



**ASEAN REGIONAL SEMINAR ON WEATHER MODIFICATION 2024**

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***MALAYSIAN METEOROLOGICAL DEPARTMENT***

***MINISTRY OF NATURAL RESOURCE AND ENVIROMENTAL SUSTAINABILITY***

# **WEATHER MODIFICATION ACTIVITIES IN MALAYSIA**

**BANGKOK AND CHONBURI, THAILAND**



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## **HISTORICAL BACKGROUND**

- December 1973 – January 1974 : First cloud seeding was carried out in Malaysia as an experiment for flood control over east coast region
- 1977 : Cloud seeding over Pedu and Muda dam to increase water storage for agricultural purposed during severe drought
- 1978 : Establishment of Cloud seeding unit in Meteorological Department
- 1979 : Cloud seeding over Temengor catchment to maintain reservoir level for hydroelectric power generation.
- 20 April – 30 June 1983 : Cloud seeding Over Klang Gates and Langat Dam due to drought early this year



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## **PRESENT STATUS**

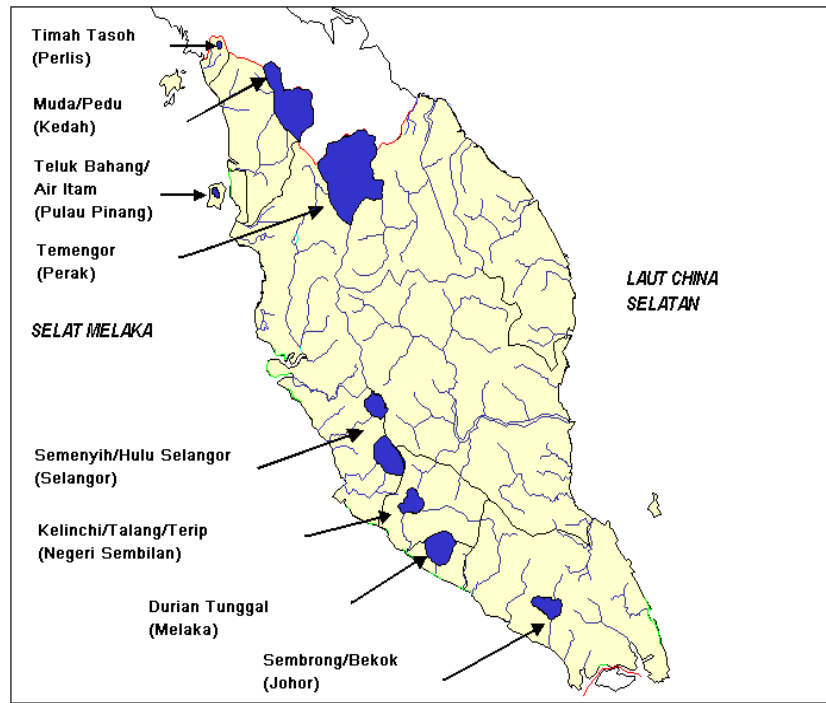
- The weather modification activities /cloud seeding in Malaysia are undertaken by Atmospheric Science and Cloud Seeding Division (ASCS), Malaysian Meteorological Department (MET Malaysia)
- There are 9 meteorological officers and 20 assistance meteorological assistance in this division.
- Current use of cloud seeding to :
  1. Enhance rainfall to increase dam storage for **agriculture** and **domestic water supply**
  2. Supress **haze** during dry seasons
- Currently, cloud seeding operation for rainfall enhancement are carried out in all parts of Malaysia upon request by Federal Government, State Government or Water regulatory bodies. Cloud seeding operation for haze suppression, however, depends on National Haze Action Plan



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## PRESENT STATUS



CLOUD SEEDING OPERATION TO INCREASE WATER SUPPLY AT DAMS

Fig.1 Cloud seeding area



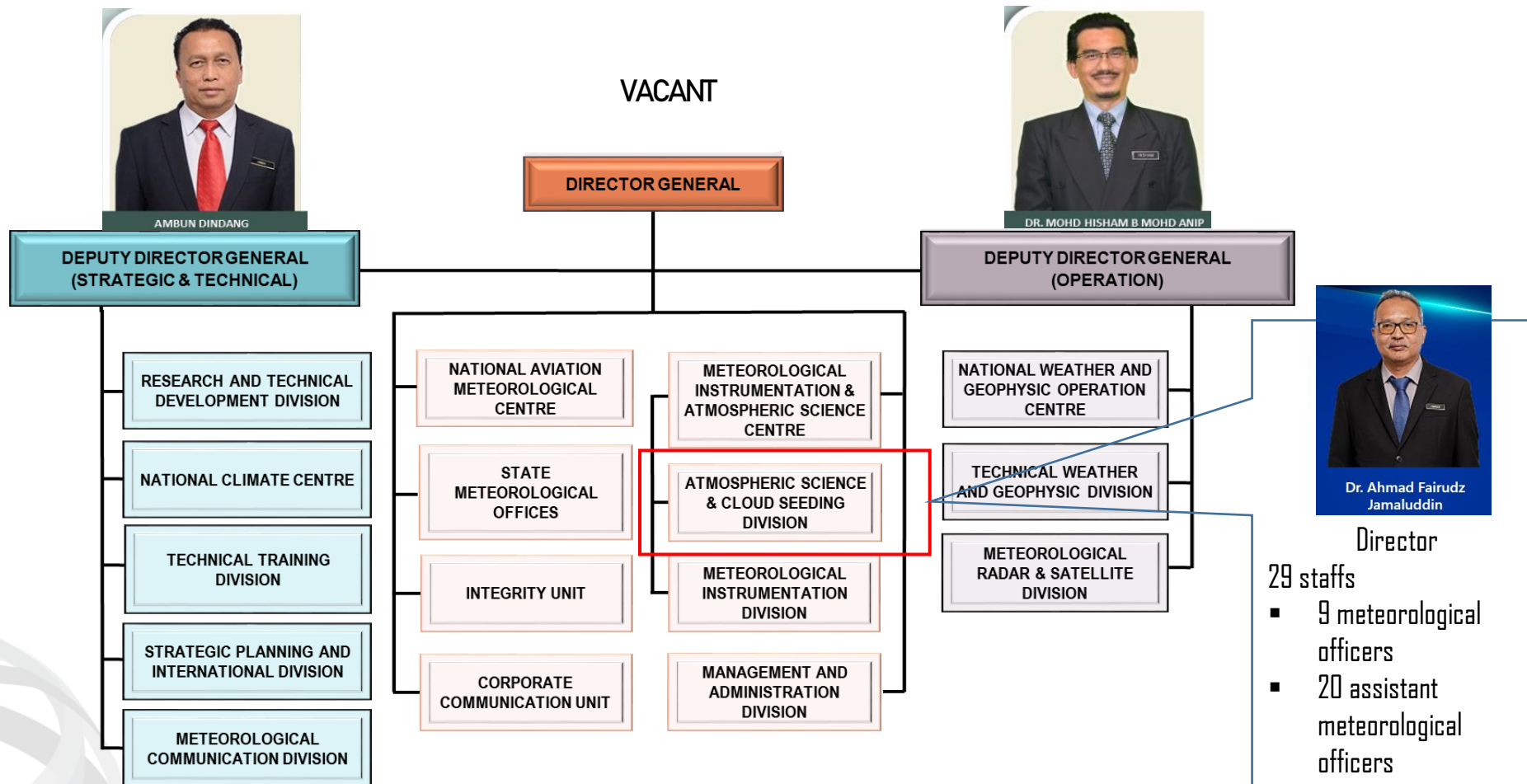
Fig.2 Cloud seeding base



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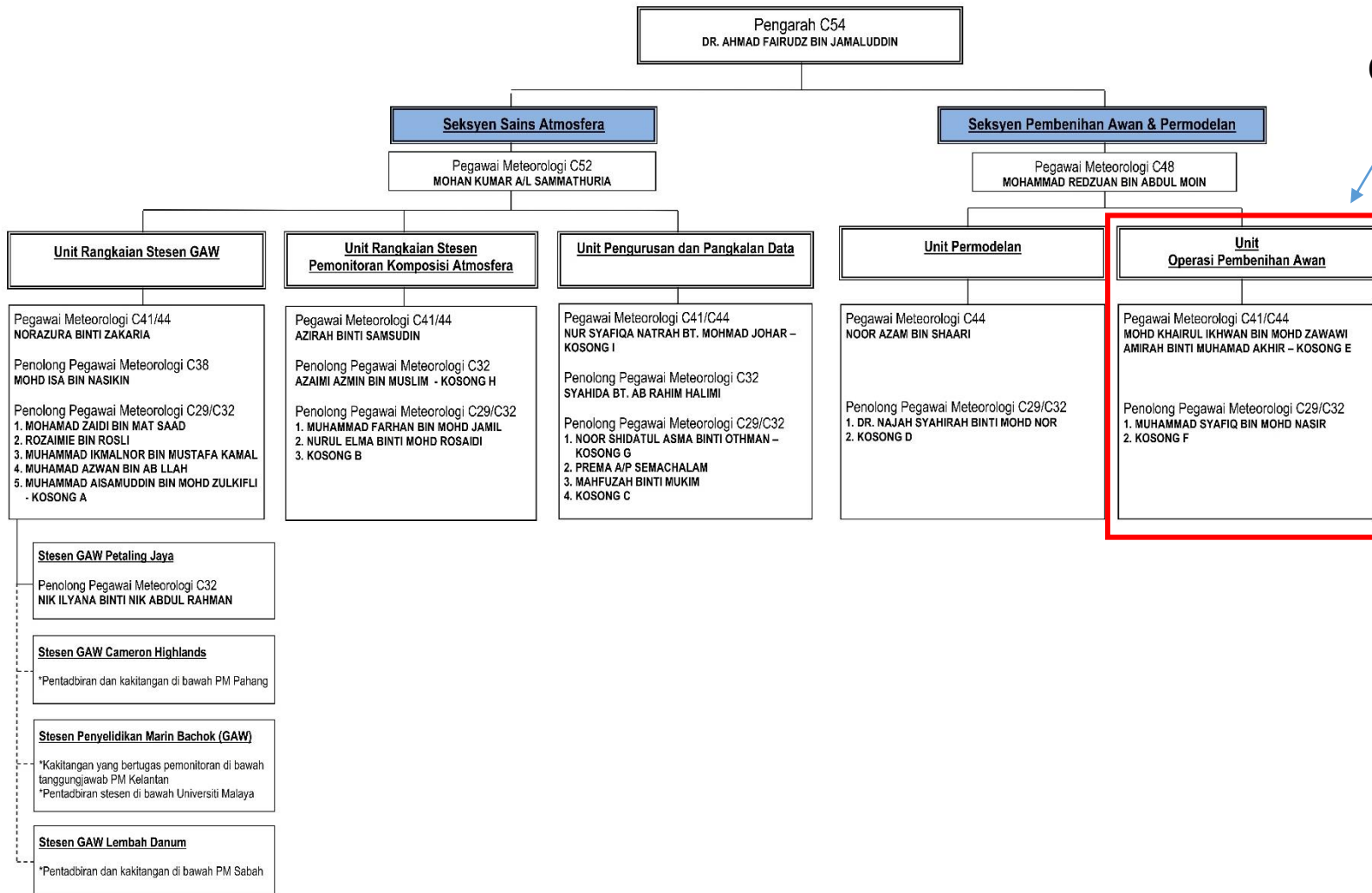
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## ORGANIZATION CHART MET MALAYSIA





# ORGANIZATION CHART FOR ASCS



Cloud Seeding Unit





## METHODOLOGY OF SEEDING

- Seeding agent are introduced into the clouds by direct release from the aircraft
- There are two modes of dispersal:
  - Salt Solution (Wet Seeding)** :Chemicals (salt) are dissolved in water and stored inside tank on board the C-130H. The solutions discharged into the middle of clouds through spray boom attach on the ramp at the back of the aircraft. The C-130H carries a full load of 6000 liter of salt solution, which is distribute into four separate tanks.
  - Hygroscopic flare (Dry seeding)** : Hygroscopic flare are burned at base of clouds. Each unit of hygroscopic flare weighs around 1.3 kg, with the seeding material weighing 1 kg. The amount of chemical dispersed is around 24 kg preflight, whis is the maximum load (24 units) that the burn-in-place hygroscopic flare rack can carry.



Fig. 3 Wet seeding equipment



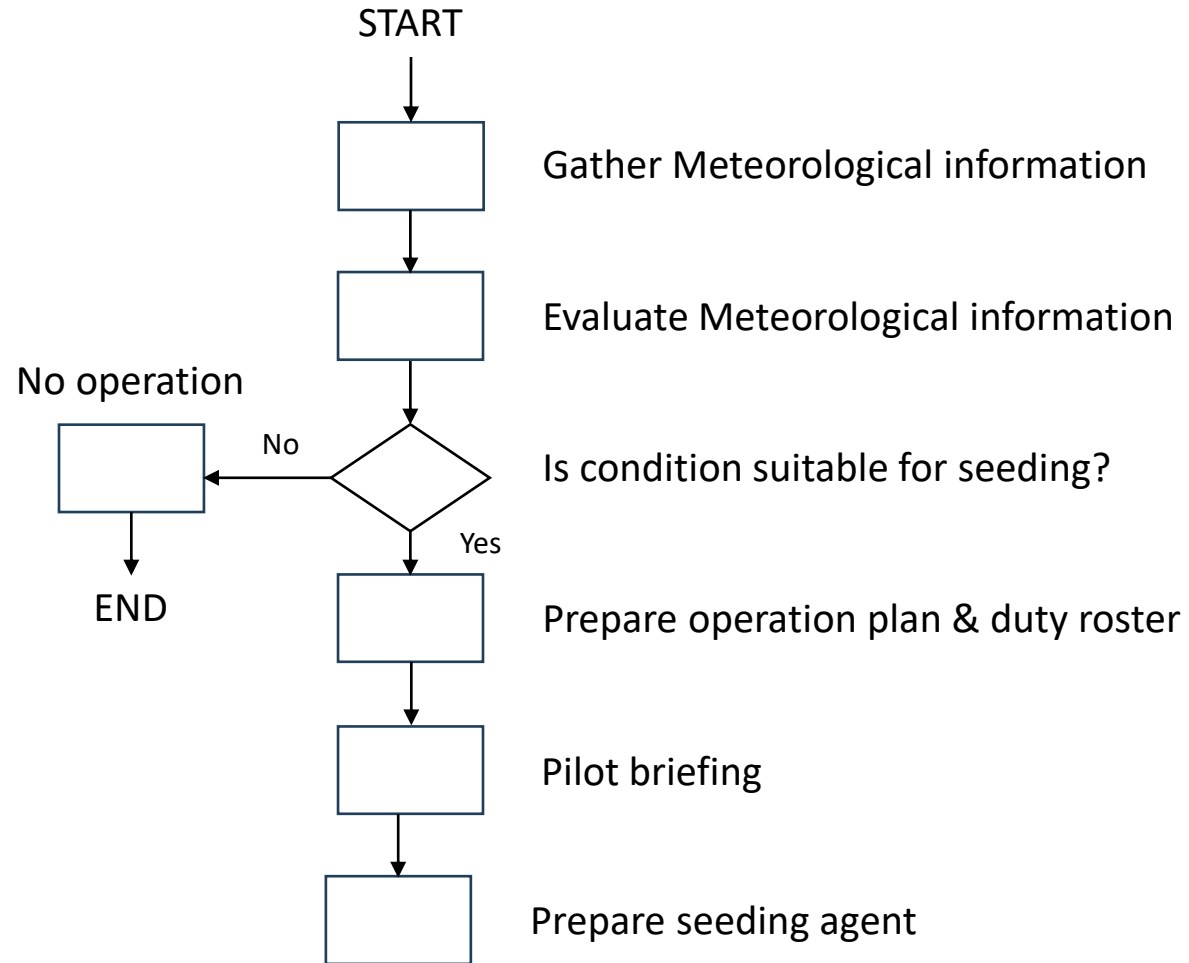
Fig. 4 Dry seeding equipment



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## FLOW CHART FOR CLOUD SEEDING OPERATIONS



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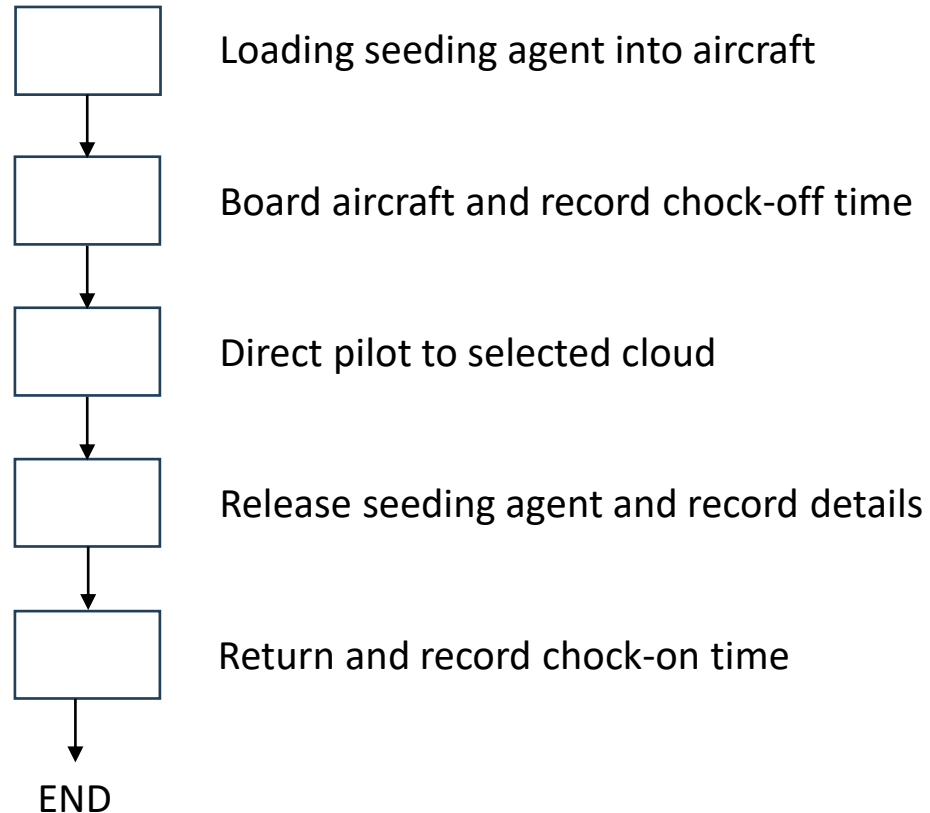




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## FLOW CHART FOR CLOUD SEEDING OPERATIONS





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## AIRCRAFT USED

- Two aircrafts have been used for cloud seeding in Malaysia, which are:

a) **C-130 Hercules**



- Own by RMAF
- Collaboration with NADMA, RMAF and MET Malaysia

b) **Cessna**



- Chartered from private company
- Aircraft equipped with Burn-in-place hygroscopic flare rack



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## WEATHER MODIFICATION ACTIVITIES OVER PAST FIVE YEAR

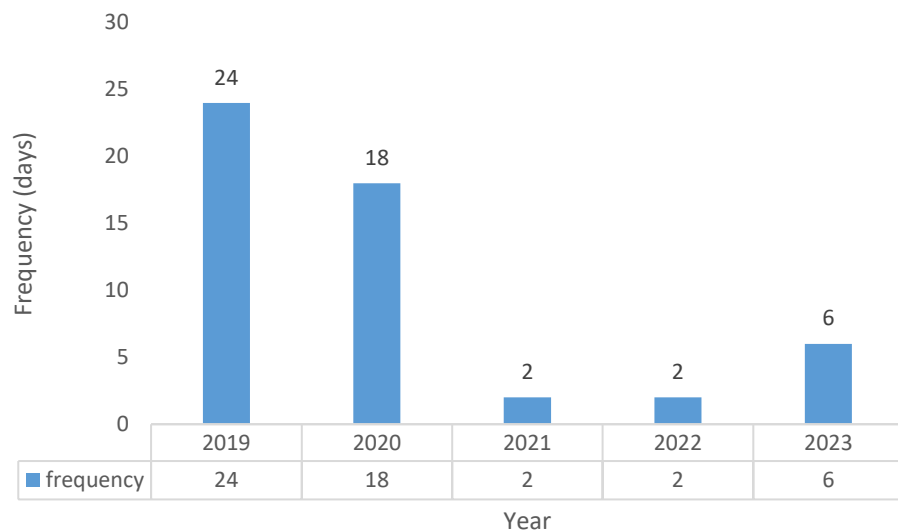


Fig.5 Weather Modification activities from 2019-2023

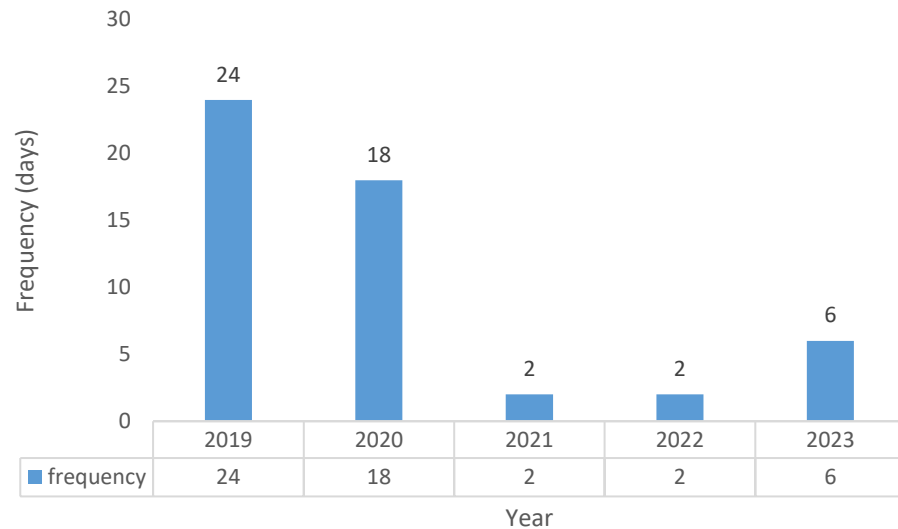
- 2019 :
  - i) 10 – 14 April 2019 – Kelantan } **Agricultural**
  - ii) 26 – 30 April 2019 – Kedah } **Agricultural**
  - iii) 16 – 18 May & 29 -31 May 2019 – Melaka → **Domestic**
  - iv) 12 September 2019 – Sarawak
  - v) 16 & 19 September 2019 – West coast of peninsular } **Haze suppression**
  - vi) 20 & 21 September 2019 – Sarawak } **Haze suppression**
  - vii) 23 September 2019 – Selangor } **Haze suppression**
  - viii) 27 – 30 September 2019 – Melaka → **Domestic**
  
- 2020 :
  - i) 19 & 21 January 2020 – Kedah → **Agricultural**
  - ii) 9 & 10 February 2020 – Melaka → **Domestic**
  - iii) 14 & 17 February 2020 – Kedah → **Agricultural**
  - iv) 26 - 28 April 2020 – Penang
  - v) 13 May 2020 – Penang
  - vi) 6 – 10 November 2020 - Penang } **Domestic**
  - vii) ) 20 & 21 November 2020 - Penang } **Domestic**



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## WEATHER MODIFICATION ACTIVITIES OVER PAST FIVE YEAR



- 2021 : i) 28 & 30 Mac 2021 – Melaka → **Domestic**
- 2022 : i) 18 & 19 June 2023 – Perak → **Agricultural**
- 2023 : i) 2 - 4 May 2023 – Penang  
ii) 11 - 13 June 2023 – Penang } **Domestic**

Fig.5 Weather Modification activities from 2019-2023



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## **WEATHER MODIFICATION ACTIVITIES IN CURRENT YEAR**

- As of September 2024, a total number of 11 cloud seeding operations have been conducted in several locations as follows:
  - i. 27 and 28 February 2024 – Perak & Penang → **Agriculture & Domestic**
  - ii. 28 – 30 March 2024 – Sabah → **Domestic**
  - iii. 21 – 23 June 2024 – Kelantan
  - iv. 29 – 31 July 2024 – Perak

} **Agricultural**



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## CHALLENGES

- The operation mainly depends on the availability of aircraft from RMAF and chartered companies
- The cost of cloud seeding operations is high
- There is insufficient equipment and knowledge to evaluate the effectiveness of cloud seeding



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## CONCLUSION

- The weather modification activities in Malaysia are operational to address water problems related to agriculture and domestic use, as well as to suppress haze during dry periods
- There are two approaches for seeding: using salt solution and hygroscopic flares
- The frequency of seeding operations depends on weather situations, such as extended dry spell due to global circulation such as El Niño and IOD
- Currently, there are no concrete schemes or methods for evaluating cloud seeding effectiveness, aside from using dam water levels, rain gauges, and radar echoes for validation.



# TERIMA KASIH



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