *Average water tariff*		
		20m^3 pertama *first 20m^3*	30m^3 pertama *first 30m^3*	35m^3 pertama *first 35m^3*
Purata negara *National average*		**1.64**	**1.67**	**1.74**
Sabah	2015	1.65	1.77	1.94

Sumber: Kementerian Alam Sekitar
Source: Ministry of Environment and Water

Jadual 5.6: Peratusan isi rumah dengan kemudahan bekalan elektrik mengikut strata, Sabah, 2019
Table 5.6: Percentage of households with the accessibility to electricity supply by strata, Sabah, 2019

	Kemudahan bekalan elektrik *Accessible to electricity*		
	Jumlah *Total*	Bandar *Urban*	Luar bandar *Rural*
Malaysia	**100.0**	**100.0**	**100.0**
Sabah	100.0	100.0	100.0

Nota: Berdasarkan Laporan Penyiasatan Pendapatan Isi Rumah dan Kemudahan Asas 2019
Note: Based on Household Income and Basic Amenities Report 2019

Jadual 5.7: Penjanaan tenaga elektrik mengikut stesen, Sabah, 2016-2020
Table 5.7: Electricity generated by station, Sabah, 2016-2020

Juta kWj
Million kWh

Tahun *Year*	Stesen wap *Steam stations*	Stesen diesel *Diesel stations*	Stesen hidro *Hydro stations*	Turbin gas *Gas turbines*	Lain-lain[1] *Others*	**Jumlah** *Total*
2016	129.4	562.1	268.3	5,429.2	240.4	6,629.4
2017	118.0	429.9	334.1	5,400.3	215.5	6,497.8
2018	24.6	346.3	369.7	5,559.7	245.0	6,545.4
2019^r	84.5	410.1	343.9	5,794.3	313.0	6,945.8
2020^p	**78.7**	**382.9**	**421.7**	**5,541.0**	**282.6**	**6,706.9**

Nota: [1] merujuk kepada biomas
Notes: refers to biomass

Sumber: Sabah Electricity Sdn Bhd
Source: Sabah Electricity Sdn. Bhd

Jadual 5.8: Bilangan ketibaan dan pelepasan kapal laut yang terlibat dalam perdagangan luar negeri, Sabah, 2016-2020
Table 5.8: Number of arrivals and departures of ocean-going vessel engaged in foreign trade, Sabah, 2016-2020

Pelabuhan *Port*	Ketibaan *Arrivals*					Berlepas *Departures*				
	2016	2017	2018	2019	**2020**	2016	2017	2018	2019	**2020**
Kota Kinabalu	358	338	427	483	339	358	338	427	483	339
Kudat dan Kunak	212	185	133	169	136	212	185	133	169	136
Lahad Datu	556	528	488	559	500	556	528	488	559	500
Sandakan	1,234	1,152	1,080	822	756	1,234	1,152	1,080	822	756
Sepanggar Bay Oil Terminal	264	256	295	253	200	264	256	295	253	200
Sepanggar Bay Container Port	198	218	218	240	154	198	218	218	240	154
Tawau	1,673	1,089	641	597	544	1,686	1,089	641	597	544

Sumber: Lembaga Pelabuhan Sabah
Source: Sabah Port Authority

Jadual 5.9: Kargo yang dikendalikan mengikut pelabuhan, Sabah, 2016-2020
Table 5.9: Cargo throughput by port, Sabah, 2016-2020

Tan metrik (*freightweight*) '000
Metric tonnes

Pelabuhan *Port*		2016	2017	2018	2019	**2020**
Bintulu	**Jumlah** *Total*	44,620	46,352	42,479	43,947	**41,499**
	Import *Imports*	6,310	5,919	5,485	4,370	**4,245**
	Eksport *Exports*	38,310	40,433	36,994	39,577	**37,254**
Sabah	**Jumlah** *Total*	33,542	35,507	36,449	34,163	**29,558**
	Import *Imports*	11,850	12,083	12,892	12,526	**10,674**
	Eksport *Exports*	21,692	23,424	23,557	21,637	**18,883**

Nota: Tidak termasuk pindah kapal
Note: Excluding trans-shipment

Sumber: Kementerian Pengangkutan
Source: Ministry of Transport

Jadual 5.10: Kadar insiden keracunan makanan, kolera dan tifoid, Sabah, 2016-2020
Table 5.10: Incidence rate food poisoning, cholera and typhoid, Sabah, 2016-2020

Bagi setiap 100,000 penduduk
Per 100,000 population

Insiden *Incidence*	2016	2017	2018	2019	**2020**
Keracunan makanan *Food poisoning*	45.1	45.1	41.9	71.2	**15.9**
Kolera *Cholera*	3.0	0.1	4.2	2.0	**2.9**
Tifoid *Typhoid*	1.3	1.7	1.5	2.4	**0.6**

Sumber: Kementerian Kesihatan Malaysia
Source: Ministry of Health Malaysia

Jadual 5.11: Bilangan kes demam denggi, demam denggi berdarah dan malaria, Sabah, 2016-2020
Table 5.11: Number of dengue fever, dengue haemorrhagic fever and malaria cases, Sabah, 2016-2020

Kes *Cases*	2016	2017	2018	2019	**2020**
Demam denggi *Dengue fever*	3,658	2,547	3,386	5,451	**4,057**
Demam denggi berdarah *Dengue haemorrhagic fever*	10	13	37	27	**21**
Malaria *Malaria*	717	2,004	2,316	2,047	**1,537**

Sumber: Kementerian Kesihatan Malaysia
Source: Ministry of Health Malaysia

Jadual 6.1: Perbelanjaan perlindungan alam sekitar mengikut jenis perbelanjaan, Sabah, 2019
Table 6.1: Environmental protection expenditure by type of expenditure, Sabah, 2019

RM '000

Jenis *Type*	**Jumlah** *Total*	**Pengurusan pencemaran** *Pollution management*	**Perlindungan hidupan liar & habitat** *Protection of wildlife & habitats*	**Penilaian dan caj alam sekitar** *Environmental assessment and charges*	**Pengurusan sisa** *Waste management*	**Perbelanjaan lain untuk perlindungan alam sekitar** *Other environmental protection expenditure*
Jumlah *Total*	**249,863**	**215,962**	**2,228**	**10,207**	**19,689**	**1,777**
Modal *Capital*	186,456	182,704	302	2,530	860	59
Operasi *Operation*	63,407	33,258	1,926	7,677	18,829	1,718

Sumber: Berdasarkan kepada Laporan Penyiasatan Perbelanjaan Perlindungan Alam Sekitar, Malaysia, 2020
Source: Based on Report on the Survey of Environmental Protection Expenditure, Malaysia, 2020

Jadual 6.2: Peruntukan dan perbelanjaan pembangunan hutan, Sabah, 2014-2018
Table 6.2: Forest development allocation and expenditure, Sabah, 2014-2018

RM juta
RM million

Bidang Kuasa *Jurisdiction*	Perkara *Items*	2014	2015	2016	2017	**2018**
Jumlah *Total*	Peruntukan *Allocation*	30.70	33.40	35.99	44.53	**35.91**
	Perbelanjaan *Expenditure*	30.50	32.80	35.15	43.90	**35.79**
Negeri *State*	Peruntukan *Allocation*	25.80	28.60	25.90	23.27	**22.92**
	Perbelanjaan *Expenditure*	25.60	28.00	25.07	22.88	**22.85**
Persekutuan *Federal*	Peruntukan *Allocation*	4.90	4.80	10.09	21.23	**12.99**
	Perbelanjaan *Expenditure*	4.90	4.80	10.08	21.02	**12.94**

Sumber: Kementerian Tenaga dan Sumber Asli
Source: Ministry of Energy and Natural Resources

Jadual 6.3: Pembangunan sumber hutan, Sabah, 2014-2018
Table 6.3: Forest resource development, Sabah, 2014-2018

Hektar
Hectares

Sumber *Source*	2014	2015	2016	2017	**2018**
Tanaman mengaya *Enrichment planting*	45,615	52,831	55,192	60,297	**61,296**
Ladang hutan *Forest plantation*	231,714	244,428	254,085	278,565	**288,710**
Tanaman bakau *Mangroves*	20	269	50	55	**23**
Rawatan silvikultur *Silviculture treatment*	215,901	271,268	297,339	345,603	**367,911**

Sumber: Jabatan Perhutanan Sabah
Source: Sabah Forestry Department

LAMPIRAN

APPENDICES

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Framework for the Development of Environment Statistics **(FDES) dan hubung kait dengan rangka kerja Daya Penggerak-Tekanan-Keadaan-Impak-Respon (DPSIR)**

The FDES and its relationship with the Driving Force-Pressure-State-Impact-Response (DPSIR) framework

Daya Penggerak: Sosio-ekonomi dan sosio-kultur yang memacu aktiviti manusia bagi meningkatkan atau mengurangkan tekanan terhadap alam sekitar
Driving Force: *The socioeconomic and sociocultural forces driving human activities, which increase or mitigate pressures on the environment*

Tekanan: Tekanan aktiviti manusia kepada alam sekitar
Pressure: *The stresses that human activities place in the environment*

Keadaan: Situasi terkini alam sekitar
State: *The current condition of the environment*

Impak: Kesan degradasi alam sekitar
Impact: *The effects of environmental degradation*

Respon: Tindak balas oleh masyarakat terhadap keadaan alam sekitar
Response: *Responses by society to the environmental situation*

Sumber: ***Framework for the Development of Environment Statistics*** **(FDES 2013)**
Source:

Perbandingan nilai IPU dengan tahap pencemaran dan kawalan kesihatan
Comparison of API values with level of pollution and health measures

Indeks Pencemaran Udara (IPU) *Air Pollutant Index (API)*	**Status**	**Tahap pencemaran** *Level of pollution*	**Kawalan kesihatan** *Health measures*
0 – 50	Baik	Pencemaran rendah yang tidak ada kesan buruk terhadap kesihatan	Tidak ada sekatan aktiviti bagi semua lapisan orang. Amalkan gaya hidup yang sihat seperti tidak merokok, kerap bersenam dan mengamalkan pemakanan yang sesuai
	Good	*Low pollution and has no ill-effects on health*	*No restriction of activities for all groups of people. To practice healthy lifestyle e.g. not to smoke, exercise regularly and to observe proper nutrition*
51 – 100	Sederhana	Pencemaran sederhana dan tidak ada kesan buruk terhadap kesihatan	Tidak ada sekatan aktiviti bagi semua lapisan orang. Amalkan gaya hidup yang sihat seperti tidak merokok, kerap bersenam dan mengamalkan pemakanan yang sesuai
	Moderate	*Moderate pollution and has no ill-effects on health*	*No restriction of activities for all groups of people. To practice healthy lifestyle e.g. not to smoke, exercise regularly and to observe proper nutrition*
101 – 200	Tidak Sihat	Tanda-tanda sederhana yang menyebabkan bertambah teruk di kalangan orang berisiko tinggi, iaitu mereka yang menghidap sakit jantung dan paru-paru	Sekatan aktiviti kegiatan luar terhadap bagi orang yang berisiko tinggi. Penduduk amnya perlu mengurangkan aktiviti yang lasak
	Unhealthy	*Mild aggravation of symptoms among high risk persons, i.e. those with heart or lung disease*	*Restriction of outdoor activities for high risk persons. The population should reduce vigorous outdoor activity*
201 – 300	Sangat Tidak Sihat	Tanda-tanda ketara yang menyebabkan bertambah teruk dan toleransi senaman rendah di kalangan orang yang menghidap sakit jantung atau paru-paru	Warga tua dan orang yang menghidap penyakit jantung atau paru-paru dilarang keluar dan kurangkan aktiviti fizikal. Penduduk amnya mesti mengelakkan dari aktiviti luar yang lasak. Sesiapa yang menghadapi masalah kesihatan perlu merujuk kepada doktor
	Very Unhealthy	*Significant aggravation of symptoms and decreased exercise tolerance in person with heart or lung disease*	*Elderly and persons with known heart or lung disease should stay indoors and reduce physical activity. Population should avoid vigorous outdoor activity. Those with any health problems to consult a doctor*
301 – 500	Berbahaya	Tanda-tanda yang menyebabkan bertambah teruk dan membahayakan kesihatan	Warga tua dan orang yang menghidap penyakit jantung atau paru-paru dilarang keluar dan kurangkan aktiviti lasak. Penduduk amnya mesti menghindari aktiviti luar yang lasak
	Hazardous	*Severe aggravation of symptoms and endangers health*	*Elderly and persons with existing heart or lung disease should stay indoors and reduce physical activity. General population should avoid vigorous outdoor activity*
Melebihi 500	Kecemasan	Tanda-tanda yang menyebabkan bertambah teruk dan membahayakan kesihatan	Penduduk amnya dinasihatkan mengikut peraturan oleh Majlis Keselamatan Negara dan sentiasa mengikut pengumuman melalui media massa
Above 500	*Emergency*	*Severe aggravation of symptoms and endangers health*	*General population are advised to follow the orders of the National Security Council and follow the announcements through the mass media*

Sumber: Kementerian Kesihatan Malaysia
Source: Ministry of Health Malaysia

Punca dan kesan bahan pencemar udara kepada manusia dan tumbuhan
Sources and effects of air pollutants on human and plants

Bahan pencemar udara *Air pollutant*	**Punca** *Source*	**Kesan kepada kesihatan manusia dan ekologi** *Human health and ecological effects*
Ozon (O_3) *Ozone*	Motosikal dua lejang, kenderaan bermotor dan punca-punca industri. *Two-stroke motor cycles, motor vehicles and industrial sources.*	**Manusia/ *Human*** Menjejaskan fungsi pernafasan dan penurunan prestasi atlet yang melakukan senaman lasak dan bahaya penyakit barah kulit *Impairment of respiratory function and decreasing performance by some athletes exercising heavily and skin cancer risks* **Tumbuhan/ *Plants*** Memusnahkan tumbuhan dan mengurangkan pengeluaran tanaman *Damage vegetation and reduces crop production*
Plumbum (Pb) *Lead*	Sektor pengangkutan *Transport sector*	**Manusia/ *Human*** Pendedahan yang berlarutan boleh mengakibatkan gangguan sistem saraf *Long-term exposure can lead to nervous disorders*
Karbon Monoksida (CO) *Carbon Monoxide*	Sektor pengangkutan *Transport sector*	**Manusia/ *Human*** Menjejaskan mereka yang merokok dan yang menghidap masalah peredaran darah dan anemia *Affects smokers and people with circulatory and anaemic problems*
Sulfur Dioksida (SO_2) *Sulphur Dioxide*	Industri minyak dan gas, pengeluaran tenaga, pembakaran arang, proses industri dan industri berasaskan pembakaran *Oil and gas industry, energy production, coal burning, industrial combustion and industrial process*	**Manusia/ *Human*** Menambahkan derita pesakit yang menghidap asma dan bronkitis *Aggravates asthmatic and bronchitis patients* **Tumbuhan/ *Plants*** Memusnahkan tumbuhan *Damages vegetation*
Nitrogen Dioksida (NO_2) *Nitrogen Dioxide*	Pengangkutan, penjanaan kuasa dan industri berasaskan pembakaran *Transport, power generation and industrial combustion*	**Manusia/ *Human*** Menjejaskan fungsi pernafasan *Affects respiratory function* **Tumbuhan/ *Plants*** Menyekat pertumbuhan tanaman *Suppresses vegetation growth*
Habuk Halus (PM_{10}) *Particulate Matter*	Pembakaran terbuka *Open burning*	**Manusia/ *Human*** Melemahkan fungsi pernafasan *Impairs respiratory function* **Tumbuhan/ *Plants*** Memusnahkan tumbuhan *Damages vegetation*

Sumber: Kementerian Kesihatan Malaysia
Source: Ministry of Health Malaysia

Klasifikasi kualiti air berdasarkan Indeks Kualiti Air
Water quality classification based on Water Quality Index

Parameter	Indeks *Index*		
	Bersih (B) *Clean (C)*	**Sederhana Tercemar (ST)** *Slightly Polluted (SP)*	**Tercemar (T)** *Polluted (P)*
Indeks Kualiti Air (IKA) *Water Quality Index (WQI)*	81 – 100	60 – 80	0 – 59
Keperluan Oksigen Biokimia (BOD_5) *Biochemical Oxygen Demand*	91 – 100	80 – 90	0 – 79
Ammoniakal Nitrogen (NH_3-N) *Ammoniacal Nitrogen*	92 – 100	71 – 91	0 – 70
Pepejal Terampai (SS) *Suspended Solids*	76 – 100	70 – 75	0 – 69

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Klasifikasi Indeks Kualiti Air
Water Quality Index classification

Parameter	Unit	Kelas *Class*				
		I	II	III	IV	V
Ammoniakal Nitrogen (NH_3-N) *Ammoniacal Nitrogen*	mg/l	< 0.1	0.1 - 0.3	0.3 - 0.9	0.9 - 2.7	> 2.7
Keperluan Oksigen Biokimia (BOD_5) *Biochemical Oxygen Demand*	mg/l	< 1	1 - 3	3 - 6	6 - 12	> 12
Keperluan Oksigen Kimia (COD) *Chemical Oxygen Demand*	mg/l	< 10	10 - 25	25 - 50	50 - 100	> 100
Oksigen Terlarut *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
Jumlah Pepejal Terampai (SS) *Total Suspended Solid*	mg/l	< 25	25 - 50	50 - 150	150 - 300	> 300
Indeks Kualiti Air (IKA) *Water Quality Index (WQI)*		> 92.7	76.5 - 92.7	51.9 - 76.5	31.0 - 51.9	< 31.0

Kelas air dan kegunaan
Water classes and uses

Kelas *Class*	**Kegunaan** *Uses*
Kelas I *Class I*	Pemuliharaan alam semula jadi *Conservation of natural environment* Bekalan Air I – Hampir tiada rawatan diperlukan *Water Supply I – Practically no treatment necessary* Perikanan I – Spesis akuatik yang sangat sensitif *Fishery I – Very sensitive aquatic species*
Kelas IIA *Class IIA*	Bekalan Air II – Memerlukan rawatan secara konvensional sahaja *Water Supply II – Conventional treatment required* Perikanan II – Spesis akuatik yang sensitif *Fishery II – Sensitive aquatic species*
Kelas IIB Class IIB	Kegunaan rekreasi yang melibatkan persentuhan badan dengan air *Recreational use with body contact*
Kelas III *Class III*	Bekalan Air III – Memerlukan rawatan yang ekstensif *Water Supply III – Extensive treatment required* Perikanan III – Spesis tertentu yang mempunyai nilai ekonomi biasa Bekalan air minum haiwan ternakan *Fishery III – Tolerant species with common economic value* *Livestock drinking*
Kelas IV *Class IV*	Pengairan *Irrigation*
Kelas V *Class V*	Tiada seperti di atas. *None of the above*

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Standard dan kriteria kualiti air marin
Marine water quality criteria and standards

	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 & Gas *Ports, Oil & Gas Fields*	Paya Bakau & Muara Sungai *Mangroves, Estuarine & River-mouth Water*
1	Suhu (°C) *Temperature*		≤2 °C peningkatan terhadap ambien maksimum *≤2 °C increase over maximum ambient*		
2	Oksigen Terlarut (mg/L) *Dissolved Oxygen*	>80% tepu *>80% saturation*	5	3	4
3	Jumlah Pepejal Terampai* (mg/L) *Total Suspended Solid*	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*	50 mg/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*
4	Minyak dan Geris (mg/L) *Oil and Grease*	0.01	0.14	5	0.14
5	Raksa*(µg/L) *Mercury*	0.04	0.16 (0.04)	50	0.5
6	Kadmium*(µg/L) *Cadmium*	0.5	2 (3)	10	2
7	Kromium (VI) (µg/L) *Chromium*	5	10	48	10
8	Kuprum (µg/L) *Copper*	1.3	2.9	10	2.9
9	Arsenik (III)* (µg/L) *Arsenic*	3	20(3)	50	20(3)
10	Plumbum(µg/L) *Lead*	4.4	8.5	50	8.5
11	Zink (µg/L) *Zinc*	15	50	100	50
12	Sianida(µg/L) *Cyanide*	2	7	20	7
13	Ammonia (tidak terion) (µg/L) *Ammonia (unionized)*	35	70	320	70
14	Nitrit(NO_2) (µg/L) *Nitrite (NO_2)*	10	55	1,000	55
15	Nitrat(NO_3) (µg/L) *Nitrate (NO_3)*	10	60	1,000	60
16	Fosfat(µg/L) *Phosphate*	5	75	670	75
17	Fenol (µg/L) *Phenol*	1	10	100	10
18	Tributyltin (TBT) (µg/L)	0.001	0.01	0.05	0.01
19	Faecal Coliform	70 faecal coliform $100mL^{-1}$	70 faecal coliform $100mL^{-1}$ & (70 faecal coliform $100mL^{-1}$)	200 faecal coliform $100mL^{-1}$	100 faecal coliform $100mL^{-1}$ & (70 faecal coliform $100mL^{-1}$)
20	Polycyclic Aromatic Hydrocarbon (PAHs) µg/L	100	200	1,000	1,000

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

***Nilai Standard dan Kriteria Kualiti Air Marin (SKKAM) dalam kurungan digunakan untuk kawasan air marin yang menjadi sumber makanan laut**
Marine Water Quality Criteria and Standard (MWQCS) in parentheses are for coastal and marine water areas where seafood for human consumption is applicable

Status kualiti air bagi lembangan sungai Bersih yang diawasi, Sabah, 2019 dan 2020
Water quality status for monitored Clean river basins, Sabah, 2019 and 2020

Negeri *State*	Lembangan Sungai *River Basin*	Sungai *River*	Bilangan Stesen *Number of Stations*	2019			2020		
				IKA *WQI*	Kategori *Category*	Kelas *Class*	IKA *WQI*	Kategori *Category*	Kelas *Class*
Sabah	Sg. Apas	Sg. Apas	1	91	B/C	II	89	B/C	II
	Sg. Balung	Sg. Balung	1	93	B/C	I	87	B/C	II
	Sg. Bongawan	Sg. Bongawan	1	88	B/C	II	87	B/C	II
	Sg. Bengkoka	Sg. Bengkoka	2	85	B/C	II	88	B/C	II
	Sg. Bingkongan	Sg. Menggaris	2	91	B/C	II	93	B/C	I
		Sg. Bandau	1	90	B/C	II	91	B/C	II
		Sg. Bingkongan	2	92	B/C	II	91	B/C	II
		Sg. Tandek	1	90	B/C	II	91	B/C	II
	Sg. Kalabakan	Sg. Kalabakan	3	86	B/C	II	84	B/C	II
	Sg. Brantian	Sg. Brantian	1	91	B/C	II	86	B/C	II
	Sg. Kalumpang	Sg. Kalumpang	3	89	B/C	II	86	B/C	II
		Sg. Pang Burong 1	1	89	B/C	II	83	B/C	II
	Sg. Kedamaian	Sg. Kedamaian	1	93	B/C	I	90	B/C	II
		Sg. Wariu	1	91	B/C	II	91	B/C	II
		Sg. Tempasuk	2	92	B/C	II	91	B/C	II
	Sg. Kimanis	Sg. Kimanis	1	89	B/C	II	87	B/C	II
	Sg. Kinabatangan	Sg. Koyah	1	88	B/C	II	87	B/C	II
		Sg. Menanggul	1	87	B/C	II	81	B/C	II
		Sg. Pin	1	85	B/C	II	86	B/C	II
		Sg. Takala	1	88	B/C	II	85	B/C	II
		Sg. Leepang	1	88	B/C	II	84	B/C	II
		Sg. Kinabatangan	4	87	B/C	II	84	B/C	II
		Sg. Karamuak	1	92	B/C	II	91	B/C	II
	Sg. Labok	Sg. Kinipir	2	91	B/C	II	90	B/C	II
		Sg. Liwagu	2	91	B/C	II	88	B/C	II
		Sg. Maliau	1	93	B/C	I	92	B/C	II
		Sg. Labok	1	89	B/C	II	87	B/C	II
		Sg. Tungud	1	90	B/C	II	88	B/C	II
	Sg. Lakutan	Sg. Lakutan	1	90	B/C	II	89	B/C	II
	Sg. Likas	Sg. Menggatal	2	90	B/C	II	85	B/C	II
		Sg. Inanam	3	84	B/C	II	84	B/C	II
	Sg. Lingkungan	Sg. Lingkungan	1	89	B/C	II	91	B/C	II
		Sg. Bukau	1	90	B/C	II	88	B/C	II
	Sg. Membakut	Sg. Membakut	1	87	B/C	II	85	B/C	II
	Sg. Menggalong	Sg. Menggalong	2	91	B/C	II	89	B/C	II
	Sg. Merotai	Sg. Merotai	3	87	B/C	II	89	B/C	II
	Sg. Padas	Sg. Bunsit	1	92	B/C	II	91	B/C	II
		Sg. Liawan	1	91	B/C	II	91	B/C	II
		Sg. Padas	4	87	B/C	II	86	B/C	II
		Sg. Pegalan	3	89	B/C	II	88	B/C	II
		Sg. Tandulu	1	90	B/C	II	91	B/C	II
		Sg. Pangatan	1	86	B/C	II	86	B/C	II

Status kualiti air bagi lembangan sungai Bersih yang diawasi, Sabah, 2019 dan 2020 (samb.)
Water quality status for monitored Clean river basins, Sabah, 2019 and 2020 (cont'd)

Negeri *State*	Lembangan Sungai *River Basin*	Sungai *River*	Bilangan Stesen *Number of Stations*	2019			2020		
				IKA *WQI*	Kategori *Category*	Kelas *Class*	IKA *WQI*	Kategori *Category*	Kelas *Class*
Sabah	Sg. Mounad	Sg. Mounad	2	87	B/C	II	86	B/C	II
	Sg. Moyog	Sg. Moyog	4	92	B/C	II	89	B/C	II
	Sg. Paitan	Sg. Paitan	1	88	B/C	II	85	B/C	II
	Sg. Papar	Sg. Papar	5	92	B/C	II	90	B/C	II
	Sg. Sapi	Sg. Sapi	3	87	B/C	II	85	B/C	II
		Sg. Sualong	1	91	B/C	II	92	B/C	II
	Sg. Segama	Sg. Segama	3	91	B/C	II	85	B/C	II
	Sg. Segaliud	Sg. Segaliud	2	87	B/C	II	87	B/C	II
	Sg. Silabukan	Sg. Silabukan	2	90	B/C	II	89	B/C	II
	Sg. Sugut	Sg. Merali	1	92	B/C	II	91	B/C	II
		Sg. Bongkud	1	92	B/C	II	88	B/C	II
		Sg. Lohan	1	92	B/C	II	91	B/C	II
		Sg. Sugut	3	91	B/C	II	88	B/C	II
	Sg. Tawau	Sg. Tawau	4	88	B/C	II	85	B/C	II
	Sg. Tenghilan	Sg. Tenghilan	1	91	B/C	II	92	B/C	II
	Sg. Tingkayu	Sg. Tingkayu	2	89	B/C	II	85	B/C	II
	Sg. Tuaran	Sg. Tuaran	2	92	B/C	II	92	B/C	II
		Sg. Song Sai	1	91	B/C	II	90	B/C	II
		Sg. Damit	2	88	B/C	II	89	B/C	II
	Sg. Tungku	Sg. Tungku	2	88	B/C	II	89	B/C	II
	Sg. Umas Umas	Sg. Umas Umas	1	90	B/C	II	83	B/C	II
	Sg. Telipok	Sg. Telipok	2	77	ST/SP	II	86	B/C	II

Nota:
Notes:

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

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

Status kualiti air bagi lembangan sungai Sederhana Tercemar yang diawasi, Sabah, 2019 dan 2020
Water quality status for monitored Slightly Polluted river basins monitored, Sabah, 2019 and 2020

Negeri *State*	Lembangan Sungai *River Basin*	Sungai *River*	Bilangan Stesen *Number of Stations*	2019			2020		
				IKA *WQI*	Kategori *Category*	Kelas *Class*	IKA *WQI*	Kategori *Category*	Kelas *Class*
Sabah	Sg. Sembulan	Sg. Sembulan	2	77	ST/SP	II	79	ST/SP	II
	Sg. Kalumpang	Sg. Pang Burong 2	1	76	ST/SP	III	69	ST/SP	III
	Sg. Likas	Sg. Darau	1	76	ST/SP	III	80	ST/SP	II
		Sg. Likas	2	78	ST/SP	II	78	ST/SP	II

Nota:
Notes:

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

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

Status kualiti air marin di kawasan pesisiran pantai, Sabah, 2018-2020
Marine water quality status for coastal, Sabah, 2018-2020

Negeri *State*	Kawasan *Area*	Nilai IKAM *MWQI Value*			Kategori *Category* (2020)
		2018	2019	2020	
Sabah	Pantai Teluk Brunei 1	92	85	67	Sederhana/ *Moderate*
	Pantai Teluk Brunei 2	93	94	69	Sederhana/ *Moderate*
	Pantai Teluk Brunei 3	92	81	62	Sederhana/ *Moderate*
	Pantai Teluk Brunei 4	93	78	72	Sederhana/ *Moderate*
	Pantai Teluk Brunei 5	93	88	64	Sederhana/ *Moderate*
	Pantai Teluk Brunei 6	93	94	67	Sederhana/ *Moderate*
	Borneo Golf Seawater	92	88	72	Sederhana/ *Moderate*
	Pantai Manis Papar	91	92	60	Sederhana/ *Moderate*
	Pantai Melinsung	93	90	67	Sederhana/ *Moderate*
	Pantai Tanjung Aru (Roll Skating)	93	92	67	Sederhana/ *Moderate*
	Pantai Tanjung Aru (No. 3)	93	88	64	Sederhana/ *Moderate*
	Pantai Lok Kawi	93	87	72	Sederhana/ *Moderate*
	Pantai Tanjung Aru (Rest Lido)	93	79	63	Sederhana/ *Moderate*
	Pantai Dalit Tuaran	93	88	78	Sederhana/ *Moderate*
	Mangrove Paradise	93	87	73	Sederhana/ *Moderate*
	Pantai Sabandar	93	95	75	Sederhana/ *Moderate*
	Pantai Bak-Bak Kudat	93	85	62	Sederhana/ *Moderate*
	Pasir Putih Sandakan	92	84	63	Sederhana/ *Moderate*
	Pantai TLDM	92	67	72	Sederhana/ *Moderate*
	Pantai Batu Sapi	93	93	61	Sederhana/ *Moderate*
	Pantai Ulu Tungku	92	70	66	Sederhana/ *Moderate*
	Pantai Sarina Kunak	93	84	74	Sederhana/ *Moderate*
	Pantai Kg. Lamak	91	79	64	Sederhana/ *Moderate*
	Pantai Tinagat	93	78	58	Sederhana/ *Moderate*

Nota/*Note***:**

***** **Stesen baru**
New station

** **Stesen tutup**
Station closed

\- **Tiada data**
No data

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Status kualiti air marin di kawasan muara sungai, Sabah, 2018-2020
Marine water quality status for estuary, Sabah, 2018-2020

Negeri *State*	Kawasan *Area*	Nilai IKAM *MWQI Value*			Kategori *Category* (2020)
		2018	2019	2020	
Sabah	Kuala Penyu	92	83	63	Sederhana/ *Moderate*
	Muara Sungai Inanam	91	75	57	Sederhana/ *Moderate*

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Nota/*Note***:**

***** **Stesen baru**
New station

** **Stesen tutup**
Station closed

\- **Tiada data**
No data

Status kualiti air marin di kawasan pulau, Sabah, 2018-2020
Marine water quality status for island, Sabah, 2018-2020

Negeri *State*	Kawasan *Area*	Nilai IKAM *MWQI Value*			Kategori *Category* (2020)
		2018	2019	2020	
Sabah	Gaya	93	86	65	Sederhana/ *Moderate*
	Mabul	93	60	67	Sederhana/ *Moderate*
	Sipadan (N)	93	63	60	Sederhana/ *Moderate*
	Sipadan (W)	93	77	65	Sederhana/ *Moderate*
	Sapi	93	85	61	Sederhana/ *Moderate*
	Manukan	93	85	59	Sederhana/ *Moderate*
	Tiga	92	87	68	Sederhana/ *Moderate*
	Kalampunian Besar	93	89	65	Sederhana/ *Moderate*
	Kapalai	93	77	58	Sederhana/ *Moderate*
	Molleangan Besar	93	91	59	Sederhana/ *Moderate*
	Banggi (South)	93	79	58	Sederhana/ *Moderate*
	Banggi (East)	93	93	75	Sederhana/ *Moderate*
	Balambangan	93	88	72	Sederhana/ *Moderate*
	Selingan	93	85	75	Sederhana/ *Moderate*
	Gulisan	93	80	69	Sederhana/ *Moderate*
	Bakungan Kecil	93	83	72	Sederhana/ *Moderate*
	Mantanani Besar	93	95	58	Sederhana/ *Moderate*

Sumber: Jabatan Alam Sekitar
Source: Department of Environment

Nota/*Note***:**

***** **Stesen baru**
New station

** **Stesen tutup**
Station closed

\- **Tiada data**
No data

NOTA DAN SIMBOL
NOTES AND SYMBOLS

-	tiada/kosong/tiada kes *nil/blank/no cases*
..	tidak diperoleh *not available*
n.a.	tidak berkenaan *not applicable*
Def.	nilai defektif *defective value*
0.0	kurang daripada setengah unit terkecil yang ditunjukkan *less than half the smallest unit shown*
r	pindaan *revised*
e	anggaran *estimate*
p	awalan *preliminary*
i.e.	iaitu *that is*
PM	Habuk Halus *Particulate Matter*
CO	Karbon Monoksida *Carbon Monoxide*
NO_2	Nitrogen Dioksida *Nitrogen Dioxide*
O_3	Ozon *Ground Level Ozone*
SO_2	Sulfur Dioksida *Sulphur Dioxide*
$\mu g/m^3$	mikrogram setiap meter padu *microgram per cubic metre*
ppm	bahagian setiap juta *parts per million*
ppb	bahagian setiap bilion *parts per billion*
km^2	kilometer persegi *square kilometres*
mg/l	miligram setiap liter *milligram per litres*
JKPS *MMscf*	juta kaki padu standard *million standard cubic feet*

bil. *no.*	bilangan *number*
max.	maksimum *maximum*
min.	minimum
RM	Ringgit Malaysia
FDES	Rangka Kerja untuk Pembangunan Perangkaan Alam Sekitar *Framework for the Development of Environment Statistics*
KETSA	Kementerian Tenaga dan Sumber Asli *Ministry of Energy and Natural Resources*
ILP	Institut Latihan Perindustrian *Industrial Training Institute*
IPD	Ibu Pejabat Polis Daerah
LPG	Gas Asli cecair *Liquefied Petroleum Gas*
MPOB	Lembaga Minyak Sawit Malaysia *Malaysian Palm Oil Board*
PERHILITAN *DWNP*	Jabatan Perlindungan Hidupan Liar dan Taman Negara *Department of Wildlife and National Parks*
UPE *EPU*	Unit Perancang Ekonomi *Economic Planning Unit*
UNEP	Program Alam Sekitar Bangsa-Bangsa Bersatu *United Nations Environment Programme*
USM	Universiti Sains Malaysia
W.P.	Wilayah Persekutuan

NOTA
NOTE

Pembundaran: *Rounding:*	Jumlah bagi komponen mungkin berbeza dengan jumlah besar dalam jadual penerbitan disebabkan oleh pembundaran angka *The sum of components may not add up to the totals in the tables presented in this publication due to rounding*

GLOSARI

GLOSSARY

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TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
A			
Air payau	Air yang mengandungi garam yang mana kepekatan garamnya kurang daripada kepekatan garam dalam air laut. Kepekatan jumlah garam yang terlarut biasanya dalam lingkungan 1,000-10,000 miligram per liter (mg/l).	***Brackish water***	*Water containing salts at a concentration significantly lower than that of sea water. The concentration of total dissolved salts is usually in the range of 1,000-10,000 milligrams per litre (mg/l).*
Air tawar	Air bersih semula jadi yang mengandungi kurang kepekatan garam. Pada amnya ia sesuai untuk pengeluaran dan dirawat supaya menjadi air bersih yang sesuai untuk minum.	***Freshwater***	*Naturally occurring water having a low concentration of salts. It is generally accepted as suitable for abstraction and treatment to produce potable water.*
Aktiviti perlindungan alam sekitar	Tujuan utama adalah pencegahan, pengurangan dan penghapusan pencemaran dan lain-lain bentuk degradasi alam sekitar.	***Environmental protection activities***	*Primary purpose is the prevention, reduction and elimination of pollution and other forms of degradation of the environment.*
Ammoniakal Nitrogen (NH_3-N)	Komponen nitrogen yang digunakan sebagai penunjuk untuk menentukan pencemaran oleh kumbahan. Ia terhasil daripada aktiviti mikrobiologi dan biasanya wujud di dalam air permukaan dan air bawah tanah. Sumber utama bagi bahan pencemar NH_3-N adalah kumbahan domestik dan ladang ternakan.	***Ammoniacal Nitrogen***	*A component of nitrogen which is adopted as an indicator to determine pollution by sewage. It is formed from microbiology activity and usually exists inside surface water and groundwater. The main sources of NH_3-N were domestic sewage and livestock farming.*
Akuakultur	Akuakultur ialah proses pengeluaran yang melibatkan pengkulturan (termasuk tuaian) organisma akuatik (ikan, moluska, krustasia, tumbuhan) dengan menggunakan teknik yang direka bentuk untuk meningkatkan pengeluaran organisma tersebut melebihi kapasiti persekitaran semula jadinya.	***Aquaculture***	*Aquaculture refer to the production process involving the culturing or farming (including harvesting) of aquatic organisms (fish, molluscs, crustaceans, plant) using techniques designed to increase the production of the organism beyond the natural capacity of the environment.*
Atmosfera	Jisim udara yang mengelilingi bumi yang sebahagian besarnya terdiri daripada oksigen dan nitrogen.	***Atmosphere***	*Mass of air surrounding the earth, composed largely of oxygen and nitrogen.*
B			
Bahan pencemar udara	Bahan yang terkandung di dalam udara pada kepekatan yang cukup tinggi, boleh memudaratkan kesihatan manusia, haiwan, tanaman dan harta benda. Pencemar udara adalah termasuk bahan yang hampir kepada bentuk asal atau kandungan tiruan yang wujud terapung di udara. Ia boleh terdiri daripada pepejal, titisan cecair atau gas atau gabungan kesemuanya.	***Air pollutants***	*Substances in air that could, at high enough concentrations, harm human beings, animals, vegetation or material. Air pollutants may thus include forms of matter of almost any natural or artificial composition capable of being airborne. They may consist of solid particles, liquid droplets or gases or combination of these forms.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Bahan pencemar	Bahan yang terdapat dalam kepekatan yang boleh membahayakan organisma (manusia, tumbuhan dan haiwan) atau melebihi standard kualiti alam sekitar. Istilah ini sering digunakan seiring dengan pencemar.	***Pollutant***	*Substance that is present in concentration that may harm organisms (humans, plants and animals) or exceed an environmental quality standard. The term is frequently used synonymously with contaminant.*
Banjir	Kuantiti air yang melimpah keluar dari tebing sungai, tasik atau sistem perparitan sedia ada yang disebabkan oleh curahan hujan yang lebat, air laut pasang dan halangan pada sistem saliran.	***Flood***	*A body of water, rising, swelling and overflowing land not usually thus covered. It is also, overflowing of the bank of a stream, lake or drainage system of water onto adjacent land due to storm tidal action and channel obstruction.*
Bencana	Bencana merupakan peristiwa luar jangka dan berlaku secara tiba-tiba yang boleh menyebabkan kerosakan, kemusnahan dan penderitaan manusia. Bencana sering digambarkan sebagai kesan daripada pendedahan kepada peristiwa melampau dan boleh dikelaskan sebagai semula jadi dan teknologi bergantung kepada punca.	***Disasters***	*Disasters are unforeseen and often sudden events that cause great damage, destruction and human suffering. A disaster is often described as a result of exposure to the extreme event and can be both natural and technological depending on their cause.*
Bencana teknologi	Mungkin disebabkan oleh niat, kecuaian atau kesilapan manusia, atau daripada aplikasi teknologi yang rosak atau gagal. Tiga jenis bencana teknologi: kemalangan industri, kemalangan pengangkutan dan pelbagai kemalangan.	***Technological disasters***	*May arise as a result of human intent, negligence or error, or from faulty or failed technological applications. Three types of technological disasters: industrial accidents, transport accidents and miscellaneous accidents.*
Buangan terjadual	Merupakan buangan toksik dan berbahaya yang dihasilkan oleh industri, pertanian, bengkel, kontraktor buangan terjadual, aktiviti domestik dan buangan klinikal dari hospital. Kategori sisa adalah yang tersenarai dalam Jadual Pertama Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005.	***Scheduled waste***	*Defined as toxic waste and hazardous generated by industries, agriculture, workshop, scheduled waste contractors, domestic activities and clinical wastes from hospitals. The waste category listed in the First Schedule Environmental Quality Regulation (Scheduled Waste) 2005.*
D			
Rangka Kerja *Driving Force-Pressure-State-Impact-Response* (DPSIR)	Rangka analitikal yang berdasarkan hubungan di antara komponen D-P-S-I-R.	***Driving Force-Pressure-State-Impact-Response (DPSIR) framework***	*An analytical framework that is based on the casual relationship between its D-P-S-I-R components.*
Demam denggi	Penyakit jangkitan virus yang merebak melalui gigitan nyamuk Aedes aegypti yang telah dijangkiti.	***Dengue fever***	*A type of viral infection that spreads through infected Aedes aegypti mosquito bites.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Disentri	Disentri adalah cirit-birit akut yang mengandungi darah di dalam najis. Disentri kebanyakannya disebabkan oleh spesies Shigella (*disentri bacillary*) atau *Entamoeba histolytica* (*disentri amoebic).*	***Dysentery***	*Dysentery is acute diarrhoea with visible blood in the stool. Dysentery is most often caused by Shigella species (bacillary dysentery) or Entamoeba histolytica (amoebic dysentery).*
F			
Fauna	Semua kehidupan haiwan.	***Fauna***	*All animal life.*
Flora	Semua kehidupan tumbuhan.	***Flora***	*All plant life.*
H			
Habuk Halus (PM)	Partikel pepejal atau titisan cecair dalam udara atau pelepasan yang saiznya 0.01-100µm, contohnya habuk, asap, wasap, semburan dan kabut.	***Particulate Matter (PM)***	*Solid particles or liquid droplets in the air or emission 0.01-100µm size, eg: dust, smoke, fume, spray and mist.*
Habuk Halus (PM_{10})	Partikel terampai berukuran kurang daripada diameter 10 mikron. Pm_{10} boleh berbentuk pepejal atau cecair dan ia termasuk aerosol, debu, asap dan debunga. Partikel ini berpunca daripada stesen janakuasa, proses industri dan aktiviti pembakaran terbuka.	***Particulate Matter (PM_{10})***	*Respirable particles of less than 10 micron in diameter. PM_{10} can be in solid or liquid form and it includes aerosol, dust, smoke and pollen. These particles originate from power plants, industrial processes and open burning activities.*
Halaju angin	Suatu kuantiti vektor di mana ia mempunyai magnitud dan arah. Magnitud halaju angin dipanggil laju angin manakala arah angin merujuk dari mana angin bertiup.	***Wind velocity***	*A quantity of vectors in which it has magnitude and direction. The magnitude of the wind velocity is called the wind speed while the wind direction refers to where the wind blows.*
Hakisan	Proses penghausan permukaan fizikal. Biasanya dikaitkan dengan kehilangan tanah disebabkan air, salji atau angin. Hakisan berlaku secara semula jadi dan menyebabkan bertambah buruk akibat pembersihan tanah yang berkaitan dengan aktiviti manusia seperti pertanian, perumahan atau perindustrian.	***Erosion***	*Wearing away and transport of the soil by wind or running water, glaciers or waves. Erosion occurs naturally but is often intensified by human land-clearing activities related to farming, residential or industrial development.*
Hutan	Tanah merangkumi lebih daripada 0.5 hektar dengan ketinggian pokok lebih daripada 5 meter dan penutup kanopi lebih daripada 10 peratus, atau pokok yang dapat mencapai ambang in situ. Ia tidak termasuk tanah yang didominasi oleh penggunaan tanah pertanian atau bandar.	***Forest***	*Land spanning more than 0.5 hectares with tree higher than 5 metres and a canopy cover of more than 10 per cent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Hutan bandar	Menanam, memelihara dan mengurus pokok di kawasan awam seperti taman rekreasi, taman permainan dan kawasan lapang termasuk sepanjang lebuh raya.	***Urban forest***	*Planting, protecting and managing trees in public areas such as recreational parks, playgrounds and open spaces includes the route along the highway.*
Hutan Simpanan Kekal (HSK)	Mana-mana tanah (tanah berhutan dan tidak berhutan) yang diwartakan atau disifatkan sebagai HSK untuk tujuan perhutanan di bawah Seksyen 7, 8 dan 9 Akta Perhutanan Negara.	***Permanent Reserved Forest (PRF)***	*Any land (forested and non-forested land) that has been enacted or deemed PRF for forestry purposes under Sections 7, 8 and 9, the National Forestry Act.*
I			
Indeks Kualiti Air	Purata pemberat bagi kepekatan ambien bahan pencemar terpilih biasanya berkait kepada pengelasan kualiti air.	***Water Quality Index***	*Weighted average of selected ambient concentrations of pollutants usually linked to water quality classes.*
Indeks Pencemaran Udara (IPU)	Satu indikator yang dicipta berdasarkan kepada penilaian saintifik bagi memaklumkan dengan cara yang mudah difahami kehadiran pencemaran udara dan impaknya terhadap kesihatan manusia. Nilai IPU dikira berdasarkan kepekatan purata setiap pencemar udara iaitu SO_2, NO_2, CO, O_3 dan PM_{10}. Pencemar udara yang dominan dengan kepekatan tertinggi diambil kira sebagai pencemar yang akan menentukan nilai IPU. Pada lazimnya, kepekatan (PM_{10}) adalah yang tertinggi berbanding dengan pencemar yang lain dan ini menentukan bacaan IPU.	***Air Pollutant Index (API)***	*An indicator which is created based on scientific assessment to provide user friendly information about the presence of air pollution and its impact on human health. API value is calculated based on the average concentration of each air pollutant SO_2, NO_2, CO, O_3 and PM_{10}. Dominant of air pollutant with the highest concentrations of pollutants are accounted for as that will determine the value of the API. In general, concentrations of PM_{10} are the highest compared to other concentrations and this determines the API readings.*
Indeks UV Suria (UVI)	Menerangkan tentang sinaran UV di permukaan Bumi. Nilai indeks tersebut mempunyai julat dari sifar ke atas – semakin tinggi nilai indeks, semakin besar potensi berlaku kerosakan pada kulit dan mata dan semakin cepat kesan tersebut boleh berlaku.	***Solar UV Index (UVI)***	*Describes the UV rays on the Earth's surface. The value of the index has a range from zero upwards - the higher the value of the index, the greater the potential for damage to the skin and eyes and the faster the effect can occur.*
Insinerator	Relau untuk membakar bahan buangan di bawah keadaan terkawal.	***Incinerator***	*Furnace for burning wastes under controlled conditions.*
K			
Kadar mortaliti bayi	Nisbah bilangan kematian bayi di bawah umur 1 tahun dalam sesuatu tahun kepada jumlah bilangan kelahiran hidup dalam tahun itu (bagi setiap seribu kelahiran hidup).	***Infant mortality rate***	*The ratio number of deaths of infants under 1 year of age in a given year to the total number of live births in that year (per thousand live births).*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Kawasan tadahan	Kawasan di mana hujan mengalir ke dalam sungai, tasik, atau takungan.	***Catchment area***	*The area from which rainfall flows into a river, lake, or reservoir.*
Kapasiti pengeluaran	Keupayaan pengeluaran air bagi loji yang beroperasi sepenuhnya dalam tahun berkenaan. Kapasiti pengeluaran berbeza setiap tahun tertakluk kepada reka bentuk loji.	***Production capacity***	*The ability to produce water by fully operated plants in the respective year. The production capacity varies every year according to the design of the plants.*
Karbon Monoksida	Tidak berwarna, tidak berbau dan gas beracun yang dihasilkan oleh pembakaran bahan api dan fosil yang tidak lengkap.	***Carbon Monoxide***	*Colourless, odourless and poisonous gas produced by incomplete fossil fuel combustion.*
Kawasan bandar	Kawasan yang diwartakan serta kawasan tepubina yang bersempadan dengannya dan gabungan kedua-dua kawasan ini mempunyai penduduk seramai 10,000 atau lebih. Kawasan tepubina didefinisikan sebagai kawasan yang terletak bersebelahan kawasan yang diwartakan dan mempunyai sekurang-kurangnya 60 peratus (berumur 15 tahun dan lebih) yang terlibat dalam aktiviti bukan Pertanian.	***Urban area***	*Gazetted areas with their adjoining built-up areas which had a combined population of 10,000 or more. Built-up areas were defined as more. Built-up areas were defined as areas contiguous to a gazetted area and had at least 60 per cent of their population (aged 15 years and over) engaged in non-agricultural activities.*
Kawasan perlindungan/ simpanan	Kawasan tanah dan/atau laut khususnya bagi perlindungan dan pemuliharaan kepelbagaian biologi, yang berkaitan dengan sumber semula jadi dan diurus melalui perundangan ataupun cara lain yang berkesan. Definisi ini diadaptasi daripada *The International Union for Conservation of Nature* (IUCN).	***Protected/preserved area***	*An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means. This definition is adopted by The International Union for Conservation of Nature (IUCN).*
Kemalangan jalan raya	Kemalangan atau kejadian yang mana kerosakan berlaku ke atas mana-mana orang, harta, kenderaan, struktur atau haiwan dan berlaku di mana-mana jalan awam termasuklah jambatan, terowong, hentian sebelah, jalan bertingkat, jejambat, plaza tol dan sebagainya.	***Road traffic crash***	*Accidents or occurrences whereby damage or injury is caused to any person, property, vehicle, structure or animal and occurs in any public road including bridge, tunnels, lay-bye, interchanges, overpasses, toll plazas and so on.*
Kelajuan angin permukaan	Merujuk kepada laju angin pada ketinggian piawai 10m di atas tanah.	***Surface wind speed***	*Refers to the wind speed at a standard altitude of 10m above ground.*
Kepadatan penduduk	Jumlah bilangan penduduk setiap unit per segi di kawasan muka bumi.	***Population density***	*Total number of inhabitants per square unit of surface area.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Kepelbagaian biologi	Kepelbagaian biologi bermaksud variasi di antara organisma hidup daripada pelbagai sumber termasuk daratan, marin serta ekosistem akuatik lain; ia termasuklah kepelbagaian di dalam peringkat genetik, spesies dan ekosistem. Definisi ini diadaptasi daripada *United Nations Convention on Biological Diversity*.	***Biological diversity***	*Biological diversity means the variability among living organisms from various sources including terrestrial, marine and other aquatic ecosystems; this includes diversity at the genetic, species and ecosystem level. This definition is adopted by the United Nations Convention on Biological Diversity.*
Keperluan Oksigen Biokimia (BOD_5)	Ukuran jumlah oksigen terlarut yang diperlukan oleh organisma untuk mengurai bahan organik yang terdapat di dalam air. Biasanya bacaan diambil dalam tempoh 5 hari.	***Biochemical Oxygen Demand (BOD_5)***	*Dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water. This measurement is usually taken within 5 days.*
Keperluan Oksigen Kimia (COD)	Indeks pencemaran air yang digunakan sebagai ukuran kepekatan jisim oksigen yang diperlukan untuk mengurai bahan organik dan bukan organik.	***Chemical Oxygen Demand (COD)***	*Index of water pollution measuring the mass concentration of oxygen consumed by the chemical breakdown of organic and inorganic matter.*
Kolera	Penyakit usus pada umumnya disebabkan oleh pencemaran najis daripada air dan makanan.	***Cholera***	*Intestinal disease generally caused by faecal contamination of water and food.*
Kuasa hidro	Tenaga primer yang disimpulkan tersedia untuk pengeluaran elektrik dan ditunjukkan dari segi konvensional setara dengan bahan api fosil menggunakan kecekapan purata penukaran haba untuk tahun tersebut.	***Hydropower***	*Is the inferred primary energy available for electricity production and is shown in terms of conventional fossil fuel equivalent using the average thermal efficiency of conversion for the year.*
Kutipan biji benih	Biji benih pokok hutan yang dikutip secara terus dari atas pokok.	***Seeds collections***	*Seeds of forest trees collected directly from the tree.*
L			
Ladang hutan	Kawasan yang ditanam dengan pokok atau tumbuh-tumbuhan hutan, sama ada daripada spesies tempatan atau dagang, dengan kaedah tanaman secara terbuka yang luasnya tidak kurang daripada 50 ha. Ladang hutan boleh merangkumi kawasan yang terletak di dalam atau di luar HSK.	***Forest plantation***	*Area planted with trees or forest plants, whether from local or foreign species, the method of cultivation as wide open no less than 50 ha. Forest plantations can include areas that are located within or outside the PRF.*
Latar belakang	Stesen yang tidak terpengaruh dengan faktor-faktor pencemaran udara dari industri dan kenderaan bermotor. Stesen ini biasanya ditempatkan di kawasan yang jauh dari punca pencemar dan dijadikan bacaan rujukan bagi kategori stesen yang lain.	***Background***	*Stations that is not affected by air pollution factors from industry and motor vehicles. The station is usually located in a remote area of interest and is a reference point for other categories of stations.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Logam berat	Logam bertoksik yang digunakan dalam proses industri, sebagai contoh, arsenik, kadmium, kromium, tembaga, plumbum, raksa, nikel dan zink. Ia boleh merosakkan kehidupan tumbuhan dan haiwan pada kepekatan yang rendah dan cenderung untuk berkumpul dalam rantaian makanan.	***Heavy metals***	*Potentially toxic metals used in industrial processes, for example, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. They may damage plant and animal life at low concentrations and tend to accumulate in the food chain.*
M			
Megakepelbagaian	Konsep megakepelbagaian melibatkan anggaran jumlah bilangan semua organisma hidup di dalam ekosistem dan ini bermakna sesuatu kawasan itu mempunyai sekurang-kurangnya 60.0 peratus daripada spesis yang diketahui di dunia. Sebahagian besar daripada kepelbagaian tersebut adalah endemisme dan ini menggambarkan keunikan kawasan tersebut.	***Megadiversity***	*The concept of megadiversity involves an estimate of the total number of all the organisms in an ecosystem and is represented by an area that comprises at least 60.0 per cent of the world's known species. A major part of diversity is endemism as this reflects the uniqueness of an area.*
N			
Nilai defektif	Nilai yang diragui atau nilai yang tidak diterima setelah menjalani proses semakan kualiti data.	***Defective value***	*A doubtful value or an unacceptable value after undergoing a data quality review process.*
Nilai pH	Ukuran kepada keasidan untuk nilai alkali dalam cecair. Nilai pH di antara lingkungan 0 ke 7 menunjukkan asid, nilai pH di antara lingkungan 7 ke 14 menunjukkan alkali, dan nilai pH 7 menandakan neutral.	***pH Value***	*Measure of the acidity or alkalinity of a liquid. A pH value in the range of 0 to 7 indicates acidity, a pH value in the range of 7 to 14 indicates alkalinity, and a pH value of 7 signifies neutrality.*
Nitrogen Dioksida (NO_2)	Nitrogen Dioksida terbentuk di persekitaran udara melalui pengoksidaan Nitrogen Monoksida (NO). Gas bertoksik berwarna merah keperangan ini mempunyai bau yang kuat dan tajam.	***Nitrogen Dioxide (NO_2)***	*Nitrogen Dioxide is formed in the ambient air through the oxidation of Nitrogen Monoxide (NO). This reddish brown toxic gas has a sharp and pungent odour.*
O			
Oksigen Terlarut (DO)	Jumlah gas oksigen (O_2) yang berada dalam air, dikira mengikut kandungannya dalam isi padu air (miligram O_2 seliter) atau jumlah peratusnya dalam air tepu.	***Dissolved Oxygen (DO)***	*Amount of gaseous oxygen (O_2) actually present in water expressed in terms either of its presence in the volume of water (milligrams of O_2 per litre) or of its share in saturated water (percentage).*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Ozon (O_3)	Gas yang mengeluarkan bau yang tidak menyenangkan, tidak berwarna dan bertoksik yang menyumbang kepada fotokimia asbut (campuran asap dan kabut). O_3 terbentuk hasil daripada reaksi kimia antara Sebatian Organik Meruap (VOC) dan Nitrogen Oksida (NO_x). Pada lewat tengah hari atau awal petang, lazimnya kepekatan ozon adalah tinggi dan mendominasi bacaan IPU di sesetengah kawasan. Di bawah pengaruh cahaya matahari, NO_x dan VOC yang dilepaskan dari ekzos kenderaan bermotor dan industri ia bertindak balas bagi membentuk ozon di permukaan bumi.	***Ground Level Ozone (O_3)***	*A pungent, colourless and toxic gas that contributes to photochemical smog. O_3 is formed as a result of chemical reaction in the air between Volatile Organic Compounds (VOCs) and Nitrogen Oxide (NO_x). By the late afternoon or early evening, usually O_3 concentration is high and dominating API readings in some areas. Under the sunlight influence, and reaction between NO_x and VOC that released from motor vehicles exhaust and industrial which form the O_3 in the earth's surface. Under the influence of sunlight, nitrogen oxide (NO_x) and volatile organic compounds (VOCs) emitted from motor vehicle exhaust and industry reacts to form O_3 in the earth's surface.*
P			
Pelepasan	Pembuangan bahan pencemar ke atmosfera dari punca tetap seperti cerobong asap dan lain-lain, kawasan komersial atau perindustrian dan juga berpunca daripada punca bergerak seperti kenderaan bermotor, lokomotif dan pesawat.	***Emission***	*Discharge of pollutants into the atmosphere from stationary sources such as smokestacks, other vents, surface areas of commercial or industrial facilities and mobile sources, for example, motor vehicles, locomotives and aircraft.*
Pemantauan kualiti udara	Bacaan *standard* dan pemerhatian terhadap udara yang diambil secara berterusan atau kerap yang digunakan sebagai peringatan dan kawalan.	***Air quality monitoring***	*Continuous or frequent standardised measurement and observation of the air, often used for warning and control.*
Pencemaran marin	Pengenalan langsung atau tidak langsung oleh manusia atau tenaga ke dalam alam sekitar marin (termasuk muara), menghasilkan kemusnahan kepada sumber kehidupan, berbahaya kepada kesihatan hidupan, halangan kepada kegiatan marin termasuk memancing, merosakkan kualiti air laut dan mengurangkan keselesaan.	***Marine pollution***	*Direct or indirect introduction by humans of substances or energy into the marine environment (including estuaries), resulting in harm to living resources, hazards to human health, hindrances to marine activities including fishing, impairment of the quality of sea water and reduction of amenities.*
Pencemaran udara	Kandungan sesuatu gas, cecair atau zarah yang terampai di udara ambien yang boleh menjejaskan kehidupan atau memberi kesan negatif kepada manusia, tumbuh-tumbuhan dan haiwan.	***Air pollution***	*Content of a gas, liquid or particles suspended in the ambient air that could affect life or a negative impact on humans, plants and animals.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Penempatan penduduk	Konsep penyatuan yang terdiri daripada (a) komponen fizikal tempat berteduh dan infrastruktur dan (b) perkhidmatan yang mana menyokong penyediaan elemen fizikal. Ini boleh dikatakan seperti perkhidmatan komuniti seperti pendidikan, kesihatan, kebudayaan, kebajikan, rekreasi dan pemakanan.	***Human settlements***	*Integrative concept that comprises (a) physical components of shelter and infrastructure and (b) services to which the physical elements provide support, that is to say, community services such as education, health, culture, welfare, recreation and nutrition.*
Pengawasan kualiti air	Bacaan *standard* dan pemerhatian terhadap air yang diambil secara berterusan atau kerap yang digunakan sebagai peringatan dan kawalan.	***Water quality monitoring***	*Continuous or frequent standardised measurement and observation of the water often used for warning and control.*
Penyejatan	Suatu proses yang melibatkan perubahan fasa cecair kepada gas apabila cecair terdedah kepada atmosfera. Dalam meteorologi ia diukur sebagai jumlah sejatan iaitu jumlah air yang disejat daripada tangki sejatan.	***Evaporation***	*A process that involves the phase change of a liquid to a gas when the liquid is exposed to the atmosphere. In meteorology, it is measured as the amount of evaporation i.e. the amount of water evaporated from the evaporation tank.*
Penyiasatan migrasi	Mengumpul maklumat responden di tempat kediaman pada dua titik masa (tarikh tertentu), di mana tempoh antaranya genap satu tahun. Pertukaran lokaliti tempat kediaman pada dua titik masa ini dianggap sebagai migrasi. Penduduk yang bertukar lokaliti tempat kediaman serta selalu merentasi sempadan negeri adalah migran antara negeri.	***Migration survey***	*Collects information on respondents' usual place of residence at two specific points of time which are exactly one year apart. Changes in the usual place of residence locality at these two points in time constitute migration. Population that changes its usual place of residence across state boundaries is known as inter-state migrant.*
Pepejal Terampai (SS)	Pepejal Terampai (SS) berpunca daripada hakisan tanah dan mendapan daripada pembangunan kawasan tanah tinggi dan pembukaan tanah untuk pembalakan dan perlombongan. Ia akan mengakibatkan peningkatan SS dan perubahan kepada kualiti air di dalam lembangan sungai.	***Suspended Solids***	*Suspended Solids (SS) is caused by soil erosion and sedimentation from the development in highlands and clearance of land for logging and mining. It is resulted in the increase of SS and affects water quality in the river basins.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Perangkaan alam sekitar	Statistik yang menerangkan keadaan dan arah aliran alam sekitar, meliputi media alam sekitar semula jadi (udara/iklim, air, tanah), biota dalam media dan penempatan penduduk. Perangkaan alam sekitar mengukur aktiviti manusia dan kejadian semula jadi yang membawa kesan kepada alam sekitar, kesan daripada aktiviti-aktiviti dan kejadian ini, reaksi masyarakat kepada kesan alam sekitar dan kualiti kesediaan aset semula jadi. Definisi lengkap termasuk petunjuk alam sekitar, indeks dan perakaunan.	***Environment statistics***	*Statistics that describe the state and trends of the environment, covering the media of the natural environment (air/climate, water, land/soil), the biota within the media, and human settlements. Environment statistics are integrative in nature, measuring human activities and natural events that affect the environment, the impacts of these activities and events, social responses to the environmental impacts, and the quality and availability of natural assets. Broad definitions include environmental indicators, indices and accounting.*
Perubahan iklim	Istilah yang kerap digunakan merujuk kepada kepanasan sejagat berkaitan pelepasan gas rumah kaca hasil kegiatan manusia.	***Climate change***	*Term frequently used in reference to global warming due to greenhouse gas emissions from human activities.*
R			
Rangka Kerja Pembangunan Perangkaan Alam Sekitar	Konsep rangka kerja bagi membantu membangunkan, menyelaras dan menguruskan perangkaan alam sekitar dan perangkaan berkaitan dengan sosial ekonomi dan demografi. Ia dibangunkan oleh *United Nations Statistics Division* dalam tahun 1984, dan ianya berdasarkan kepada prinsip tekanan-tindak balas impak alam sekitar.	***Framework for the Development of Environment Statistics (FDES)***	*Conceptual framework that assists in development, coordination and organisation of environment statistics and related socio-economic and demographic statistics. It was developed by the United Nations Statistics Division in 1984, and is based on stress-response principles of environmental impacts.*
S			
Sinaran global	Jumlah sinaran radiasi elektomagnet yang dipancarkan oleh matahari ke permukaan bumi.	***Global radiation***	*The amount of electromagnetic radiation emitted by the sun to the earth's surface.*
Sisa	Aliran bahan pepejal, cecair dan gas, serta tenaga, yang dibuang, dilepaskan atau dikeluarkan oleh pertubuhan dan isi rumah melalui proses pengeluaran, penggunaan atau pengumpulan.	***Residuals***	*Flows of solid, liquid and gaseous materials, and energy, discarded, discharged or emitted by establishments and households through production, consumption or accumulation processes.*
Sistem bekas lombong	Sistem untuk menternak ikan di mana-mana tanah yang pernah (tetapi tidak lagi) diberi atau dikeluarkan pajakan lombong atau sijil lombong di bawah mana-mana undang-undang bertulis mengenai perlombongan.	***Ex-mining culture system***	*System of fish culture on any land in respect of which a mining lease or certificate were once but no longer granted or issued under any written law relating to mining.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Sistem kandang	Sistem yang merupakan suatu kepungan yang dibuat daripada bahan pengadang yang dilekatkan pada tiang yang ditanam ke dasar laut.	***Pen culture system***	*System of fish culture in an enclosure made of any screening material attached to poles staked to the seabed.*
Sistem kolam	Sistem ternakan ikan di dalam kolam.	***Culture system***	*System of fish culture in ponds.*
Sistem sangkar	Sistem untuk menternak ikan di dalam suatu kepungan yang dibuat daripada apa-apa bahan saringan yang diikat pada struktur yang dilabuhkan pada dasar perairan sungai atau mana-mana tempat di darat.	***Cage culture system***	*System of fish culture in an enclosure on whatever shape or size made of any screening material and attached to floating structures which are anchored to the sea-bed.*
Sistem tangki	Sistem ternakan ikan di dalam tangki di atas tanah.	***Tank culture system***	*System of fish culture in tanks on land.*
Standard kualiti udara	Kepekatan sesuatu bahan cemar yang dibenarkan dalam atmosfera oleh undang-undang untuk meminimumkan kesan mudarat.	***Air quality standards***	*Levels of air pollutants prescribed by regulations that may not be exceeded during a specified time in a defined area.*
Subbandar	Stesen pengawasan kualiti udara yang terletak di kawasan pinggir bandar.	***Suburban***	*Air quality monitoring stations located in the suburban areas.*
Sulfur Dioksida (SO_2)	Berat, tajam, gas tidak berwarna terbentuk terutamanya oleh pembakaran bahan api fosil. Ia adalah berbahaya kepada manusia dan tumbuh-tumbuhan dan menyumbang kepada keasidan dalam hujan.	***Sulphur Dioxide (SO_2)***	*Heavy, pungent, colourless gas formed primarily by the combustion of fossil fuels. It is harmful to human beings and vegetation and contributes to the acidity in precipitation.*
T			
Taman Laut	Kawasan perairan laut yang dizonkan sejauh dua batu nautika dari tikas air surut terendah, kecuali Pulau Kapas di Terengganu, Pulau Kuraman, Pulau Rusukan Besar dan Pulau Rusukan Kecil di W.P. Labuan yang dizonkan sejauh satu batu nautika dari tikas air surut terendah. Taman Laut ditubuhkan untuk melindungi dan memulihara pelbagai habitat dan hidupan marin akuatik.	***Marine Park***	*Sea zoned area for a distance of two nautical miles from the lowest sea level, except in Kapas Island in Terengganu, Kuraman Island, Rusukan Besar Island and Rusukan Kecil Island in W.P. Labuan. These areas are zoned for a distance of one nautical mile from the lowest sea level. Marine Park is established to protect and conserve various habitats and aquatic marine life.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Tanah Bencah-Ramsar	Kawasan yang berpaya, fen, tanah gambut atau berair samada semula jadi atau buatan manusia, kekal atau sementara, mengandungi air yang tidak mengalir, mengalir, air bersih, air tawar atau masin termasuk kawasan perairan laut, di mana dalamannya tidak melebihi enam meter.	***Wetland-Ramsar***	*Areas of marshes, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static, flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres.*
Tanah bencah	Kawasan dari lapisan tanah rendah yang mana aras air bumi yang berada atau berhampiran dengan permukaan tanah pada kebanyakan masa. Tanah bencah termasuk semua tanah berpaya, tanah berlumpur, fen dan muara.	***Wetland***	*Area of low-lying land where the water table is at or near the surface most of the time. Wetlands include swamps, bogs, fens, marshes and estuaries.*
Tanah berhutan	Tanah yang merangkumi lebih daripada 0.5 hektar dengan pokok-pokok yang lebih tinggi daripada 5 meter dan litupan kanopi melebihi 10%, atau pokok yang mampu untuk mencapai tahap in-situ (FAO 1998; FRA 2000). Ia tidak termasuk tanah di bawah penggunaan tanah pertanian atau bandar (dirian pokok di kawasan pertanian, taman dan sebagainya). Keluasan kawasan berhutan ini dibahagikan kepada Hutan Simpanan Kekal (HSK), Hutan Tanah Kerajaan (HTK), Hutan Hidupan Liar di luar kawasan HSK, lain-lain Rizab Berhutan dan Tanah Berimilik.	***Forested land***	*A land area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 metres with a tree canopy cover of more than 10 per cent. It does not include land under agricultural or urban land use (stand of trees in agricultural areas, parks, etc.). Forested land is divided into permanent forest reserve (PRF), forest land government (FLG), forest wildlife outside the PRF, others forested reserve and alienated land.*
Tanaman	Tanaman merujuk kepada tumbuhan atau hasil pertanian yang ditanam untuk makanan atau keperluan ekonomi lain seperti pakaian atau makanan ternakan.	***Crops***	*Crops refer to plants or agricultural produce grown for food or other economic purposes, such as clothes or livestock fodder.*
Tanaman buluh	Buluh digunakan secara meluas dalam industri pembuatan perabot, kraftangan, bekas barangan, tikar, pulpa, kertas, bahan bakar, pembinaan dan peralatan rumah.	***Bamboo plantation***	*Bamboo is a widely used in the furniture manufacturing industry, handicrafts, container products, matting, pulp, paper, fuel, and construction as well as home appliances.*
Tanaman mengaya	Merupakan suatu rawatan pemulihan hutan ke atas kawasan hutan miskin dan kawasan lapang yang dilaksanakan ke atas kawasan di dalam HSK yang telah diusahasil bagi membantu meningkatkan isi kandungan hutan tersebut supaya mencapai tahap yang dikehendaki.	***Enrichment planting***	*Forest restoration treatments on poor forest areas and open spaces that are performed on the areas in PRF which has been harvested to help improve the content of the forest to reach the desired level.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
Tanaman rotan	Salah satu hasil hutan bukan kayu utama. Bertujuan untuk meningkatkan stok tumbuhan dalam kawasan HSK yang sesuai bagi memastikan pengeluaran sumber ini secara berkekalan untuk menampung keperluan industri perabot rotan tempatan.	***Rattan plantation***	*One of the main non-timber forest products. The plantation is to increase the stock of this plant in the PRF appropriate to ensure sustainable production of these resources to meet the needs of the local rattan furniture industry.*
Tanaman tumbuhan ubatan	Spesies tumbuhan yang mempunyai nilai perubatan dan ditanam secara ladang.	***Planting of medicinal plants***	*Species of plants that have medicinal value and cultivated fields.*
Tapak pelupusan	Pemindahan terakhir bahan sisa di dalam atau di atas tanah yang dikawal atau tidak dikawal mengikut cara kebersihan yang berbeza, perlindungan alam sekitar dan keperluan keselamatan yang lain.	***Landfill***	*Final replacement of waste in or on the land in a controlled or uncontrolled way according to different sanitary, environmental protection and other safety requirements.*
Tapak pelupusan sanitari	Kaedah untuk melupuskan sisa pepejal di atas tanah tanpa menimbulkan gangguan atau bahaya kepada kesihatan awam dan alam sekitar. Berdasarkan prinsip kejuruteraan, sisa pepejal dihadkan kepada kawasan kecil, dikurangkan kepada jumlah yang lebih kecil dan ditutup dengan lapisan tanah pada penghujung waktu operasi setiap hari, atau pada jangka masa yang lebih kerap mengikut keperluan.	***Sanitary landfill***	*A method of disposing of solid wastes on land without creating nuisances or hazards to public health or the environment. Using the principles of engineering, the solid waste is confined to the smallest practical area, reduced to the smallest practical volume and covered with a layer of earth at the conclusion of each day's operation (daily cover), or at more frequent intervals as may be necessary.*
Tapak semaian	Menghasilkan anak benih dan anak pokok untuk digunakan bagi projek-projek penghutanan semula, penyelidikan, perhutanan bandar dan aktiviti landskap.	***Nursery***	*Produce seedlings and saplings to be used for reforestation projects, research, urban forestry and landscape activities.*
Tekanan aras laut	Tekanan udara yang diukur berdasarkan jarak ketinggian dari paras purata aras laut (mengikut *ICAO Standard Atmosphere.*	***Sea level pressure***	*The air pressure measured based on the altitude distance from the mean sea level according to the ICAO Standard Atmosphere.*
Tidak diperoleh	Tiada pencerapan dilaksanakan.	***Not available***	*No observations are performed*
Topografi	Bentuk fizikal kawasan permukaan, termasuk muka bumi atau ketinggian relatif dan kedudukan bentuk muka bumi buatan manusia dan semula jadi.	***Topography***	*Physical feature of a surface area, including its relief or relative elevations, and the position of human-made and natural features.*

TERMA	PENERANGAN	*TERMS*	*EXPLANATIONS*
V			
Viral Hepatitis A	Penyakit akut biasanya termasuk demam, dedar, keletihan melampau, anoreksia, loya, jaundis akut dan kuadran atas kanan abdomen dengan pertambahan lebihan alanine aminotransferase melebihi 2.5 kali kadar biasa.	***Viral Hepatitis A***	*Acute illness typically including fever, malaise, extreme fatigue, anorexia, nausea, acute jaundice and right upper quadrant of abdomen tenderness with raised alanine aminotransferase more than 2.5 times normal rate.*

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