Indonesia

Food Security Monitoring Bulletin

Special Focus: The Impact of Drought related to El Niño

Volume 1
October 2015

LAPAN

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Key messages

1. According to a set of predictive models[1], the **global El Niño effect will continue into February/March 2016**[2].

2. The Indonesia Weather and Meteorology Bureau (BMKG) predicts **the dry season will be prolonged in most of the country**[3]. In South Sumatra, Southeast Sulawesi, and West Java, the rainy season may not start until the end of November 2015. In Central and East Java, Bali and West Nusa Tenggara the rainy season is predicted to start in mid-December 2015, while most of East Nusa Tenggara may not start until January 2016.

3. Interventions by Government of Indonesia are ongoing to address the impact of drought including distribution of water, supplying drought-resistant seeds to farmers and increasing access to irrigation. However, to mitigate impacts of the ongoing drought**, the following issues require special attention**:

   a) Decreased water availability may decrease crop productivity and lead to damaged crops. **Production in the current dry season harvest will likely be reduced.** This is of immediate concern for households engaged in agriculture, **particularly for wage laborers and smallholder farmers - whose primary source of income will be reduced**.

   b) The current secondary season (normally October to February) typically produces insufficient rice to meet consumption needs. Due to drought, total planted area during the primary season (January – April), may be less than normal, and **harvests will likely be reduced.** Therefore, to maintain sufficient yields while water availability is reduced, efficient water management along with distribution of seeds and planting of drought tolerant varieties is recommended.

   c) Java produces 44% of Indonesia's rice. Twenty-two percent of Java's rice fields are dependent on rainfall. **A poor rainy season that affects Java may impact rice production nationally**.

   d) As drought will reduce water availability, including wells, springs, and other sources, **household access to clean drinking water is a major concern** that may affect large populations.

   e) As food production will likely be reduced, rising food prices require close monitoring. **Poor urban households may be heavily impacted by price fluctuations**.

   f) Poor water access and reduced diet quality are significant issues due to **already high levels of chronic (stunting) and acute (wasting) malnutrition**.

[1]http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current
[2]Based on the NINO 3.4 region, where changes in local sea-surface temperature are important for shifting the large region of rainfall typically located in the far western Pacific. http://iridl.ldeo.columbia.edu/maproom/ENSO/Diagnostics.html
[3]http://bmkg.go.id/BMKG_Pusat/Informasi_Iklim/Prakiraan_Iklim/Prakiraan_Hujan_Bulanan.bmkg

Introduction

This is the first of a series of monthly bulletins on the impact of drought on food security in Indonesia.

In the first section of this issue, the current drought's extent and severity is examined and compared to previous El Niño years. A significant portion of the current analysis is derived from Columbia University's International Research Institute for Climate and Society.

The next section examines the impact on agriculture. This is in the form of the Vegetation Health Index, which is a measure of the current stress on crops. This bulletin also examines the most drought impacted areas in terms of days since last rainfall against rice fields dependent on rainfed agriculture. It also examines the extent to which rice fields are currently experiencing drought.

The next section then examines the potential socio-economic impact of drought. This part of the analysis is based upon scenarios which may change as the drought continues to evolve. Finally, an outlook section concludes this round of the bulletin.

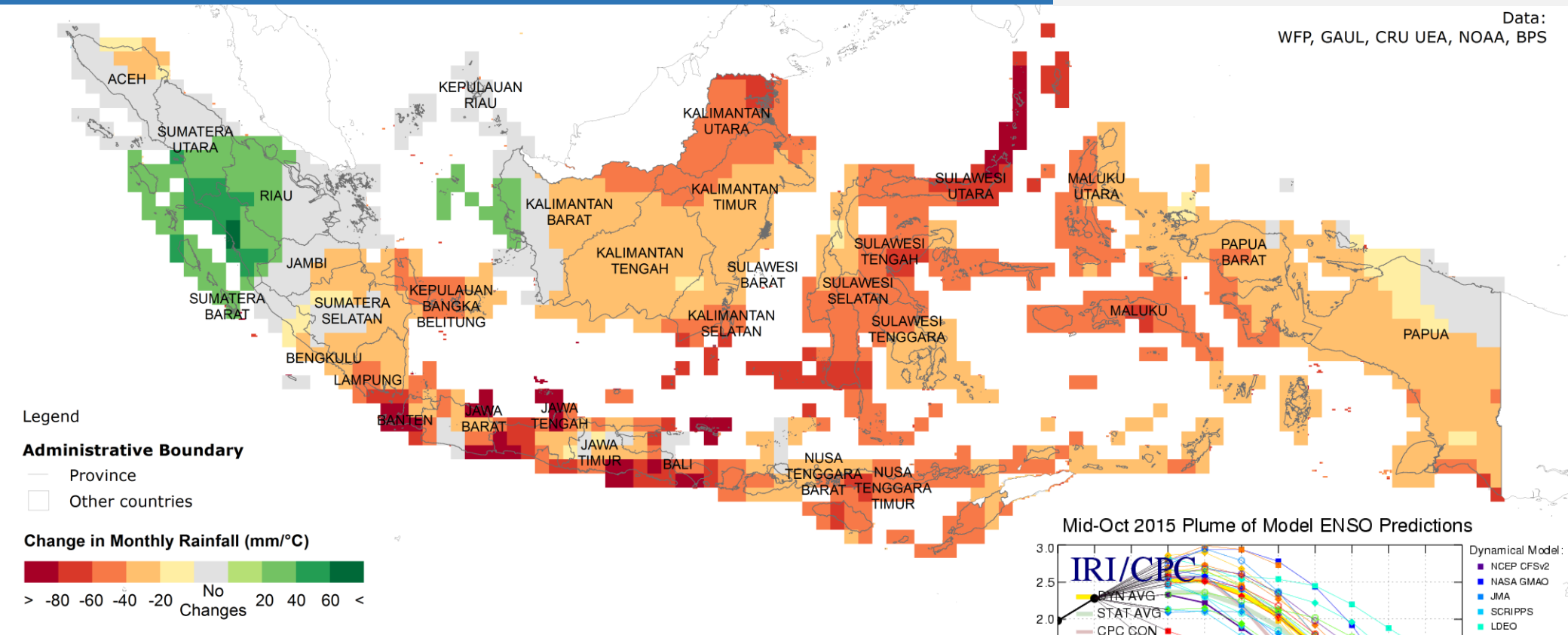
List of maps and analysis

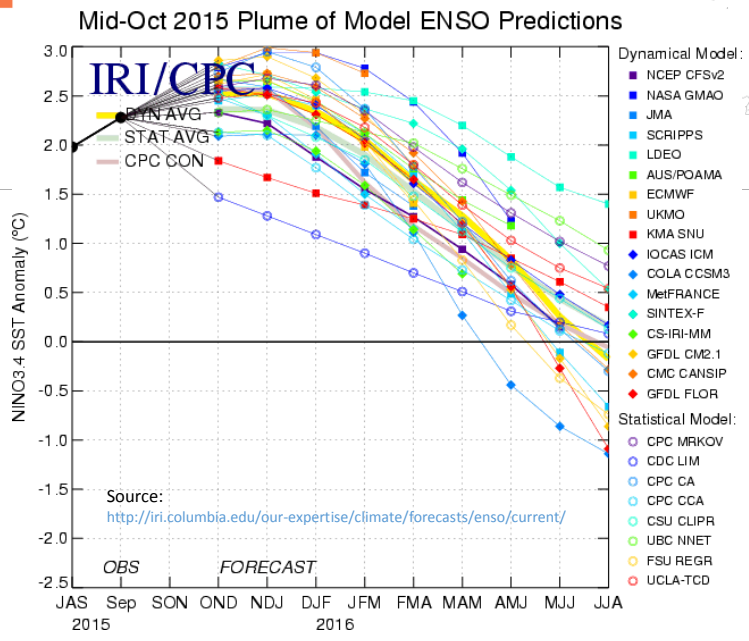
The bulletin contains the following maps:

1. Change in rainfall associated with a rise in sea surface temperature
2. Number of days since last rainfall
3. Comparison to drought severity in 1997
4. Vegetation Health Index
5. Rainfed agricultural areas affected by drought
6. Rice fields with high drought exposure
7. Districts with low coping capacity and drought impacted
8. Rainfall outlook for the next three months

El Niño and the Indonesian context

Change in monthly rainfall with 1ºC increase in sea surface temperature in NINO 3.4 region



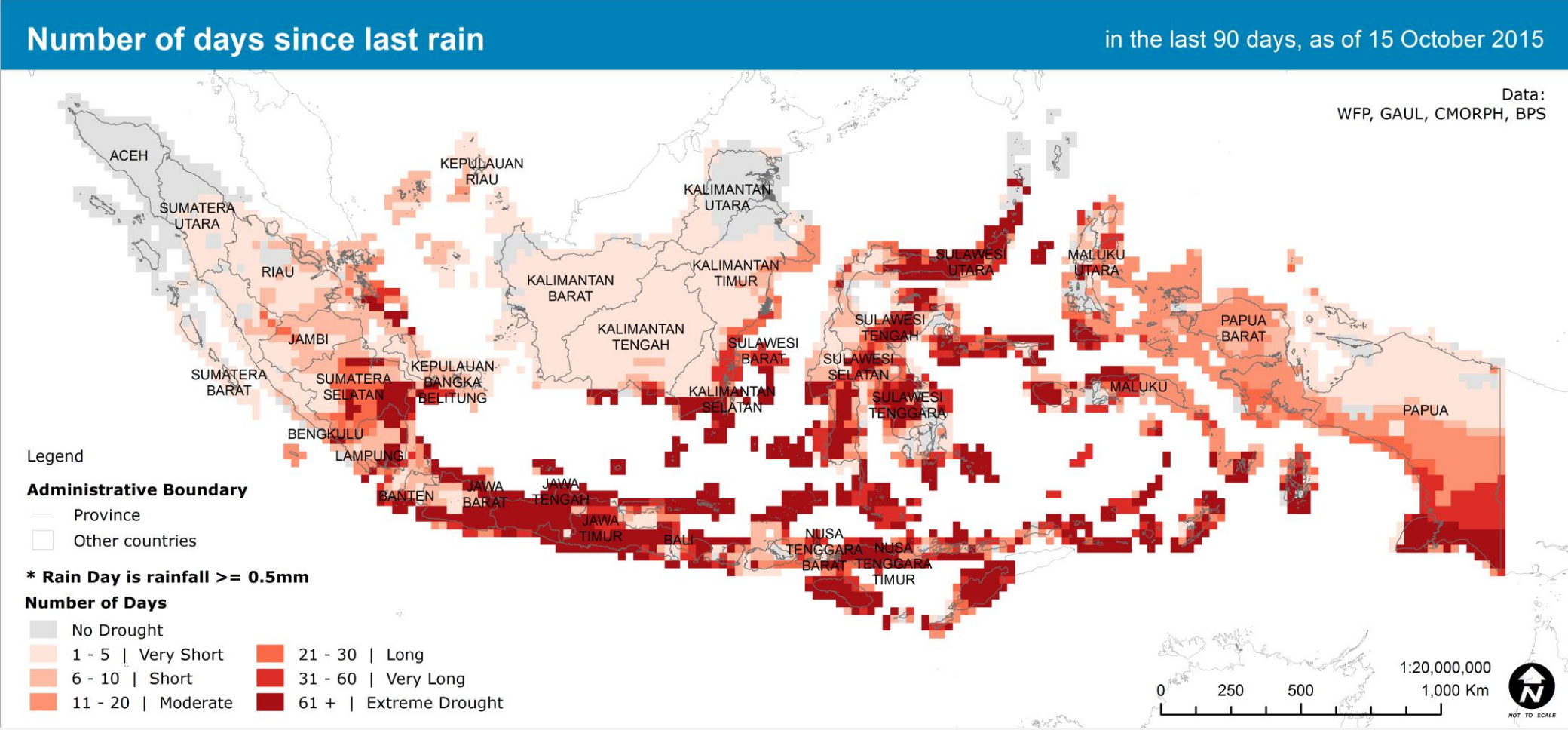


Relationship between the ENSO signal and rainfall in Indonesia

Current analysis of the El Niño Southern Oscillation (ENSO) shows an El Niño event began in March 2015 and became strong from late August through early September 2015. This is confirmed by other atmospheric indicators including weakened trade winds and abnormally high amounts of rainfall in the east-central tropical Pacific. As shown in the chart above from IRI, ENSO prediction models predict strong El Niño conditions will continue in October-November 2015 and the overall event will last through Q1 2016.

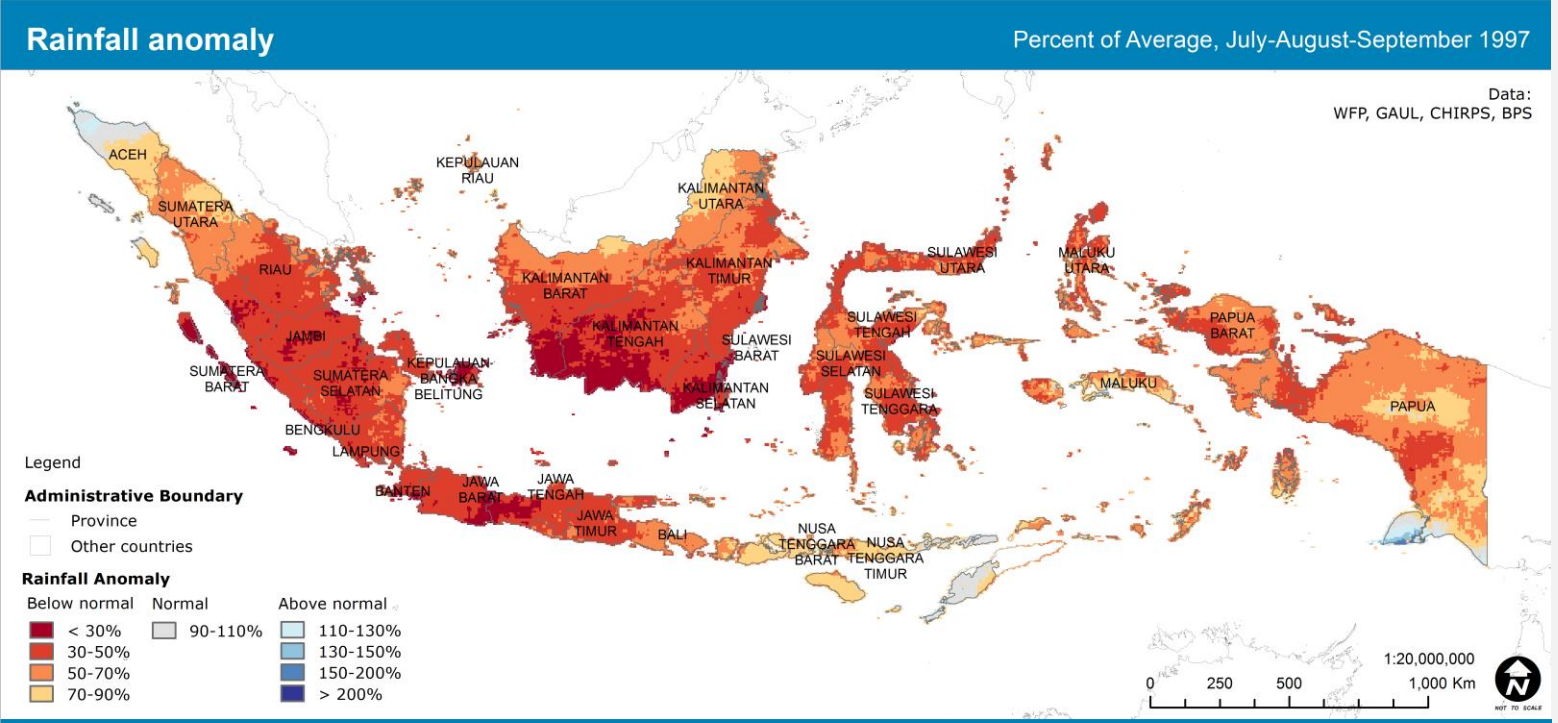
Indonesia is heavily affected by El Niño which is associated with a rise in sea surface temperature (SST), negatively impacting rainfall in much of the country. The map above demonstrates the change in rainfall associated with a one degree rise in SST. Dark red areas represent an 80mm decrease in monthly rainfall. The map above shows a very strong correlation with the days without rainfall map which follows in the next section.

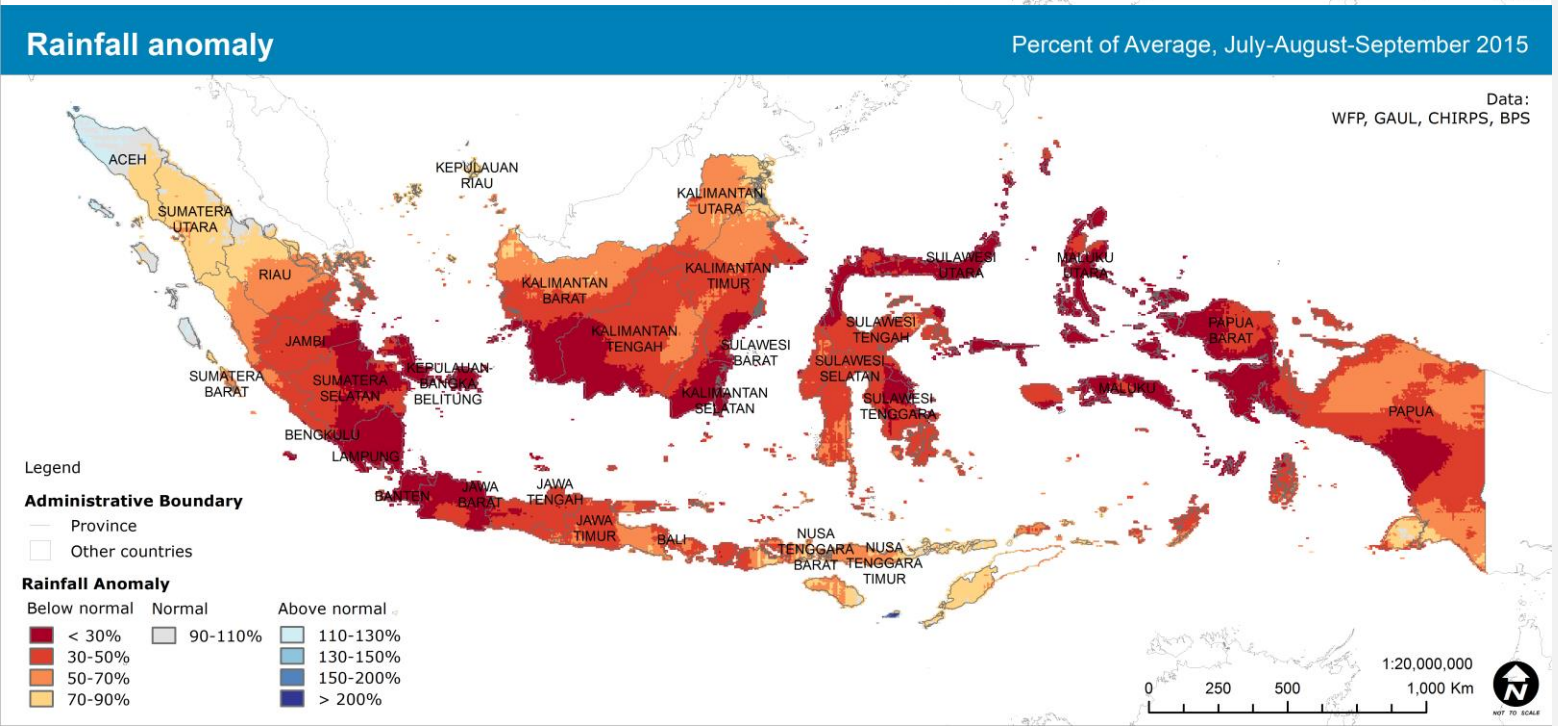
Current extent of drought



Days since the last rain

The number of days since the last rainfall shows another view of drought based on a period of 90 days. This map depicts areas of Indonesia, as of 15-October-2015, where there has been little or no rainfall. This map highlights the extent to which key agricultural production areas have received no rainfall in more than two months. West Java, Central Java and East Java show extreme drought conditions as do extensive areas across Nusa Tenggara, Maluku, and Sulawesi.





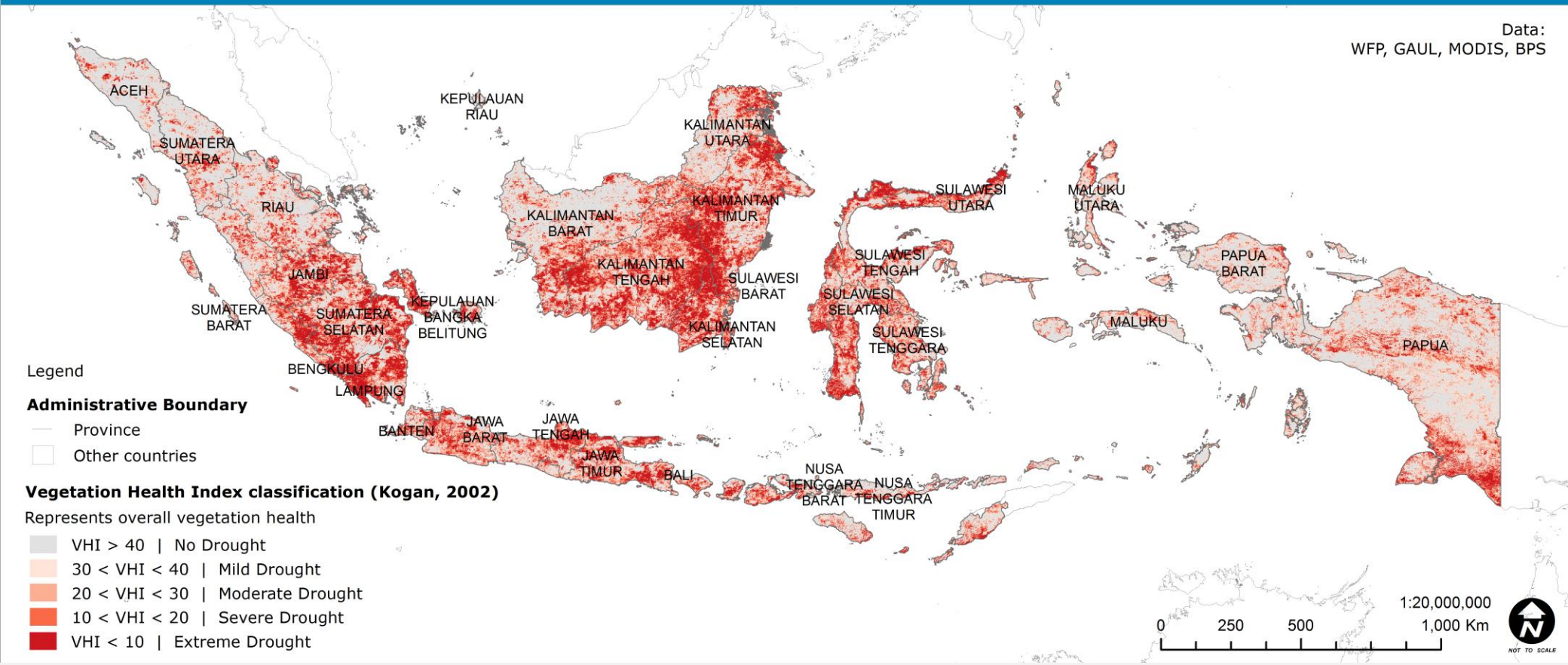
Comparison to 1997/1998 El Niño related drought (July-August-September)

As the effect of El Niño is estimated to last well into Q1 2016, direct comparisons to historical El Niño events are not yet possible for the full period. The 2015 El Niño effect on rainfall from July to September is as intense as in 1997 while extreme rainfall deficits are more spread across Indonesia.

Agricultural impact

Agricultural Drought - Vegetation Health Index

August 2015



Impact of drought on agriculture

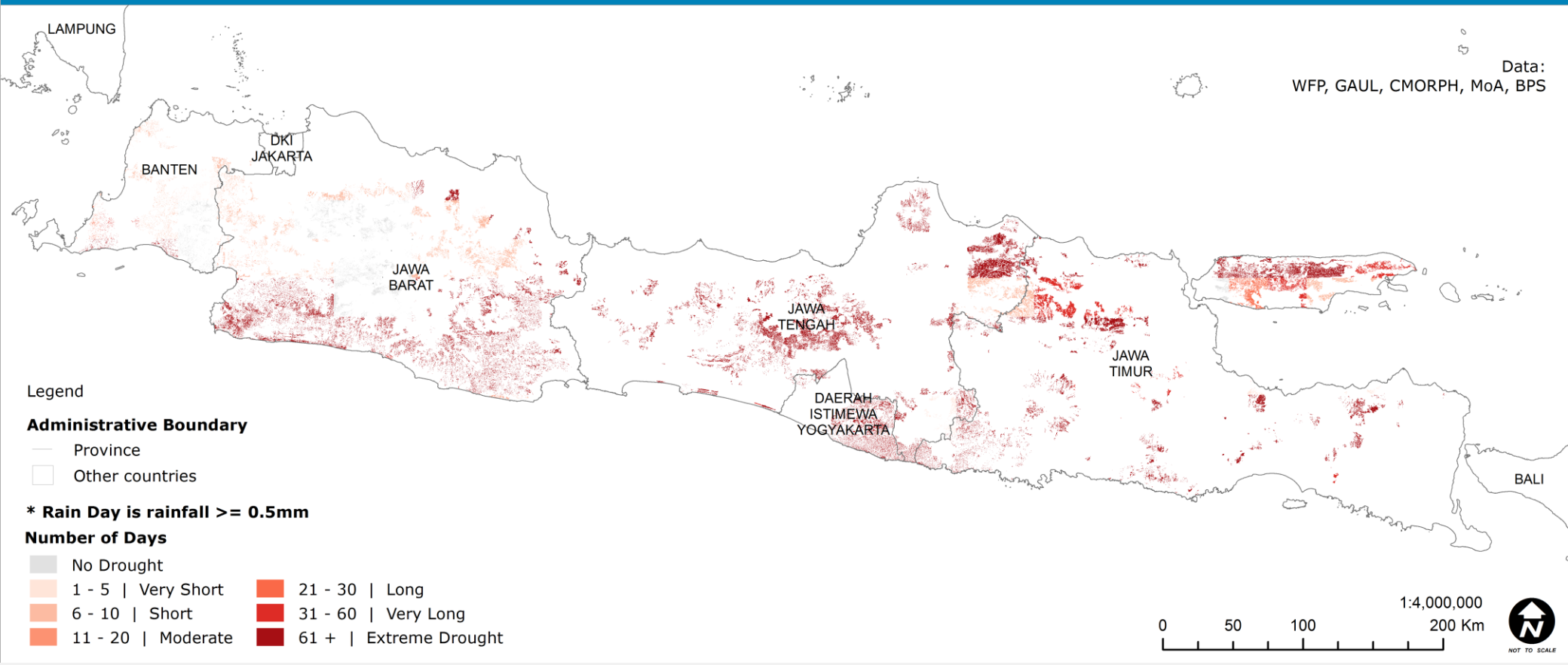
The lack of rainfall will reduce water supplies in reservoirs and the flow of rivers, decreasing the availability of water for irrigation. There is an increased risk of harvest failure due to drought for crops planted after May 2015 and in locations at the tail end of irrigation systems. In the last major El Niño in 1997, drought affected more than 500,000 hectares of rice fields and damaged approximately 87,000 hectares[1].

The Vegetation Health Index (VHI) combines two components: deviations in land surface temperature and the extent to which vegetation density varies from normal patterns. The VHI depicts stress on vegetation and can be used to assess potential crops losses. Based on this criteria, extreme drought is seen across Java, along with Lampung on Sumatra, areas throughout Kalimantan, Sulawesi and the highlands of Papua as well as Merauke in the south of Papua.

[1] http://pusdatin.setjen.pertanian.go.id/berita-187-el-nino-2015-lebih-kuat-dari-1997-pemerintah-belum-impor-beras.html

Rainfed agricultural areas affected by drought

Over the last 90 days, as of 15 October 2015



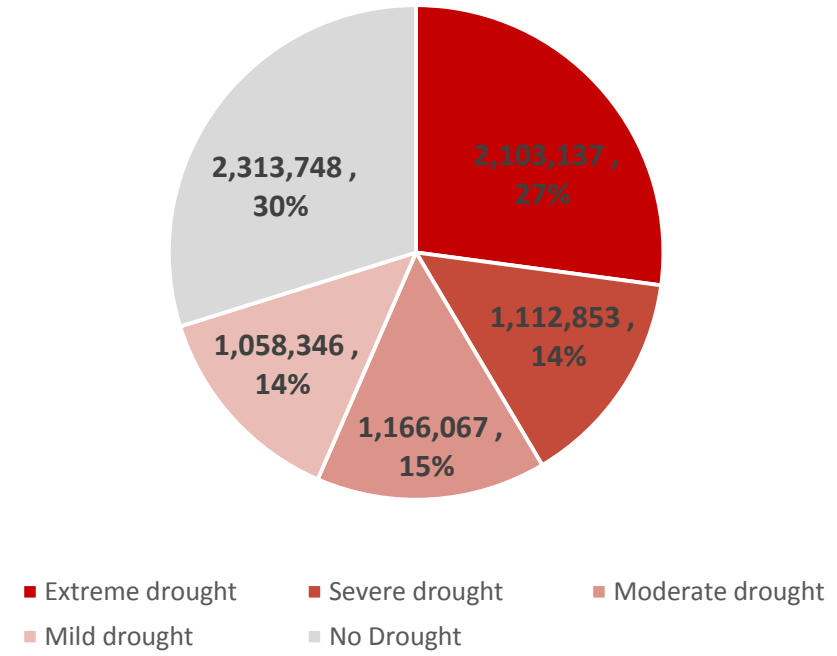
Agricultural land affected by drought and dependent on rain

The island of Java accounts for 44 percent of total rice production in Indonesia. Twenty-two percent of Java's rice fields are dependent on rainfall. An overlay of drought impact, as measured by number of days since the last rainfall, combined with rainfed agriculture highlights areas across Java where crops are at serious risk due to drought. West Java has vulnerable areas throughout as does the center of Central Java and the northern areas of Central and East Java - including a significant part of Madura island. Staple crops are commonly grown in rainfed areas, even during the dry season. These crops are at high risk due to drought.

Estimates of rice fields in extreme or severe drought

Province	District	Total rice field size (hectares)	Percent of rice fields with severe or extreme drought (VHI)
Jawa Tengah	Rembang	40,349	86%
Lampung	Tanggamus	18,155	86%
Sulawesi Selatan	Jeneponto	18,131	86%
Sulawesi Barat	Polewali Mandar	16,770	85%
Jawa Timur	Lumajang	31,814	82%
Kalimantan Selatan	Tapin	60,335	82%
Lampung	Pringsewu	13,344	80%
Kalimantan Selatan	Balangan	25,356	80%
Jawa Tengah	Pati	69,114	80%
Jawa Timur	Mojokerto	29,579	77%
Papua	Merauke	16,219	76%
Sumatera Selatan	Empat Lawang	12,073	76%
Sulawesi Selatan	Bulukumba	22,783	76%
Kalimantan Selatan	Barito Kuala	100,228	75%
Jawa Timur	Pamekasan	25,872	75%
Sulawesi Selatan	Pangkajene Dan Kepulauan	16,339	75%
Kalimantan Selatan	Tabalong	30,314	75%
Jawa Timur	Sumenep	20,552	72%
Jawa Timur	Jember	68,353	72%
Jawa Timur	Sampang	45,643	72%

Estimates of hectares and percent of rice fields in drought nation-wide



Rice fields potentially impacted by drought

The table above depicts the 20 most drought affected districts that are in estimated to be in severe or extreme drought as measured by the Vegetation Health Index. While this does not necessarily equate to harvest loss, it shows the potential impact of a prolonged drought in rice producing areas. This table only includes districts with more than 10,000 hectares of rice fields. The chart on the right displays the national estimates of rice fields in drought. Up to three million hectares of rice field are estimated to be in extreme or severe drought in August, representing 41% of all rice fields in Indonesia.

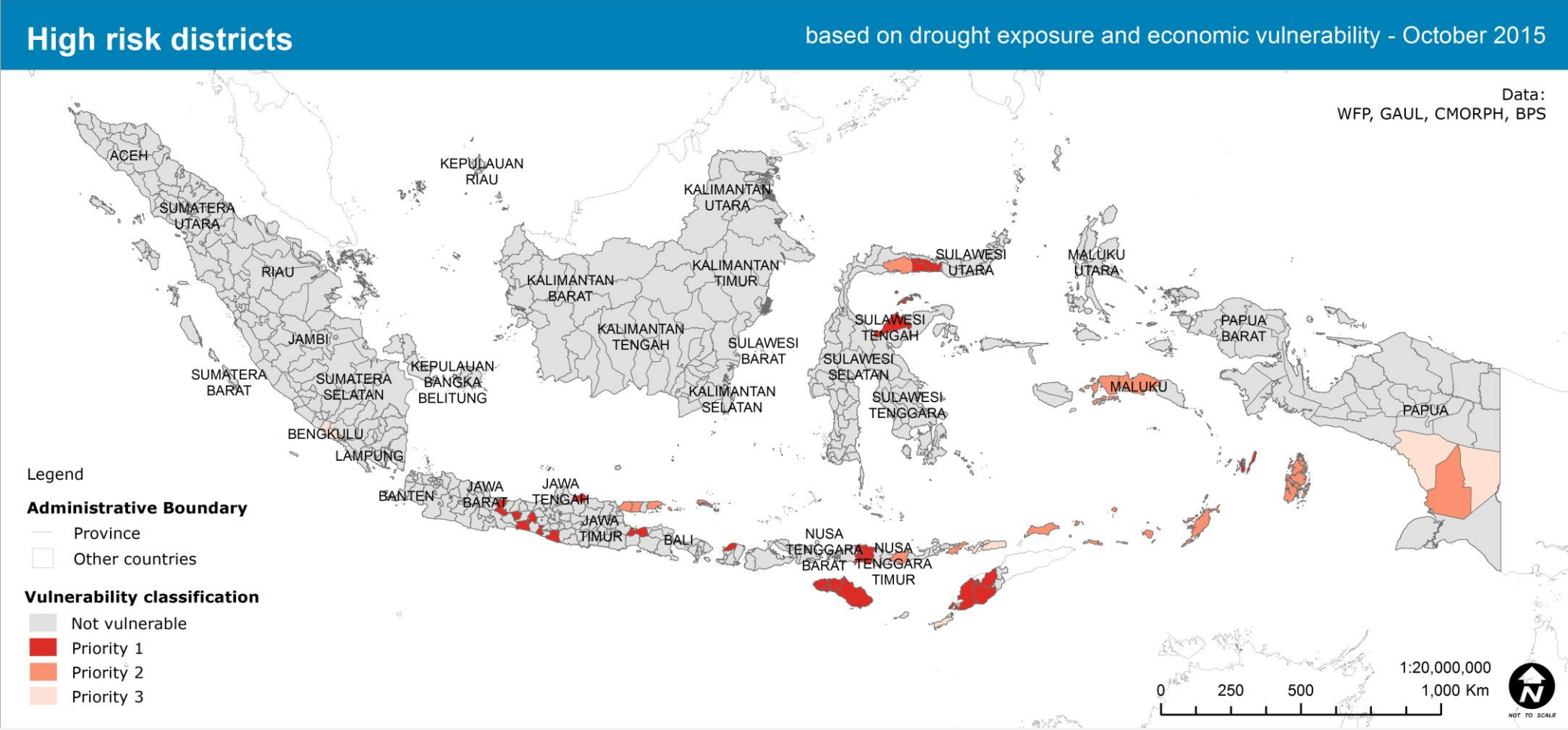
Vulnerable areas and geographic targeting

District classification of drought impact

	Province	District	Priority	Total population	Population at risk
1	Daerah Istimewa Yogyakarta	Gunung Kidul	1	715,282	155,240
2	Daerah Istimewa Yogyakarta	Kulon Progo	1	412,198	88,181
3	Gorontalo	Boalemo	1	149,832	32,646
4	Gorontalo	Gorontalo	1	370,441	79,912
5	Jawa Tengah	Brebes	1	1,781,379	370,881
6	Jawa Tengah	Kebumen	1	1,184,882	252,661
7	Jawa Tengah	Purbalingga	1	898,376	184,463
8	Jawa Tengah	Rembang	1	619,173	129,869
9	Jawa Tengah	Wonosobo	1	777,122	171,612
10	Jawa Timur	Probolinggo	1	1,140,480	240,909
11	Maluku	Maluku Tenggara	1	98,684	24,733
12	Nusa Tenggara Barat	Lombok Utara	1	212,265	76,167
13	Nusa Tenggara Timur	Kupang	1	348,010	69,807
14	Nusa Tenggara Timur	Manggarai	1	319,607	66,991
15	Nusa Tenggara Timur	Manggarai Timur	1	272,514	67,718
16	Nusa Tenggara Timur	Sumba Barat	1	121,921	35,265
17	Nusa Tenggara Timur	Sumba Barat Daya	1	319,119	85,732
18	Nusa Tenggara Timur	Sumba Tengah	1	68,515	21,875
19	Nusa Tenggara Timur	Sumba Timur	1	246,294	70,383
20	Nusa Tenggara Timur	Timor Tengah Selatan	1	459,310	127,746
21	Nusa Tenggara Timur	Timor Tengah Utara	1	244,714	52,826
22	Sulawesi Tengah	Tojo Una-Una	1	147,536	30,402
			Total Priority 1	**10,907,654**	**2,436,019**
			Total Priority 2	**4,484,451**	**1,065,164**
			Total Priority 3	**615,096**	**153,793**
			Total for all priority groups	**16,007,201**	**3,654,975**

Economic vulnerability and drought impacted

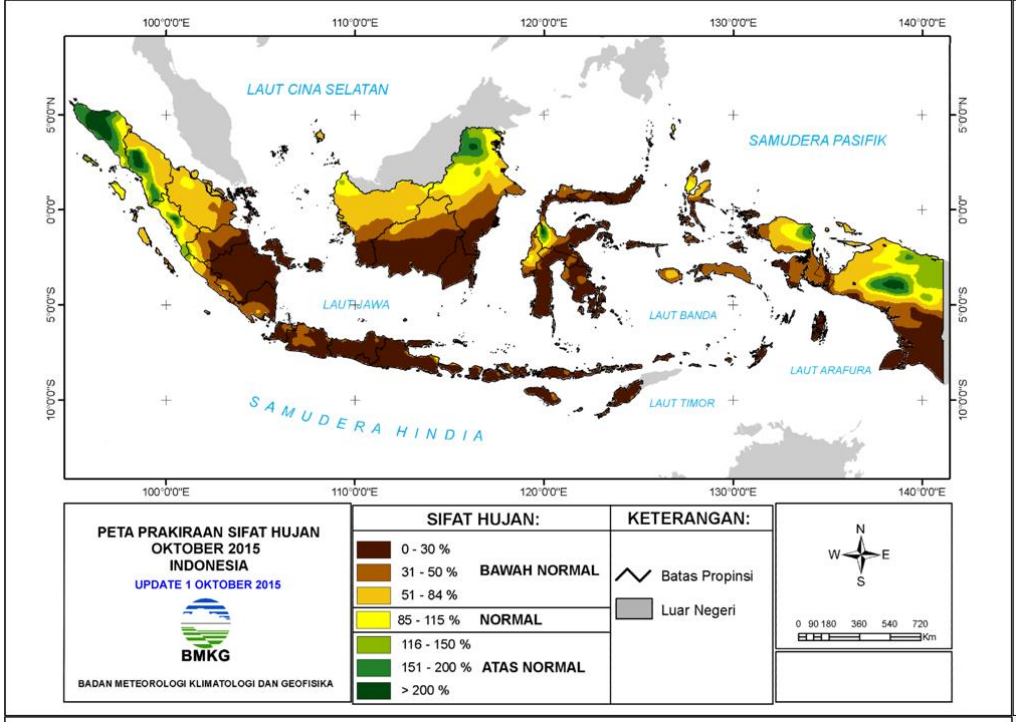
To initially assess the socio-economic impact of the drought, exposure to drought and economic vulnerability were combined at the district level. Three priority groups were created based on exposure to drought and low coping capacity as measured by poverty rates at district level. Districts without rain for > 60 days and poverty rates above 20% were considered as Priority 1. Priority 2 districts have not had rain between 31-60 days and have poverty rates above 20% while Priority 3 districts have not had rain for 21-30 days and have poverty rates above 20%. The table above shows Priority 1 districts and the total population and population below the poverty line, which are considered to be at risk across the three groups and in total.

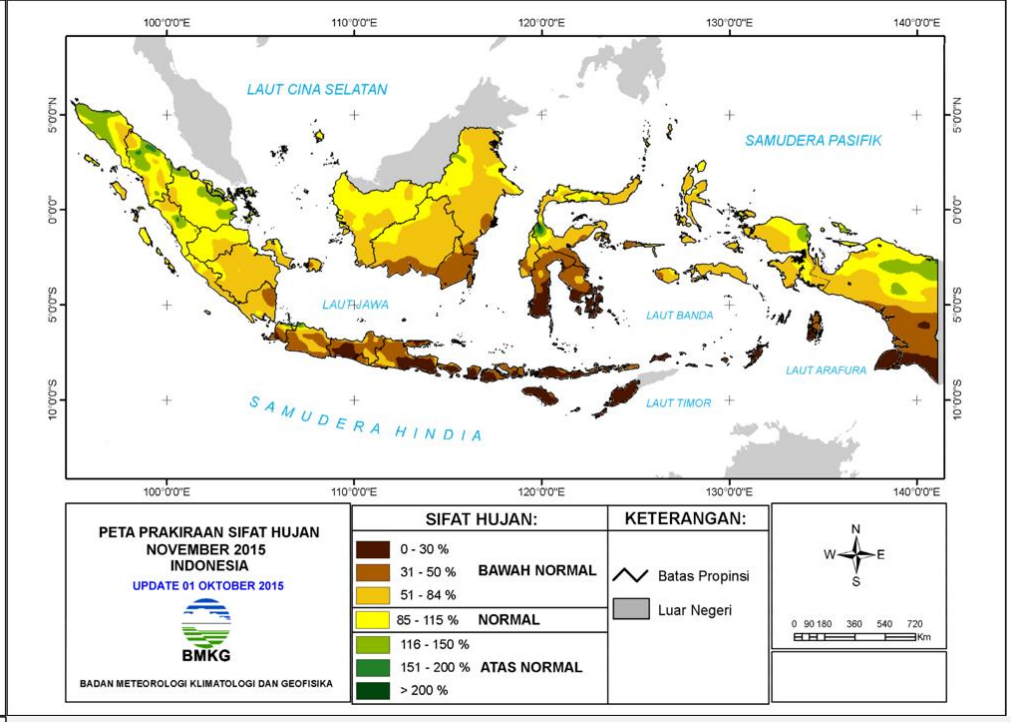


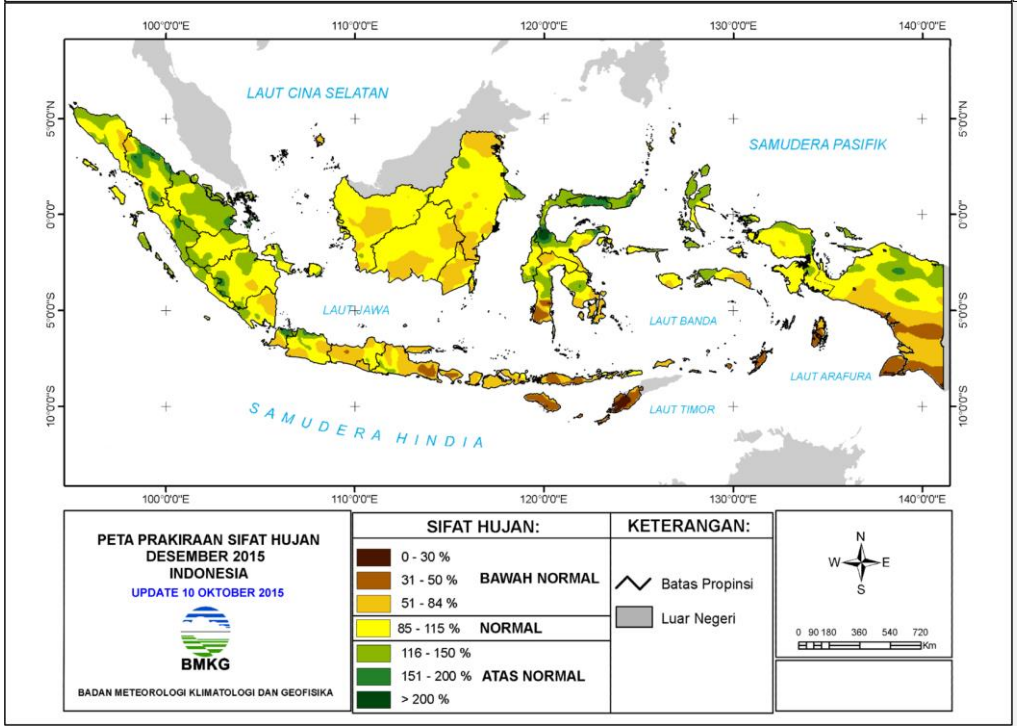
Economic vulnerability and drought impacted

The map above visualizes the data shown in the previous table. Based on the classification of no rainfall and high poverty rates, the priority districts are mainly in East Nusa Tenggara, Maluku, Sulawesi, Papua, and across Java with higher concentration in Central Java. In these districts and across Indonesia, rising food prices require close monitoring. Poor urban households may be heavily impacted by price fluctuations. Beyond food access, access to clean drinking water is a major concern that may affect large populations. Poor water access and reduced diet quality are a significant issue due to high levels of chronic (stunting) and acute (wasting) malnutrition.

Weather outlook

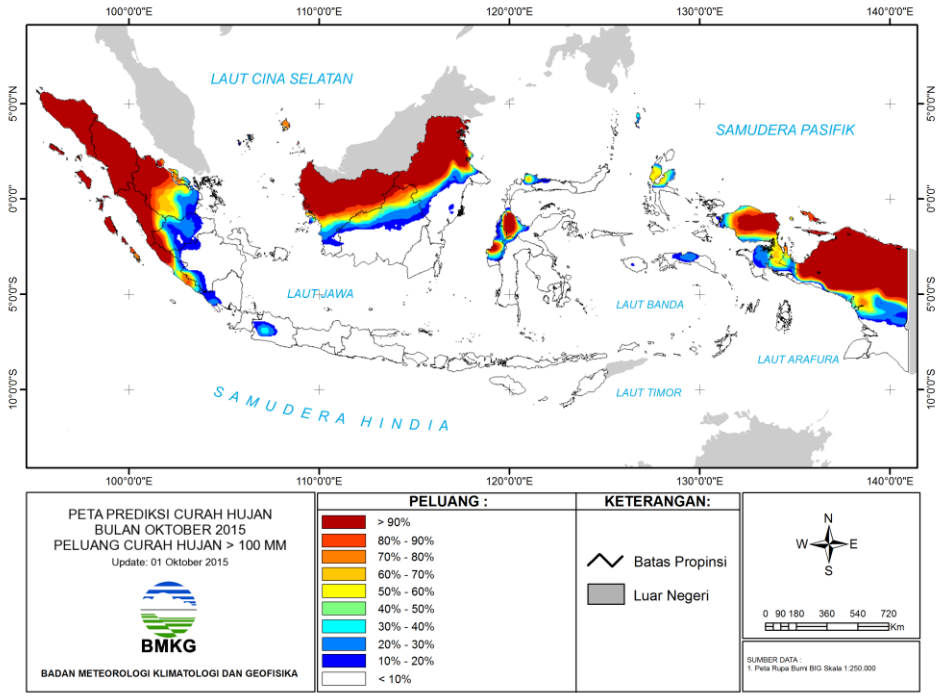


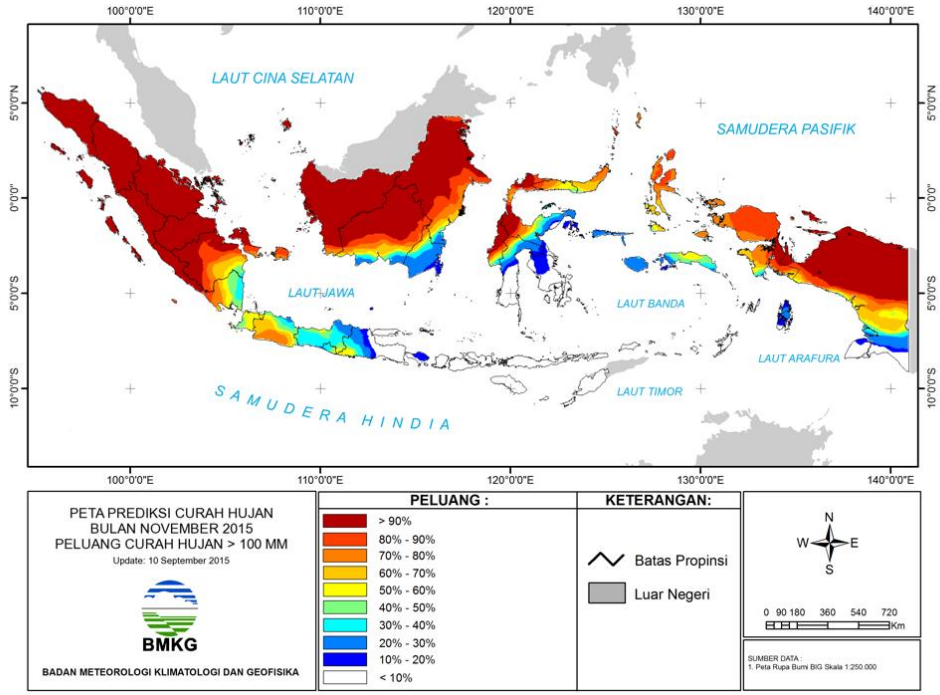


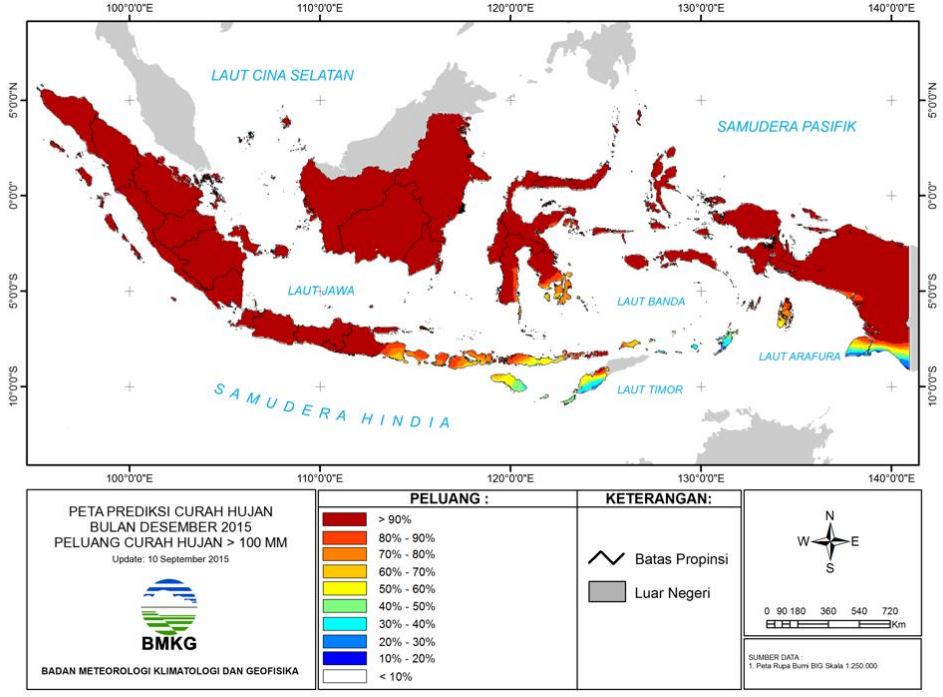


Rainfall anomaly prediction for October-December 2015

These maps are produced by the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). They show predictions of rainfall anomaly where yellow represents normal rainfall and orange to dark red shows less than normal rainfall. The month of October shows a continuing trend of below normal rainfall across all of Indonesia with the largest negative deviations across Java, Nusa Tenggara, Maluku, and the southern areas of Kalimantan, Sulawesi and Papua. In November, the delay of the rainy season is predicted to continue for large parts of Indonesia along its southern half. Nusa Tenggara, large parts of Java, South Sulawesi and the southern part of Papua will face a much drier than normal November. The rainy season is predicted to start in most of Indonesia by December, except for areas of southern Papua and East Nusa Tenggara.







Probability of more than 100 mm of rainfall for October-December 2015

These maps area also produced by BMKG and indicate predictions of rainfall greater than 100 mm per month. In these maps, dark red indicates a higher probability of rainfall greater than 100 mm while dark blue indicates a lower probability and white indicates no chance of rainfall greater than 100 mm. In October, there is a very low probability of significant rainfall predicted for Java, Nusa Tenggara, Maluku, Sulawesi, and southern areas of Kalimantan and Papua. By November, BMKG forecasts that the northern parts of Indonesia will experience rainfall accumulation greater than 100 mm. However dryness will continue in rice producing Java, South Sulawesi, and Merauke in Papua, and across Maluku and Nusa Tenggara. By December, BMKG forecasts greater precipitation across most of Indonesia. Exceptions remain in parts of Nusa Tenggara and Maluku. Significant rainfall will likely not begin until January 2016 in these areas, which may lead to a shorter planting season than normal and negatively affect water access.

Methodology

The maps in this bulletin are largely based on satellite data which is the processed and used to create various indicators relating to drought.

Rainfall anomaly is a measure of lack of rainfall in a period compared to the average. Data is derived from the University of California, Santa Barbara and used to compute the anomaly. Thresholds for anomaly follow a standard protocol.

CMORPH is a global precipitation dataset with high spatial and temporal resolution acquired through the US National Oceanic and Atmospheric Administration (NOAA) on a periodic basis for all of Indonesia. This data is then processed to determine the number of days since the last rainfall (were a day with rainfall is noted as one where more than 0.5mm of precipitation as observed). Each pixel of data (27.5km x 27.5km) is then given a value for the number of days since the last rain. Using a standard classification, also used by the Indonesia Weather and Meteorology Bureau (BMKG), drought level is then determined.

The Vegetation Health Index (VHI), also called the Vegetation-Condition-Temperature Index, is based on a combination of Vegetation Condition Index (VCI) and Temperature Condition Index (TCI). In Indonesia, the VCI is constructed using the Enhanced Vegetation Index (EVI). EVI is used instead of NDVI as it is more sensitive to changes in areas having high biomass, it reduces the influence of atmospheric conditions on vegetation index values, and it corrects for canopy background signals. The VHI is effective enough to be used as proxy data for monitoring vegetation health, drought, moisture, thermal condition, etc.

Data on rainfall dependent agriculture is derived from satellite imagery and then verified by Ministry of Agriculture staff at district level in Indonesia. Rice field plots were also defined via satellite imagery – from the now defunct IKONOS satellite.

To rank the highest priority districts, exposure to drought and economic vulnerability were combined at the district level. Not all levels of drought exposure were considered, just those in a long drought or worse based on number of days of rainfall. Economic vulnerability was classified based upon the prevalence of poverty. In this case, districts were considered to have high economic vulnerability if more than 20% of the population is below the national poverty line. The priority groups are defined as 1) poverty above 20% and more than 60 days without rain 2) poverty above 20% and 30-60 days without rain and 3) poverty above 20% and 21-30 days without rain

Contributors

This bulletin is produced by a technical working group consisting of the Food Security Agency, the National Institute of Aeronautics and Space (LAPAN), and other agencies/ministries. The bulletin is directed by Professor Rizaldi Boer of the Bogor Agricultural University (IPB). The World Food Programme provides technical support including generation of maps and data analysis.

All content within this bulletin is based upon the most current available data. As the drought is a dynamic situation, the current realities may differ from what is depicted in this document.

Response

1. The National Disaster Management Agency (BNPB) has stated that 84 districts are currently affected by drought. The agency has deployed water trucks to districts which have declared drought emergency.
2. The State Logistics Agency (BULOG) expects rice imports to begin arriving in November to replenish reserves if rains have not begun by the end of October.
3. The Ministry of Social Affairs has allocated 100mt of rice in each district and 200mt of rice per province upon declaration of emergency. This supplements the existing rations of the Rice for Family Welfare program.
4. BNPB, the Ministry of Agriculture (MoA) and Ministry of Transportation are building 1,000 water reservoirs and distributing 20,000 water pumps in affected districts.
5. MoA has focused on risk mitigation by improving tertiary irrigation access - targeting 2.6 million hectares of fields, providing agricultural equipment (water pumps, tractors, combines, threshers, etc.), and distributing drought-resistant seeds and fertilizer.
6. Through its Special Program for Improving Rice, Maize and Soybean Production (Upsus), MoA has tasked 45,000 agricultural extension workers, 10,000 farmer and fishermen groups and more than 8,000 university students with direct farm assistance.
7. Fire management has reached critical status; the Government has allocated Rp385 billion (USD 28.3 million) for forest fire prevention and management.

Recommended actions

1. Intensify monitoring of weather patterns and food production. Continue monthly bulletins
2. Strengthen monitoring of food prices (rice and other commodities) and wages / income.
3. Increase the availability of staple foods (rice and other cereals); replenish reserves; take measures to ease prices.
4. Strengthen monitoring of nutritional status in at risk districts
5. Provide direct assistance to the most vulnerable in urban and rural settings
    a. Additional food assistance through the Rice for Family Welfare program (formerly Raskin)
    b. Distribute cash and vouchers to groups in districts most at risk -- the poor, children under 2 and pregnant/lactating women (potentially through PKH)
    c. Distribute water for household and agricultural use (some is underway by BNPB and Ministry of Agriculture)
6. Provide livelihood assistance
    a. Extension services to ensure farmers have most accurate, actionable weather information
    b. Distribute seeds
    c. Labor intensive schemes for drought mitigation

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