



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

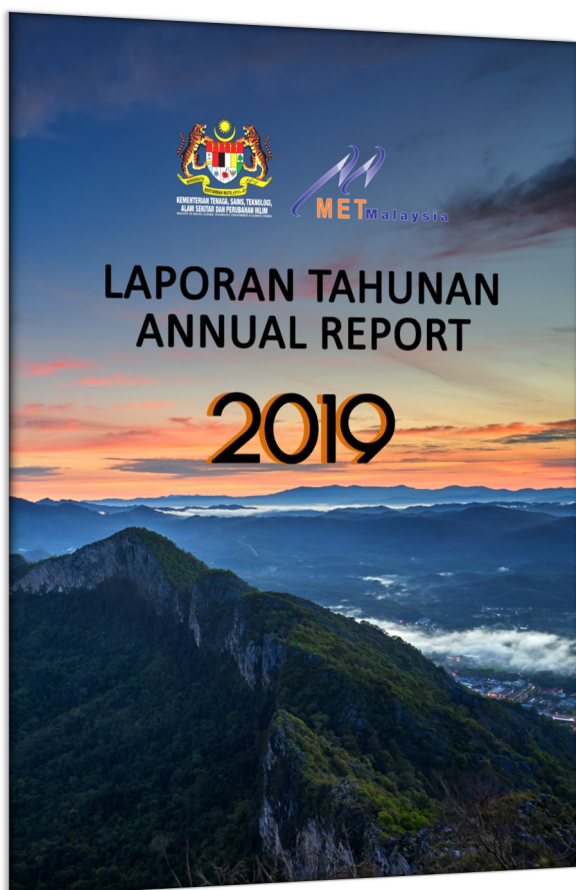


LAPORAN TAHUNAN ANNUAL REPORT

2019



LAPORAN TAHUNAN ANNUAL REPORT 2019



Jabatan Meteorologi Malaysia
Kementerian Tenaga, Sains, Teknologi,
Alam Sekitar dan Perubahan Iklim

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PERUTUSAN KETUA PENGARAH
MESSAGE FROM DIRECTOR GENERAL



Perutusan KETUA PENGARAH

Message From DIRECTOR GENERAL

Sepanjang tahun 2019, negara telah mengalami beberapa kejadian cuaca ekstrem. Kehadiran Ribut Tropika Pabuk berhampiran dengan perairan negara pada 31 Disember 2018 hingga 4 Januari 2019 telah membawa angin kencang, ombak besar dan hujan lebat ke negeri-negeri di pantai timur Semenanjung, seperti Kelantan dan Terengganu. Manakala kawasan utara Semenanjung telah menerima tempias apabila Taufan Lekima membadaai bahagian timur negara China pada 9 Ogos 2019. Kesan ekor Taufan Lekima membentuk garis badai yang melanda negeri-negeri di utara Semenanjung seperti Pulau Pinang, Kedah dan Perlis menyebabkan kerosakan teruk kepada struktur bangunan dan rumah. Monsun Timur Laut 2019/2020 juga merekodkan kejadian banjir besar di Kelantan, Terengganu, Pahang dan Johor pada Disember 2019.

Throughout 2019, our country experienced various extreme weather events. The presence of Tropical Storm Pabuk near our waters on December 31, 2018 until January 4, 2019 brought strong winds, surging waves and heavy rains to the east coast states of the Peninsula such as Kelantan and Terengganu. Meanwhile, the northern part of the Peninsula suffered a devastating blow when Typhoon Lekima lashed the eastern part of China on August 9, 2019. The tail-end effect of Typhoon Lekima developed a squall line that struck the northern states of the Peninsula such as Penang, Kedah and Perlis causing severe damage to buildings and houses. The Northeast Monsoon 2019/2020 also recorded major floods in Kelantan, Terengganu, Pahang and Johor in December 2019.

Tahun 2019 turut merekodkan beberapa siri gelombang haba susulan daripada kehadiran fenomena El-Nino. Chuping, Perlis telah merekodkan gelombang haba pada 5 hingga 8 Mac 2019 dengan suhu maksimum antara 37.1°C dan 37.7°C dan pada 18 hingga 22 Mac 2019 dengan suhu maksimum antara 37.2°C dan 38°C. Semasa Monsun Barat Daya, keadaan cuaca panas dan kering telah menyebabkan jerebu tempatan dan jerebu rentas sempadan yang menyumbang kepada peningkatan Indeks Pencemaran Udara (IPU) di negeri-negeri pantai barat Semenanjung dan beberapa bahagian di Sarawak.

Pada bulan September 2019, apabila kualiti udara mencapai tahap tidak sihat dan bahaya, Kementerian Pendidikan Malaysia (KPM) mengarahkan penutupan lebih kurang 2,000 buah sekolah membabitkan dua juta pelajar di Selangor, Wilayah Persekutuan Putrajaya, Wilayah Persekutuan Kuala Lumpur, Pulau Pinang, Negeri Sembilan dan Sarawak.

Saban tahun, pada tanggal 23 Mac, komuniti meteorologi meraikan sambutan Hari Meteorologi Sedunia (WMD). Pada tahun 2019, tema WMD adalah 'Matahari, Bumi dan Cuaca'. Pemilihan tema ini menunjukkan peranan matahari sebagai sumber tenaga terhadap kehidupan di muka bumi dan kesannya terhadap kitaran hidrologi dan arus lautan yang memberi kesan terhadap corak cuaca dan iklim.

Menyedari kepentingan menerapkan kesedaran tentang cuaca dan iklim kepada generasi muda, MET Malaysia dengan kerjasama Pusat Sains, Teknologi, Kejuruteraan dan Matematik (STEM) Kementerian Pendidikan Malaysia (KPM) telah mengadakan program turun padang dengan menyambut WMD 2019 di Sekolah Menengah Kebangsaan Bukit Merchu, Kuala Kangsar, Perak. Kerjasama dengan KPM diteruskan lagi dengan sepuluh siri Program Kesedaran Awam mengenai Risiko Bencana Cuaca Ekstrem, Gempa Bumi dan Tsunami di seluruh negara melibatkan pelajar dan guru. Di samping itu, MET Malaysia telah menyertai 46 aktiviti pameran dan juga giat menjalankan program *Education In Schools (ESTECC)* di setiap negeri

The year 2019 also recorded a series of heat waves following the presence of the El-Nino phenomenon. Chuping, Perlis recorded a heat wave on March 5 to 8, 2019 with a maximum temperature of between 37.1°C and 37.7°C whereas on March 18 to 22, 2019 with a maximum temperature of between 37.2°C and 38°C. During the Southwest monsoon, hot and dry weather conditions caused local and transboundary haze that contributed to the increase in Air Pollution Index (API) in the west coast states of the Peninsula and some parts of Sarawak.

In September 2019, when the air quality reached unhealthy and dangerous levels, the Ministry of Education Malaysia (MOE) ordered the closure of about 2,000 schools affecting two million students in Selangor, Federal Territory of Putrajaya, Federal Territory of Kuala Lumpur, Penang, Negeri Sembilan and Sarawak.

Every year, on March 23, the meteorological community celebrates World Meteorological Day (WMD). In 2019, the theme of WMD was 'The Sun, The Earth and The Weather'. The selection of this theme shows the role of the sun as a source of energy for life on Earth and its effect on the hydrological cycles and ocean current that affects the climate and weather patterns.

Realising the importance of cultivating awareness on weather and climate for the younger generation, MET Malaysia in collaboration with Science, Technology, Engineering and Mathematics (STEM) Centre, Ministry of Education (MOE) has gone to the ground and celebrated the WMD 2019 at Sekolah Menengah Kebangsaan Bukit Merchu in Kuala Kangsar, Perak. The cooperation with MOE is further strengthened with a series of ten Public Awareness Programmes on Extreme Weather, Earthquake and Tsunami involving students and teachers. In addition, MET Malaysia have participated in 46 exhibitions and also actively conducted Education in Schools (ESTECC) programmes in every state to meet the goals set by MESTECC.

MET Malaysia turut melaksanakan beberapa projek pembangunan di bawah Rancangan Malaysia ke-11 (RMK-11) bagi menyokong perkhidmatan yang diberikan. Sebanyak dua projek pembangunan telah berjaya disiapkan manakala dua projek pembangunan akan disambung pada tahun 2020. Selain, pembangunan infrastruktur dan peralatan, aspek pembangunan modal insan turut diberi penekanan bagi memastikan mutu perkhidmatan yang diberikan mencapai visi dan misi seperti mana ditetapkan.

Penganjuran bengkel dan kursus dalaman serta menghadiri kursus, bengkel dan seminar di luar negara merupakan sebahagian usaha jabatan dalam meningkatkan pembangunan modal insan. Di samping itu, peluang kolaborasi dengan agensi dan institusi tempatan seperti Tentera Laut DiRaja Malaysia (TLDM), Agensi Penguatkuasaan Maritim Malaysia (APMM), Jabatan Pengairan dan Saliran (JPS) dan agensi serta institusi luar negara seperti UK MET Office dan Hong Kong Observatory (HKO) juga memberi peluang kepada kakitangan meningkatkan pengetahuan dan kemahiran. Kelulusan pelaksanaan Pakar Bidang Khusus, *Subject Matter Expert* yang diperoleh dari Jabatan Perkhidmatan Awam (JPA) merupakan peluang kenaikan pangkat alternatif kepada kakitangan bagi sebuah agensi skim tertutup seperti MET Malaysia.

Diharapkan dengan usaha dan inisiatif yang dilaksanakan, ianya akan meningkatkan keberkesanan perkhidmatan yang diberikan dan MET Malaysia akan kekal relevan mendepani cabaran. Sekalung tahniah dan penghargaan serta ucapan terima kasih kepada semua warga MET Malaysia yang telah menjalankan tugas dengan penuh dedikasi sepanjang tahun.

MET Malaysia have also implemented several development projects under the Eleventh Malaysia Plan (11MP) to support the services provided. Two development projects have been successfully completed while two other development projects will be continued in 2020. Besides infrastructure and equipment development, the human capital development aspect has also emphasized in ensuring quality of services provided meets the vision and mission as set.

Organizing workshops and courses internally as well as attending courses, workshops and seminars abroad are part of the MET Malaysia's efforts in enhancing human capital development. In addition, collaboration opportunities with local agencies and institutions such as the Royal Malaysian Navy (RMN), the Malaysian Maritime Enforcement Agency (MMEA), Department of Irrigation and Drainage (DID) and overseas agencies and institutions such as the UK MET Office and Hong Kong Observatory (HKO) also provides opportunity to employees to enhance their knowledge and skills. The approval to implement the Subject Matter Expert (SME) obtained from the Public Service Department (PSD) is an alternative promotion opportunity for employees in a closed scheme agency like MET Malaysia.

It is hoped that the efforts and initiatives implemented will enhance the effectiveness of the services provided and MET Malaysia will remain relevant to take up the challenges. My heartiest congratulations and sincere appreciation to all MET employees who have performed their tasks dedicatedly throughout the year.



JAILAN BIN SIMON

Ketua Pengarah
Jabatan Meteorologi Malaysia
Director General
Malaysian Meteorological Department

The background of the cover is a dark navy blue. On the left side, there are several diagonal stripes in shades of light grey and white. A large, stylized chevron shape, composed of three parallel bands in yellow, orange, and red, points towards the right. The text is centered within the dark blue area, to the right of the chevron.

PROFIL KORPORAT

CORPORATE PROFILE

VISI

Menjadi agensi peneraju unggul dalam bidang meteorologi, iklim dan geofizik

VISION

To become a leading agency in meteorology, climatology and geophysics

MISI

Membekal perkhidmatan meteorologi, iklim dan geofizik yang cekap dan berkesan untuk kesejahteraan, keselamatan dan pembangunan lestari selaras dengan keperluan negara dan antarabangsa

MISSION

To provide efficient and effective meteorological, climatological and geophysics services for the well-being, safety and sustainable development in order to meet the national and international needs

OBJEKTIF

1. Mengeluarkan maklumat dan ramalan cuaca bertepatan masa untuk penerbangan awam dan tentera, pelbagai aktiviti marin dan orang awam.
2. Mengeluarkan maklumat gempa bumi dan tsunami bertepatan masa untuk agensi pengurusan bencana, orang awam dan media.
3. Menyediakan amaran awal tentang kemungkinan berlakunya fenomena cuaca buruk, keadaan laut bergelora dan ancaman tsunami kepada orang awam, media dan agensi berkaitan yang terlibat dalam menangani bencana.
4. Menjalankan operasi pembenihan awan bagi menangani isu jerebu, meningkatkan sumber air dan pelbagai tujuan lain.
5. Mempromosikan kesedaran awam mengenai cuaca ekstrem, gempa bumi dan tsunami.

OBJECTIVE

1. To issue timely information and weather forecast for commercial and military aviation, public and marine activities.
2. To issue timely information on earthquakes and tsunami for disaster management agencies, public and media.
3. To provide early warning of the possibility of the bad weather phenomenon, rough seas condition and tsunami threat to public, media and related agencies involved in disaster management.
4. To conduct cloud seeding operations in order to address haze issue, increase water resources and other purposes.
5. To promote public awareness on extreme weather, earthquake and tsunami.

PIAGAM PELANGGAN

Jabatan Meteorologi Malaysia berusaha memberikan perkhidmatan meteorologi dan geofizik yang berkualiti tinggi bagi memenuhi keperluan ekonomi dan keselamatan negara kita. Kami berjanji akan melaksanakan perkara-perkara berikut:

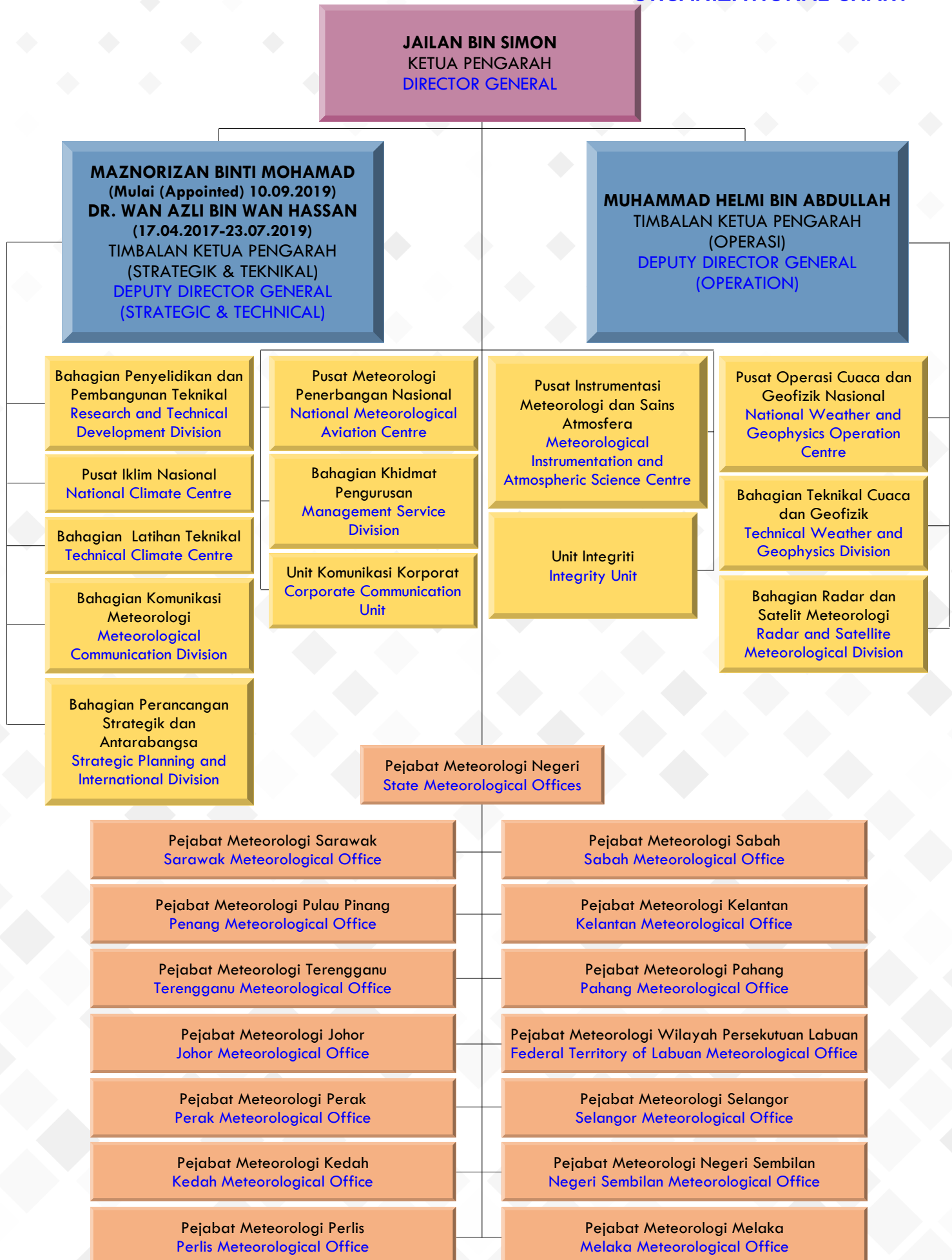
- Permohonan maklumat meteorologi, seismologi dan tsunami akan diberi maklumbalas dalam tempoh satu hari bekerja dan dibekalkan dalam tempoh lima hari bekerja.
- Maklumat cuaca untuk penerbangan disediakan dalam tempoh tiga jam sebelum pelepasan.
- Buletin Cuaca Bulanan akan diterbitkan dalam tempoh 10 hari bekerja pada setiap permulaan bulan berikutnya.
- Ringkasan Pencerapan Cuaca Tahunan akan diterbitkan pada Februari tahun berikutnya.
- Buletin Agrometeorologi 10 hari akan diterbitkan dalam tempoh lima hari bekerja selepas setiap dekad.
- Tinjauan dan Analisis Agroklimatik Bulanan akan diterbitkan pada minggu kedua bulan berikutnya.
- Imej radar dan satelit di laman web akan dikemaskini setiap 10 minit.
- Maklumat awal gempa bumi dan tsunami akan disebarkan kepada agensi-agensi berkaitan dan media massa dalam tempoh lapan minit daripada kejadian gempa bumi dikesan.

CLIENT CHARTER

Malaysian Meteorological Department is responsible to provide high quality meteorological and geophysical services to fulfil both economic and security needs of our nation. We pledge to perform as follows:

- Request for meteorological, seismological and tsunami information will be responded within one working day and supplied within five working days.
- Weather information for flights will be ready three hours before departure.
- Monthly Weather Bulletin will be published within 10 working days in the beginning of the following month.
- Annual Weather Observation Summary will be published by February of the following year.
- 10-day Agrometeorological Bulletin will be published within five working days after each decade.
- Monthly Agroclimatic Review and Analysis will be published in the second week of the following month.
- Radar and satellite images on the website will be updated every 10 minutes.
- Preliminary earthquake and tsunami information will be disseminated to the relevant agencies and media within eight minutes upon the detection of earthquake.

CARTA ORGANISASI ORGANIZATIONAL CHART



PENGURUSAN TERTINGGI
TOP MANAGEMENT

KETUA PENGARAH
DIRECTOR GENERAL



JAILAN BIN SIMON

TIMBALAN KETUA PENGARAH
(STRATEGIK & TEKNIKAL)
DEPUTY DIRECTOR GENERAL
(STRATEGIC & TECHNICAL)



**MAZNORIZAN BINTI
MOHAMAD**
(Mulai (Appointed)
10.09.2019)



**DR. WAN AZLI BIN
WAN HASSAN**
(17.04.2017 -
23.07.2019)

TIMBALAN KETUA PENGARAH
(OPERASI)
DEPUTY DIRECTOR GENERAL
(OPERATION)



**MUHAMMAD HELMI BIN
ABDULLAH**

PENGARAH & KETUA UNIT DIRECTORS & UNIT HEADS

PEJABAT KETUA PENGARAH/DIRECTOR GENERAL OFFICE

DR. MOHD HISHAM BIN MOHD ANIP

PENGARAH KANAN/SENIOR DIRECTOR

Pusat Meteorologi Penerbangan Nasional
National Meteorological Aviation Centre

LING LEONG KWOK

PENGARAH KANAN/SENIOR DIRECTOR

Pusat Instrumentasi Meteorologi
dan Sains Atmosfera
Meteorological Instrumental and
Atmospheric Science Centre

ROZZITA SULAIMAN

PENGARAH/DIRECTOR

Bahagian Khidmat Pengurusan
Management Service Division

RAMLAN AB. RAHMAN

KETUA UNIT/UNIT HEAD

Unit Komunikasi Korporat
Corporate Communication Unit

**THANARUBINI A/P
VADIVELOO**

KETUA UNIT/UNIT HEAD

Unit Integriti
Integrity Unit

DR. AHMAD FAIRUDZ JAMALUDDIN

PENGARAH/DIRECTOR

Bahagian Sains Atmosfera dan Pembenihan Awan
Atmospheric Science and Cloud Seeding Division

WAN MOHD NAZRI WAN DAUD

PENGARAH/DIRECTOR

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Meteorological Instrumental Division

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PENGARAH/DIRECTOR

Bahagian Penyelidikan dan
Pembangunan Teknikal
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KHAZAINANI BINTI SALLEH

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LIM ZE HUI

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AZEMI BIN DAUD	NOR ADAWIAH BINTI ABDULLAH
PENGARAH/DIRECTOR Pejabat Meteorologi Pulau Pinang Pulau Pinang Meteorological Office	PENGARAH/DIRECTOR Pejabat Meteorologi Johor Johor Meteorological Office
RABIAH AL ADAWIAH BINTI ZAKARIA	ROSLI BIN ZAKARIA @ CHE KOB
PENGARAH/DIRECTOR Pejabat Meteorologi Kelantan Kelantan Meteorological Office	PENGARAH/DIRECTOR Pejabat Meteorologi Terengganu Terengganu Meteorological Office
KHAIRUL NAJIB BIN IBRAHIM	AZMI BIN ATAN
PENGARAH/DIRECTOR Pejabat Meteorologi Pahang Pahang Meteorological Office	PENGARAH/DIRECTOR Pejabat Meteorologi Selangor Selangor Meteorological Office

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Meteorological Office

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Pejabat Meteorologi Perlis
Perlis Meteorological Office

RAFIZAM BIN RAMLI

PENGARAH/DIRECTOR
Pejabat Meteorologi Negeri Sembilan
Negeri Sembilan Meteorological Office



**MET MALAYSIA BERSAMA
MESTECC**

**MET MALAYSIA WITH
MESTECC**

Menteri Tenaga, Sains, Teknologi, Alam Sekitar dan Perubahan Iklim (MESTECC), YB Puan Yeo Bee Yin melawat Pangkalan Tentera Udara Diraja Malaysia (TUDM) Subang pada 12 September 2019 bagi meninjau persiapan Operasi Pembenihan Awan.



MET MALAYSIA BERSAMA MESTECC MET MALAYSIA WITH MESTECC

Minister of Energy, Science, Technology, Environment and Climate Change (MESTECC), YB Puan Yeo Bee Yin visited the Subang Royal Malaysian Air Force on September 12, 2019 to see the preparations of Cloud Seeding Operations.



Timbalan Menteri MESTECC, YB Puan Isnaraissah Munirah Majilis melawat pameran jabatan dalam Program Sambutan Hari Bumi 2019 Peringkat Kebangsaan yang diadakan di Kota Kinabalu, Sabah pada 21 April 2019.



Deputy Minister of MESTECC, YB Puan Isnaraissah Munirah Majilis visited the department exhibition at The National Level World Earth Day 2019 celebration programme. The programme was held in Kota Kinabalu, Sabah on April 21, 2019.



Ketua Setiausaha MESTECC, YBhg. Datuk Seri Dr. Mohd Azhar bin Haji Yahaya merasmikan sambutan Hari Meteorologi Sedunia 2019 dan Pelancaran Buku Iklim Perak di Sekolah Menengah Kebangsaan Bukit Merchu, Kuala Kangsar, Perak pada 19 Mac 2019.



Secretary General of MESTECC, YBhg. Datuk Seri Dr. Mohd Azhar bin Haji Yahaya officiated The World Meteorological Day 2019 celebration and Iklim Perak Book Launch at Sekolah Menengah Kebangsaan Bukit Merchu, Kuala Kangsar, Perak on March 19, 2019.





SOROTAN 2019

2019 OVERVIEW

SOROTAN 2019 2019 OVERVIEW

SUMBER MANUSIA

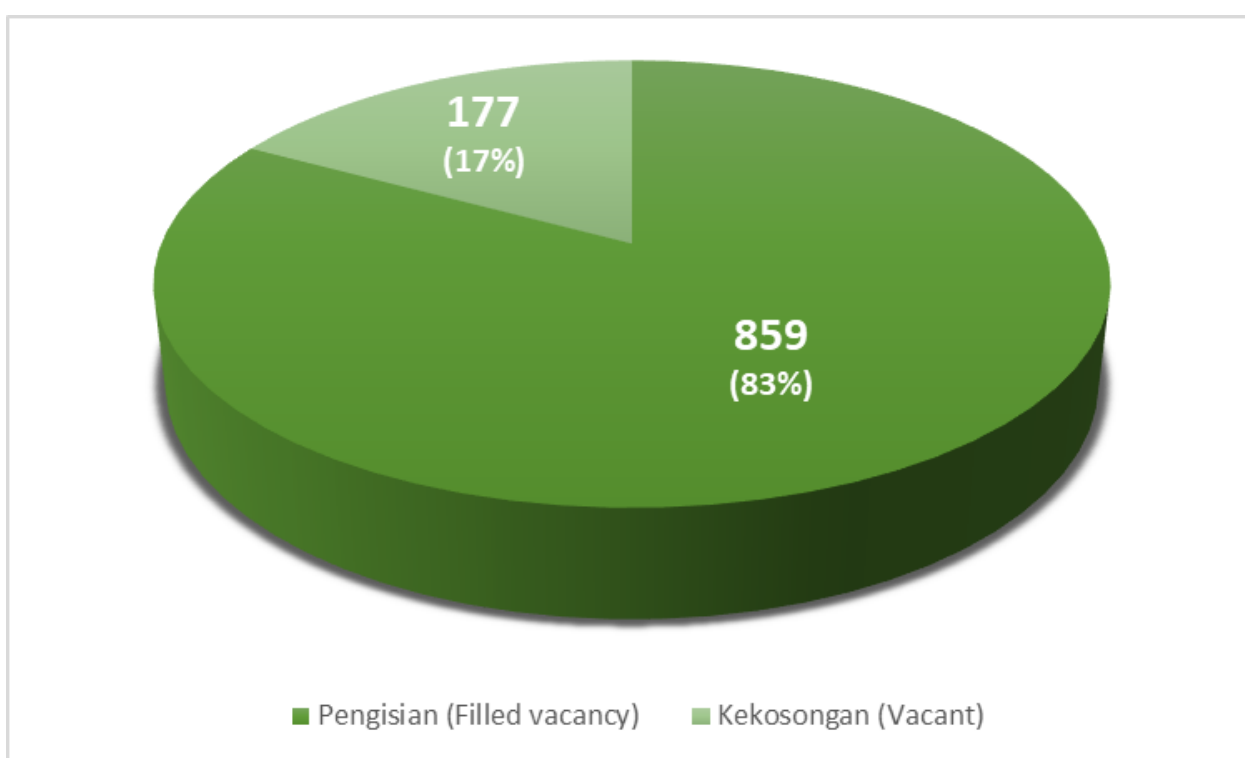
Pada tahun 2019, dalam memastikan kesinambungan fungsi-fungsi utama serta kemajuan kerjaya, MET Malaysia telah memproses 74 pemangkuan dan 58 kenaikan pangkat bagi kakitangannya.

Sehingga 31 Disember 2019, kekuatan warga kerja MET Malaysia adalah seramai 859 orang anggota daripada 1036 perjawatan. Peratus pengisian perjawatan adalah sebanyak 83%.

HUMAN RESOURCES

In 2019, to ensure the continuity of the core business and career development, MET Malaysia processed the acting posts for 74 employees and promotions for 58 of its employees.

As at December 31, 2019 MET Malaysia had a total number of 859 employees from 1036 posts. The percentage of positions filled was 83%.



Bilangan anggota MET Malaysia pada 31 Disember 2019
Total number of MET Malaysia employees on December 31, 2019

PEMBANGUNAN MODAL INSAN

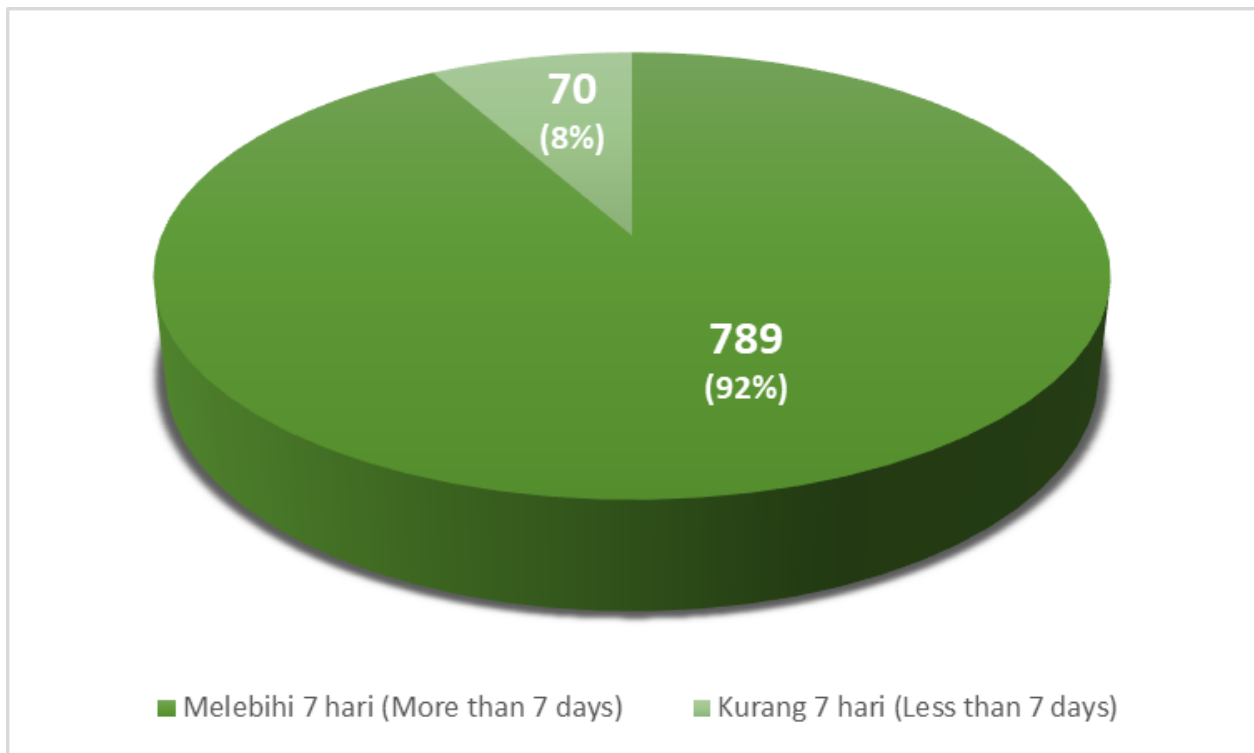
Sepanjang tahun 2019, sebanyak 31 kursus dalaman telah dilaksanakan untuk meningkatkan kefahaman dan kemahiran dalam bidang berkaitan meteorologi dan pembangunan modal insan, selain meningkatkan kesedaran mengenai kepentingan dan kegunaan maklumat meteorologi.

Sejumlah 789 daripada 859 keseluruhan pegawai berjaya menghadiri tujuh atau lebih hari berkursus. Ini mewakili pencapaian Petunjuk Prestasi Utama sebanyak 92% bagi tahun 2019.

HUMAN CAPITAL DEVELOPMENT

Throughout the year 2019, a total of 31 internal courses were conducted to enhance the understanding and skills in the areas of meteorology and human capital development, besides increasing awareness on the importance and usage of meteorological information.

789 out of 859 employees had successfully attended seven or more days of courses. This represented a Key Performance Indicator of 92% in 2019.



Antara kursus-kursus yang dijalankan adalah :

- i) Kursus Pengendalian dan Pemantapan Sistem Aplikasi *Automatic Weather System* (AWS)
- ii) Kursus Sistem Pengurusan Keselamatan Maklumat MS ISO/IEC 27001:2013
- iii) Kursus Asas Penolong Pegawai Meteorologi Sesi 2018/2019
- iv) Kursus Pengukuhan Sistem Aplikasi Radar *Dual Polarization* dan Satelit Meteorologi Generasi Baru

Among the courses conducted were:

- i) Automatic Weather System (AWS) System Application Managing and Strengthening Course
- ii) MS ISO/IEC 27001:2013 Information Security Management System Course
- iii) Basic Course for Assistant Meteorological Officers 2018/2019 Session
- iv) Radar Dual Polarization Application and New Generation Meteorological Satellite Strengthening Course



MET Malaysia juga telah melaksanakan Program *Apprenticeship* bertujuan untuk memberi bimbingan, sokongan dan bantuan melalui penerapan elemen psikologi dan kaunseling kerjaya oleh mentor kepada *apprentice*.

Program *Apprenticeship* Siri 1/2019 telah diadakan pada 19 Jun 2019 sehingga 4 September 2019. Program ini melibatkan penyertaan sembilan pegawai pelbagai gred (Gred 11 hingga 48) bersama dua orang mentor (Gred Utama C).



Di samping itu, sebanyak 10 program Skim Latihan Kepakaran Teknikal (LKT) dan satu program Skim Latihan Kepakaran Teknikal (EXPT) telah dilaksanakan di bawah Program Pembangunan Modal Insan MESTECC dengan penglibatan seramai 25 orang kakitangan.

MET Malaysia also conducted the *Apprenticeship Programme* aimed at providing guidance, support and assistance by inculcating psychological elements and career counselling through mentors for the apprentice.

The Series 1/2019 *Apprenticeship Programme* was held from June 19 till September 4, 2019. Nine officers from various ranks (Grade 11 till 48) took part in the programme along with two mentors (Grade Utama C).

Besides that, a total of 10 programmes on Technical Expertise Training Scheme (LKT) and one Technical Expertise Training Scheme (EXPT) were completed under MESTECC's Human Capital Development Program involving 25 employees.



MET Malaysia turut mengalakkan kakitangannya melanjutkan pelajaran di peringkat Sarjana dan Doktor Falsafah (PhD). Pada tahun 2019, seramai dua orang pegawai meteorologi telah melanjutkan pelajaran ke peringkat Sarjana manakala seorang pegawai melanjutkan pelajaran ke peringkat PhD.

MET Malaysia also encourages its employees to pursue higher education at the Masters and Doctoral (PhD) levels. In 2019, two meteorological officers pursued masters studies and one meteorological officer pursued PhD studies.

Pada 5 Julai 2019, MET Malaysia telah mendapat kelulusan Jabatan Perkhidmatan Awam (JPA) bagi pelaksanaan Pakar Bidang Khusus (SME) dalam bidang iklim, geofizik dan meteorologi.

On July 5, 2019, MET Malaysia obtained the approval from the Public Service Department (JPA) for the implementation of Subject Matter Expert (SME) in the areas of climate, geophysics and meteorology.

Selain itu, bagi menyokong pembangunan sumber manusia negara, MET Malaysia telah menawarkan latihan industri kepada 40 orang pelajar.

Besides that, in support of the national human resources development, MET Malaysia offered industrial trainings to 40 students.



MET Malaysia juga terlibat dalam aktiviti yang berorientasikan masyarakat bagi mendidik, memberi kesedaran dan meningkatkan kesiapsiagaan dalam kalangan orang awam terutamanya dari aspek kepentingan memahami maklumat dan data meteorologi.



MET Malaysia was also involved in community-oriented activities in educating, creating awareness and improving preparedness among the people especially on the importance of understanding the meteorological information and data.

Sepanjang tahun 2019, sejumlah 46 aktiviti pameran dan program kesedaran awam telah berjaya dilaksanakan oleh MET Malaysia. Jabatan juga telah bekerjasama dengan Kementerian Pendidikan Malaysia (KPM) bagi menganjurkan sepuluh siri Program Kesedaran Awam Mengenai Risiko Bencana Cuaca Ekstrem, Gempa Bumi dan Tsunami.

In 2019, a total of 46 exhibition and public awareness programmes were successfully conducted by MET Malaysia. The department in collaboration with the Ministry of Education (MOE) organised ten series of Public Awareness Programme on the Risk of Extreme Weather, Earthquake and Tsunami.

BIL NO	TARIKH DATE	LOKASI LOCATION
1	12/03/2019	Kuala Terengganu, Terengganu
2	14/03/2019	Tumpat, Kelantan
3	09/04/2019	Bukit Keteri, Perlis
4	11/04/2019	Teluk Bahang, Pulau Pinang
5	25/06/2019	Miri, Sarawak
6	27/06/2019	Bintulu, Sarawak
7	16/07/2019	Kota Belud, Sabah
8	18/07/2019	Kudat, Sabah
9	20/08/2019	Sandakan, Sabah
10	22/08/2019	Lahad Datu, Sabah

Butiran program kesedaran awam tahun 2019
List of public awareness programmes in 2019

PERUNTUKAN

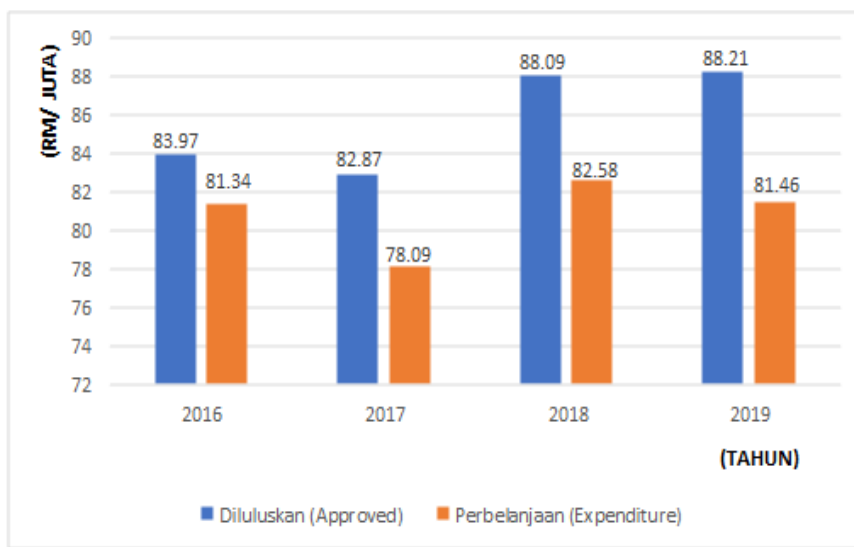
Perbelanjaan mengurus MET Malaysia bagi tahun 2019 adalah berjumlah RM81.46 juta, iaitu 92.36% berbanding dengan peruntukan yang diluluskan berjumlah RM88.21 juta.

Pengurangan peratusan perbelanjaan berbanding tahun 2018 (93.75%) adalah disebabkan penjimatan perbelanjaan yang diamalkan jabatan selaras dengan hasrat kerajaan bagi mengoptimumkan perbelanjaan kerajaan.

BUDGET

MET Malaysia's operating expenditure for 2019 was RM81.46 million, i.e. 92.36% compared to the approved allocation of RM88.21 million.

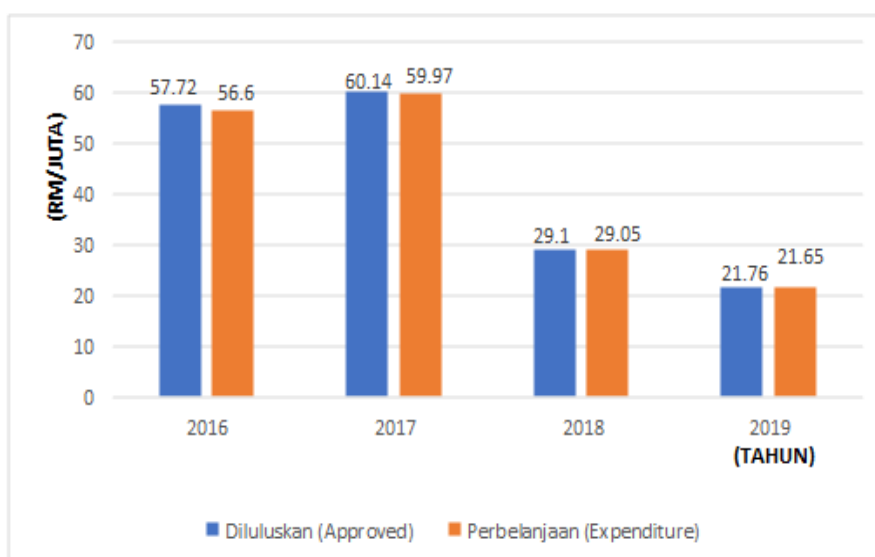
The reduction of expenditure compared to year 2018 (93.75%) was due to the saving measures practised by the department in line with the government's intention to optimise government spending.



Perbelanjaan Mengurus dari tahun 2016 hingga 2019
Operating Expenditure from year 2016 till 2019

Perbelanjaan pembangunan MET Malaysia bagi tahun 2019 adalah sebanyak RM21.65 juta iaitu 99.55% berbanding peruntukan yang diluluskan iaitu RM21.76 juta. Jumlah ini adalah satu pengurangan berbanding dengan tahun 2018 (99.85%).

MET Malaysia's development expenditure for 2019 was RM21.65 million, i.e. 99.55% compared to the approved allocations of RM21.76 million. There is a slight decrease in development expenditure compared to year 2018 (99.85%).



Perbelanjaan Pembangunan dari tahun 2016 hingga 2019
Development Expenditure from year 2016 till 2019

PROJEK PEMBANGUNAN

Pada tahun 2019, dua projek pembangunan telah berjaya disiapkan manakala dua projek disambung ke tahun 2020.

Projek yang siap dilaksanakan adalah:

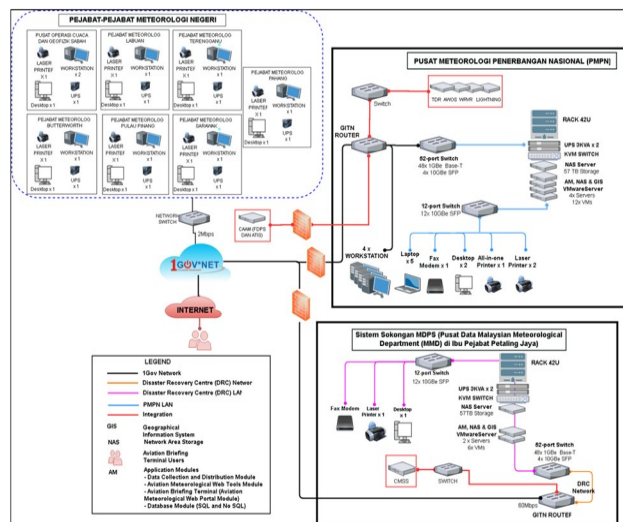
- Projek pemasangan *wind shear detection system* di lapangan terbang seluruh Malaysia.
- Penggantian *Meteorological Data Processing System (MDPS)* di Lapangan Terbang Antarabangsa Kuala Lumpur (KLIA) dan mewujudkan *Disaster Recovery Centre (DRC)* bagi MDPS.

DEVELOPMENT PROJECT

In 2019, two development projects were successfully completed whereas two other projects will be continued in 2020.

The completed projects were:

- Installation of wind shear detection system at airports nationwide.
- Replacement of Meteorological Data Processing System (MDPS) at Kuala Lumpur International Airport (KLIA) and to create the Disaster Recovery Centre (DRC) for MDPS.



Pelan Reka bentuk Sistem MDPS dan DRC
Design of MDPS System and DRC

Dua projek pembangunan yang disambung ke tahun 2020 adalah:

- Peningkatan kecekapan sistem rangkaian radar cuaca
- Peningkatan perkhidmatan iklim

PENCAPAIAN PETUNJUK PRESTASI UTAMA (KPI)

Secara keseluruhan, Pencapaian Petunjuk Prestasi Utama (KPI) MET Malaysia pada tahun 2019 adalah seperti berikut:

- Purata kejituan ramalan cuaca awam bagi tempoh

Two development projects that will be continued in 2020 are:

- Enhancement of the Weather Radar Network System Efficiency
- Enhancement of climate services

KEY PERFORMANCE INDICATORS (KPI) ACHIEVEMENT

Overall, the achievement of MET Malaysia's Key Performance Indicator (KPI) in 2019 is as follows

- Public weather forecast accuracy for:

Pencapaian Sasaran/ Achieved Target

HARI DAY	PENCAPAIAN ACHIEVEMENT	SASARAN TARGET
1 hari / day	86.59%	85%
3 hari / day	84.69%	75%
7 hari / day	82.95%	65%

ii) Purata kejituan ramalan cuaca lautan bagi tempoh:

ii) Average accuracy of marine weather forecast within:

Pencapaian Sasaran/ Achieved Target

HARI DAY	PENCAPAIAN ACHIEVEMENT	SASARAN TARGET
1 hari / day	87.12%	85%
3 hari / day	85.68%	75%
7 hari / day	83.58%	65%

iii) Purata penghantaran maklumat awal berkaitan gempa bumi dan tsunami tempatan dalam tempoh 8 minit dari masa kejadian gempa tersebut adalah 93%.

iii) The average dissemination of early information on local earthquakes and tsunamis within 8 minutes from the beginning of the earthquake is 93%.

- Purata kejituan ramalan cuaca penerbangan: 93%
- Purata kejituan tinjauan cuaca bermusim dan iklim: 64%

- Average accuracy of aviation weather forecast is 93%
- Average accuracy of seasonal weather and climate is 64%

Kesinambungan pensijilan ISMS ISO / IEC 27001:2013 jabatan diteruskan berikutan penemuan *Surveillance Audit* yang baik dengan tempoh sah laku pada 31 Oktober 2017 hingga 30 Oktober 2020.

The continuity of MET Malaysia's ISMS certification ISO/IEC 27001:2013 was achieved following the favourable findings through the *Surveillance Audit* from October 31, 2017 until October 30, 2020.



SIRIM QAS
INTERNATIONAL

SIJIL



SIRIM QAS International Sdn. Bhd. dengan ini mengesahkan bahawa

JABATAN METEOROLOGI MALAYSIA
JALAN SULTAN
46667 PETALING JAYA
SELANGOR DARUL EHSAN
MALAYSIA



telah melaksanakan Sistem Pengurusan Keselamatan Maklumat yang menepati

ISO/IEC 27001:2013
Information Technology – Security Techniques – Information Security Management Systems – Requirements



Skop Pensijilan

**SISTEM PENGURUSAN KESELAMATAN MAKLUMAT (ISMS) BAGI
PENGURUSAN PENGOPERASIAN LAMAN WEB DI PUSAT DATA JABATAN
METEOROLOGI MALAYSIA.**

**INI ADALAH MEHEPATI PENYATAAN PEMAKAIAN:
NO. KELUARAN: 3, NO. PINDAAN: 00, 08 MEI 2017**

Issue date : 23 Oktober 2017

Validity period : 31 Oktober 2017 - 30 Oktober 2020

Certification No. : ISM 00232

SIRIM QAS INTERNATIONAL SDN. BHD.
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Mohd Azanuddin Salleh
Pegawai Urusan
SIRIM QAS International Sdn. Bhd.

Pengeluaran sijil ini bertaklik kepada peraturan-peraturan dan syarat-syarat seperti tertera dalam Perjanjian Pensijilan.



THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and SIRIM QAS International hereby certify that

JABATAN METEOROLOGI MALAYSIA
JALAN SULTAN
46667 PETALING JAYA
SELANGOR DARUL EHSAN
MALAYSIA

has implemented and maintains a

INFORMATION SECURITY MANAGEMENT SYSTEM

which fulfils the requirements of the following standard

ISO/IEC 27001:2013

for the following activities

INFORMATION SECURITY MANAGEMENT SYSTEM FOR THE
MANAGEMENT OF WEBSITE OPERATION AT MALAYSIAN
METEOROLOGICAL DEPARTMENT DATA CENTRE.

THIS IS IN ACCORDANCE TO STATEMENT OF APPLICABILITY: ISSUE NO. : 3,
REVISION NO. : 00, 08 MAY 2017

Issued on : 23 October 2017

Validity date : 30 October 2020

Certification Number : MY-ISM 00232



Alex Stoichitoiu
President of IQNet



Mohd Azanuddin Salleh
Managing Director
SIRIM QAS International Sdn Bhd

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CUACA DAN IKLIM
WEATHER AND CLIMATE

CUACA DAN IKLIM WEATHER AND CLIMATE

CUACA PADA 2019

Anggaran suhu purata dunia bagi 2019 adalah $0.81 \pm 0.1^{\circ}\text{C}$ atas paras purata 1961–1990 dan suhu purata 2019 berada di tangga kedua terpanas selepas tahun 2016. Tahun paling panas yang direkodkan dalam 10 tahun terkini adalah pada tahun 2016 dengan $0.87 \pm 0.1^{\circ}\text{C}$ lebih daripada purata 1961–1990 disebabkan kehadiran El Niño kuat pada tahun 2015 dan 2016.

WEATHER IN 2019

The world's average temperature estimation for 2019 was $0.81 \pm 0.1^{\circ}\text{C}$ above the average of 1961–1990 and the average temperature for 2019 was the second warmest recorded after year 2016. The warmest year in record for the last ten years was in 2016 with the estimation of $0.87 \pm 0.1^{\circ}\text{C}$ above the average of 1961–1990 due to strong El Niño in 2015 and 2016.

KEDUDUKAN RANK	TAHUN YEAR	ANOMALI ($^{\circ}\text{C}$) ANOMALY ($^{\circ}\text{C}$)	ANOMALI ($^{\circ}\text{F}$) ANOMALY ($^{\circ}\text{F}$)
1	2016	0.95	1.71
2	2019	0.92	1.66
3	2015	0.91	1.64
4	2017	0.85	1.53
5	2018	0.79	1.42

Sumber/Source:

National Centers for Environment Information (2019)

<https://www.ncdc.noaa.gov/sotc/global/201911>

Iklim Malaysia dicirikan oleh tiga komponen utama iaitu corak tiupan angin, taburan hujan dan suhu. Di samping itu kehadiran *El-Niño Southern Oscillation* (ENSO), kitaran berkala *Indian Ocean Dipole* (IOD) dan *Madden Julian Oscillation* (MJO) turut mempengaruhi taburan hujan negara.

Malaysia's climate can be characterized by three main components namely wind pattern, rainfall and temperature. In addition, the presence of *El-Niño Southern Oscillation* (ENSO), *Indian Ocean Dipole* (IOD) periodic cycle and *Madden Julian Oscillation* (MJO) affects the nation's rainfall distribution.

Negara telah mengalami fasa lemah El-Niño yang bermula pada Oktober 2018 dan berterusan sehingga Jun 2019, diikuti dengan ENSO neutral yang berterusan sehingga Disember 2019. Fenomena El Niño yang lemah lazimnya memberi impak yang minimum terhadap taburan hujan di Malaysia.

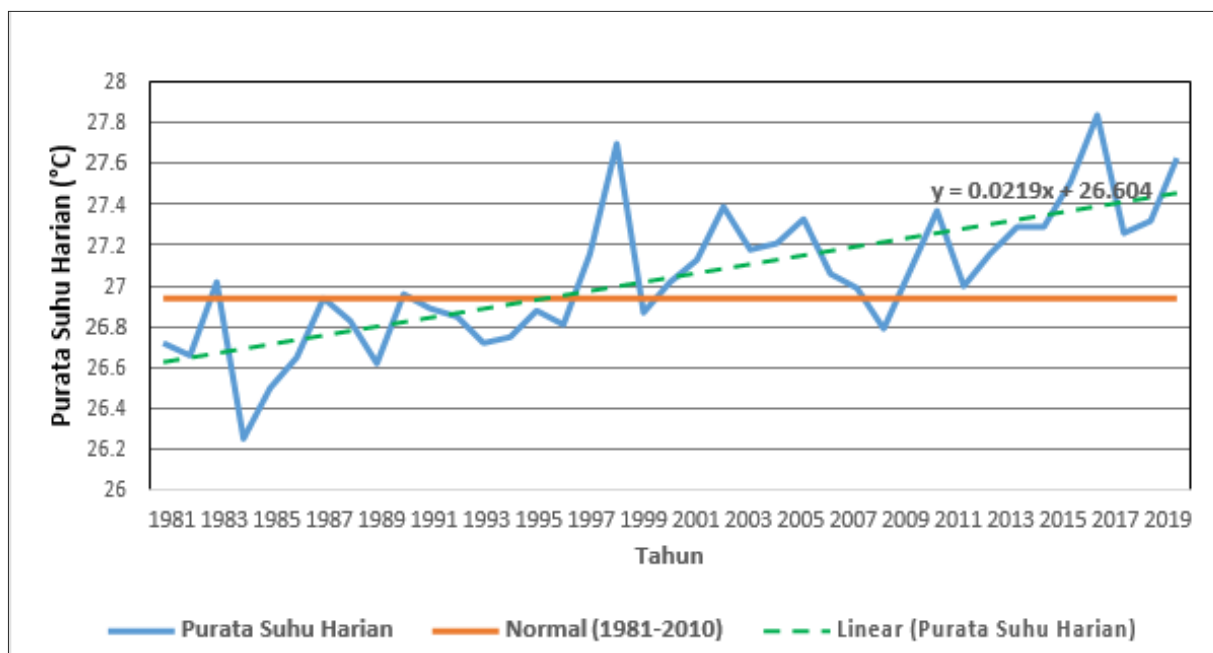
The country had experienced a weak phase of El-Niño which started in October 2018 and continued until June 2019, followed by a neutral ENSO that continued until December 2019. A weak El Niño phenomenon usually has a minimal impact on rainfall distribution in Malaysia.

Purata suhu untuk tahun 2019 adalah 27.63°C , iaitu 0.69°C di atas normal. Suhu normal bagi Malaysia adalah 26.94°C . Purata suhu maksimum 2019 pula sekitar 32.67°C , iaitu 0.71°C di atas normal manakala purata suhu minimum 2019 adalah 24.24°C , iaitu 0.66°C di atas normal. Purata suhu ini secara umumnya menunjukkan trend peningkatan berbanding normal.

The average temperature for 2019 was 27.63°C , was 0.69°C above normal. The normal temperature for Malaysia is 26.94°C . The average maximum temperature of 2019 was around 32.67°C , which was 0.71°C above normal while the average minimum temperature of 2019 is 24.24°C , which was 0.66°C above normal. This average temperature generally indicates an increasing trend compared to normal.

Perubahan iklim dikaitkan sebagai salah satu faktor berlakunya peningkatan suhu ini. Kitaran ENSO juga memainkan peranan utama iaitu kebanyakan tahun dengan suhu tertinggi adalah merupakan tahun-tahun El Niño.

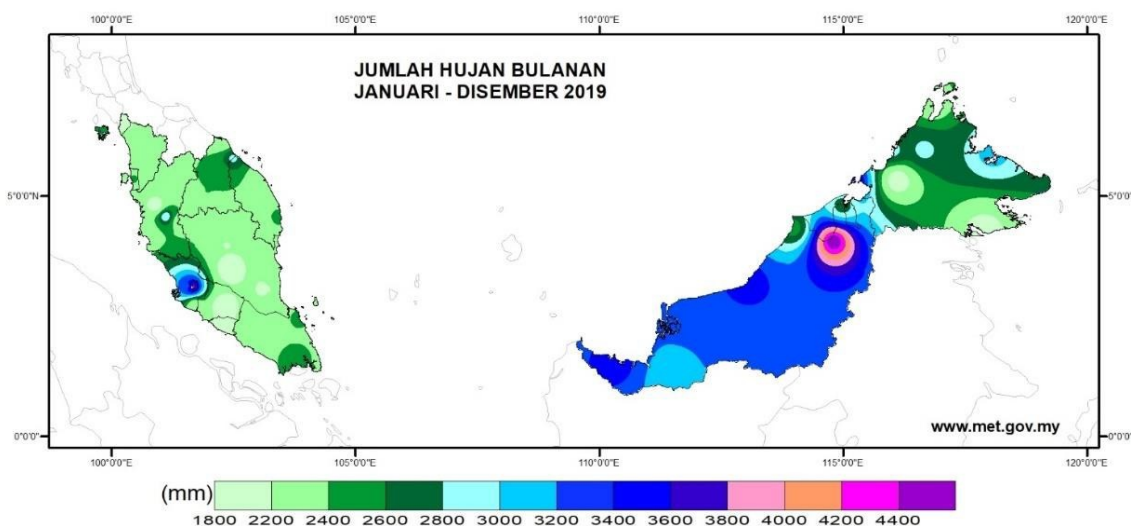
Climate change is one of the factors that causes a rise in temperature. The ENSO cycle also plays a key role where most years with the highest temperatures recorded are the El Niño years.



Purata suhu harian di Malaysia berbanding normal (1981-2010)
Average daily temperature in Malaysia compared to normal (1981-2010)

Pada tahun 2019, jumlah hujan tertinggi di rekodkan di Sarawak antara 3200mm dan 4600mm. Di Sabah pula, jumlah hujan yang direkodkan adalah antara 1500mm dan 3100mm dengan hujan lebih tertumpu di Sandakan. Di Semenanjung pula, jumlah hujan yang direkodkan adalah antara 1800mm dan 3900mm dengan hujan lebih tertumpu di Selangor.

In 2019, the highest total rainfall recorded was in Sarawak between 3200mm and 4600mm. In Sabah, the total rainfall recorded was between 1500mm and 3100mm, mostly in Sandakan. Whereas in Peninsula, the total rainfall recorded was between 1800mm and 3900mm, mostly in Selangor.



Jumlah taburan hujan tahun 2019
Total annual rainfall for 2019

Sepanjang tahun 2019, Malaysia telah mengalami pelbagai kejadian cuaca ekstrem. Pada 10 Ogos 2019, kawasan utara Semenanjung turut menerima kesan angin kencang serta hujan lebat apabila Taufan Lekima membadaai China. Kehadiran taufan ini telah menggalakkan pembentukan garis badai di utara Semenanjung yang telah kerosakan teruk kepada infrastruktur dan menjejaskan kehidupan penduduk.

Throughout 2019, Malaysia had experienced various extreme weather events. On August 10, 2019 the northern part of the Peninsula suffered from strong winds and heavy rain when Typhoon Lekima hit China. The presence of the typhoon encouraged the formation of squall lines over the northern part of the Peninsula which severely damaged infrastructure and affected the lives of the people.



Ribut akibat kesan Taufan Lekima pada 10 Ogos 2019 di Pulau Pinang
[Storm effects of the Typhoon Lekima on August 10, 2019 in Penang](#)
(Gambar/Photo: Berita Harian Online)

Dua episod gelombang haba telah direkodkan pada 5 hingga 8 Mac 2019 (suhu maksimum harian 37.1°C – 37.7°C) dan 18 hingga 22 Mac 2019 (suhu maksimum harian 37.2°C–38°C) berlaku di Chuping, Perlis.

Two episodes of heat waves were recorded on 5th till 8th March 2019 (maximum daily temperature 37.1°C - 37.7°C) and March 18 to 21, 2019 (maximum daily temperature 37.2°C - 38°C) in Chuping, Perlis.

Pemantauan status gelombang haba menunjukkan tahap berjaga-jaga (suhu maksimum harian 35°C–37°C) juga direkodkan di kawasan utara Semenanjung seperti Kedah, Perlis, utara Perak, sebahagian kawasan di Pahang, Kelantan, Kapit serta Sibul, Sarawak pada sekitar bulan Februari dan Mac 2019.

The monitoring of heat wave indicated that alert level (daily maximum temperature 35°C - 37°C) was also recorded to mainly in the northern areas of the Peninsula such as Kedah, Perlis, northern Perak, some areas in Pahang, Kelantan, Kapit and Sibul, Sarawak in February and March 2019.



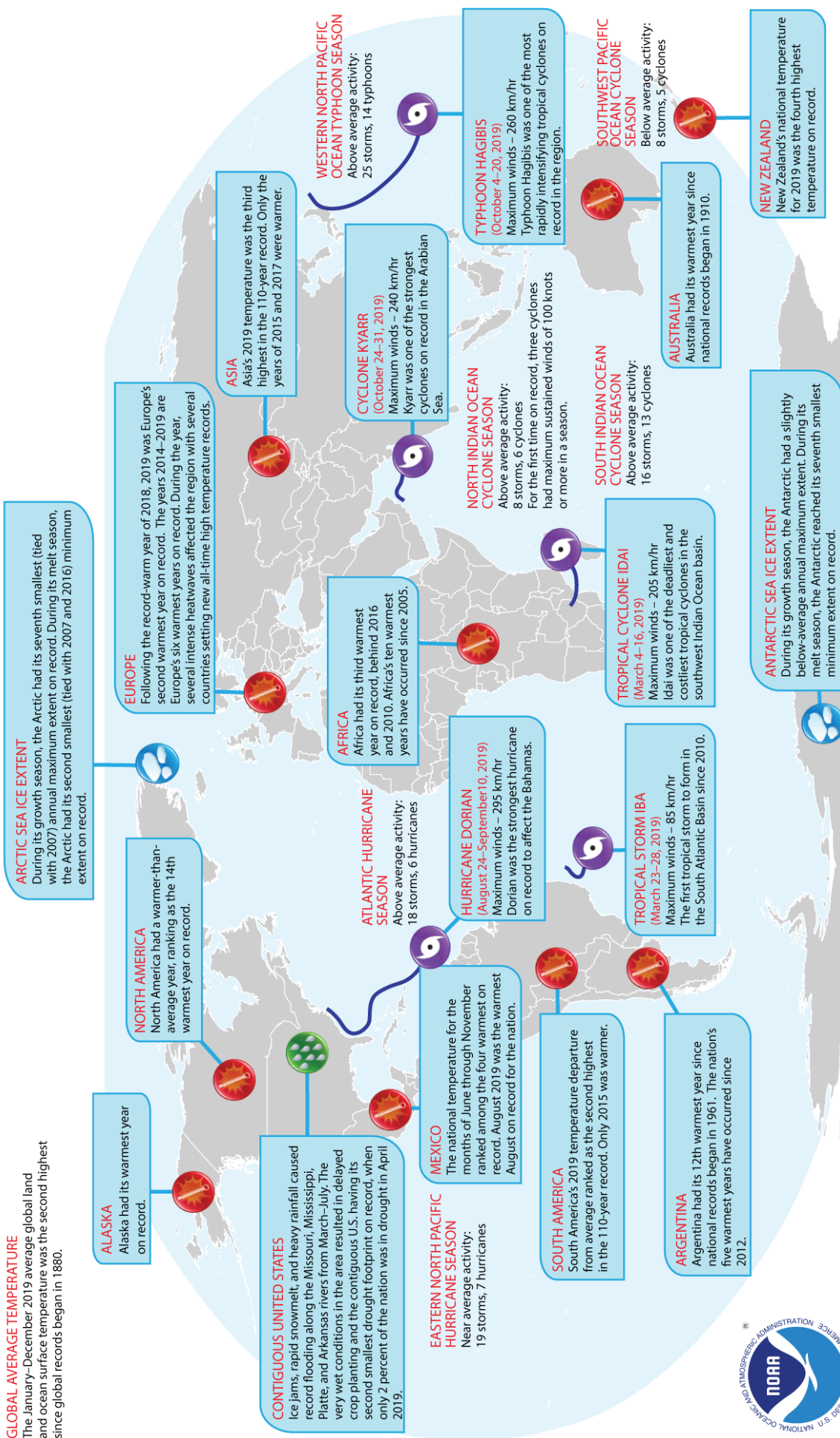
Jerebu di Kuala Lumpur pada 17 September 2019
[Haze in Kuala Lumpur on September 17, 2019](#)
(Gambar/Photo: Bernama)



Jerebu di Sri Aman pada 20 September 2019
[Haze in Sri Aman on September 20, 2019](#)
(Gambar/Photo: Berita Harian)

GLOBAL AVERAGE TEMPERATURE

The January–December 2019 average global land and ocean surface temperature was the second highest since global records began in 1880.



Please Note: Material provided in this map was compiled from NOAA's NCEI State of the Climate Reports and the WMO Provisional Status of the Climate in 2019. For more information please visit: <http://www.ncdc.noaa.gov/sotc>

Anomali iklim signifikan dan peristiwa-peristiwa global yang berlaku dalam tahun 2019

The significant climate anomalies and global events that occurred in 2019

Sumber/ source: <https://www.ncdc.noaa.gov/sotc>



Keadaan cuaca kering yang berlaku di rantau ini semasa Monsun Barat Daya pada bulan Ogos hingga September 2019 telah mengakibatkan keadaan cuaca jerebu akibat peningkatan bilangan titik panas. Beberapa negeri di Malaysia terjejas dengan Indeks Pencemaran Udara (IPU) melebihi 200 seperti Sarawak, Negeri Sembilan, Selangor, Wilayah Persekutuan Kuala Lumpur dan Putrajaya.

Semasa Monsun Timur Laut 2019/2020, sebanyak tujuh episod hujan lebat menyeluruh telah berlaku pada bulan November dan Disember 2019 sehingga mengakibatkan beberapa kawasan di Kelantan, Terengganu, Pahang, Johor, Negeri Sembilan dan Sarawak mengalami banjir.

The dry weather conditions that occurred in the region during the Southwest Monsoon in August till September 2019 had resulted in haze conditions due to the increase in the number of hot spots. Several states in Malaysia were severely affected when the Air Pollution Index (API) exceeded 200 such as Sarawak, Negeri Sembilan, Selangor, Federal Territory of Kuala Lumpur and Putrajaya.

During the Northeast Monsoon 2019/2020, seven episodes of heavy rainfall occurred in November and December 2019 which resulted in floods in Kelantan, Terengganu, Pahang, Johor, Negeri Sembilan and Sarawak.

MUSIM/SEASON	TEMPOH/PERIOD
Monsun Timur Laut (2018/2019) Northeast Monsoon	26 Oktober 2018 sehingga 18 Mac 2019 26 October 2018 to 18 March 2019
Peralihan Monsun Inter Monsoon	19 Mac sehingga 1 Mei 2019 19 March to 1 May 2019
Monsun Barat Daya Southwest Monsoon	2 Mei sehingga 24 September 2019 2 May to 24 September 2019
Peralihan Monsun Inter Monsoon	25 September sehingga 13 November 2019 25 September to 13 November 2019
Monsun Timur Laut (2019/2020) Northeast Monsoon	14 November 2019 sehingga 18 Mac 2020 14 November 2019 to 18 March 2020

Tempoh musim monsun pada tahun 2019
Duration of monsoon season in 2019

Semasa tempoh peralihan monsun, beberapa kejadian banjir kilat telah berlaku di negeri-negeri pantai barat Semenanjung pada Oktober 2019. Dua kejadian belalai air juga telah dilaporkan iaitu di Pulau Pinang pada 1 April dan di Miri, Sarawak pada 15 April 2019.

Kehadiran serta pembentukan ribut tropika atau taufan di Laut China Selatan boleh memberi kesan kepada taburan hujan dan angin kencang terutamanya di pantai barat Sabah, utara Sarawak, utara serta timur laut Semenanjung. Kehadiran Ribut Tropika Pabuk pada awal tahun di perairan negara telah menyebabkan kerosakan harta benda penduduk di negeri Kelantan dan Terengganu.

During the inter-monsoon period, several flash floods occurred in the west coast states of the Peninsula in October 2019. Two water spouts incidents were also reported in Penang on April 1 and Miri, Sarawak on April 15, 2019.

The presence and formation of tropical storms or hurricanes in the South China Sea can affect the distribution of rain and strong winds, especially on the west coast of Sabah, northern Sarawak, north and northeast of the Peninsula. The presence of Tropical Storm Pabuk at the beginning of the year caused damage to residents in the states of Kelantan and Terengganu.

Walaupun Malaysia secara relatifnya selamat daripada dilanda siklon tropika, namun kehadiran siklon tropika di kedudukan tertentu boleh mengubah corak tiupan angin di rantau kita, menyebabkan hujan lebat, angin kencang dan ombak besar.

Taufan Lekima yang membadai timur China pada 9 Ogos 2019 juga telah menjejaskan keadaan cuaca dengan teruk di utara Semenanjung.

Although Malaysia is relatively safe from direct tropical cyclone hit, the presence of a tropical cyclone at a certain location may alter the wind pattern over our region, resulting in heavy rainfall, strong winds and high waves.

Typhoon Lekima which ravaged eastern China on August 9, 2019 and also adversely affected the weather condition over northern part of Peninsula.

BULAN MONTH	TAUFAN TYPHOON	RIBUT TROPIKA/ LEKUKAN TROPIKA TROPICAL STORM/TROPICAL DEPRESSION
Januari January	-	Pabuk
Mac March	-	Lekukan Tropika/ Tropical Depression
Julai July	-	Mun
	-	Lekukan Tropika/ Tropical Depression
Ogos August	-	Wipha
	Lekima	-
	-	Poduk
September September	-	Kajiki
Oktober October	-	Matmo
November November	Nakri	-

Senarai taufan dan siklon tropika yang merentasi Laut China Selatan pada tahun 2019
List of typhoon and cyclones across South China Sea in 2019

MAKLUMAT IKLIM 2019

CLIMATE INFORMATION 2019

SUHU/TEMPERATURE	DATA	LOKASI/LOCATION
Suhu tertinggi pernah direkodkan Highest temperature recorded	38.0°C	Chuping, Perlis 19.03.2019
Suhu terendah pernah direkodkan Lowest temperature recorded	17.6°C	Mulu, Sarawak 17.09.2019
Perubahan suhu terendah dalam satu hari Lowest temperature variation in a day	0.8°C	Kuala Krai, Kelantan 18.12.2019
Perubahan suhu tertinggi dalam satu hari Highest temperature variation in a day	17.2°C	Mulu, Sarawak 17.09.2019
HUJAN/RAINFALL		
Hujan tertinggi dalam sejam Highest rainfall in an hour	117.6 mm	Sri Aman, Sarawak 03.06.2019
Hujan tertinggi dalam sehari Highest rainfall in a day	349.21 mm	Gong Kedak, Terengganu 01.12.2019
Hujan tahunan tertinggi Highest annual rainfall	4354.54 mm	Mulu, Sarawak
Hujan tahunan terendah Lowest annual rainfall	1308.26 mm	Sandakan, Sabah
ANGIN/WIND		
Purata harian tertinggi kelajuan angin Highest mean daily wind speed	6.6 m/s	Mersing, Johor 07.12.2019
Kelajuan angin maksimum tertinggi Highest maximum wind speed	22.2 m/s	Kapit, Sarawak 31.10.2019

Analisa adalah berdasarkan rekod bagi 42 stesen meteorologi utama bagi tempoh sehingga 31 Disember 2019
 The analysis was based on records of 42 principal meteorological stations till December 31, 2019

LAPORAN DAN ANALISIS BULANAN MONTHLY REPORT AND ANALYSIS

PUSAT AKTIVITI MONSUN KUALA LUMPUR

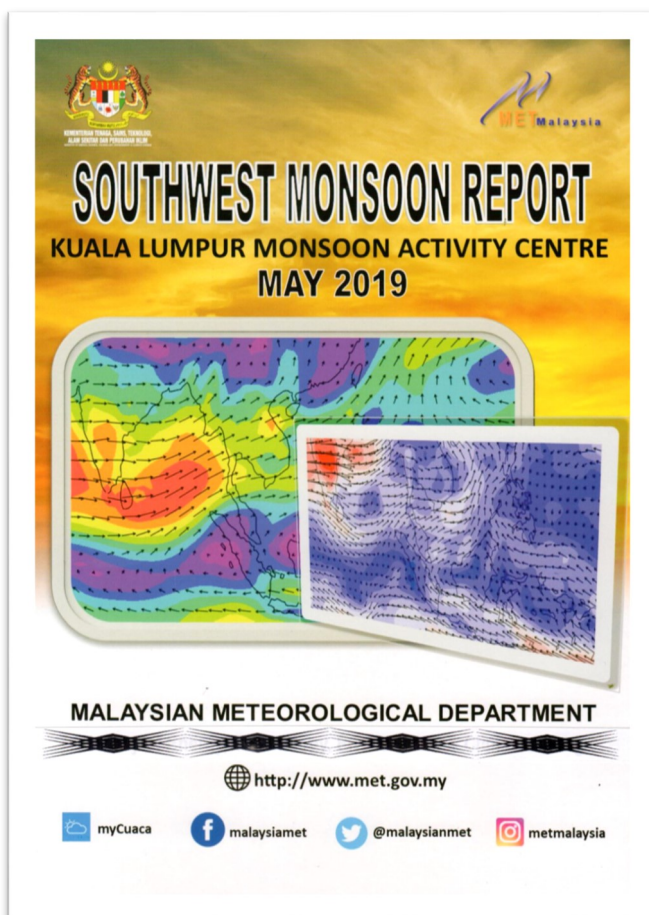
MET Malaysia merupakan agensi yang bertanggungjawab bagi Pusat Aktiviti Monsun di bawah *World Meteorological Organization* (WMO) untuk komuniti antarabangsa. MET Malaysia telah menerbitkan dua laporan monsun pada tahun 2019, iaitu Laporan Monsun Barat Daya dan Laporan Monsun Timur Laut.

Kedua-dua laporan ini menerangkan keadaan sinoptik dan perkembangan cuaca semasa bulan-bulan pra-monsoon yang mempengaruhi corak cuaca di Asia Tenggara. Ramalan hujan bermusim bagi rantau ini juga turut disertakan. Laporan ini turut dimuat naik ke laman web jabatan.

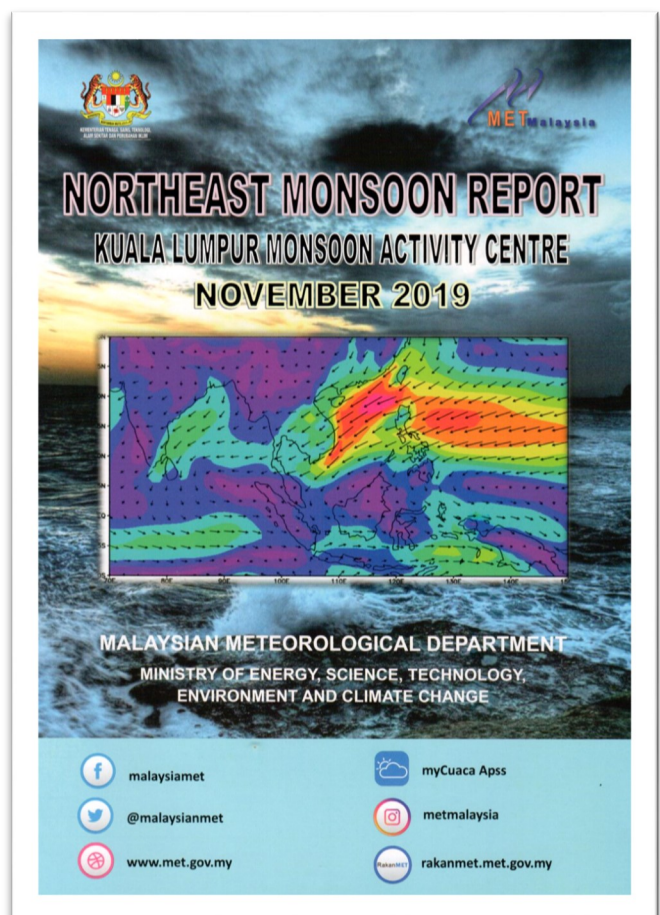
KUALA LUMPUR MONSOON ACTIVITY CENTRE

MET Malaysia is the agency responsible for the Kuala Lumpur Monsoon Activity Centre under the World Meteorological Organization (WMO) for the international community. MET Malaysia published two reports in 2019, namely the Southwest Monsoon Report and Northeast Monsoon Report.

These reports presented the synoptic situation and recent weather development prior to monsoons that influenced the weather pattern in Southeast Asia. Seasonal rainfall forecasts were also included in the reports. The reports were uploaded in the department's website.



Southwest Monsoon Report
May 2019



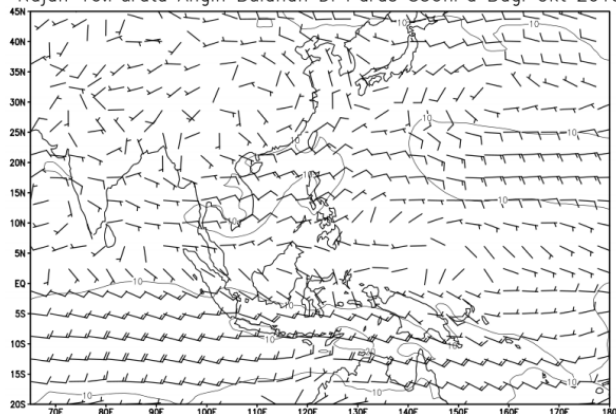
Northeast Monsoon Report
November 2019

KLIMATOLOGI SINOPTIK

Bagi memantau dan menganalisis corak pergerakan angin di rantau Malaysia dan Asia Tenggara, Laporan Klimatologi Sinoptik diterbitkan setiap bulan.

Laporan tersebut menjelaskan keadaan sinoptik dan kehadiran ribut tropika, jika ada. Laporan tersebut menghuraikan keadaan sinoptik kepada tiga dekad iaitu dekad pertama untuk 1 hingga 10 haribulan, dekad kedua dari 11 hingga 20 haribulan dan dekad tiga 21 hingga 31 haribulan.

Rajah 10: Purata Angin Bulanan Di Paras 850hPa Bagi Okt 2019

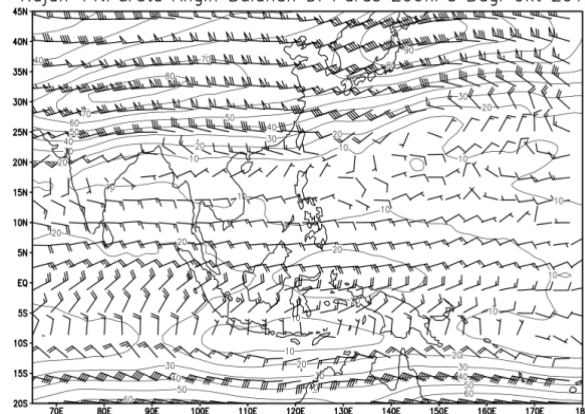


SYNOPTIC CLIMATOLOGY

In monitoring and analysing wind pattern over Malaysia and the Southeast Asia region, the Synoptic Climatology Report is published every month.

The report describes the synoptic condition of the month and presence of tropical storm, if any. The report is divided into three decades, namely first decade for 1st until 10th of the month, second decade from 11th until 20th of the month and third decade from 21st until 31st of the month.

Rajah 11: Purata Angin Bulanan Di Paras 200hPa Bagi Okt 2019



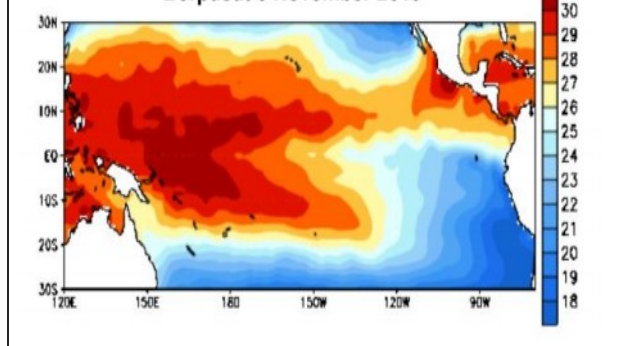
TINJAUAN ENSO

Interaksi laut dan atmosfera berskala besar seperti fenomena ENSO turut mempengaruhi cuaca serantau dan keadaan ini dipantau rapi dan dikemaskini setiap bulan melalui Laporan Tinjauan ENSO. Laporan ini diterbitkan setiap bulan dan dimuat naik ke laman web jabatan.

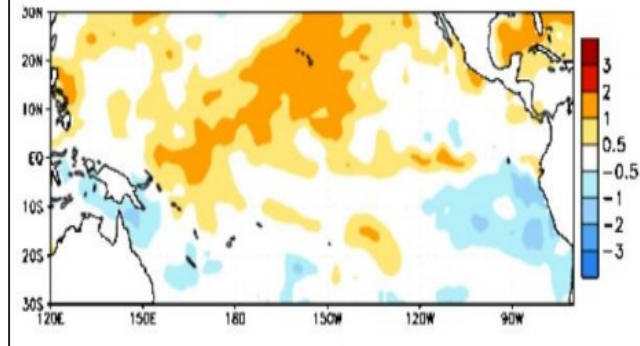
ENSO OUTLOOK

Large scale interaction between the ocean and atmosphere such as the ENSO phenomenon affects the regional weather and this situation is monitored through monthly ENSO Outlook Report. This report is published every month and uploaded to the department's website.

Rajah 2(a): Suhu Permukaan Laut (°C) Minggu Berpusat 6 November 2019



Rajah 2(b): Anomali Suhu Permukaan Laut (°C) Minggu Berpusat 6 November 2019



DATA IKLIM

Pada tahun 2019 sebanyak 2,234 permohonan maklumat dan data iklim telah dicatatkan, pengurangan berbanding tahun 2018. Namun kutipan fi yang direkodkan berjumlah RM422,080, satu peningkatan berbanding tahun 2018.

Agensi swasta mendahului dengan permohonan tertinggi iaitu 1,926 permohonan, diikuti dengan 175 permohonan daripada pelajar dan 98 permohonan daripada agensi kerajaan. Hanya 35 permohonan diterima dari kategori penyelidik.

CLIMATE DATA

In 2019, a total of 2,234 applications for climate information and data were recorded, a reduction compared to 2018. However, the collection of fees amounted to RM422,080, an increase compared to 2018.

Private agencies led with the highest number application of 1,926 applications, followed by 175 applications from students and 98 applications from government agencies. Only 35 applications were received from the researchers category.

Perbandingan Bilangan Permohonan Mengikut Kategori	
 Tempatan (Local) - 2226	 Luar negara (International) - 8
KATEGORI (CATEGORY)	BILANGAN (QUANTITY)
Agensi Kerajaan (Government)	98
Agensi Swasta (Private Sector)	1926
Pelajar (Students)	175
Penyelidik (Researchers)	35

Permohonan maklumat dan data iklim yang diterima mengikut kategori pada tahun 2019
Requests for climate information and data by category in 2019



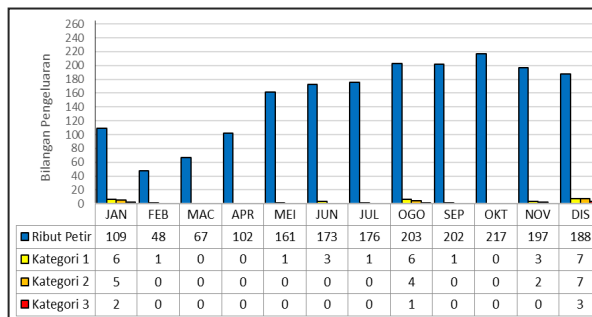
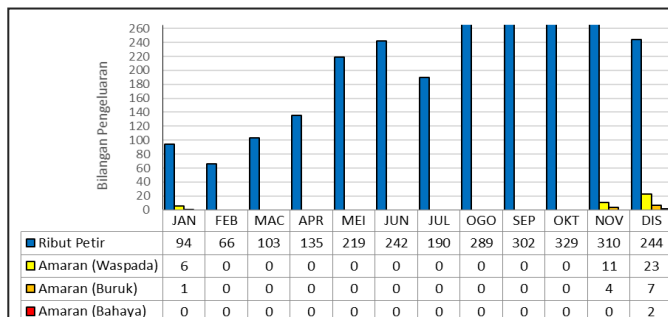
Jumlah kutipan fi pada tahun 2019
Total fees collection 2019

MAKLUMAT CUACA

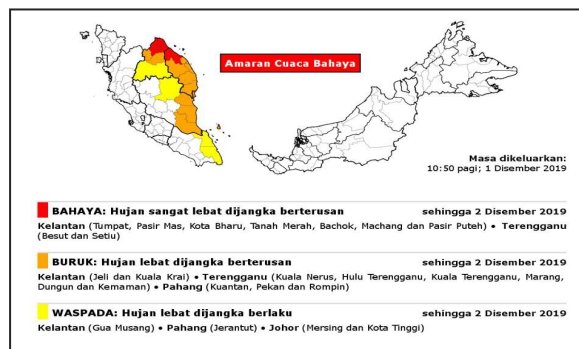
Sepanjang 2019, jabatan telah mengeluarkan sebanyak 4,473 maklumat dan amaran berkaitan cuaca yang meliputi 2,577 amaran di darat dan 1,896 amaran cuaca di laut.

WEATHER INFORMATION

Throughout 2019, a total of 4,473 products related to weather information and warning comprising 2,577 land warnings and 1,896 marine warnings were issued.



Pengeluaran amaran cuaca darat dan laut
Weather and marine forecast issued



Amaran peringkat bahaya yang dikeluarkan pada 1 dan 14 Disember 2019
Danger category warning issued on December 1 to 14, 2019

Seramai 10 pegawai meteorologi yang bertugas di Pusat Operasi Cuaca dan Geofizik Nasional telah diberi latihan untuk menjadi penyampai cuaca. Penyampaian laporan cuaca diadakan sebanyak tiga kali sehari menerusi slot Selamat Pagi Malaysia (SPM), Berita Wilayah dan Berita Perdana dengan kerjasama RTM.

Ten meteorological officers from the National Weather and Geophysics Operations Centre had been trained to become weather presenters. The weather report is presented three times a day through the Selamat Pagi Malaysia (SPM), Berita Wilayah and Berita Perdana slots with the cooperation of RTM.



Penyampai Cuaca MET Malaysia
MET Malaysia Weather Presenters

PERISTIWA BERKAITAN CUACA 2019 WEATHER EVENTS 2019



Impak Ribut Tropika Pabuk di Terengganu
pada 23 Januari
Impact of Tropical Storm Pabuk in Terengganu
on January 23



Kejadian gelombang haba pada bulan Mac
Heatwave in March



Banjir kilat di Kuala Lumpur pada 25 Mac
Flash flood in Kuala Lumpur on March 25



Banjir di Rantau Panjang, Kelantan
pada 3 Disember
Flood in Rantau Panjang, Kelantan
on December 3



Banjir di Miri, Sarawak pada 3 Disember
Flood in Miri, Sarawak on December 3



Banjir di Beaufort, Sabah pada 14 Disember
Flood in Beaufort, Sabah on December 14



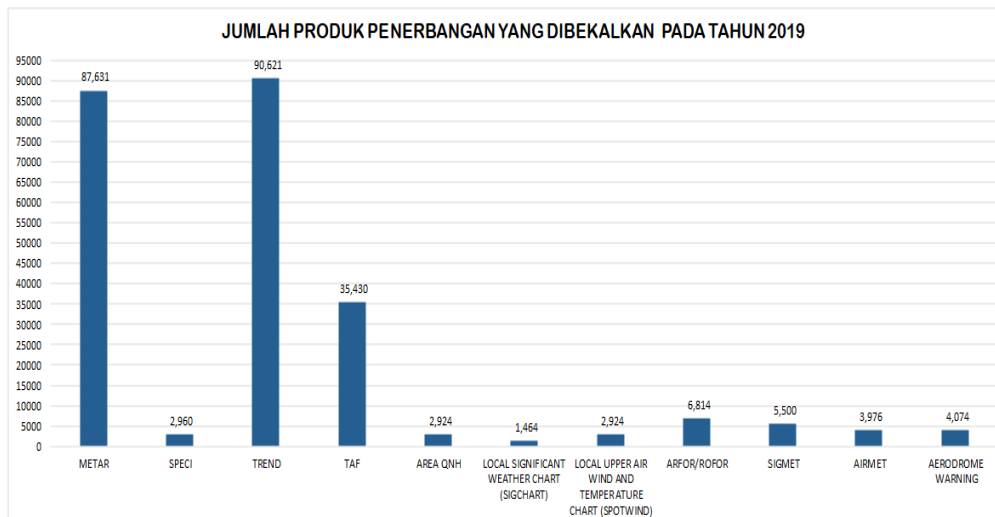
METEOROLOGI PENERBANGAN DAN METEOROLOGI NEGERI

**AVIATION METEOROLOGY
AND METEOROLOGICAL OFFICES**

METEOROLOGI PENERBANGAN AVIATION METEOROLOGY

Sepanjang tahun 2019, jumlah keseluruhan produk penerbangan yang dibekalkan oleh MET Malaysia adalah 244,318.

In 2019, the total number of aviation products produced by MET Malaysia was 244,318.



Jumlah produk penerbangan yang dikeluarkan pada tahun 2019
Total aviation products produced in 2019

Pejabat Meteorologi Penerbangan Nasional (PMPN) yang merupakan *Meteorological Watch Office (MWO)* bagi Kuala Lumpur *Flight Information Region (KL FIR)* telah mengeluarkan sebanyak 54,718 produk penerbangan.

National Aviation Meteorological Centre (PMPN) as a designated *Meteorological Watch Office (MWO)* for Kuala Lumpur *Flight Information Region (KL FIR)* produced 54,718 aviation products.

JENIS PRODUK PENERBANGAN	JAN	FEB	MAR	APR	MEI	JUN	JUL	OGOS	SEPT	OKT	NOV	DIS	JUMLAH (TAHUNAN)
METAR	1,488	1,344	1,488	1,440	1,488	1,440	1,488	1,488	1,440	1,488	1,440	1,488	17,520
SPECI	26	12	29	29	37	44	28	20	54	54	43	33	409
TREND	1,514	1,356	1,517	1,469	1,525	1,484	1,516	1,508	1,494	1,542	1,483	1,521	17,929
TAF	620	560	620	600	620	600	620	620	600	620	620	620	7,320
AREA QNH	124	112	124	120	124	120	124	124	120	124	124	124	1,464
LOCAL SIGNIFICANT WEATHER CHART (SIGCHART)	124	112	124	120	124	120	124	124	120	124	124	124	1,464
LOCAL UPPER AIR WIND AND TEMP. CHART (SPOTWIND)	124	112	124	120	124	120	124	124	120	124	124	124	1,464
ARFOR/ ROFOR	63	59	62	60	6	60	62	62	0	6	59	62	561
SIGMET	56	53	115	253	348	242	167	130	190	307	235	143	2,239
AIRMET	109	94	191	262	354	274	262	313	559	266	248	149	3,081
AERODROME WARNING	70	64	89	130	128	121	102	50	83	216	135	79	1,267
WIND SHEAR WARNING	0	0	0	0	0	0	0	0	0	0	0	0	0
JUMLAH (BULANAN)	4,318	3,878	4,483	4,603	4,878	4,625	4,617	4,563	4,780	4,871	4,635	4,467	54,718

Jumlah produk penerbangan yang dikeluarkan oleh PMPN pada tahun 2019
Total aviation products produced by PMPN in 2019

Pusat Operasi Cuaca dan Gempa Bumi Sabah (POCGS) di bawah Pejabat Meteorologi Sabah bertanggungjawab memantau Kota Kinabalu *Flight Information Region (FIR)* dan telah mengeluarkan sebanyak 48,328 produk penerbangan.

The Sabah Weather and Earthquake Operation Centre (POCGS) under Sabah Meteorological Office is responsible to monitor the Kota Kinabalu *Flight Information Region (KK FIR)* and has produced 48,328 aviation products.

JENIS PRODUK PENERBANGAN	JAN	FEB	MAR	APR	MEI	JUN	JUL	OGOS	SEPT	OKT	NOV	DIS	JUMLAH (TAHUNAN)
METAR	1,488	1,344	1,488	1,440	1,488	1,440	1,488	1,488	1,440	1,488	1,440	1,488	17,520
SPECI	18	6	18	47	68	82	55	70	61	91	82	64	662
TREND	1,506	1,350	1,506	1,487	1,556	1,552	1,543	1,558	1,501	1,579	1,522	1,552	18,212
TAF	496	448	496	480	496	480	496	496	480	496	480	496	5,840
AREA QNH	124	112	124	120	124	120	124	124	120	124	120	124	1,460
LOCAL SIGNIFICANT WEATHER CHART (SIGCHART)	-	-	-	-	-	-	-	-	-	-	-	-	-
LOCAL UPPER AIR WIND AND TEMPERATURE CHART (SPOTWIND)	-	-	-	-	-	-	-	-	-	-	-	-	-
ARFOR/ROFOR	-	-	-	-	10	-	-	1	-	-	-	8	19
SIGMET	290	145	139	247	323	352	215	172	110	450	386	432	3,261
AIRMET	25	26	22	35	31	20	53	100	488	25	26	44	895
AERODROME WARNING	19	3	15	18	26	51	38	35	145	38	42	29	459
WIND SHEAR WARNING	-	-	-	-	-	-	-	-	-	-	-	-	-
JUMLAH BULANAN	3,966	3,434	3,808	3,874	4,122	4,097	4,012	4,044	4,345	4,291	4,098	4,237	48,328

Jumlah produk penerbangan yang dikeluarkan oleh POCGS pada tahun 2019
Total aviation products produced by POCGS in 2019

PEJABAT METEOROLOGI NEGERI

Pejabat Meteorologi Negeri adalah ahli jawatankuasa pengurusan bencana di peringkat negeri dan daerah.

Pejabat Meteorologi Negeri bertanggungjawab memantau dan mengeluarkan tinjauan cuaca negeri masing-masing, menyebarkan nasihat/amaran cuaca buruk, nasihat/amaran angin kencang dan laut bergelora, maklumat gempa bumi, tsunami kepada orang awam, Pejabat Setiausaha Kerajaan Negeri, pejabat daerah dan agensi-agensi pengurusan bencana.

STATE METEOROLOGICAL OFFICES

The State Meteorological Offices are members of disaster management committee at district and state levels.

The State Meteorological Offices are responsible for monitoring and issuing weather forecasts for their respective states, broadcasting advice/warnings of severe weather, strong winds and rough seas, information on earthquakes and tsunami to the public, State Secretary Office, district office and other disaster management agencies.



Peserta SAREX 2019
Participants of SAREX 2019

Dua orang pegawai meteorologi dari Pejabat Meteorologi Pulau Pinang di Bayan Lepas dan Butterworth telah terlibat dalam Latihan Pengoperasian Mencari dan Menyelamat (SAREX) dari 26 hingga 28 Mac.

Two meteorological officers from the Penang Meteorological Office in Bayan Lepas and Butterworth were involved in the Search and Rescue Operations Training (SAREX) from 26 to 28th March.

Latihan SAREX ini diadakan sebagai persediaan menghadapi sebarang kemungkinan semasa Pameran Udara dan Maritim Antarabangsa Langkawi 2019 (LIMA'19) yang berlangsung dari 26 hingga 30 Mac 2019. Penglibatan pegawai dalam program sebegini memberi peluang pegawai meningkat kemahiran dan keyakinan untuk memberi perkhidmatan kepada pelanggan.

The SAREX training was held to prepare for any possibilities during the Langkawi International Air and Maritime Exhibition 2019 (LIMA'19) which was held from 26th to 30th March 2019. The involvement of officers in such programmes gave them an opportunity to enhance their skills and confidence in serving customers.

Pejabat Meteorologi Negeri juga berperanan menyelenggara peralatan di stesen-stesen meteorologi masing-masing.

The State Meteorological Office is also responsible for maintaining the equipment at their respective meteorological stations.



Kerja-kerja penyelenggaraan Stesen Auksiliari Laban Rata di Gunung Kinabalu, Sabah
Maintenance works at Laban Rata Auxiliary Station in Mount Kinabalu, Sabah

Pejabat Meteorologi Negeri juga terlibat dengan aktiviti kesedaran awam dan pameran serta menerima lawatan dari pelajar sekolah, institusi pengajian tinggi, agensi kerajaan dan swasta.

The State Meteorological Office is also involved in organising public awareness activities, exhibitions and handling visits from school students, institutions of higher learning, government and private agencies.



Aktiviti kesedaran awam dan pameran yang dijalankan oleh Pejabat Meteorologi Negeri
Public awareness activities and exhibitions conducted by the State Meteorological Office

**PENCERAPAN CUACA DAN
RANGKAIAN PEMANTAUAN**

**WEATHER OBSERVATION AND
MONITORING NETWORKS**

PENCERAPAN CUACA DAN RANGKAIAN PEMANTAUAN WEATHER OBSERVATIONS AND MONITORING NETWORKS

Sejarah pencerapan cuaca telah bermula di Semenanjung pada tahun 1883 iaitu di Pulau Pinang dan Melaka. Perkembangan teknologi turut memberi impak terhadap sistem dalam pencerapan cuaca.

The history of weather observation began in the Peninsula on 1883, in Penang and Melaka. The Technological development also had an impact on the weather observation system.



H Kuala Pilah



Ampangan Semenyih



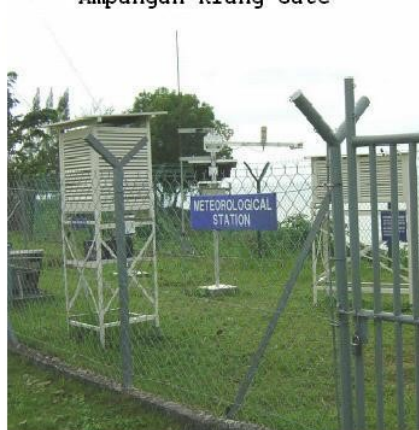
Ampangan Klang Gate



H Bentong, Pahang



Lentang



ALAM, Melaka

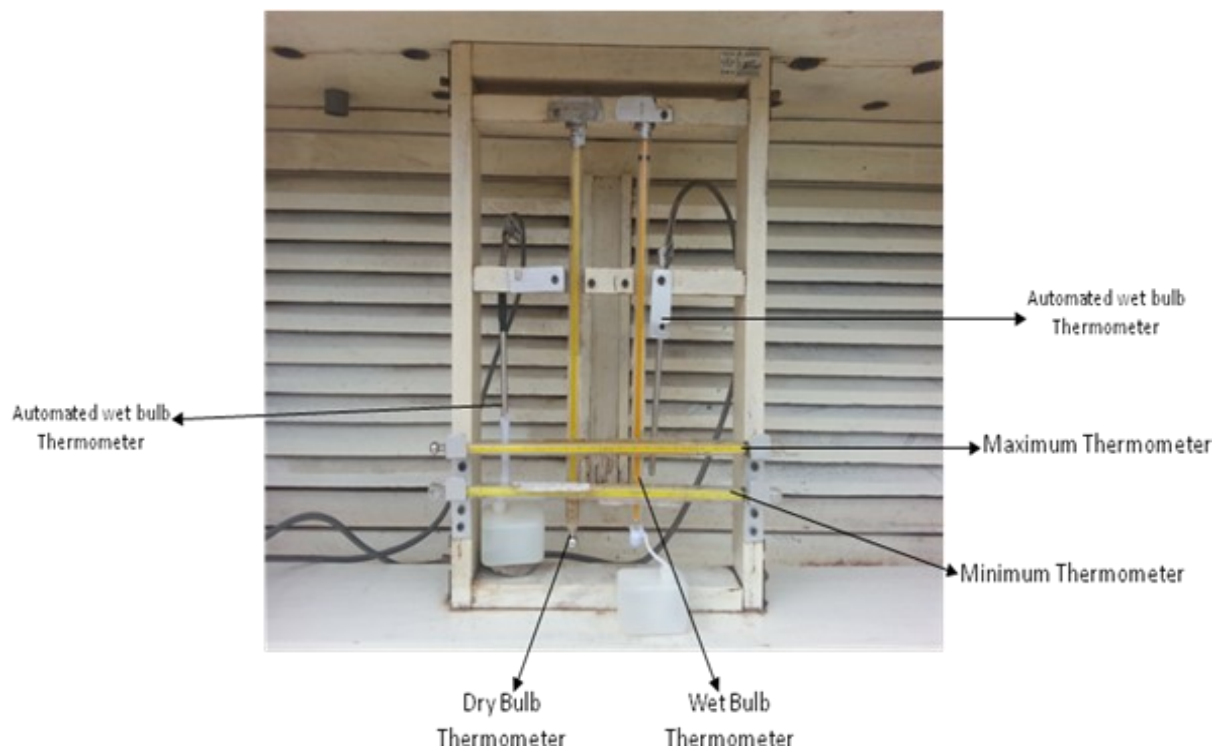
Stesen Auksilari menggunakan Vaisala MAWS pada tahun 2002
Auxiliary Station using Vaisala MAWS in year 2002

Pada 1 April 2005, *Automatic Weather System (AWS)* telah beroperasi di 38 stesen pencerapan permukaan kajuca utama dan kini terdapat 43 (Stesen) Pejabat Meteorologi Utama yang menggunakan sistem AWS di seluruh Malaysia.

On April 1, 2005, the *Automatic Weather System (AWS)* was operational at 38 major meteorological observation stations and now there are 43 (stations) Main Meteorological Offices using AWS systems throughout Malaysia.

Pada Oktober 2007, sebanyak 203 stesen AWS auksilari telah dipasang di seluruh negara dan salah satu elemen cuaca permukaan yang dicerap ialah suhu udara yang direkodkan menggunakan termometer maksimum dan minimum.

In October 2007, a total of 203 auxiliary AWS stations were installed nationwide and among the observed surface weather elements was air temperature which was recorded using maximum and minimum thermometers.



Adang Stevenson (tempat perlindungan alat cuaca)
[Stevenson Screen \(weather instrument shelter\)](#)

Projek penggantian termometer merkuri dalam Rancangan Malaysia ke-11 telah dilaksanakan kerana penggunaan merkuri diharamkan dan tidak boleh digunakan pada tahun 2020 seperti yang dinyatakan dalam *Minamata Convention on Mercury*.

[The mercury thermometer replacement project under the 11th Malaysia Plan was carried out as mercury will be banned and phased out by 2020 as stated in the *Minamata Convention on Mercury*.](#)



Pemasangan PT100 untuk wet bulb dan dry bulb
[Installation of PT100 for wet bulb and dry bulb](#)

Termometer merkuri digunakan sebagai data sokongan (*back-up*) bagi elemen suhu yang dicerap secara manual di 43 pejabat meteorologi utama di seluruh negara dan juga dicerap secara manual oleh pemerhati di 184 stesen AWS konvensional.

Pelaksanaan penggantian termometer ini dibuat secara perolehan tender pada bulan Januari 2019. Penggantian termometer menggunakan PT-100 akan dilakukan di 43 pejabat meteorologi utama manakala HMP155 pula akan dipasang di 37 stesen AWS konvensional yang terpilih.

Mercury thermometers are used as back-up data for manually observed temperature elements at 43 main meteorological offices across the nation and are also manually observed by observers at 184 conventional AWS stations.

The installation of this thermometer replacement was implemented through tender procurement in January 2019. Replacement of the thermometer using PT-100 will be conducted at 43 main meteorological offices while HMP155 will be installed at 37 selected AWS conventional stations.



Kedudukan solar panel dan data logger yang disambung dengan PT-100 dalam Adang Stevenson
The position of solar panel and data logger which are connected with PT-100 in Stevenson Screen



Paparan data logger yang disambung dengan sensor PT-100 menunjukkan data suhu secara nyata
View of data logger connected with PT-100 sensor and displays real-time temperature

RADAR DAN SATELIT METEOROLOGI

Projek pembangunan *Wind Shear Detection System* (WSDS) di Lapangan Terbang Antarabangsa (LTAB) Senai yang bermula sejak 2017 telah ditauliahkan pada 1 November 2019.

RADAR AND SATELLITE METEOROLOGY

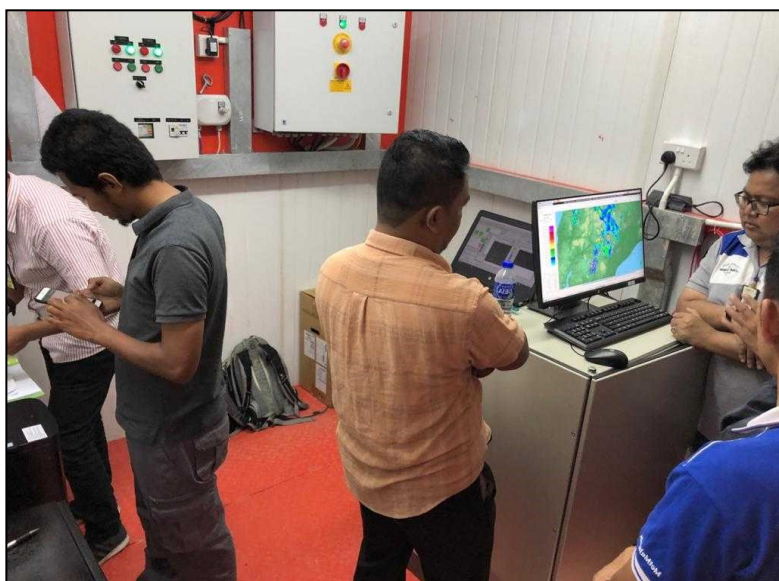
The *Wind Shear Detection System* (WSDS) development project at Senai International Airport which began in 2017 was commissioned on November 1, 2019.



WSDS di Lapangan Terbang Antarabangsa Senai
WSDS at Senai International Airport

Pada 19 hingga 20 Ogos 2019, kakitangan MET Malaysia telah mengikuti *Final Acceptance Test* yang dijalankan oleh pihak kontraktor bagi meningkatkan pengetahuan dalam aspek teknikal sistem WSDS.

On August 19 to 20, 2019 MET Malaysia's staff attended a *Final Acceptance Test* conducted by the project contractor to increase their knowledge on the technical aspects of the WSDS system.



Sesi latihan kakitangan semasa *Final Acceptance Test System WSDS*
Staff training session during *Final Acceptance Test WSDS System*

Selain itu, satu bengkel *End-user Training* juga telah diadakan kepada pegawai-pegawai MET Malaysia dan pihak berkuasa Penerbangan Awam Malaysia (CAAM) Senai mengenai aplikasi sistem *Hazard Weather Warning Display* (HWWD) dan *Rainbow5* dalam operasi pemantauan dan pengeluaran amaran cuaca dan angin ricih.

Di bawah RMK-11, MET Malaysia telah melaksanakan Projek Peningkatan Kecekapan Sistem Rangkaian Radar Cuaca bertujuan menambahbaik kualiti data dan produk pencerapan radar cuaca melalui peningkatan ketersediaan sistem rangkaian, kawasan liputan dan kekerapan pencerapan radar cuaca.

In addition, an End-user Training workshop was also held for employees of MET Malaysia and the Senai Civil Aviation Authority of Malaysia (CAAM) on the application of the Hazard Weather Warning Display (HWWD) and Rainbow5 systems in weather and wind shear monitoring and warning operations.

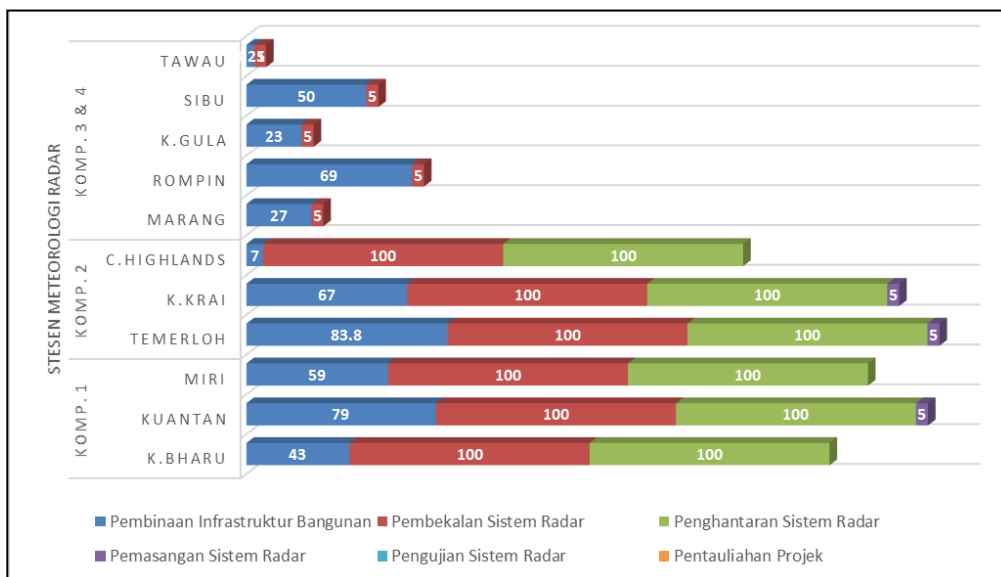
Under the 11th Malaysia Plan, MET Malaysia has implemented the Weather Radar Network Enhancement Project to improve the quality of weather radar data and products through enhanced network system availability, coverage area and frequency of weather radar observation.

KOMPONEN COMPONENT	SKOP SCOPE
1	Mengganti dan menaik taraf Sistem Radar Cuaca (S-band) dan menara sedia ada di SMR Kuantan (Pahang), Kota Bharu (Kelantan) dan Miri (Sarawak) Replace and upgrade existing Weather Radar Systems (S-band) and towers at SMR Kuantan (Pahang), Kota Bharu (Kelantan) and Miri (Sarawak)
2	Menambah Sistem Radar Cuaca (X-band) berserta menara di Pejabat Meteorologi Kuala Krai (Kelantan), Temerloh (Pahang) dan Cameron Highlands (Pahang) Increase the number of Weather Radar System (X-band) with tower in Kuala Krai (Kelantan), Temerloh (Pahang) and Cameron Highlands (Pahang) Meteorological Offices
3	Pembinaan infrastruktur SMR yang terdiri daripada sebuah menara, sebuah pejabat dan dua unit kuarters di Marang (Terengganu), Kuala Gula (Perak), Kuala Rompin (Pahang), Sibul (Sarawak) dan Tawau (Sabah) tanpa kuarters Construction of SMR infrastructures consisting of a tower, an office and two quarters units in Marang (Terengganu), Kuala Gula (Perak), Kuala Rompin (Pahang), Sibul (Sarawak) and Tawau (Sabah) without quarters
4	Menambah Sistem Radar Cuaca (S-band) di lokasi-lokasi seperti di Komponen 3 Increase the number of Weather Radar System (S-band) at locations as stated in Component 3

Komponen-komponen Projek Peningkatan Kecekapan Sistem Rangkaian Radar Cuaca
Components of the Weather Radar Network Enhancement Project

Melalui projek ini, sebanyak 11 Stesen Meteorologi Radar (SMR) baharu akan dibina iaitu di Kota Bharu, Kuantan, Miri, Temerloh, Kuala Krai, Cameron Highlands, Marang, Rompin, Kuala Gula, Sibul dan Tawau. Secara amnya, projek ini melibatkan pembinaan infrastruktur bangunan serta pembekalan dan pemasangan sistem radar cuaca. Ia terbahagi kepada empat komponen mengikut skop yang ditetapkan.

Through this project, 11 new Radar Meteorological Stations (SMR) will be built in Kota Bharu, Kuantan, Miri, Temerloh, Kuala Krai, Cameron Highlands, Marang, Rompin, Kuala Gula, Sibul and Tawau. In general, this project includes the construction of building infrastructures and the procurement and installation of weather radar equipment. The project is divided into four components according to the specified scopes.



Status kemajuan Projek Peningkatan Kecekapan Sistem Rangkaian Radar Cuaca
The progress status of Weather Radar Network Enhancement Project



Temerloh, Pahang



Kuala Krai, Kelantan



Marang, Terengganu



Rompin, Pahang



Sibu, Sarawak



Tawau, Sabah

Pembinaan Stesen Meteorologi Radar baru
Construction of new Radar Meteorology Stations



SAINS ATMOSFERA DAN PEMBENIHAN AWAN

ATMOSPHERIC SCIENCE AND CLOUD SEEDING

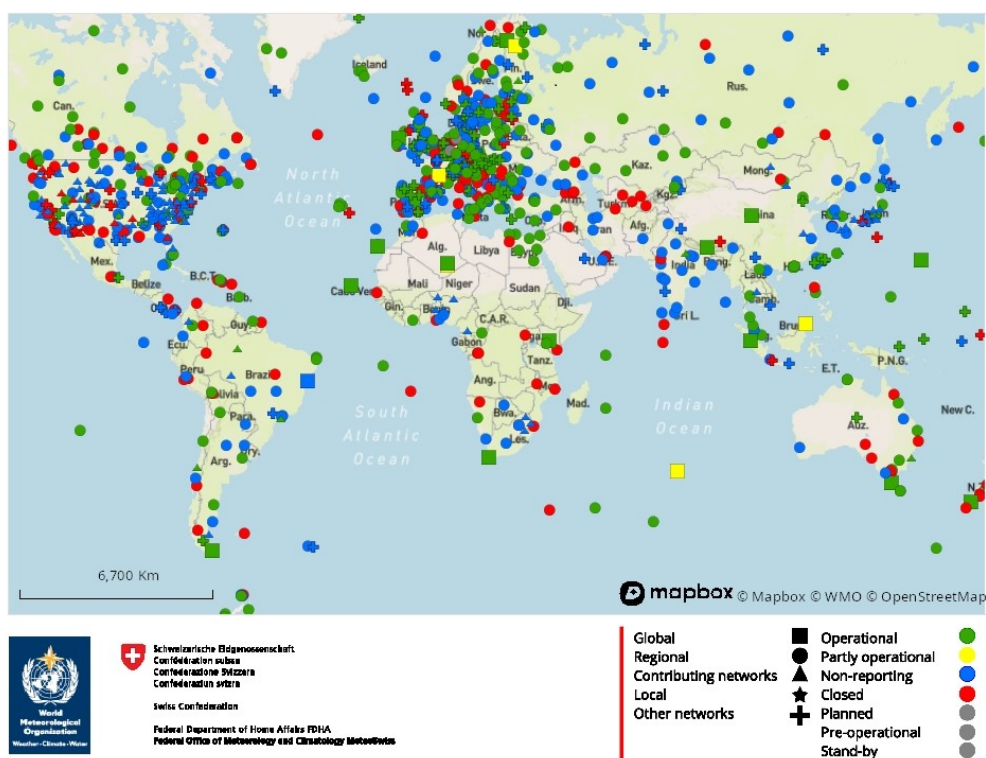
SAINS ATMOSFERA DAN PEMBENIHAN AWAN ATMOSPHERIC SCIENCE AND CLOUD SEEDING

MET Malaysia bertanggungjawab menjalankan pemantauan komposisi atmosfera secara berterusan di 27 stesen pemantauan di seluruh negara, termasuk empat stesen *Global Atmospheric Watch (GAW)* iaitu di Lembah Danum (Sabah), Cameron Highlands (Pahang), Petaling Jaya (Selangor) dan Bachok (Kelantan).

Pemantauan yang dijalankan bertumpu kepada enam bidang utama GAW iaitu pemendapan atmosfera (23 lokasi), gas reaktif terpilih (6 lokasi), aerosol (23 lokasi), ozon (9 lokasi), gas rumah kaca (1 lokasi) dan sinaran UV (6 lokasi).

MET Malaysia is responsible to monitor the atmospheric composition at 27 monitoring stations nationwide, including four *Global Atmospheric Watch (GAW)* stations in the Danum Valley (Sabah), Cameron Highlands (Pahang), Petaling Jaya (Selangor) and Bachok (Kelantan).

The monitoring is focused at six major areas of GAW namely atmospheric deposition (23 locations), selected reactive gases (6 locations), aerosols (23 locations), ozone (9 locations), greenhouse gases (1 location) and UV radiation (6 locations).



Rangkaian pemantauan GAW dunia
World GAW monitoring network

MET Malaysia juga bertanggungjawab melaksanakan aktiviti pemantauan pemendapan berasid di Malaysia dan terlibat sebagai *National QA/QC Manager* dan *National Center* di dalam program *Acid Deposition Monitoring Network in East Asia (EANET)* sejak tahun 2000. Pada 4 hingga 5 September 2019, MET Malaysia telah menjadi tuan rumah bagi kali kedua untuk penganjuran *20th Senior Technical Managers' Meeting (STM20)* of the *Acid Deposition Monitoring Network in East Asia (EANET)*.

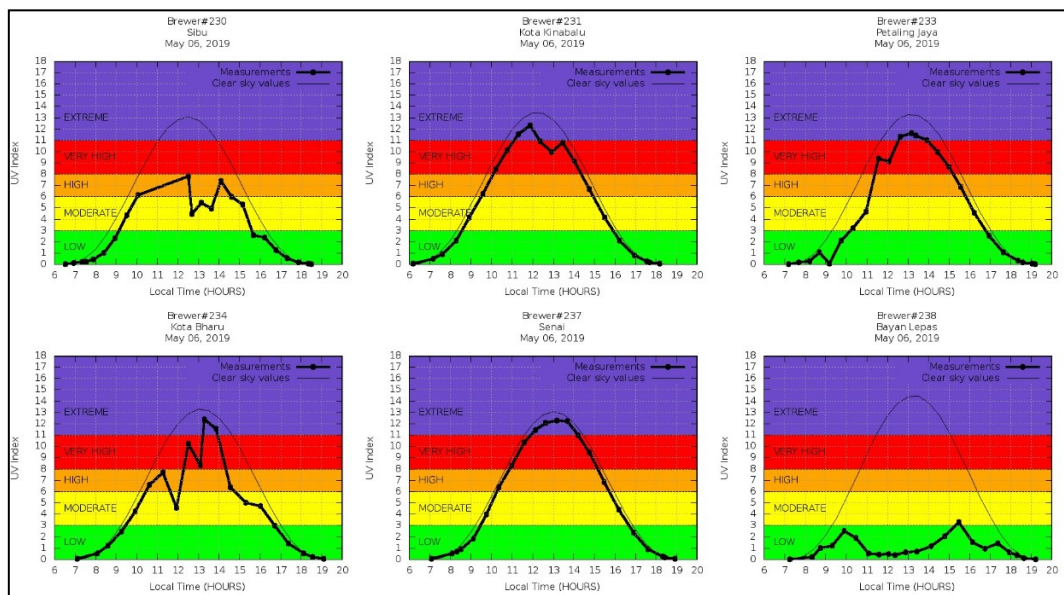
MET Malaysia is also responsible for acidic deposition monitoring activities in Malaysia and involved as *National QA / QC Manager* and *National Center* in the *Acid Deposition Monitoring Network in East Asia (EANET)* programme since year 2000. On September 4 to 5, 2019 MET Malaysia hosted for the second time *The 20th Senior Technical Managers' Meeting (STM20)* of the *Acid Deposition Monitoring Network in East Asia (EANET)*.

Pada 26 hingga 28 November 2019, MET Malaysia dengan kerjasama *United Nations Environment Programme (UNEP)* telah menganjurkan *National Awareness Workshop - Acid Deposition Monitoring Network in East Asia (EANET)* bertujuan untuk meningkatkan pengetahuan dan kefahaman serta menyediakan platform perkongsian maklumat mengenai pemendapan berasid dan impaknya kepada alam sekitar dan sosio ekonomi negara.

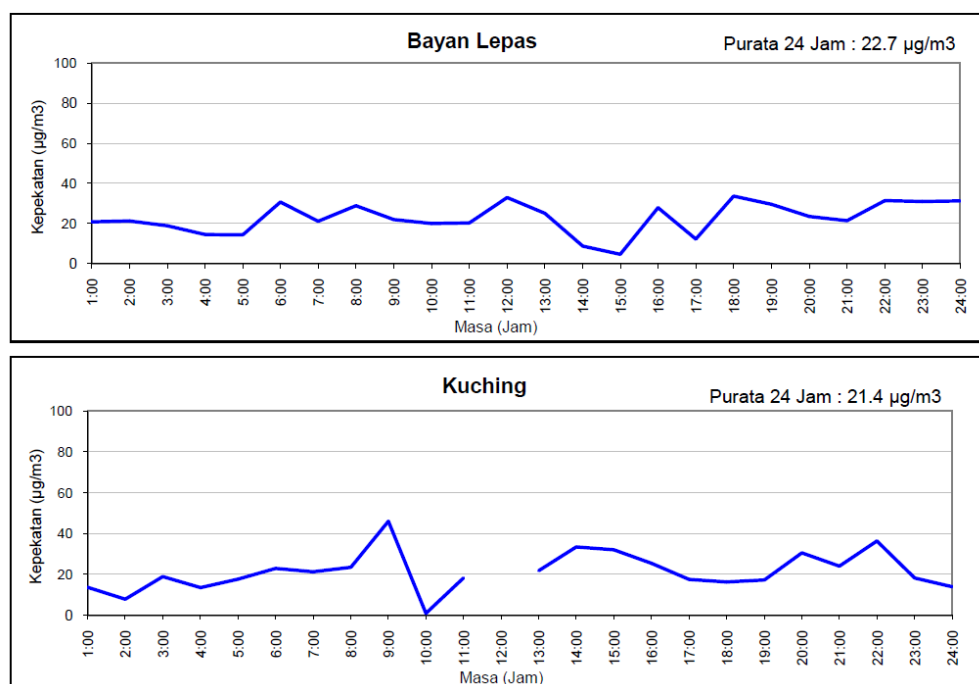
MET Malaysia mengeluarkan Laporan Zarah Terampai PM-10 secara harian dan Indeks Ultra Ungu (UV) setiap jam yang boleh dicapai oleh orang awam di dalam laman web.

On November 26 to 28, 2019 MET Malaysia in collaboration with the United Nations Environment Program (UNEP) organised the National Awareness Workshop - Acid Deposition Monitoring Network in East Asia (EANET) aimed to increase the knowledge and understanding as well as creating an information sharing platform on acid deposition and its impact on environmental and socio economic to the country.

MET Malaysia also produces daily Suspended Particulate PM-10 reports and hourly UV Index for the public which can be obtained from the website.



Laporan Harian Indeks Ultra-Ungu
UV Index Daily Report



Laporan Zarah Terampai PM-10
Suspended Particulated PM-10 Report

PEMBENIHAN AWAN CLOUD SEEDING

PEMBENIHAN AWAN

MET Malaysia dengan kerjasama Agensi Pengurusan Bencana Negara (NADMA) dan Tentera Udara Diraja Malaysia (TUDM) telah melaksanakan Operasi Pembentukan Awan (OPA) bagi mengurangkan kesan jerebu di rantau negara kita selaras dengan Pelan Tindakan Jerebu Kebangsaan.



OPA dengan pesawat TUDM
OPA with RMAF aircraft

Pada tahun 2019, OPA secara kaedah pembentukan basah telah dilaksanakan sebanyak lima kali. Dua operasi telah dilaksanakan di Semenanjung pada 16 dan 19 September 2019, manakala tiga lagi OPA dilaksanakan di Sarawak pada 12, 20 dan 21 September 2019.

MET Malaysia juga telah melaksanakan OPA menggunakan kaedah pembentukan kering di Selangor pada 23 September 2019 menggunakan pesawat



Proses penyediaan larutan garam untuk OPA dengan pesawat TUDM
The salt solution preparation for CSO with RMAF aircraft

CLOUD SEEDING

MET Malaysia in collaboration with the National Disaster Management Agency (NADMA) and the Royal Malaysian Air Force (RMAF) have carried out Cloud Seeding Operations (CSO) to reduce the effects of haze in our region in line with the National Haze Action Plan.



In 2019, CSO with wet seeding method was carried out five times. Two operations were conducted in the Peninsula on September 16 and 19, 2019. While, three others in Sarawak on September 12, 20 and 21, 2019 respectively.

MET Malaysia also carried out CSO with dry seeding method in Selangor on September 23, 2019 using private aircraft.



Permohonan bagi OPA juga diterima daripada agensi pengurusan air dan pertanian negeri seperti Badan Kawal Selia Air (BKSA), Lembaga Kemajuan Pertanian Kemubu (KADA) dan Lembaga Kemajuan Pertanian Muda (MADA) bagi meningkatkan sumber bekalan air di empangan dan kawasan tadahan negeri masing-masing. OPA telah dilaksanakan di empangan dan kawasan tadahan negeri Melaka sebanyak enam kali iaitu pada 16 dan 18 Mei 2019 serta 27 hingga 30 September 2019, menggunakan pesawat swasta.

Requests to conduct CSO were received from state water and agricultural management agencies like Badan Kawal Selia Air (BKSA), Lembaga Kemajuan Pertanian Kemubu (KADA) dan Lembaga Kemajuan Pertanian Muda (MADA) to increase water supply in dams and catchments in their respective states. CSO was conducted at the dam and catchment areas of Melaka for six times, on May 16 and 18, and also from September 27 till 30, 2019 using private aircraft.



OPA menggunakan pesawat swasta
OPA using private aircraft

Selain itu, OPA juga dijalankan di kawasan empangan dan tadahan di bawah seliaan KADA dan MADA masing-masing sebanyak lima kali pada 10 hingga 14 April 2019 dan empat kali pada 26, 27, 29 dan 30 April 2019.

Besides that, CSO was also carried out at dams and catchment areas of KADA and MADA respectively for five times from April 10 till 14, 2019 and four times on April 26, 27, 29 and 30, 2019.



Sesi Taklimat OPA
CSO Briefing Session

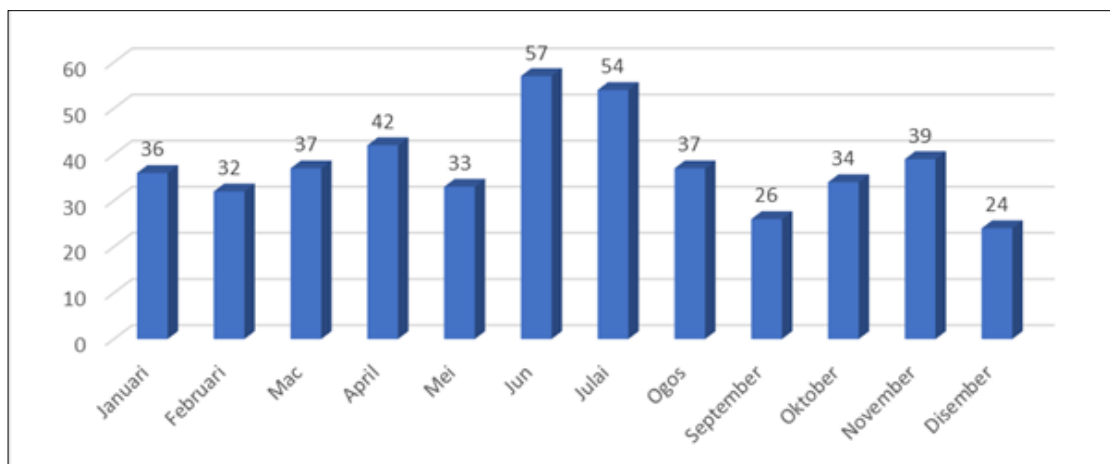


GEMPA BUMI
EARTHQUAKE

GEMPA BUMI EARTHQUAKE

Pada tahun 2019, MET Malaysia telah mengesan 451 kejadian gempa bumi di seluruh dunia. Sebanyak 183 kejadian gempa bumi tempatan (magnitud kurang daripada 5.0 pada skala Richter) telah dikesan di 18 kawasan di Sabah dan satu di Gerik, Perak.

In 2019, MET Malaysia had detected a total of 451 earthquake incidents worldwide. A total of 183 local earthquakes (magnitude less than 5.0 Richter scale) were detected at 18 areas in Sabah and one in Gerik, Perak.



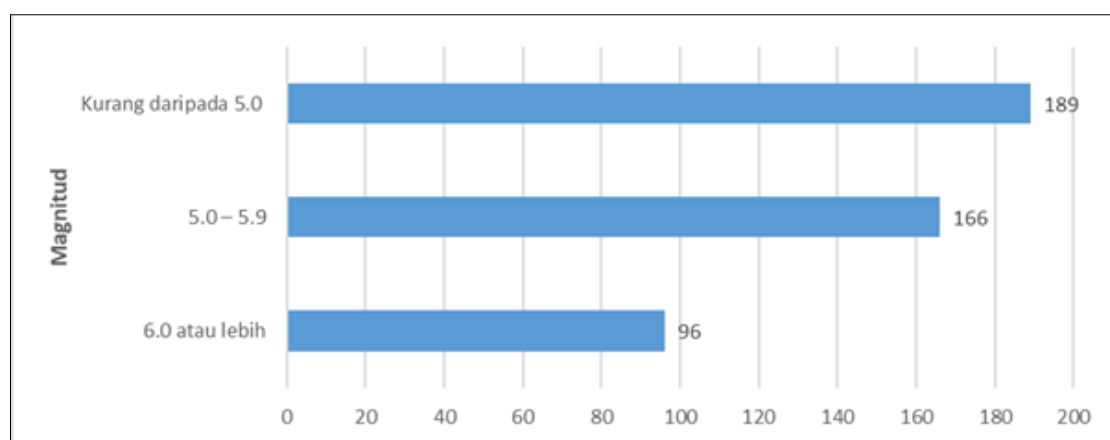
Bilangan gempa bumi yang dikesan pada tahun 2019
Total number of earthquakes detected in year 2019

Di Sabah, Ranau merekodkan jumlah kejadian gempa bumi yang tertinggi iaitu sebanyak 119 kejadian diikuti oleh Kundasang sebanyak 17 kejadian. Kejadian gempa bumi tempatan dengan magnitud tertinggi yang direkodkan adalah pada 24 Jun 2019 pada jam 11.08 pagi di Tongod, Sabah dengan magnitud 4.0 pada skala Richter.

In Sabah, Ranau recorded the highest number of earthquake incidences with 119 incidents followed by Kundasang with 17 incidents. The highest magnitude recorded of local earthquakes occurred on the June 24, 2019 in Tongod, Sabah at 11.08am with a magnitude of 4.0 on the Richter scale.

Sebanyak dua laporan gegaran dirasai berpunca daripada kejadian gempa bumi tempatan dan satu laporan kejadian gempa bumi luar Malaysia telah diterima.

Two reports of tremors felt due to local earthquakes and one report of tremors felt by an earthquake outside of Malaysia were received.



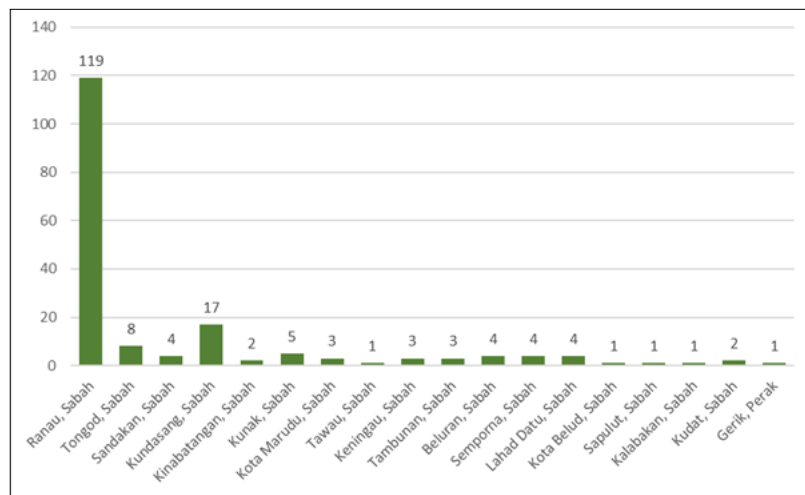
Bilangan gempa bumi mengikut magnitud pada tahun 2019
The total number of earthquakes based on magnitude in year 2019

Pencapaian Petunjuk Prestasi Utama (KPI) bagi pengeluaran maklumat gempa bumi dalam tempoh 8 minit kepada agensi pengurusan bencana dan orang awam adalah 88.2%.

The Key Performance Indicator (KPI) achievement for the release of earthquake information within 8 minutes to the disaster management agency and the public was 88.2%.

Sekiranya gempa bumi besar bermagnitud 6 atau lebih pada skala Richter berlaku di dalam negara atau gegarannya boleh dirasakan orang awam, maka siaran media dan makluman di TV melalui crawlers dan laman media sosial jabatan akan dibuat.

If a major earthquake with a magnitude of 6 or more on the Richter scale and tremors can be felt by the public, a media release, information through TV crawlers and department's social media pages will be disseminated.



Bilangan gempa bumi tempatan yang dikesan pada tahun 2019
Total number of local earthquakes detected in year 2019

Pada tahun 2019, sebanyak 222 siaran media dan *crawler* TV telah dikeluarkan. Pencapaian KPI untuk penghantaran siaran media dan *crawler* TV mematuhi masa penghantaran dalam 30 minit adalah 98.2%.

In 2019, a total of 222 media releases and TV crawlers were issued. The department achieved a KPI of 98.2% for within 30 minutes in disseminating information to the media and TV crawler.

Bagi meningkatkan perkhidmatan pemantauan cuaca, gempa bumi dan tsunami, satu bengkel Semakan Semula Peraturan Tetap Operasi (PTO) MET Malaysia berkaitan cuaca, gempa dan tsunami telah diadakan pada 15 hingga 18 April 2019.

In enhancing the services of weather, earthquake and tsunami, a workshop to Review MET Malaysia's Standard Operating Procedure (SOP) in Weather, Earthquake And Tsunami was held from April 15 to 18, 2019.

Bengkel ini bertujuan untuk mengkaji semula PTO yang digunapakai selaras dengan perkembangan teknologi pemantauan dan pengeluaran amaran berkaitan dengan cuaca, gempa dan tsunami seiring dengan perubahan pengurusan bencana di Malaysia.

The workshop was aimed to revise the current SOP used to be on par with the latest technology in monitoring and issuing the weather, earthquake and tsunami warnings in accordance with the changes in disaster management in Malaysia.

Selain itu, semakan semula PTO ini dilakukan supaya kelemahan dan kekurangan yang dikenal pasti dalam PTO sedia ada dapat diperbaiki.

Besides that, revision of the SOP was also conducted to ensure that the identified weaknesses and shortcomings would be rectified.



Bengkel Semakan Semula PTO MET Malaysia berkaitan cuaca, gempa dan tsunami
 Workshop to Review MET Malaysia's SOP related to weather, earthquake and tsunami



Sebanyak dua kursus telah diadakan bagi memberi pendedahan dan pengetahuan kepada kakitangan yang terlibat dalam pemantauan aktiviti seismik dan penyelenggaraan peralatan seismik dan tsunami.

Antara kursus tersebut adalah:

- i) Kursus Pengendalian dan Penyelenggaraan Peralatan Seismik dan Tsunami dari 7 hingga 11 Oktober 2019
- ii) Kursus Interpretasi Data Gelombang Seismik dari 4 hingga 8 November 2019

Two courses were held to give an exposure and knowledge to the employees who involves in monitoring seismic activities and maintenance of seismic and tsunami equipment's.

Among the courses are:

- i) Seismic and Tsunami Equipment Handling and Maintenance Course from October 7 till 11, 2019
- ii) Seismic Wave Interpretation Course from November 4 to 8, 2019



Kursus Pemantauan Seismik dan Penyelenggaraan Peralatan Seismik
 Seismic Monitoring and Seismic Equipment Maintenance Course



**PENYELIDIKAN
DAN PEMBANGUNAN TEKNIKAL**

**RESEARCH
AND TECHNICAL DEVELOPMENT**

PENYELIDIKAN DAN PEMBANGUNAN TEKNIKAL RESEARCH AND TECHNICAL DEVELOPMENT

PERINGKAT ANTARABANGSA

Pada tahun 2019, MET Malaysia telah terlibat dalam program di bawah *Weather and Climate Science for Service Partnership (WCSSP)*. WCSSP adalah projek kerjasama antara MET Office UK dengan agensi-agensi pengurusan bencana di Malaysia iaitu NADMA, MET Malaysia, JPS dan NAHRIM bagi meningkatkan sistem pengurusan bencana di Malaysia.

Tiga *work packages* (WPs) telah dicadangkan dalam projek ini iaitu WP1 untuk *Model Improvement*, WP2 untuk *Product and Tools Development* dan WP3 untuk *Development of Forecast to meet user's needs*.

Penglibatan Malaysia dalam Program WCSSP ini adalah melalui WCSSP Southeast Asia dan satu perjanjian persefahaman (MoU) dengan UK MET juga telah ditandatangani pada 25 Julai 2017.

Antara program antarabangsa yang dijalankan di bawah WCSSP bagi tahun 2019 adalah:

- i) Bengkel *Forecaster Training in Southeast Asia (FORTIS) Advanced Tropical Meteorology* diadakan pada 10 hingga 13 September 2019 di Petaling Jaya, Selangor. Penganjuran bengkel ini dibiayai oleh *Newton Ungku Omar Fund (NUOF)* dan dikendalikan oleh *Malaysian Industry-Government Group for High Technology (MIGHT)*.

INTERNATIONAL LEVEL

In 2019, MET Malaysia was involved in the *Weather and Climate Science for Service Partnership (WCSSP)* programme. WCSSP is a collaboration project between MET Office UK and disaster management agencies in Malaysia namely NADMA, MET Malaysia, DID and NAHRIM for improving the disaster management system in Malaysia.

Three work packages (WPs) have been proposed in this project namely WP1 for *Model Improvement*, WP2 for *Product and Tools Development* and WP3 for *Development of Forecast to meet user's needs*.

Malaysia's involvement in the WCSSP programme is through the Southeast Asia WCSSP and the mutual agreement (MoU) with the UK MET which was signed on July 25, 2017.

Among the international programmes under the WCSSP in 2019 are:

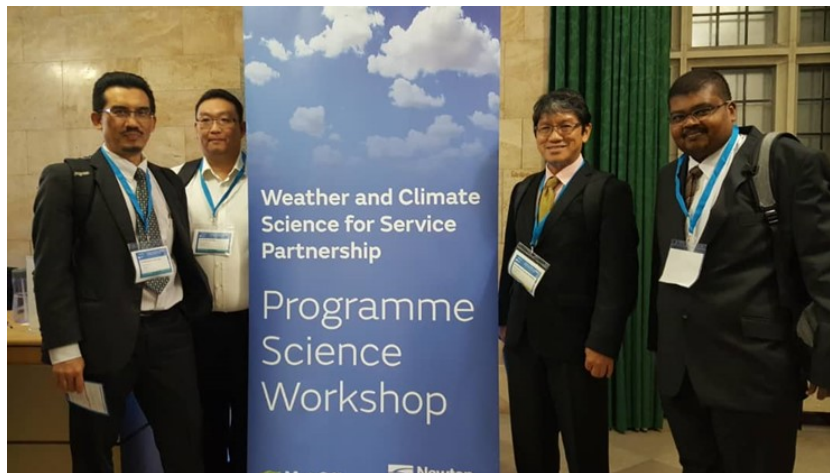
- i) The *Forecaster Training in Southeast Asia (FORTIS) Advanced Tropical Meteorology* workshop held from September 10 to 13, 2019 in Petaling Jaya, Selangor. The workshop was funded by the *Newton Ungku Omar Fund (NUOF)* and managed by the *Malaysian Industry-Government Group for High Technology (MIGHT)*.



Peserta Bengkel FORTIS
FORTIS Workshop participants

ii) Bengkel Sains bagi program WCSSP telah diadakan pada 23 hingga 24 September 2019 di London, United Kingdom melibatkan empat orang peserta dari MET Malaysia iaitu Muhammad Helmi bin Abdullah, Dr. Mohd Hisham bin Anip, Muhammad Firdaus Ammar bin Abdullah dan Diong Jeong Yik. Bengkel ini merupakan platform untuk berkongsi hasil kajian saintifik dan mencari kaedah yang terbaik dengan semua rakan kongsi projek WCSSP dan CSSP.

ii) Programme Science Workshop for WCSSP programme was held from September 23 to 24, 2019 in London, United Kingdom involving four participants from MET Malaysia namely Muhammad Helmi bin Abdullah, Dr. Mohd Hisham bin Anip, Muhammad Firdaus Ammar bin Abdullah and Diong Jeong Yik. This workshop was a platform to share scientific research results and finding the best possible methods for all WCSSP and CSSP project partners.



Peserta Bengkel WCSSP dari MET Malaysia
WCSSP Workshop participants from MET Malaysia

iii) 2nd Regional Science Workshop telah diadakan pada 5 hingga 8 November 2019 di Manila, Filipina dan dihadiri oleh tiga pegawai MET Malaysia iaitu Dr. Fariza binti Yunus, Muhammad Firdaus Ammar bin Abdullah dan Muhamad Sofian bin Muhamad Yusof. Tujuan utama lawatan ini adalah untuk memanfaatkan kepakaran saintifik yang diperlukan oleh negara-negara Asia Tenggara yang terlibat bagi memperkuat daya tahan masyarakat yang terdedah kepada cuaca dan perubahan iklim.

iii) 2nd Regional Science Workshop official visit was held on November 5 to 8, 2019 involving three officers from MET Malaysia, namely Dr. Fariza binti Yunus, Muhammad Firdaus Ammar bin Abdullah and Muhamad Sofian bin Muhamad Yusof. The main purpose of the visit was to leverage the scientific expertise required by the Southeast Asia countries to strengthen the resilience of people exposed to weather and climate change.



Peserta 2nd Regional Science Workshop
2nd Regional Science Workshop Participants

- iv) Sesi perbincangan bersama *MET Office United Kingdom* berkaitan *Work Package 3* antara MET Malaysia bersama pihak UK MET telah diadakan pada 20 hingga 22 November 2019 bagi pelaksanaan *Work Package 3 (WP3)*, *Impact Based Forecast* di bawah projek WCSSP.

- iv) Discussion session with MET Office United Kingdom related to Work Package 3 between MET Malaysia and UK MET was held from November 20 to 24, 2019 for the implementation of Work Package 3 (WP3), Impact Based Forecast under the WCSSP.



Sesi perbincangan *Work Package 3 (WP3)*
Work Package 3 (WP3) discussion

LATIHAN SANGKUTAN

- i) MET Malaysia dengan kerjasama *Hong Kong Observatory (HKO)* telah mengadakan Latihan Sangkutan berkaitan *RaINS* mulai 17 hingga 27 September 2019 dan dibiayai sepenuhnya oleh *ESCAP/WMO Typhoon Committee Preliminary Project*. Dua orang peserta dari *Guangxi Meteorological Administration* dan *Thai Meteorological Department* telah menyertai latihan ini.

ATTACHMENT TRAINING

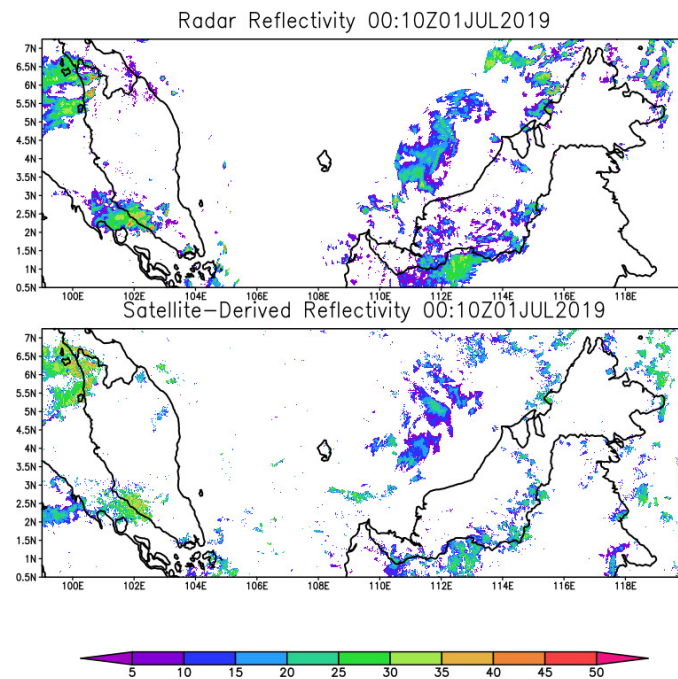
- i) MET Malaysia in collaboration with the *Hong Kong Observatory (HKO)* held an Attachment Training on *RaINS* from September 17 to 21, 2019 and was sponsored by *ESCAP/WMO Typhoon Committee Preliminary Project*. Two participants from *Guangxi Meteorological Administration* and *Thai Meteorological Department* participated in this training.



Dua peserta latihan sangkutan
Two attachment training participant

ii) Latihan Sangkutan berkaitan *Incorporation of Himawari Satellite Data in an Existing Blended NWP-Radar Nowcasting System and the Verification of the New Satellite Blended Nowcasting System* telah disertai oleh pegawai meteorologi, Yip Weng Sang di *Hong Kong Observatory (HKO)* mulai 28 Oktober hingga 8 November 2019.

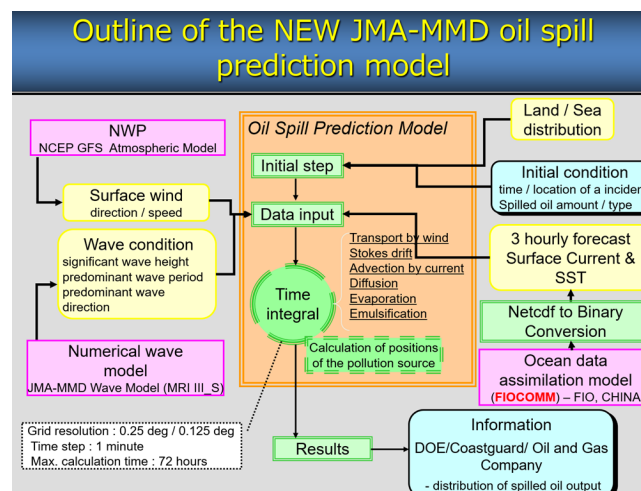
ii) Attachment training on Incorporation of Himawari Satellite Data in an Existing Blended NWP-Radar Nowcasting System and the Verification of the New Satellite Blended Nowcasting System was attended by meteorological officer, Yip Weng Sang at the Hong Kong Observatory (HKO) from October 28 to November 8, 2019.



Cerapan radar dan cerapan satelit/equivalent radar reflectivity
Radar and satellite observation/equivalent radar reflectivity

iii) Latihan Sangkutan berkaitan Climatology and Variability of Ocean Waves and the Revision of Japan Meteorological Agency Oil Spill Model di Tsukuba, Jepun mulai 23 September hingga 4 Oktober 2019. Hasil latihan ini, Model Ramalan Numerikal Trajektori Tumpahan Minyak yang diadaptasi dari model marin JMA untuk tujuan operasi telah dipertingkatkan

iii) Attachment training on Climatology and Variability of Ocean Waves and the Revision of Japan Meteorological Agency Oil Spill Model in Tsukuba, Japan from September 23 till October 4, 2019. As a result, the Oil Spill Trajectory Prediction Numerical Model adapted from JMA marine model for operational use was enhanced.



Model Ramalan Tumpahan Minyak JMA-MET Malaysia
New JMA-MET Malaysia Oil Spill Prediction Model

PERINGKAT NASIONAL

MET Malaysia terlibat dalam mengendalikan beberapa projek kerjasama di peringkat nasional seperti:

- i) Kerjasama MET Malaysia dengan Pusat Hidrografi Nasional, TLDM dalam bidang ramalan cuaca dan keadaan laut telah diadakan pada 20 Ogos 2019 di Pangkalan TLDM, Lumut.
- ii) Kerjasama MET Malaysia dan LPTA dalam pembekalan data bagi projek kerjasama antarabangsa berkaitan *Enhancing Emergency Preparedness and Response in Asean: Technical Support for Decision Making* (Reg 3.01/16) telah diadakan pada 11 Oktober 2019. MET Malaysia bersetuju membekalkan data dengan resolusi mendatar 9 km melalui perkhidmatan ftp dan menjalinkan kerjasama lanjutan bagi penentusahan data yang dibekalkan.

NATIONAL LEVEL

MET Malaysia were involved in several projects at the national level, among them:

- i) The collaboration of MET Malaysia with National Hydrographic Centre, RMN in the field of weather and marine forecast was held on August 20, 2019 at the RMN Base, Lumut.
- ii) Collaboration between MET Malaysia and AELB on the supply of data for international cooperation projects related to *Enhancing Emergency Preparedness and Response in Asean: Technical Support for Decision Making* (Reg 3.01 / 16) was held on 11th October 2019. MET Malaysia agreed to provide data with 9 km resolution via the ftp service and to provide further cooperation for the validation of the data provided.



Perbincangan bersama LPTA
Discussion with AELB

- iii) Kerjasama dengan Agensi Penguatkuasaan Maritim Malaysia (APMM) dalam membekalkan data-data ramalan angin, ombak dan arus laut dari Model Kitaran Arus Lautan FIO-MMD menggunakan Model Global Kitaran Lautan, FIOCOMM.

- iii) Collaboration with the Malaysian Maritime Enforcement Agency (MMEA) in supplying wind, wave and Ocean Currents Forecasting data from the FIO-MMD Ocean Cycle Model using the Ocean Cycle Global Model, FIOCOMM.



Perbincangan bersama APMM
Discussion with MMEA

iv) Kerjasama dengan JPS dalam projek-projek berikut:

- Kumpulan Kerja Integrasi Data Hujan
- Program Ramalan dan Amaran Banjir Negara (Fasa 2)
- Program Pembangunan *Water Balance* bagi Pengurusan Sumber Air Negara (Fasa 1) – *National Water Balance Management System* (NAWABs) bagi Lembangan Sungai Muda
- *The Development of Integrated Flood Forecasting and River Monitoring (iFFRM) with Warning System for Kedah River Basin*
- *The Development of National Flood Forecasting and Warning System for Kelantan River Basin (NaFFWS Sungai Kelantan)*
- *The Development of National Flood Forecasting and Warning System for Terengganu River Basin (NaFFWS Sungai Terengganu)*
- *The Development of National Flood Forecasting and Warning System for Pahang River Basin (NaFFWS Sungai Pahang)*
- *Debris and Mudflow Warning System for Cameron Highlands (DMFWS Phase 2B)*

iv) Collaboration with the DID such as:

- Working Group on Rain Data Integration
- The National Flood Warnings and Forecasting Programme (Phase 2)
- Water Balance Development Program for the National Water Resources Management (Phase 1) - National Water Balance Management System for Muda River Basin
- The Development of Integrated Flood Forecasting and River Monitoring (iFFRM) with Warning System for Sungai Kedah River Basin
- The Development of National Flood Forecasting and Warning System for Kelantan River Basin (NaFFWS Sungai Kelantan)
- The Development of National Flood Forecasting and Warning System for Terengganu River Basin (NaFFWS Sungai Terengganu)
- The Development of National Flood Forecasting and Warning System for Pahang River Basin (NaFFWS Sungai Pahang)
- Debris and Mudflow Warning System (DMFS) for Cameron Highlands (DMFWS Phase 2B)

BIL	TAJUK/TITLE	JURNAL/JOURNAL
1.	<i>Seasonal Dependence of Cold Surges and their Interaction with the Madden-Julian Oscillation over Southeast Asia</i>	<i>Journal of Climate</i>
2.	<i>Occurrence of Meridional and Easterly Surges and Its Impact on Malaysian Rainfall during Northeast Monsoon: A Climatology Study</i>	<i>Meteorological Application</i>
3.	<i>Practical Predictability of the 17 December 2014 Heavy Rainfall Event Over East Coast of Peninsula using WRF Mode</i>	Sains Malaysiana
4.	<i>AERONET Remotely Sensed Measurements and Retrievals of Biomass Burning Aerosol Optical Properties During the 2015 Indonesian Burning Season</i>	<i>Journal of Geophysical Research: Atmospheres</i>
5.	Klimatologi Hujan Diurnal dan Bayu Laut-Dara di Semenanjung	Sains Malaysiana
6.	<i>An Objective Definition of Summer Monsoon Onset in the Northwestern Maritime Continent.</i>	<i>International Journal of Climatology</i>

Senarai Kertas Penerbitan Teknikal
List of Technical Publication Papers



**AKTIVITI KEBANGSAAN
DAN ANTARABANGSA**

**NATIONAL AND
INTERNATIONAL ACTIVITIES**

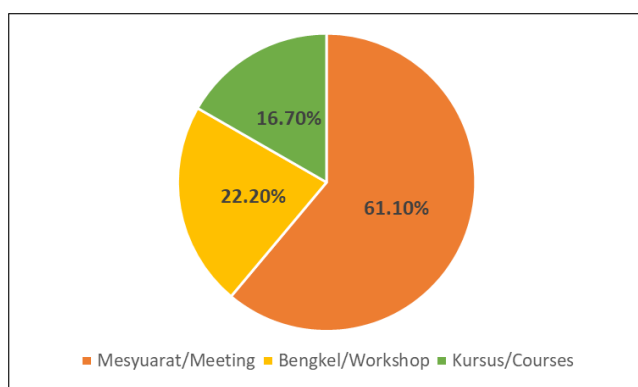
AKTIVITI KEBANGSAAN DAN ANTARABANGSA NATIONAL AND INTERNATIONAL ACTIVITIES

Pada tahun 2019 seramai 48 orang pegawai telah menyertai 56 program atau aktiviti di luar negara. Antara penyertaan tertinggi adalah menghadiri mesyuarat sebanyak 61.1%, manakala penyertaan dalam bengkel dan kursus masing-masing mencatatkan sebanyak 22.2% dan 16.7%.

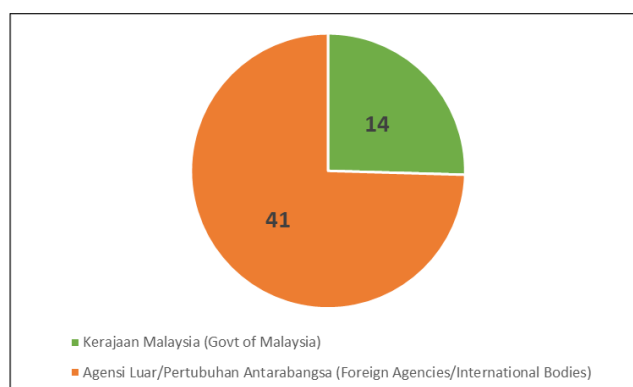
Tajaan dari agensi luar/badan pertubuhan antarabangsa mencatatkan jumlah yang tertinggi sebanyak 41 tajaan manakala 14 program luar negara dihadiri menggunakan peruntukan Kerajaan Malaysia.

In 2019, a total of 48 officers participated in 56 programmes or activities abroad. Among the highest participation is for meetings with a record of 61.1%, while workshops and courses recorded 22.2% and 16.7% respectively.

Sponsorship from foreign agencies / international organizations recorded the highest amount of 41 sponsors while 14 programmes abroad were attended using the allocation of the Government of Malaysia.



Penyertaan aktiviti antarabangsa di luar Negara
Participation in international activities abroad



Tajaan aktiviti antarabangsa di luar Negara
Sponsorship of international activities abroad

SENARAI AKTIVITI ANTARABANGSA DI LUAR NEGARA PADA TAHUN 2019 LIST OF INTERNATIONAL ACTIVITIES ABROAD FOR 2019

NO.	PERKARA/DETAIL	TEMPAT/PLACE	TARIKH/DATE
1	Weather and Climate Science for Service Partnership (WCSSP): Academic Visitor to University of Reading	Reading, United Kingdom	11 - 28 February
2	51 st Session of the ESCAP/WMO Typhoon Committee (TC)	Guangzhou, China	26 February - 1 March
3	Eighth Meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region (ICG/PTWS WG-SCS-VIII)	Jakarta, Indonesia	4 - 6 March
4	Collaborative SIGMET Issuance (CSI) Workshop 2019 Joint Session	Tokyo, Japan	5 - 8 March
5	12 th Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS-XII)	Kish Island, Iran	9 - 12 March
6	9 th Meeting of the Asia/Pacific Meteorological Services Working Group (MET/S WG/9)	Bangkok, Thailand	13 - 15 March
7	56 th Session of the Intergovernmental Panel on Climate Change (IPCC) Bureau	Geneva, Switzerland	18 - 19 March

NO.	PERKARA/DETAIL	TEMPAT/PLACE	TARIKH/DATE
8	ASEAN Project Development Workshop	Bangkok, Thailand	19 - 20 March
9	Second Workshop on ASEAN Regional Climate Data, Analysis and Projections (ARCDAP-2)	Singapore	25 - 29 March
10	International Workshop on Modelling Atmospheric Oceanic Processes for Weather and Climate Extremes (MAPEX 2019)	New Delhi, India	28 - 29 March
11	36 th Global Atmosphere Watch Training and Education Centre (GAWTEC) Training Course	Schneefernerhaus, Germany	30 March - 14 April
12	11 th International Training Workshop Climate Variability and Prediction (11ITWCVP)	Ankara, Turkey	15 - 26 April
13	WMO 2 nd Multi-Hazard Early Warning Conference (MHEWC-II) and UNISDR 6 th Session of the Global Platform for Disaster Risk Reduction 2019 (GP 2019)	Geneva, Switzerland	15 - 17 May
14	11 th Southeast Asian Sub-Regional Committee Meeting (SEA-SRC)	Vientiane Capital, Lao PDR	16 - 17 May
15	ICAO Asia/Pacific Meteorology/Air Traffic Management Seminar and Eighth Meeting of the Meteorological Requirements Working Group	Singapore	27 - 31 May
16	11 th Session of the IOC Regional Committee for the Central Indian Ocean and IOCINDIO Scientific, Technical and Institutional Innovations Workshop for National and Regional Framework on Coastal Vulnerability Assessment and Monitoring for Sea-Level Rise and Storm Surges in the Indian Ocean Region	Hyderabad, India	27 May - 1 June
17	The 18 th Session of the World Meteorological Congress (CG-18)	Geneva, Switzerland	3 - 14 June
18	Coordinators Meeting on Belt and Road Seismic Risk Reduction	Beijing, China	11 - 14 June
19	17 th WMO-GAW Brewer Operator Course	Spain	17 - 21 June
20	23 rd Meeting of the Meteorological Sub-Group (MET SG/23) of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and 6 th Meeting of The Asia and Pacific Volcanic Ash Exercises Steering Group (APAC VOLCEX/SG/6)	Bangkok, Thailand	17 - 21 June
21	EANET Individual Training Program in Summer 2019	Japan	1 - 19 July
22	KLIA Airline Operator Committee (AOC) Offshore Meeting 2019	Surabaya, Indonesia	12 - 14 July
23	3 rd Training Workshop on Subseasonal to Seasonal Predictions for Southeast Asia (S2S-SEA III)	Singapore	22 - 26 July
24	ASEAN-India Research and Training Fellowship	India	1 August 2019 - 21 January 2020
25	APEC Climate Centre (ACC) Member Working Group Meeting and APEC Climate Symposium (APCS) 2019	Chile	20 - 22 August
26	2 nd Meeting of the Steering Group for Space-Based Weather and Climate Extreme Monitoring Demonstration Project (SEMDP)	Japan	21 - 23 August

NO.	PERKARA/DETAIL	TEMPAT/PLACE	TARIKH/DATE
27	Expert/Thailand Expert Dialogue on Scaling Up Regional Cooperation in Multi-Hazard Early Warning Systems in Asia-Pacific with Focus on Flood and Drought	Bangkok, Thailand	26 - 28 August
28	The Leadership and Management Programme for Senior Management of National Meteorological and Hydrological Services (NMHSS)	Singapore	26 - 30 August
29	20 th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases and Related Measurement Techniques (GGMT – 2019) and Sag on Greenhouse Gases Meeting	Jeju, South Korea	1 - 5 September
30	2019 China-ASEAN Disaster Prevention and Reduction Science Communication Forum: Knowledge is Power	Nanning, China	16 - 18 September
31	AWOS Installation, Maintenance and Operation	Antalya, Turkey	16 - 18 September
32	Secondment of Short-Term International Staffs Form NTWCS of WG-SCS Member States to the SCTAC	Beijing, China	16 September - 15 November
33	Weather and Climate Science for Service Partnership (WCSSP)	London, United Kingdom	23 - 24 September
34	WMO Regional Association Workshop on the WICAP and Meeting of the Task Team on Aircraft – Based Observations	Singapore	24 - 29 September
35	Indian Ocean Rim Association (IORA) Workshop: Tsunami Early Warning Systems – Lessons – Learnt from the 2018 Tsunamis in Indonesia	Jakarta, Indonesia	26 - 28 September
36	i) International Symposium on the Lessons Learnt From the 2018 Tsunamis in Palu and Sunda Strait ii) ICG/IOTWMS Intersessional Meeting of Working Groups, Task Teams and Steering Group	Jakarta, Indonesia	29 September - 2 October
37	41st ASEAN Sub-Committee Meteorology and Geophysics Meeting	Singapore	7 - 8 October
38	Working Group on Meteorology of Typhoon Committee	Tokyo, Japan	7 - 10 October
39	The Nineteenth Session of the Scientific Advisory Committee on the EANET (SAC19)	Siem Reap, Cambodia	8 - 10 October
40	High-Level Dialogues on Tropical Cyclones: A 10-Year Vision to Protect Life and Property	Japan	10 - 11 October
41	5th Asia-Pacific Greenhouse Gas Training and Education Course	Seoul, Korea	28 October - 1 November

NO.	PERKARA/DETAIL	TEMPAT/PLACE	TARIKH/DATE
42	ESCAP/WMO Typhoon Committee 14th Integrated Workshop (14 th IWS)	Guam, USA	4 - 7 November
43	Global Flash Flood Guidance System Workshop	Antalya, Turkey	4 - 8 November
44	Weather and Climate Science for Service Partnership (WCSSP) Southeast Asia 2 nd Regional Science Workshop	Manila, Philippines	6 - 8 November
45	16 th Group on Earth Observations (GEO) Planery Session	Canberra, Australia	7 - 8 November
46	The International Training Course on Fengyun Satellite Products and Application	Haikou, China	11 - 17 November
47	The Twenty-First Session of Intergovernmental Meeting on the Acid Deposition Monitoring Network in East Asia	Beijing, China	12 - 13 November
48	Technical Meeting on Regional Weather Radar Network in Southeast Asia	Tokyo, Japan	13 - 15 November
49	Thirteen ASEAN Climate Outlook Forum	Bangkok, Thailand	18 - 21 November
50	Weather Radar Seminar 2019	Tokyo, Japan	18 - 22 November
51	Indian Ocean Regional Workshop on Strengthen Tsunami Warning Chain to Critical Infrastructure	Jakarta, Indonesia	20 - 21 November
52	Indian Ocean Regional Workshop on Strengthening Tsunami Warning Chain to Critical Infrastructure	Jakarta, Indonesia	20 - 22 November
53	12 th Southeast Asia Sub regional Committee Meeting	Phnom Pehn, Cambodia	21 - 22 November
54	TCC Training Seminar on Climate Analysis Information on Extreme Climate Events	Tokyo, Japan	25 - 29 November
55	Training on Earthquake Monitoring and Early Warning	Guangdong, China	2 - 6 December
56	10 th Asia-Oceania Meteorological Satellite Users' Conference (AOMSUC -10)	Melbourne, Australia	2 - 7 December
57	United Nations Climate Change Conference (UNFCCC)	Santiago, Chile	2 - 13 December

GAMBAR AKTIVITI ANTARABANGSA DI LUAR NEGARA
PICTURES OF INTERNATIONAL ACITIVITIES ABROAD

ASEAN Project Development Workshop in Bangkok, Thailand
(19-20 March 2019)



Second Workshop on ASEAN Regional Climate Data, Analysis And Projections (ARCDAP-2) in Singapore
(25-29 March 2019)



11th Southeast Asia Sub-Regional Committee Meeting (SEA-SRC) in Vientiane Capital, Lao PDR (16-17 May 2019)



3rd Training Workshop on Subseasonal to Seasonal Predictions for Southeast Asia (S2S-SEA III) in Singapore (22-26 July 2019)



20th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases and Related Measurement Techniques (GGMT-2019) in Jeju, South Korea
(1-5 September 2019)



Secondment of Short-Term International Staffs from NTWCS of WG-SCS
Member States to the SCTAC in Beijing, China
(16 September-15 November 2019)



International Training Course on Fengyun Satellite Products and Application in Haikou, China
(11-17 November 2019)



Weather Radar Seminar 2019 in Tokyo, Japan
(18-22 November 2019)



Indian Ocean Regional Workshop on Strengthening Tsunami Warning Chain to Critical Infrastructure in Jakarta, Indonesia
(20-22 November 2019)



Training on Earthquake Monitoring and Early Warning in Guangdong
(2-6 December 2019)

LAWATAN/ AKTIVITI ANTARABANGSA DALAM NEGARA
INTERNATIONAL VISIT/ ACTIVITIES IN MALAYSIA



20th Senior Technical Managers' Meeting (STM20) of EANET
(4-5 September 2019)



National Awareness Workshop - Acid Deposition Monitoring Network in East Asia
(26-28 November 2019)



Visit by Vietnam Air Traffic Management Corporation
(21-22 October 2019)



Visit by Japan Meteorological Agency (JMA)
(11-12 November 2019)

**AKTIVITI PERINGKAT KEBANGSAAN
NATIONAL LEVEL ACTIVITIES**



Forum Iklim Kebangsaan Monsun Timur Laut 2019/2020 di Universiti Malaysia Terengganu pada 1 Oktober 2019

Forum Iklim Kebangsaan Monsun Timur Laut 2019/2020 at University Malaysia Terengganu on October 1, 2019

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SENARAI SINGKATAN/ ABBREVIATION

AMP	Aeronautical Meteorological Personnel
API	Aktiviti Penilaian Inspektorat
APMM	Agensi Penguatkuasaan Maritim Malaysia
APN	Asia-Pacific Network for Global Change Research
ARSM	Agensi Remote Sensing Malaysia
ATMB/CAAC	Air Traffic Management Bureau of Civil Aviation Administration of China
CMSS	Computer Message Switching System
DID	Department of Irrigation and Drainage
DMFS	Debris and Mudflow Warning System
DRC	Disaster Recovery Centre
ENSO	El Niño Southern Oscillation
FIKMTL	Forum Iklim Kebangsaan Monsun Timur Laut
FIO	First Institute of Oceanography
GAW	Global Atmospheric Watch
HCD	Program Pembangunan Modal Insan
HKO	Hong Kong Observatory
HRMIS	Sistem Maklumat Pengurusan Sumber Manusia
ICAO	International Civil Aviation Organization
ICU	Unit Penyelarasan Pelaksanaan
iFFRM	Integrated Flood Forecasting and River Monitoring
JAS	Jabatan Alam Sekitar
JMG	Jabatan Mineral dan Geosains
JPBD	Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia
JPS	Jabatan Pengairan dan Saliran
KL FIR	Kuala Lumpur Flight Information Region
KLIA	Lapangan Terbang Antarabangsa Kuala Lumpur
KPI	Petunjuk Prestasi Utama
LKT	Latihan Kepakaran Teknikal
MDPS	Meteorological Data Processing System
MESTECC	Kementerian Tenaga, Sains, Teknologi, Alam Sekitar dan Perubahan Iklim
MIFS	Malaysian Intergrated Forecasting System

NUO	Newton Ungku Omar
NWP	Numerical Weather Prediction
OFS	Ocean Forecast System
OPA	Operasi Pembenihan Awan
PMPN	Pusat Meteorologi Penerbangan Nasional
POCGS	Pusat Operasi Cuaca dan Gempa Bumi Sabah
PTO	Peraturan Tetap Operasi
RaINS	Radar Integrated Nowcasting System
RTM	Radio dan Televisyen Malaysia
SEADPRI-UKM	Pusat Kajian Bencana Asia Tenggara-Universiti Kebangsaan Malaysia
SOA	State Oceanic Administration
SWIRLS	Short-range Warning of Intense Rainstorms Localized Systems
TUDM	Tentera Udara DiRaja Malaysia
UKMO	UK Met Office
UM	Universiti Malaya
UMP	Universiti Malaysia Pahang
UMT	Universiti Malaysia Terengganu
UV	Indeks Ultra Ungu
WCSSP	Weather and Climate Science Service Partnership
WMO	World Meteorological Organization
WPs	Work Packages
WSDS	Wind Shear Detection System
YMC	Year of the Maritime Continent



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