

ENSO Update

El Niño intensified to strong category

Fiji Meteorological Service

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In Brief

- *A strong El Niño is now established in the tropical Pacific which continues to strengthen;*
- *It is almost certain to continue through the September to November 2015 period and very likely through to the early part of 2016;*
- *It is expected to further strengthen and reach peak later in the year;*
- *The trend of below normal rainfall is likely to continue over most parts of the country during both the September to November 2015 and December 2015 to February 2016 periods;*
- *Considering the current El-Niño situation and its forecast, high rainfall deficiency in the past several months and the forecasted below normal rainfall trend, the country may continue to face severe rainfall deficiencies in the coming months;*
- *Majority of the sites are currently in meteorological drought affecting crops, trees, creeks, streams, wells and rivers.*

History and Current Situation

History

Following the near-miss El Niño in 2014, the tropical Pacific surpassed El Niño thresholds in around March 2015. The El Niño conditions continued to strengthen and matured to moderate strength by June 2015. It further strengthened and reached strong El Niño category during August 2015.

Current Situation

Recent oceanic and atmospheric conditions indicate a robust coupling between the atmosphere and ocean. The sea surface temperatures (SSTs) have continued to increase in the central and eastern Pacific during the past month and is now at warmest level since the 1997–98 El Niño. The SSTs are currently more than 2°C warmer than average across most of the eastern half of the equatorial Pacific. Waters in the sub-surface of the eastern Pacific are also considerably warmer than normal, which indicates further warming of the surface is likely in the coming months.

In the atmosphere, Trade winds have been consistently weaker than average, and on occasions reversed in direction (i.e. westerly rather than easterly). The cloudiness near the dateline has remained above average during the first half of September 2015. The southern oscillation index has also remained strongly negative with August value of –19.8 and the 5 month running mean at –12.8. Collectively, these atmospheric and oceanic anomalies reflect the presence of a strong El Niño.

ENSO Outlook

El Niño is almost certain to continue through the September to November 2015 period, and very likely through to the early part of 2016. Climate models indicate that it will further strengthen over the coming months, and may possibly come close to or even exceed the 1997–98 event, which was one of the strongest El Niño on record.

The current event is expected to peak later in the year and weaken during March to May 2016 period. Typically, El Niño peaks during the late September to November period or early December to February period, and weakens during late December to February period or early March to May period. The 2015 event has, so far, been following a normal El Niño life cycle.

Some of the leading meteorological agencies in the world, which includes Australian Bureau of Meteorology, Japan Meteorological Agency and US NOAA, predict that the El Niño is likely to further strengthen in the coming months.

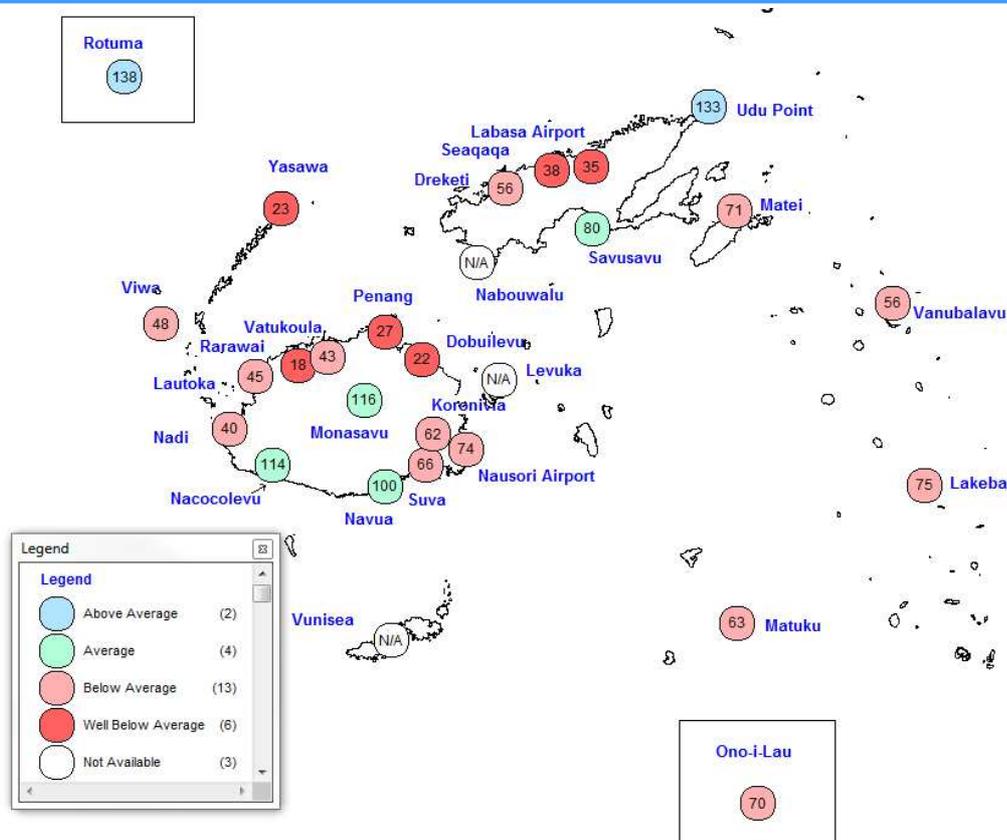
Observations of Climate Anomalies

Fiji's climate is displaying typical El Niño like characteristics with drier and cooler than *normal* conditions experienced over many parts of the country in the recent months.

The majority of the country received *below normal* to *well below normal* rainfall during the past three months. Six out of the 25 stations recorded *well below normal* rainfall, 13 recorded *below normal* rainfall, 4 recorded *normal* rainfall, while Rotuma and Udu Point recorded *above normal* rainfall though the June to August 2015 period (Figure 1). It was exceptionally dry over majority of the Western Division and northern parts of the Vanua Levu, where less than 100mm of rainfall was recorded in the last three months (Table 1).

Following on from the rainfall deficiency of the last wet season, majority of the sites continued to receive *below normal* to *well below normal* rainfall into the dry season. August brought about some relief as about 70% of the sites recorded *normal* to *above normal* rainfall. However, this was not significant enough to overcome the existing dry conditions. Consequently, majority of the sites are still experiencing meteorological drought conditions affecting crops, livestock, trees, creeks, streams, wells and rivers.

Figure 1: Percentage of Normal Rainfall from June to August 2015



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Rainfall and Temperature Outlook

The SCOPIC model, a statistical model used by FMS for seasonal predictions, favours *below normal* rainfall over most parts of the country through both September to November 2015 and December 2015 to February 2016 periods. The confidence in the predictions are generally *moderate* to *good*. This is in consensus with global climate models which also favours *below normal* rainfall in the Fiji region. Considering the current ENSO situation, anticipated continuation of the El Niño event and the model prediction of *below normal* rainfall, it is highly likely that Fiji will continue to experience drier than *normal* condition in the coming months.

The wet season in Fiji usually begins around November. However, El Niño conditions can delay its onset. While the amount of rainfall, in comparison to what was received over the past several months, is likely to increase as we progress into the wet season, it is still expected to be drier than the *normal* due to the El Niño conditions.

The maximum and minimum air temperatures are likely to be *below normal* through the September to November 2015 period.

Table 1: Rainfall Distribution for April to June 2015

Stations	June Rainfall (mm)	July Rainfall (mm)	August Rainfall (mm)	June to August 2015 Total Rainfall (mm)
Nadi Airport	14.8	15.6	49.9	80.3
Laucala Bay, Suva	56.9	53.3	132.5	242.7
Nacocolevu, Nadroga	104.8	54.2	80.4	239.4
Rotuma	211.5	209.2	269.0	689.7
Viwa	51.7	0	34.2	85.9
Udu Point	121.9	17.2	180.0	319.1
Savusavu Airfield	134.7	14.2	80.5	229.4
Labasa Airport	10.8	0	49.4	60.2
Nabouwalu	51.8	Missing	112.8	Missing
Dreketi	26.0	1.0	65.5	92.5
Seaqaqa	14.5	2.5	72.5	89.5
Koronivia	87.3	65.8	163.5	316.6
Tokotoko, Navua	135.9	133.4	165.9	435.2
Nausori Airport	81.1	69.2	138.3	288.6
Monasavu	176.3	137.8	346.1	660.2
Penang Mill	14.6	3.6	53.0	71.2
Rarawai Mill, Ba	10.4	6.4	27.9	44.7
Lautoka Mill	9.7	27.5	50.3	87.5
Dobuilevu	46.5	26.0	75.5	148
Yasawa-i-Rara	37.0	3.0	44.5	84.5
Vatukoula	9.3	15.0	28.9	53.2
Matei Airfield, Taveuni	67.6	29.9	151.3	248.8
Vunisea, Kadavu	Missing	82.7	135.0	Missing
Lakeba	74.4	70.0	95.7	240.1
Matuku	54.9	28.3	115.9	199.1
Vanuabalavu	8.4	39.1	126.4	173.9
Ono-i-Lau	59.5	38.8	103.9	202.2

Explanatory Note - El Niño and La Niña

ENSO is an irregular cycle of persistent warming and cooling of SSTs in the tropical Pacific Ocean. The warm extreme is known as El Niño and cold extreme, La Niña.

The term El Niño was given to a warming of the ocean near the Peruvian coast in South America that appears around Christmas. Scientists now refer to an El Niño event as sustained warming over a large part of central and eastern equatorial Pacific Ocean. This warming is usually accompanied by persistent negative values of Southern Oscillation Index (SOI), a decrease in the strength or reversal of the trade winds, increase in cloudiness near Dateline in the equatorial Pacific and a reduction in rainfall over most of Fiji (not immediate effect as there is a lag period) which can, especially during moderate to strong events, lead to drought.

La Niña is a sustained cooling of the central and eastern equatorial Pacific Ocean. The cooling is usually accompanied by persistent positive values of SOI, an increase in strength of the equatorial trade winds, decrease in cloudiness near the Dateline in the equatorial Pacific and higher than average rainfall for most of Fiji (not immediate effects as there is a lag period), with frequent and sometimes severe flooding, especially during the wet season (November to April).

Table 2: Drought Monitor

Timescale	Sites currently under Meteorological Drought	Sites currently under Meteorological Drought Warning Status
3 month	Dreketi, Koronivia, Labasa Airport, Lautoka Mill, Matei Airfield, Matuku, Nadi Airport, Nausori Airport, Navua, Penang Mill, Rarawai Mill, Savusavu, Udu Point, Suva, Vanuabalavu, Viwa, Yasawa-i-rara, Dobuilevu, Seaqaqa, Vatukoula, Lakeba, Ono-i-lau and Rotuma	None
6 month	Koronivia, Labasa Airport, Lakeba, Lautoka Mill, Matei Airfield, Matuku, Nadi Airport, Nausori Airport, Navua, Ono-i-lau, Penang Mill, Rarawai Mill, Suva, Udu Point, Vanuabalavu, Yasawa-i-rara, Dobuilevu, Seaqaqa, Vatukoula, Dreketi, Savusavu, Viwa and Rotuma	Nacocolevu
12 month	Vatukoula, Dreketi, Koronivia, Labasa Airport, Lakeba, Lautoka Mill, Matei Airfield, Matuku, Monasavu, Navua, Ono-i-lau, Penang Mill, Rarawai Mill, Rotuma, Savusavu Airfield, Suva, Udu Point, Viwa, Yasawa-i-rara, Dobuilevu, Nadi Airport and Seaqaqa	Nacocolevu, Nausori Airport and Vanuabalavu

Background Information on Drought Monitor

FMS currently uses the Standardized Precipitation Index (SPI) for monitoring monthly rainfall variability in Fiji. The selection of the SPI method follows extensive research into its suitability for Fiji conditions in comparison with other notable indices by both the Fiji Meteorological Service and Australian Bureau of Meteorology (via the AusAID Pacific Islands Climate Prediction Project). The SPI was developed in 1993 at the Colorado State University in the United States of America to be a relatively simple, year-round index, applicable to the water supply conditions in the United States. Since then, it has become the most widely used index for operational drought monitoring.

The SPI is widely accepted because of its special characteristic of being able to be normalized to a location and in time. Rainfall data needs to be normalized, as statistically, rainfall is not normally distributed. Rainfall is zero bounded and no rainfall days outnumber rainfall days. Fiji rainfall is also positively skewed. This standardization technique allows the SPI to determine the rarity of a current drought event, as well as the probability of the rainfall necessary to end the current drought. It allows the SPI to be computed at any location and at any number of time scales, depending on the impacts of interest to the user. Because SPI values fit a typical normal distribution, one can expect these values to be within one standard deviation approximately 68% of the time, within two standard deviations 95% of the time and within three standard deviations 99% of the time. A related interpretation would be that moderate drought occurs 16 times in 100 years, severe drought occurs two or three times in 100 years, and extreme drought occurs once in approximately 200 years. The fundamental strength of the SPI is that it can be calculated for a variety of time scales. This versatility allows the SPI to monitor short-term water supplies, such as soil moisture, important for agricultural production, and longer-term water resources such as groundwater supplies, stream flow and reservoir storage.

FMS monitors rainfall deficiencies (drought status) at three time-scales that are indicators of meteorological and as well as applied to agricultural and hydrological drought conditions:

- 3-months – most shallow rooted agricultural crops, small streams and small water tanks;
- 6-months – most deep rooted agricultural crops, fruit trees, small rivers and reservoirs; and
- 12-months – medium to large rivers, medium to large reservoirs, shallow wells, dam storages.

This Update is prepared as soon as ENSO, climate and oceanographic data/information is received from recording stations around Fiji and Meteorological Agencies around the region/world. Delays in data collection, availability of appropriate information, communication and processing occasionally arise. While every effort is made to verify observational data and information, the Fiji Meteorological Service does not guarantee the accuracy and reliability of the analyses presented, and accepts no liability for any losses incurred through the use of this Update and its contents. The contents of the Update may be freely disseminated provided the source is acknowledged. All requests for data should be addressed to the Director, Fiji Meteorological Service HQ, Namaka, Nadi.

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