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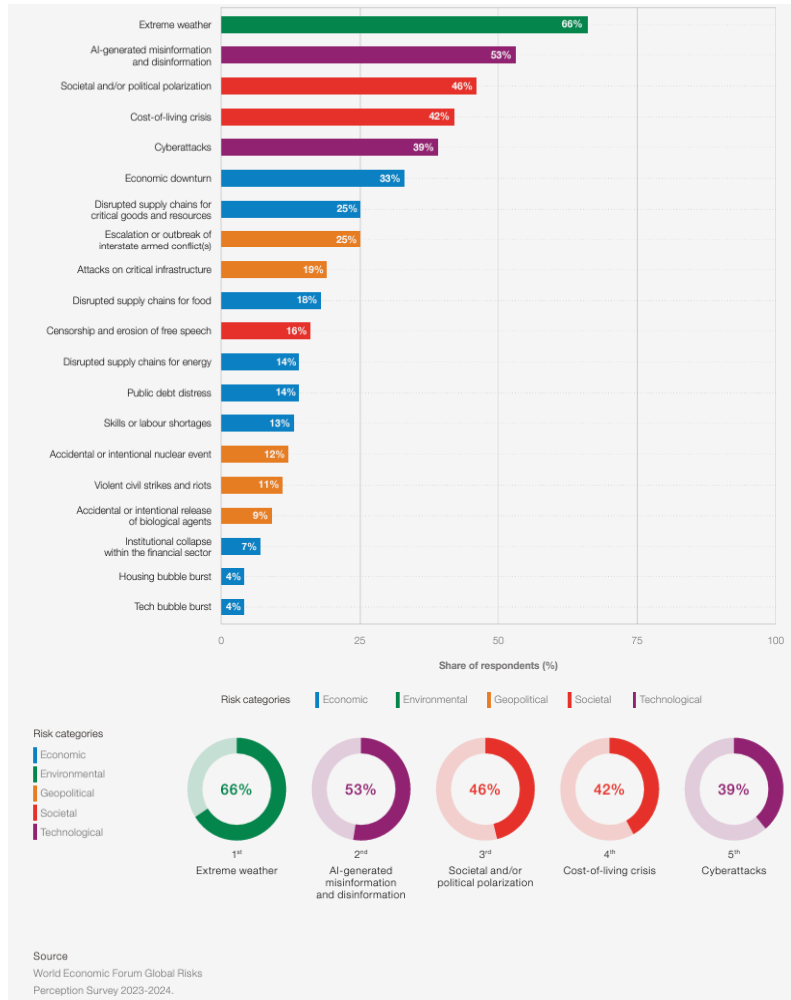


UPDATES ON WEATHER MODIFICATION IMPLEMENTATION IN INDONESIA

M. Bayu Rizky Prayoga

Meteorological, Climatological, and Geophysical Agency (BMKG)
Indonesia

INDONESIA AND ITS HYDROMETEOROLOGICAL HAZARD

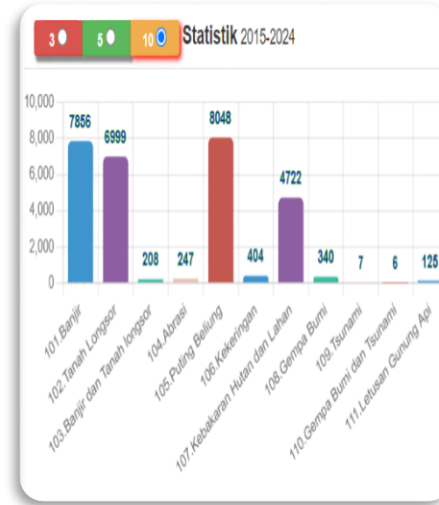


Globally, extreme weather is the main type of risk from the environmental sector. (World Economic Forum, 2024)

Frekuensi Bencana 2023 (BNPB, 2024)



Statistik Bencana 2015-2024 (BNPB, 2024)



- In 2023, >90% of disaster events in Indonesia dominated by hydrometeorological disasters. Historically (2015-2024), hydrometeorological disasters are also the dominant type of disaster in Indonesia. (BNPB, 2024)
- In the Asia-Pacific region, Indonesia is projected to be in the high disaster risk category. (Control Risks, 2024)

WEATHER MODIFICATION FOR FOREST FIRE MITIGATION

Since it was first implemented in 1997, Weather Modification is able to present as one of the technologies that can be relied upon to mitigate the smoke and haze caused by forest fire. Now WMT is used as a permanent solution in mitigating forest fires by the Indonesian government.

Weather Modification for forest fire mitigation (2000-2010)

Operation Area	Duration (days)	% of rain enhancement	Estimated water volume (million m3)
Riau	33	30-40	221
Jambi	12	20	101
South Sumatra	11	80	169
West Kalimantan	11	17	70
Central Kalimantan	11	12	27
South Kalimantan	11	85	30

INDONESIA WEATHER MODIFICATION AND ITS ROLE FOR REDUCING CARBON EMISSION DUE TO FOREST FIRES

< 2015
curative (countermeasures)
Fire Suppression

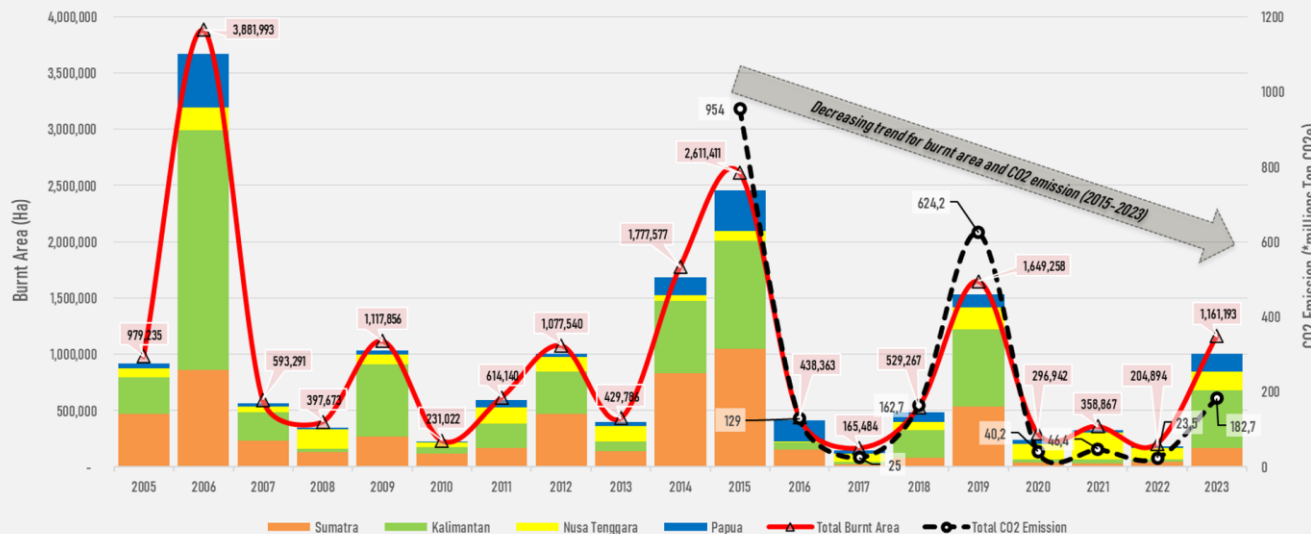


2016 >
preventive measures
Re-wetting



Paradigm for using weather modification for forest and land fires after 2015 → preventive measures by re-wetting peatlands before entering the peak of the dry season → burned area and carbon emissions due to forest and land fires tend to decrease

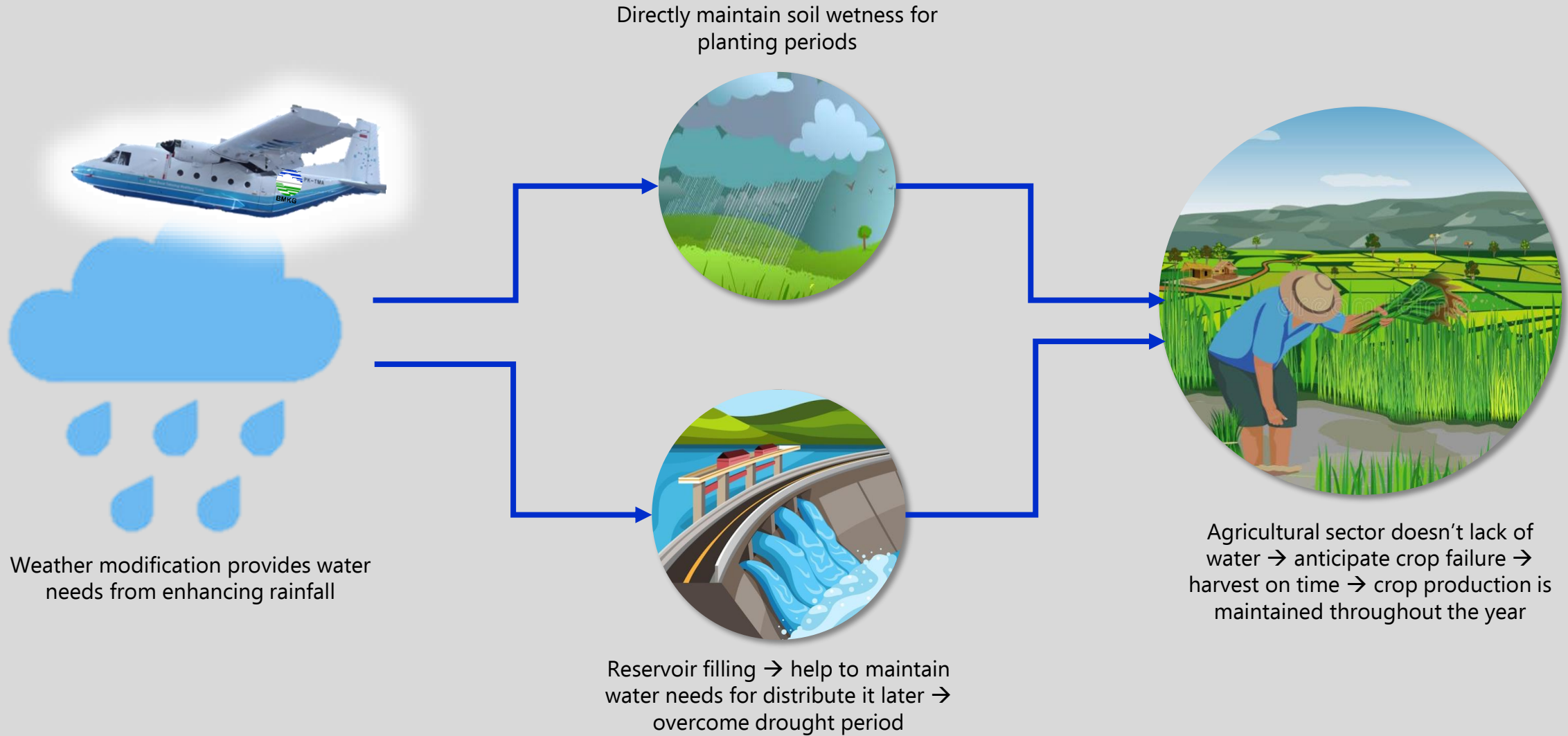
Burnt Area and CO2 Emission due to Forest and Land Fires in Indonesia



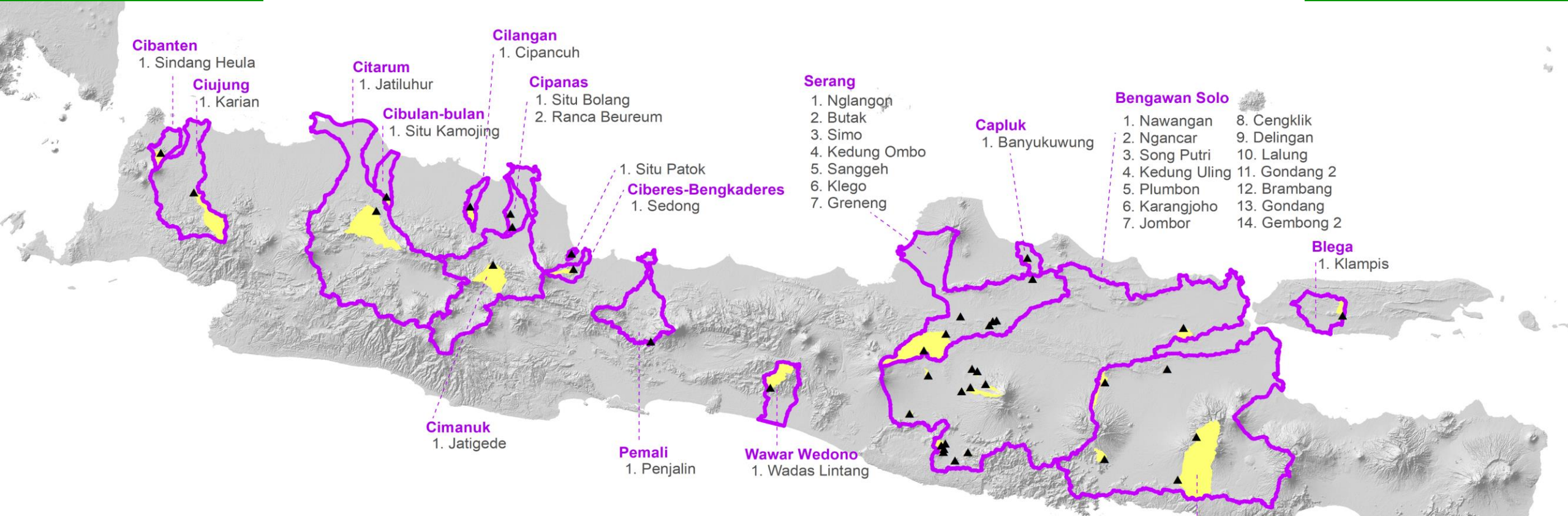
“Decreasing burnt area up to **29,6%** and also decreasing carbon emission up to **70,7%** caused from forest fires disaster”

(Harsoyo *et al.*, 2024)

WEATHER MODIFICATION AND ITS ROLE FOR SUPPORTING AGRICULTURAL SECTOR



CASE STUDY: WEATHER MODIFICATION TO FILL ADDITIONAL WATER VOLUME ON SEVERAL VITAL RESERVOIRS IN JAVA ISLAND (MAY 30 – JUNE 10, 2024)



Map Legend

- ▲ Reservoir
- ▭ Watershed
- ▭ Catchment Area

- Conducted when conditions still tend to be in the El-Nino phenomenon
- There was rain and an increase in the volume of reservoirs in 34 reservoirs out of 43 target reservoirs → 79% of target reservoirs experienced rain in conditions that still tended to be dry
- Total increase in target reservoirs → **63.8 million m³** during 9-10 effective days of weather modification operation

CASE STUDY: THE BENEFIT FROM WEATHER MODIFICATION FOR AGRICULTURAL SECTOR

Summary

YEAR	WORK AREA	PURPOSES	RESULTS
2007	West Java, Central Java, East Java, Lampung	Increase irrigation water supply	Providing an increase in water requirements for agricultural irrigation by 25%
2012	West Java	National food security program	Contributes to rice production → increasing 7.7%



Increasing water volume for several reservoirs = **703.5 million m³**



- Water needs for rice field = 9000 m³/ha
- Rice production = 4 tons/ha

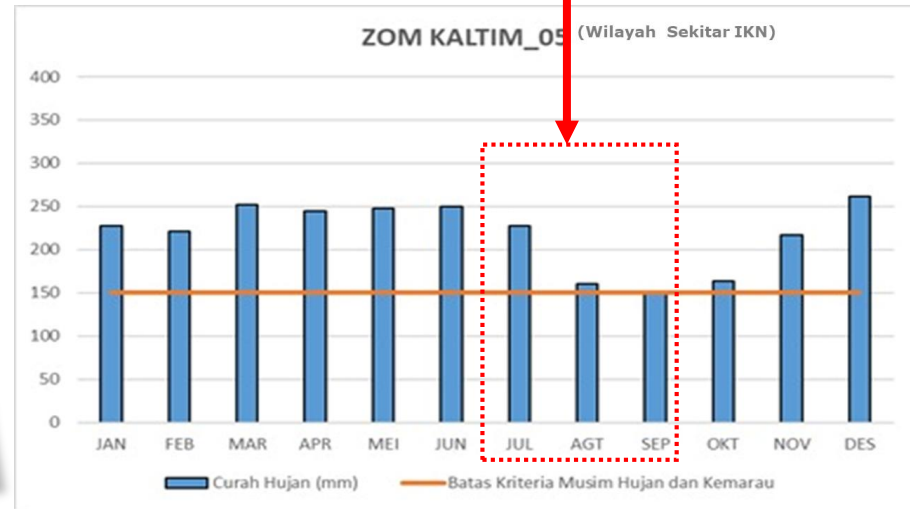


Rainfall from weather modification implementation contribute **25%** from government program for increasing 2 million tons rice production



Weather modification implementation contribute to increase up to **1.8%** from national rice production

WEATHER MODIFICATION TO SUPPORT NATIONAL PRIORITY PROJECT (CASE STUDY: THE DEVELOPMENT OF NEW CAPITAL CITY, NUSANTARA)



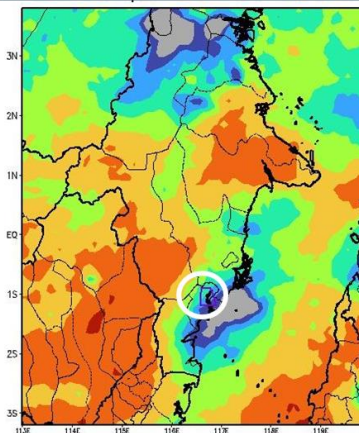
- The construction of the new national capital (Nusantara) is hampered by weather factors. As a result, many vital infrastructure developments such as airports and government buildings are disrupted.
- Based on climatology, the rainfall pattern in Nusantara has characteristics of rain with an intensity of > 150 mm/month that occurs throughout the year. That means, there is no month that is truly dry or has minimal rain.

OPERATION RESUME: WEATHER MODIFICATION TO SUPPORT THE DEVELOPMENT OF NEW CAPITAL CITY, NUSANTARA (JULY – SEPTEMBER 2024)

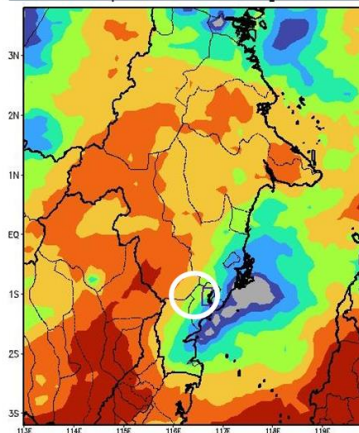
OPERATION PERIOD (JULY 4 – SEPTEMBER 12, 2024)

- **Mission Objective:** Reducing rainfall in Nusantara area to support accelerated development
- **Base Operation:** Balikpapan City and Samarinda City
- **24-hour operation**
- **Success ratio** → 94%
- **497 sorties** on **80 operation days**

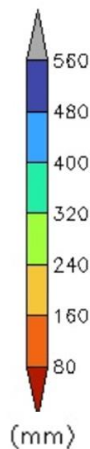
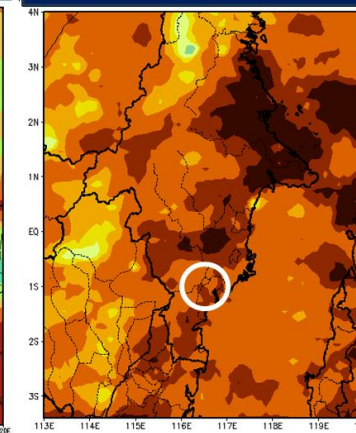
Jul 2024



Aug 2024



Sep 2024



Source: GSMap




TERIMA KASIH
khàawp Khun
Thank You



DEPUTY FOR WEATHER MODIFICATION
METEOROLOGICAL, CLIMATOLOGICAL, AND GEOPHYSICAL AGENCY (BMKG)
INDONESIA

 tu5@bmgk.go.id

 [dmc_bmgk](https://www.instagram.com/dmc_bmgk)