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INDONESIA

Impact Monitoring of Hydrometeorological Hazards

October – December (Q4) 2022

March 2023

A Joint Bulletin by:



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Key Messages

Climate Situation – Q4 2022: From October to December 2022, rainfall across Indonesia was higher than the thirty-year long-term average. Most areas in Sumatera, Jawa, Sulawesi, Kalimantan, Nusa Tenggara, and Maluku received rainfall above normal condition due to the rainy season and persisting La Niña phenomenon. On the other hand, Kalimantan Tengah and the northern parts of Papua received less rainfall than normal resulting in drier conditions compared to the long-term average.

Impact of Disasters – Q4 2022: The National Disaster Management Agency reported that at least 902 disasters occurred between October and December 2022, which represents a 30% decrease compared to the same period in 2021. Most disasters were caused by hydrometeorological hazards including floods, extreme weather, and landslides. Fifty percent of all disasters took place in Jawa.

Status of Food Security and Nutrition: The National Food Agency has reported that most provinces were food secure in December 2022. Twenty-four provinces were found to be stable, while the remaining provinces were under watch for possible deterioration of food security and nutrition. These include Kalimantan Timur, Kalimantan Selatan, Nusa Tenggara Timur, Nusa Tenggara Barat, Sulawesi Barat, Sulawesi Selatan, Sulawesi Tengah, Maluku, Maluku Utara and Papua Barat.

Climate Forecast on Agriculture: The National Research and Innovation Agency (BRIN) predicted that 1.5 million hectares of paddy cultivation will receive more rainfall while 3.1 million hectares will receive less rainfall between February and April 2023 than the thirty-year long-term average. This rainfall anomaly poses a risk of droughts, floods and pest disturbances, which can lead to crop failures.

Climate Outlook – Feb to April 2023: The La Niña phenomenon is still ongoing and forecasted to continue, despite with a weaker effect. This phenomenon is predicted to continue until it reaches its neutral phase in mid-2023. Increased rainfall is expected in the northern part of Sumatera and Kalimantan, while below normal rainfall is predicted in the southern part of Sumatera, western part of Kalimantan, and northern part of Papua.

Media Reports

Flooding in North Aceh led to the failure of 3,611 hectares of rice crops



(23/10/2022) ANTARANEWS.COM – Around 3,600 hectares of rice fields in North Aceh district were affected by floods, leading to crop failures and impacting production. This raises the critical necessity to normalize the river so it can drain water optimally, said Acting Governor of Aceh Achmad Marzuki.

He explained that for handling the agricultural areas affected by floods, the Government of Aceh provided 82.4 tonnes of seed assistance for 3,297 hectares and insurance assistance for 314 hectares. [1].

Cianjur earthquake, death toll to 600 people



(12/12/2022) ANTARANEWS.COM - The Cianjur Regency Government, West Java, recorded the number of victims who died as a result of the 5.6 Magnitude Cianjur earthquake to as many as 600 people because most of them were not recorded, while the death toll was recorded at 335 plus eight people who have not been found.

Herman Suherman, the Cianjur Head of Regency said that as many as 8,100 earthquake victims have received assistance to rebuild their homes [2].

Over 100 hectares of chili crops were inundated due to high rainfall



(10/10/2022) KOMPAS.ID - Over 100 hectares of chili crops were inundated in Bantul District, DI Yogyakarta.

This high rainfall-induced inundation put chili farmers at risk of harvest failure. The inundation has made the plant withered and yellowish, which is an early sign of failure.

In addition to the high rainfall, the inundation was also caused by poor water drainage system in the chili field [3].

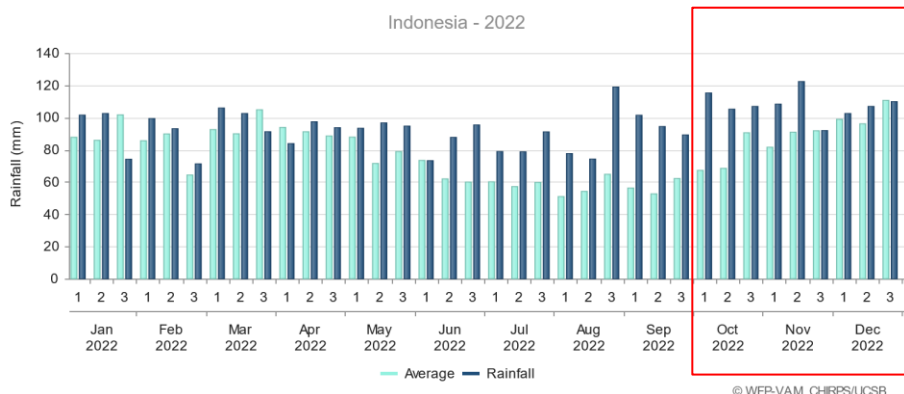
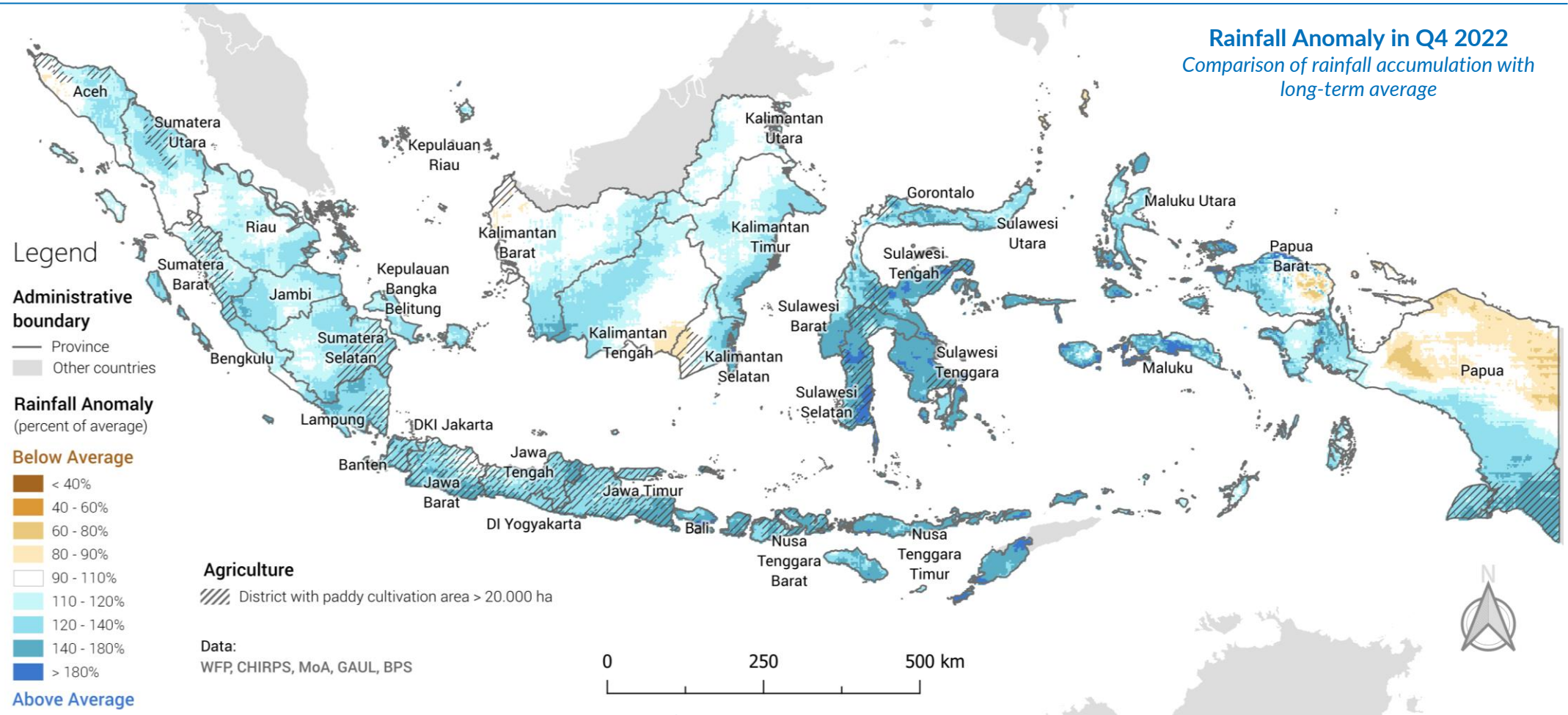
Risk for potential crop failures due to La Niña

(12/10/2022) KOMPAS.ID – The prediction of La Niña, expected to strengthen until December 2022 and subside in March 2023, overshadowed national food production. Farmers are at risk of facing crop failure. This could lead to a postponement of the main harvest in early 2023 and potentially reduce the quality of the harvest.

On Tuesday, 10 November the Australian Bureau of Meteorology released atmospheric and ocean indicators indicating a strong La Niña phenomenon until early 2023 in the Pacific Ocean. La Niña will subside in March 2023. In addition, there is also a negative dipole index phenomenon in the Indian Ocean.

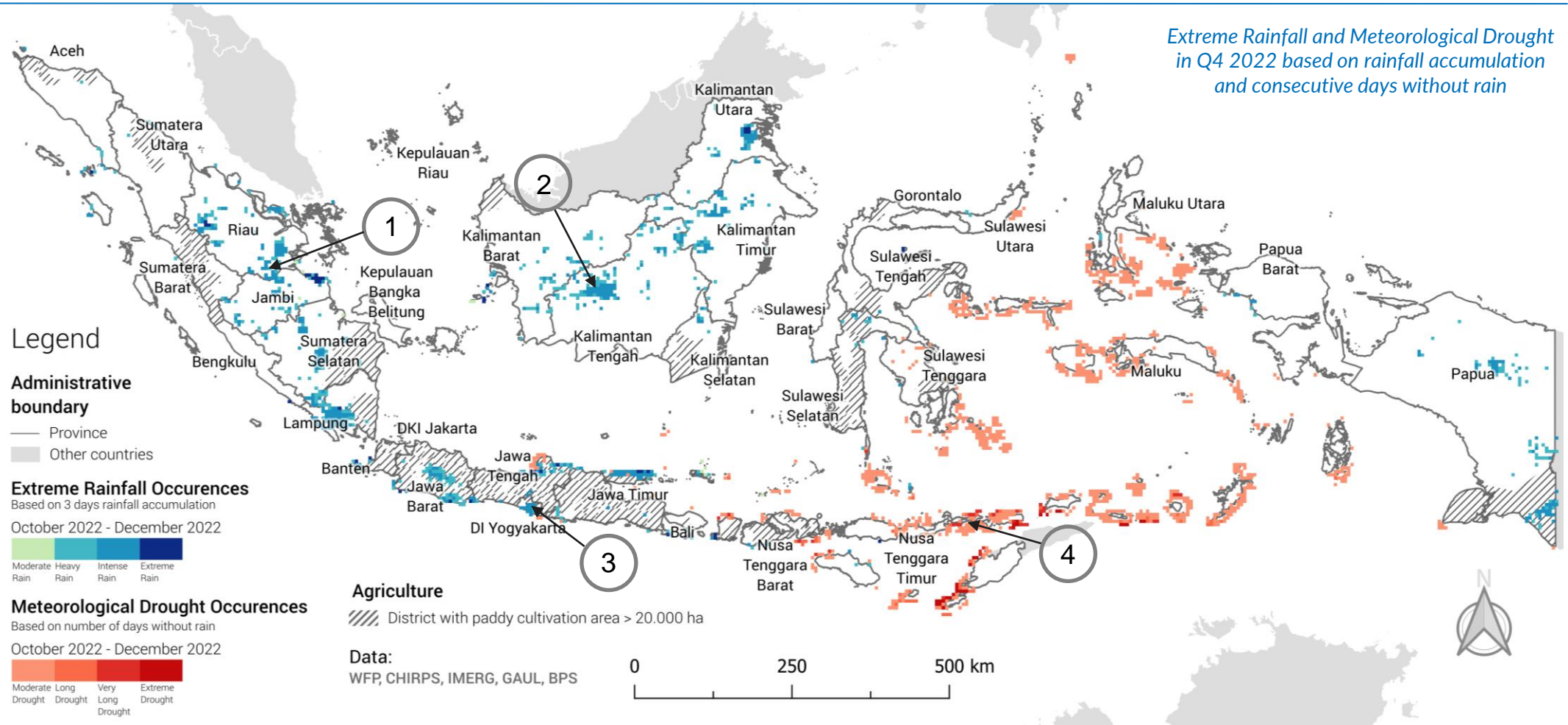
A report from the ASEAN Specialized Meteorological Center (ASMC) stated that La Niña and the negative dipole phenomenon induced the wetter climate witnessed in the Southeast Asian region, including Indonesia. From October to December 2022, ASMC expects rainfall to be above normal limits in the south-eastern and southern parts of Sumatra Island; throughout Java Island; Nusa Tenggara and Bali; East, south and west Kalimantan Island; Sulawesi island; Maluku Island; and Papua Island [4].

Rainfall Anomaly: October – December 2022



From October to December 2022, rainfall across Indonesia was higher than the long-term average (30 years). The amount of rainfall started to increase significantly in the 1st week of October through the 2nd week of November. Most areas in Sumatera, Jawa, Sulawesi, Kalimantan, Nusa Tenggara, and Maluku received rainfall above average due to rainy season and persisting La Niña phenomenon. Contrary to this, Kalimantan Tengah and the northern parts of Papua experienced below average rainfall resulting in drier conditions compared to the long-term average.










Meteorological Events: Extreme Rainfall and Meteorological Drought

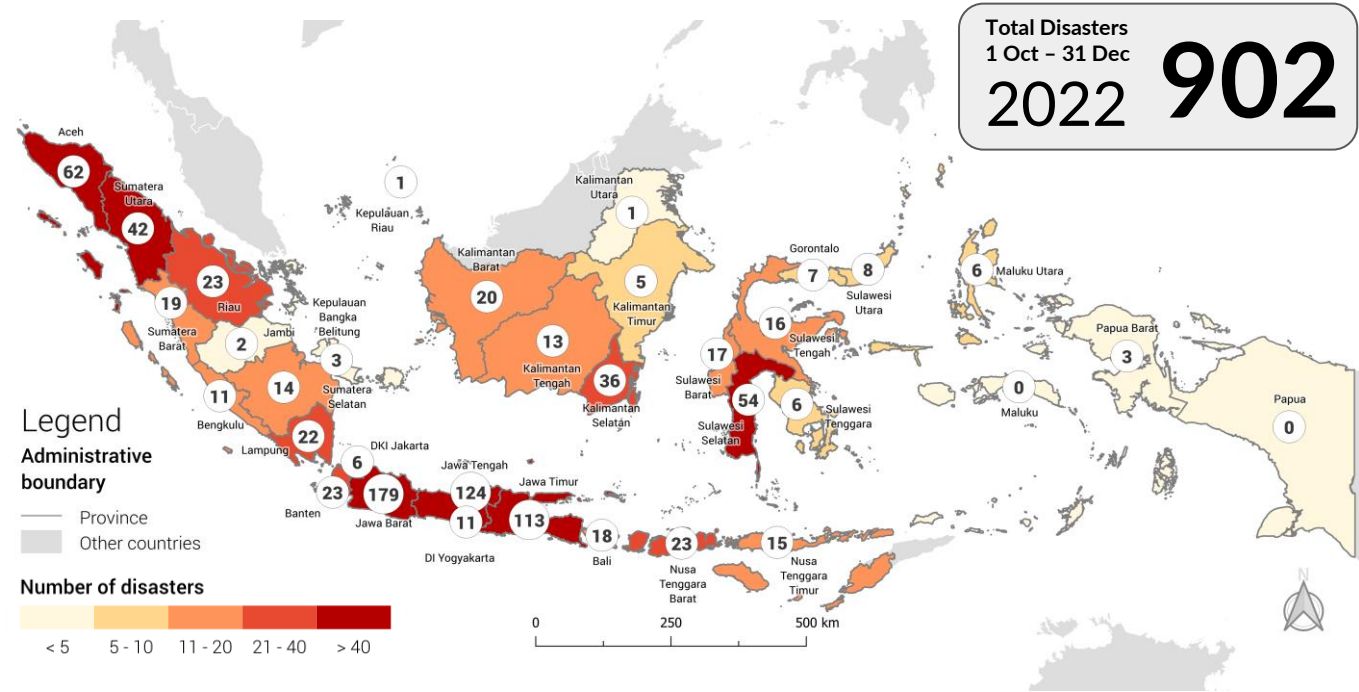


From October to December 2022, heavy to extreme rainfall (based on 3-day rainfall accumulation) was detected in the provinces of Riau, Jambi, Sumatera Selatan, Lampung, Banten, Kalimantan Timur and Kalimantan Utara. The occurrence of these events is associated with the rainy season and the ongoing La Niña phenomenon. As indicated by circles on the map, the incidence of localised extreme rainfall caused floods and landslides in the districts of Indragiri Hulu (1), Kotawaringin Timur (2), and Gunung Kidul (3).

At the same time, droughts were also observed in Jawa Tengah, Nusa Tenggara Timur. Long drought events occurred in the district of Flores Timur where the period of consecutive dry days or days without rain exceeded more than 20 days (4).

Impact of Disasters: October – December 2022

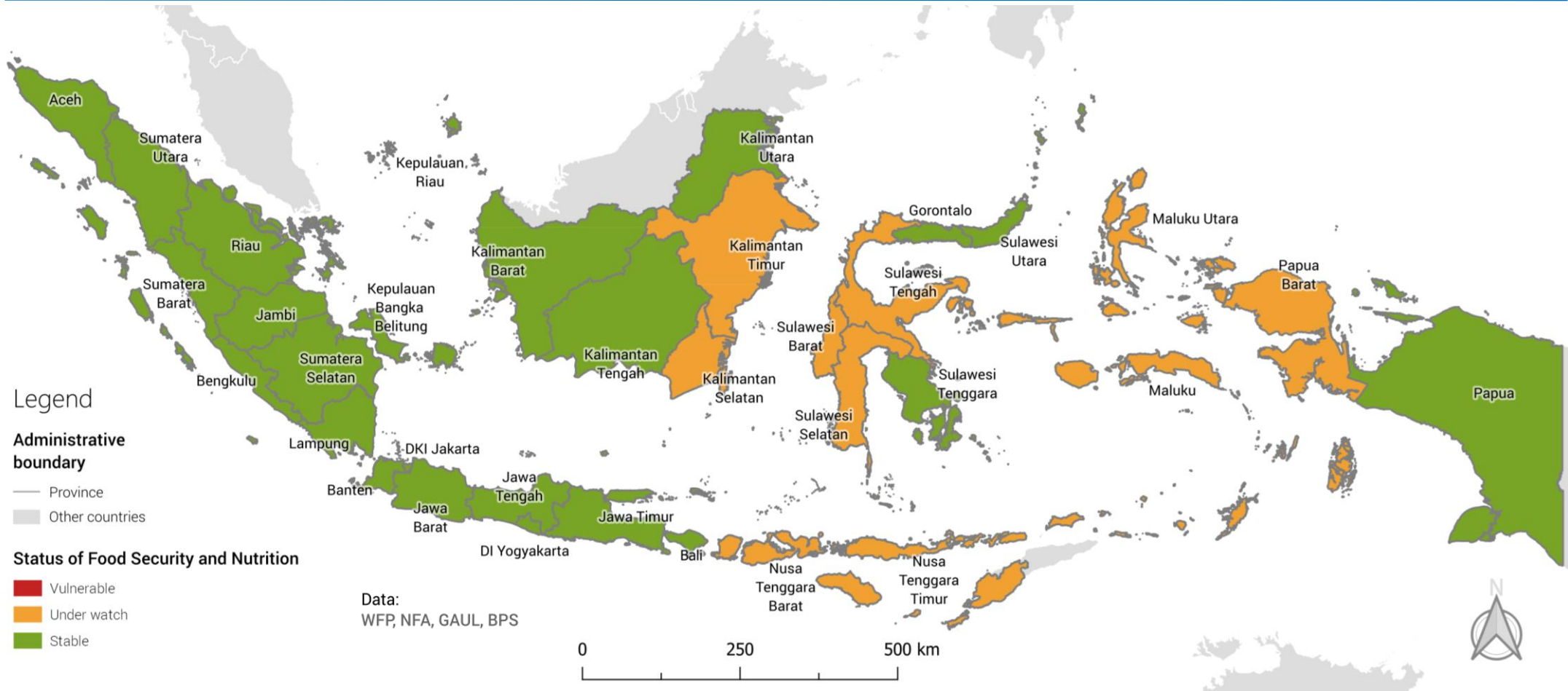
	2022 Oct-Dec	2021 Oct-Dec	
 Flood	486	563	-13.6%
 Extreme weather	216	329	-34.3%
 Landslide	169	290	-41.7%
 Land & Forest Fire	18	60	-70%
 Earthquake	8	9	-11.1%
 Tidal wave & abrasion	5	23	-78.2%
 Drought	0	10	-100%
 Impacted population	2.54 million	2.57 million	-0.9%
 Damaged house	67.3 thousand	13.4 thousand	+400.6%



The National Disaster Management Agency reported the occurrence of at least 902 disasters between October and December 2022, which represents a 29.7% decrease compared to the same period in 2021 (1,284 disasters). Most disasters were caused by hydrometeorological hazards like floods, droughts, landslides, extreme weather (e.g., storms and cyclones). The highest number of disasters occurred in Jawa Barat, Jawa Tengah, and Jawa Timur with a total of 416 disasters.

Casualty losses caused by disasters decreased by around 0.9% compared to October-December 2021. It was reported that 701 people died, 17 people went missing, 7.9 thousand people were physically injured, and 2.54 million people were impacted by disasters and consequently displaced. Despite the decreasing number of disasters, the damages to houses and public facilities were four times higher compared to the same period last year due to the Cianjur Earthquake that occurred on 21 November 2022 in Jawa Barat.

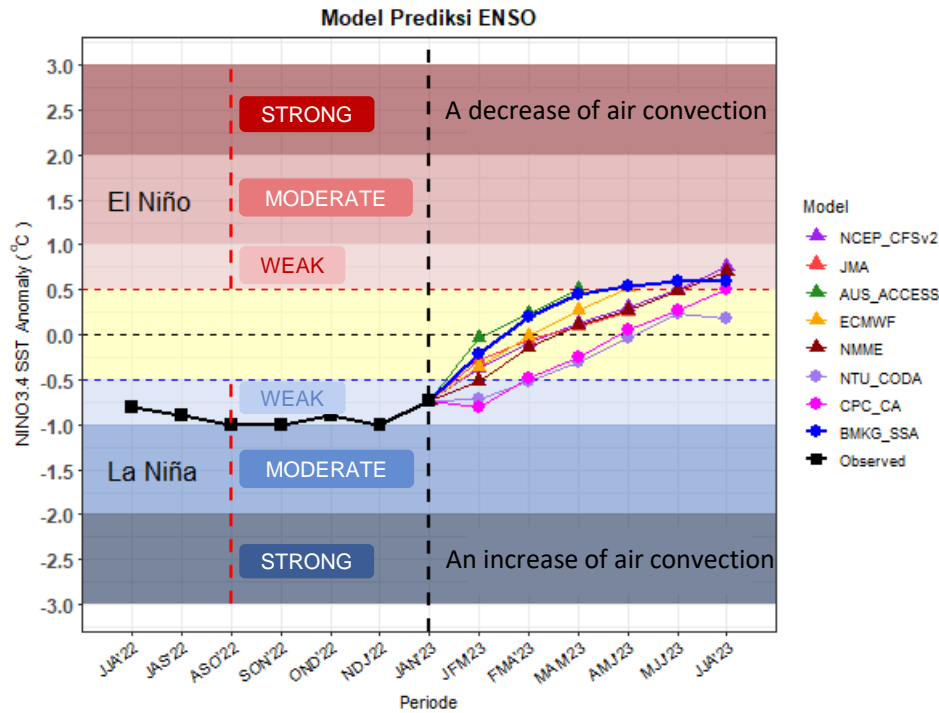
Status of Food Security and Nutrition : December 2022



According to the latest analysis of the Food and Nutrition Surveillance System (SKPG), the National Food Agency reported that most provinces were food secure in December 2022. Twenty-four provinces were found to be stable, while ten provinces were under watch for possible deterioration of food security and nutrition status. These include Kalimantan Timur, Kalimantan Selatan, Nusa Tenggara Timur, Nusa Tenggara Barat, Sulawesi Barat, Sulawesi Selatan, Sulawesi Tengah, Maluku, Maluku Utara and Papua Barat.

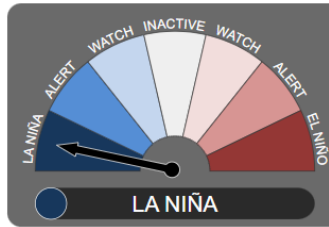
On a monthly basis, the NFA through SKPG monitors the food security and nutrition status of provinces by using several indicators including planted areas and crop failures, average prices of food commodities, and changes in the weight of children under five.

ENSO and IOD Outlook: February 2023



Monthly ENSO Outlook Values

As of January 2023, Indonesia is still exposed to La Niña. Though the effect is weakening.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña
2022	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña
2023	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña	La Niña

Legend: INACTIVE (white), La Niña WATCH (light blue), La Niña ALERT (medium blue), LA NIÑA (dark blue)

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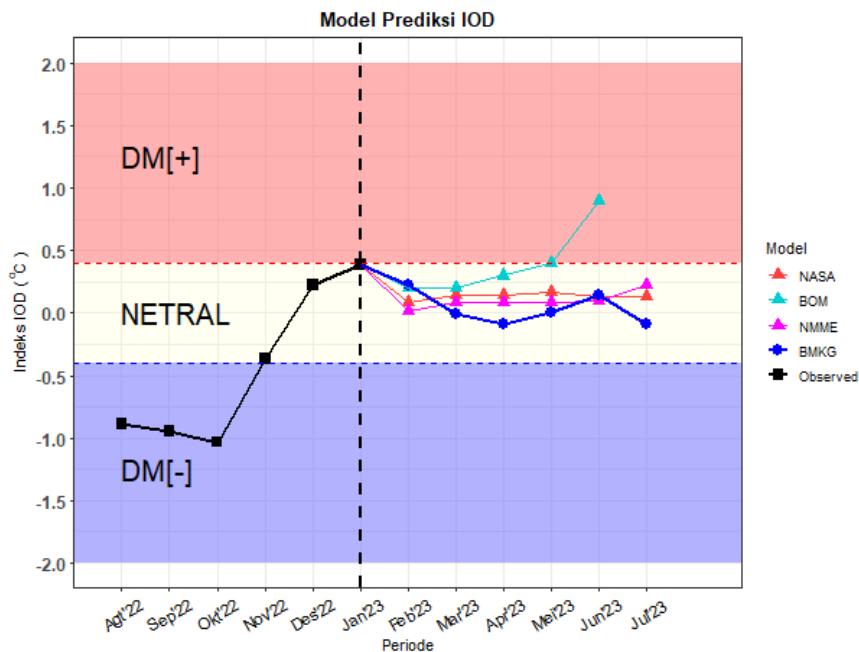
ENSO and IOD Analysis

The rainfall variability is generally influenced by El Niño–Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD). Both phenomena contribute to an increase in convective activity from the Pacific Ocean and Indian Ocean towards Indonesia. Consequently, they often cause heavy rains which increases the potential of floods. Both atmospheric and oceanic indicators suggest an ongoing La Niña phenomenon.

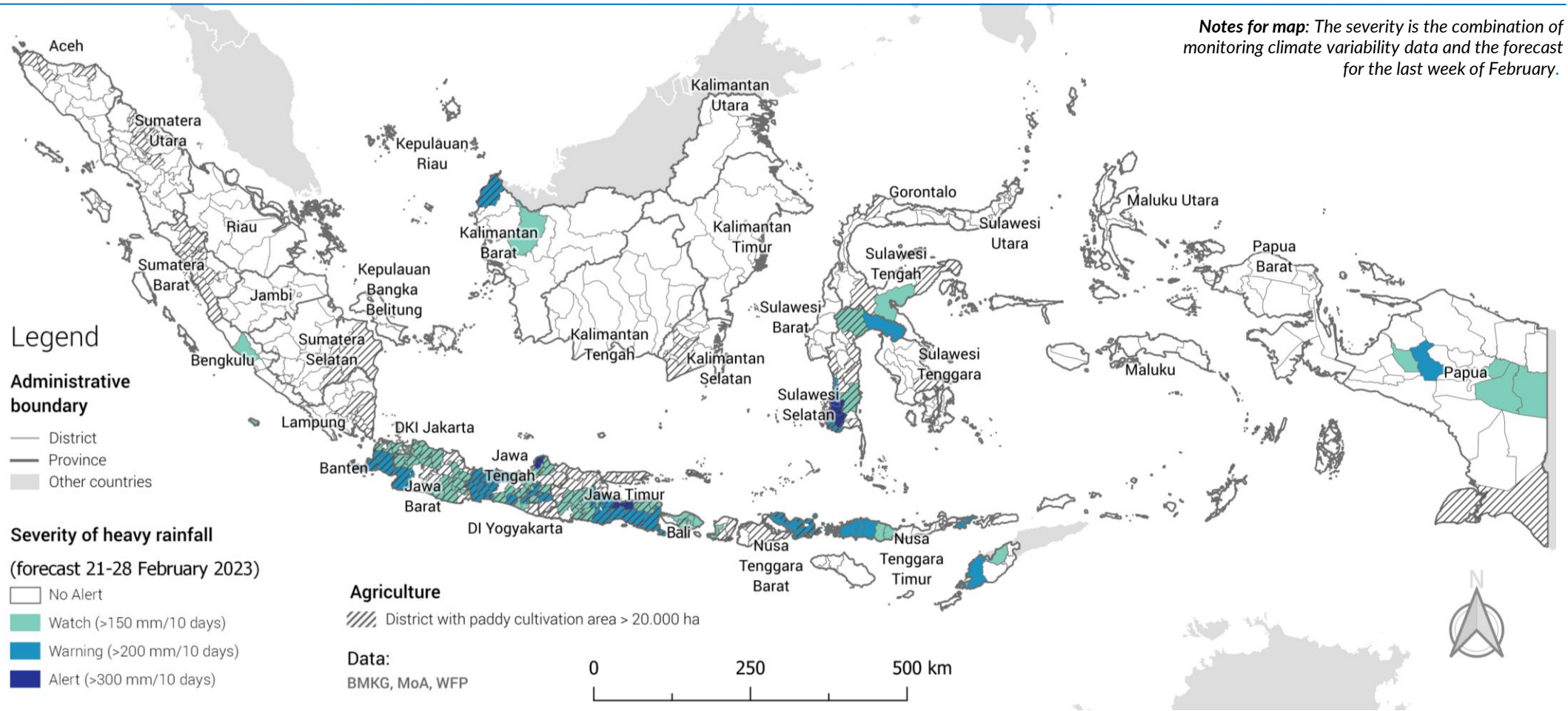
The ENSO index is used to identify La Niña or El Niño as well as the rainfall patterns associated with these climate phenomena. The occurrence of ENSO anomalies (El Niño and La Niña) was found to have increased over the past 40 years. Latest trends show that ENSO anomalies are now occurring once every 2-3 years. Before 1980, these events only happened once every 5 years.

The current La Niña phenomenon has continued to prevail for three consecutive years since 2020 (Triple-dip La Niña). This long-lasting La Niña is the first of the 21st century. Triple-dip La Niña occurred only twice in the last 50 years, from 1973-1975 and from 1998-2001.

Based on the latest oceanic observation, the ENSO and IOD show negative values of -0.61 and +0.24 in January 2023, which indicates a persisting (although weakening) La Niña phenomenon. BMKG and several climate agencies in the world predict that the ENSO and IOD indexes will gradually move to neutral phase towards the mid of 2023.



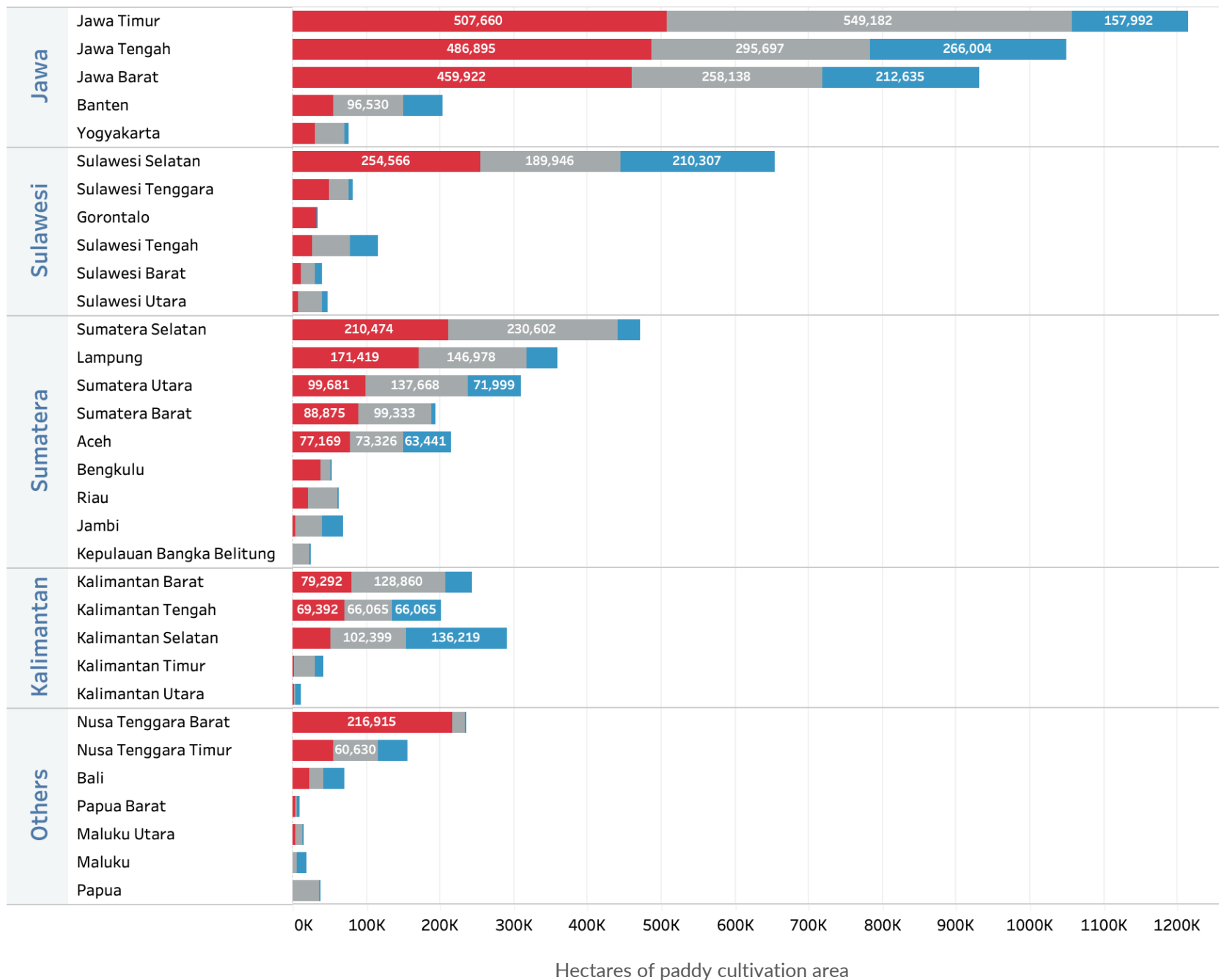
Early Warning: Heavy Rainfall - February 2023



Based on the Meteorological, Climatological, and Geophysical Agency (BMKG) early warning data as of February 2023, several districts were forecasted to experience heavy rainfall during the last 10 days of February which could increase the likelihood of floods and landslides. This is due to the rainy season combined with the persisting La Niña phenomenon.

From 21 to 28 February, the alert for heavy rainfall (>300mm/10 days) is predicted in a total of 6 districts in the provinces of Jawa Tengah, Jawa Timur, and Sulawesi Selatan. Moreover, the warning for heavy rainfall (200 – 300mm/10 days) is predicted in 34 districts in the provinces of Banten, D.I Yogyakarta, Jawa Barat, Jawa Tengah, Jawa Timur, Kalimantan Barat, Nusa Tenggara Barat, Nusa Tenggara Timur, Sulawesi Selatan and Papua. Finally, potential heavy rain (150 – 200mm/10 days) is also estimated for 67 districts in the provinces of Bali, Banten, Bengkulu, D.I Yogyakarta, DKI Jakarta, Jawa Barat, Jawa Tengah, Jawa Timur, Kalimantan Barat, Nusa Tenggara Barat, Nusa Tenggara Timur, Sulawesi Selatan, Sulawesi Tengah and Papua.

Agricultural Forecast: Rainfall in Paddy Cultivation Areas – February to April 2023



The Center for Climate and Atmospheric Research (PRIMA) of the National Research and Innovation Agency (BRIN) predicts that 20% of paddy cultivation areas will experience more rainfall, while 41% will experience less rainfall from February to April 2023.

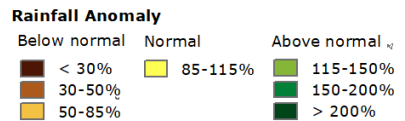
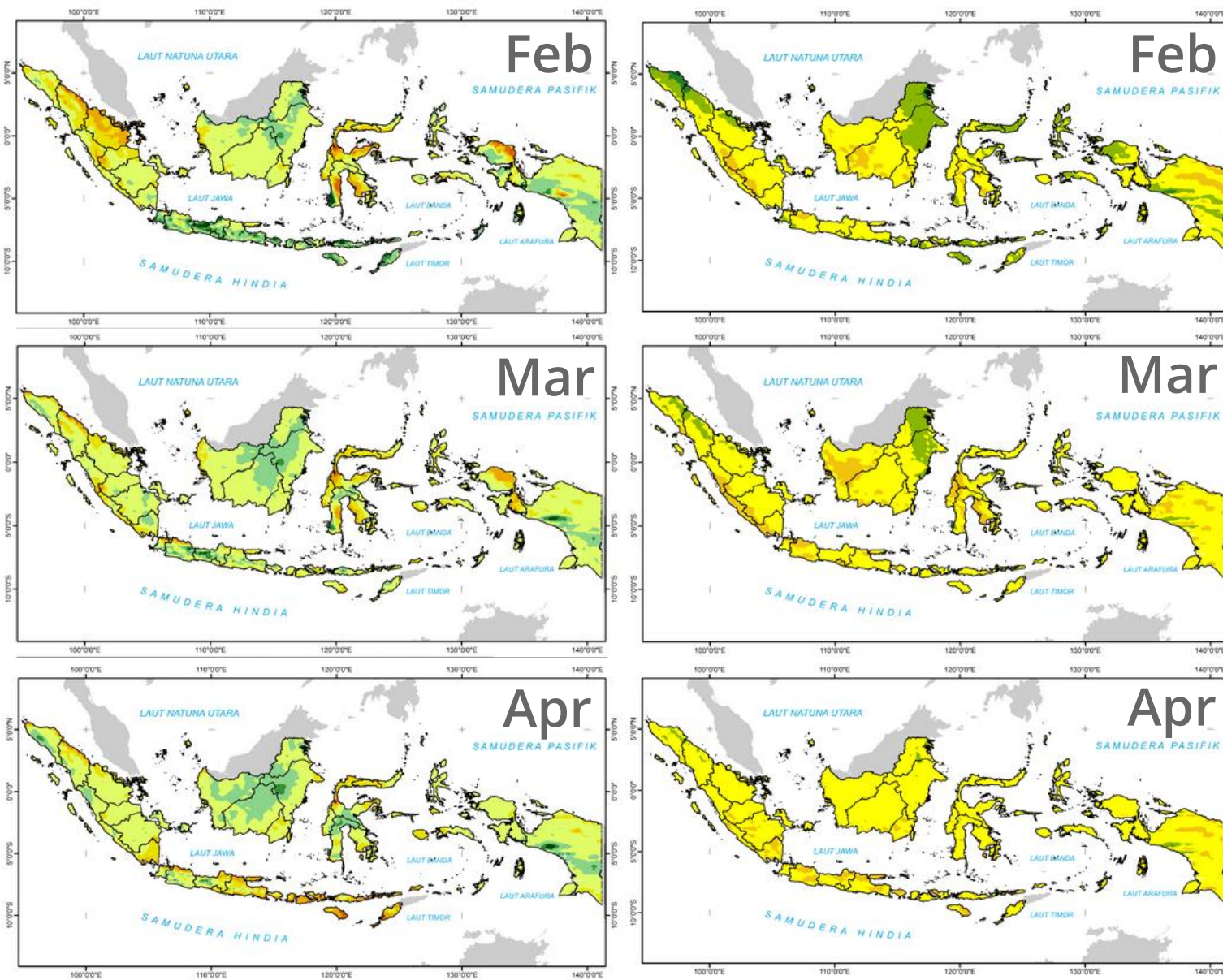
The chart on the left shows the hectares of paddy cultivation that may experience a rainfall anomaly from February to April. In total, 1.5 million hectares of paddy cultivation are estimated to experience above normal rainfall especially in Jawa Timur, Jawa Tengah, Jawa Barat, Sulawesi Selatan and Kalimantan Selatan. This poses a risk of floods and pest disturbances, which can lead to crop failures.

On the other hand, 3.1 million hectares of paddy cultivation are predicted to receive less rainfall compared to normal condition. These include paddy cultivation areas in several areas in Jawa, Sumatera, and Sulawesi Selatan.

Predicted rainfall anomaly

- Above average
- Average
- Below average

Climate Outlook Feb 2023 - Apr 2023: BMKG Rainfall Forecast



Based on BMKG forecasts, moderate to heavy rainfall is expected between February and April 2023. As of January 2023, 82.7% of Indonesia experienced moderate rainfall due to rainy season and persisting La Niña phenomenon. High and very high rainfall was observed across 13.9% of Indonesian territory, while the rest of the areas experienced low amount of rainfall.

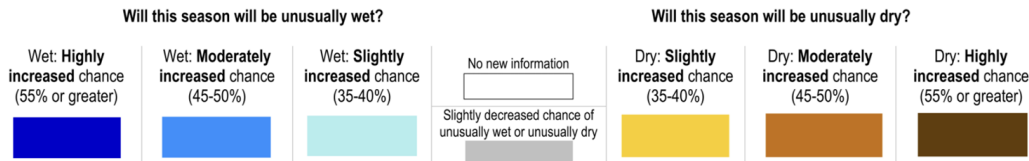
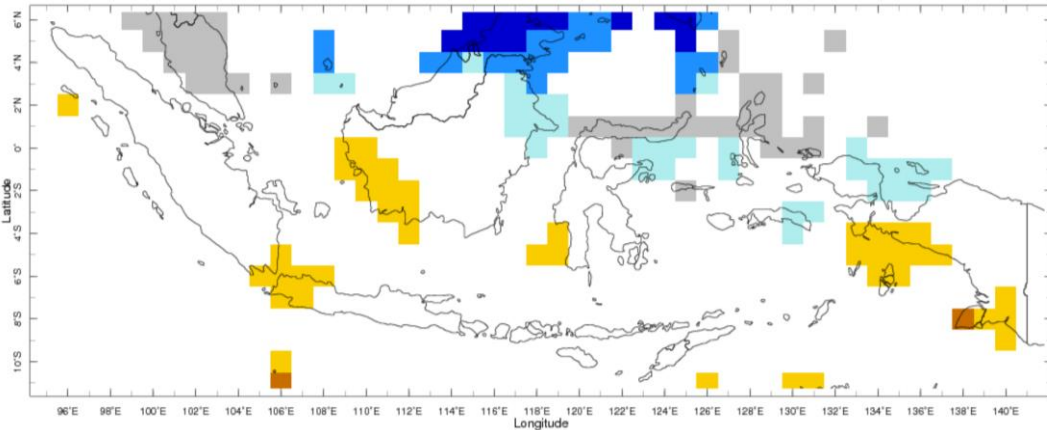
In February, 78% of Indonesia is predicted to have moderate rainfall. Most of the rainfall is expected within the normal range. However, there is a chance of increasing rainfall in the northern part of Sumatera, eastern part of Kalimantan, northern part of Sulawesi, Maluku and Papua. Less rainfall is predicted in the western part of Sumatera, southern part of Kalimantan, and northern part of Papua.

In March, 82% of Indonesia is predicted to experience moderate rainfall. Most of the rainfall is expected within the normal range. Increasing rainfall is predicted in the northern part of Kalimantan and Sumatera, while less rainfall is predicted in the southern part of Sumatera, western part of Jawa, Kalimantan, and Sulawesi.

In April, 79% of Indonesia is predicted to have moderate rainfall. Most of the rainfall is expected within the normal range. However, less rainfall is predicted across Jawa, the eastern part of Papua, and southern part of Sumatera and Kalimantan.

Climate Outlook Feb - Apr 2023: Indonesia in Global Rainfall Forecast

Forecast for Feb-Apr 2023, Forecast Issued Jan 2023



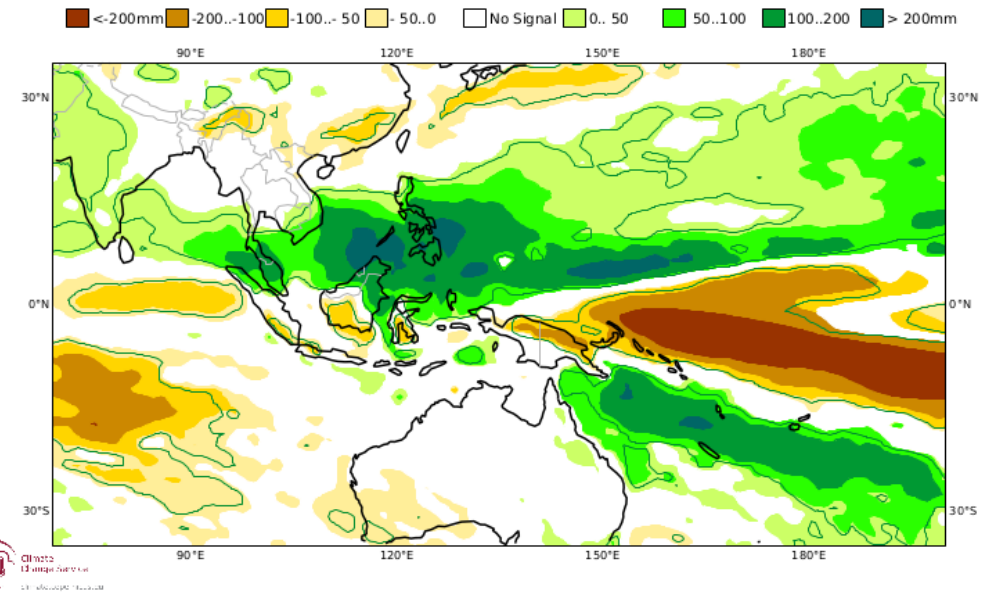
IRI Columbia University and ECMWF show a similar precipitation forecast for the period of February to April 2023.

Most areas are expected to experience normal rainfall within this three-month period. However, there is a slight chance of increasing rainfall in some areas of Kalimantan Utara, Kalimantan Timur, Sulawesi Tengah, Maluku and Papua. On the other hand, some areas of Lampung, Jawa Barat, DKI Jakarta, Kalimantan Barat, Kalimantan Tengah, and Papua will likely receive less rainfall.

These forecasts show the probability of accumulated rainfall over the next three months, either situated above or below normal conditions compared to the long-term average. They do not indicate the likelihood of individual heavy rainfall events and should not be used to forecast local conditions or floods.

C3S: ECMWF contribution
Mean precipitation anomaly
Nominal forecast start: 01/01/23
Ensemble size = 51, climate size = 600

FMA 2023
Shaded areas significant at 10% level
Solid contour at 1% level



Left: IRI Columbia University seasonal forecast for Feb - Apr 2023 indicates a probability of total rainfall within the next three months to be unusually high or low:

http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A94.584%3A-11.255%3A141.811%3A6.308%3Abb

Right: ECMWF three-month seasonal forecast for Feb - Apr 2023 where green, white, and brown shades indicate wet, normal, and dry condition, respectively:

https://climate.copernicus.eu/charts/c3s_seasonal/c3s_seasonal_spatial_ecmf_rain_3m?facets=Parameters,precipitation&time=2023010100,744,2023020100&type=enm&area=area12



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