Climate Services Division

ENSO Update

Weak La Niña conditions favoured

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Fiji Meteorological Service

Content

In Brief

- *The El Niño-Southern Oscillation (ENSO) remains in a neutral state, but approaching La Niña thresholds;*
- *Climate models suggest further cooling of the tropical Pacific with La Niña thresholds likely to be exceeded by December 2017;*
- *The November 2017 to January 2018 rainfall outlooks favours average to above average rainfall across the country;*
- *At the end of October 2017, majority of locations in the Western Division continued to be in meteorological drought state;*
- *The rainfall activity has picked up in November with majority of the stations surpassing their normal rainfall for the month, however more rain is needed to overcome the dry season deficiencies;*
- *La Niña events usually brings wetter conditions or above average rainfall in the Fiji region.*

History and Current Situation

History

From the beginning of 2017, the sea surface temperatures (SSTs) gradually warmed in the equatorial Pacific Ocean with record warmth in the far eastern Pacific Ocean, near the coast of Peru, experienced around February and March. The warm anomalies in the central and eastern equatorial Pacific Ocean peaked in May close to weak El Niño thresholds, but the warming did not sustain long enough for it to classify as an El Niño event. Since August, SSTs across much of the eastern equatorial Pacific have shifted from neutral towards La Niña thresholds.

Current Situation

The tropical Pacific is approaching La Niña thresholds with oceanic indicators showing clear progression towards La Niña. Tropical Pacific SSTs have cooled since August 2017 with SSTs currently cooler than average along the equator in the central and eastern Pacific Ocean, extending southward along the coast of Peru in south America. The subsurface temperatures remains cooler than average in the eastern Pacific.

The atmospheric indicators of the ENSO have also shown signs of shift into a La Niña like state. The Trade winds have been stronger than average across the western half of the tropical Pacific, and near average in the east. Cloudiness near the Date Line remains below average. The latest 30-day average Southern Oscillation Index (SOI) to November 19th is +5.7, which is within ENSO neutral range.

ENSO Outlook

Most of the climate models are now favouring weak La Niña conditions to develop by the end 2017. As of mid-November, all the models predict La Niña conditions from December 2017 to February 2018. If the current progression continues, and thresholds are exceeded for a sustained period, 2017–18 will be considered a La Niña event. However, models also suggest that any event is likely to be weak and short lived.

The Australian Bureau of Meteorology's latest ENSO Wrap-Up (21st November) states that the tropical Pacific is approaching La Niña thresholds. As a result, the Bureau's *ENSO Outlook* has been raised to La Niña ALERT, meaning there is approximately 70% chance or triple the normal likelihood of La Niña occurring.

The outlook from Climate Prediction Centre/International Research Institute of USA stated that as of mid November about 75% of the models predict La Niña conditions for the November 2017 to January 2018 period.

Weak La Niña conditions favoured

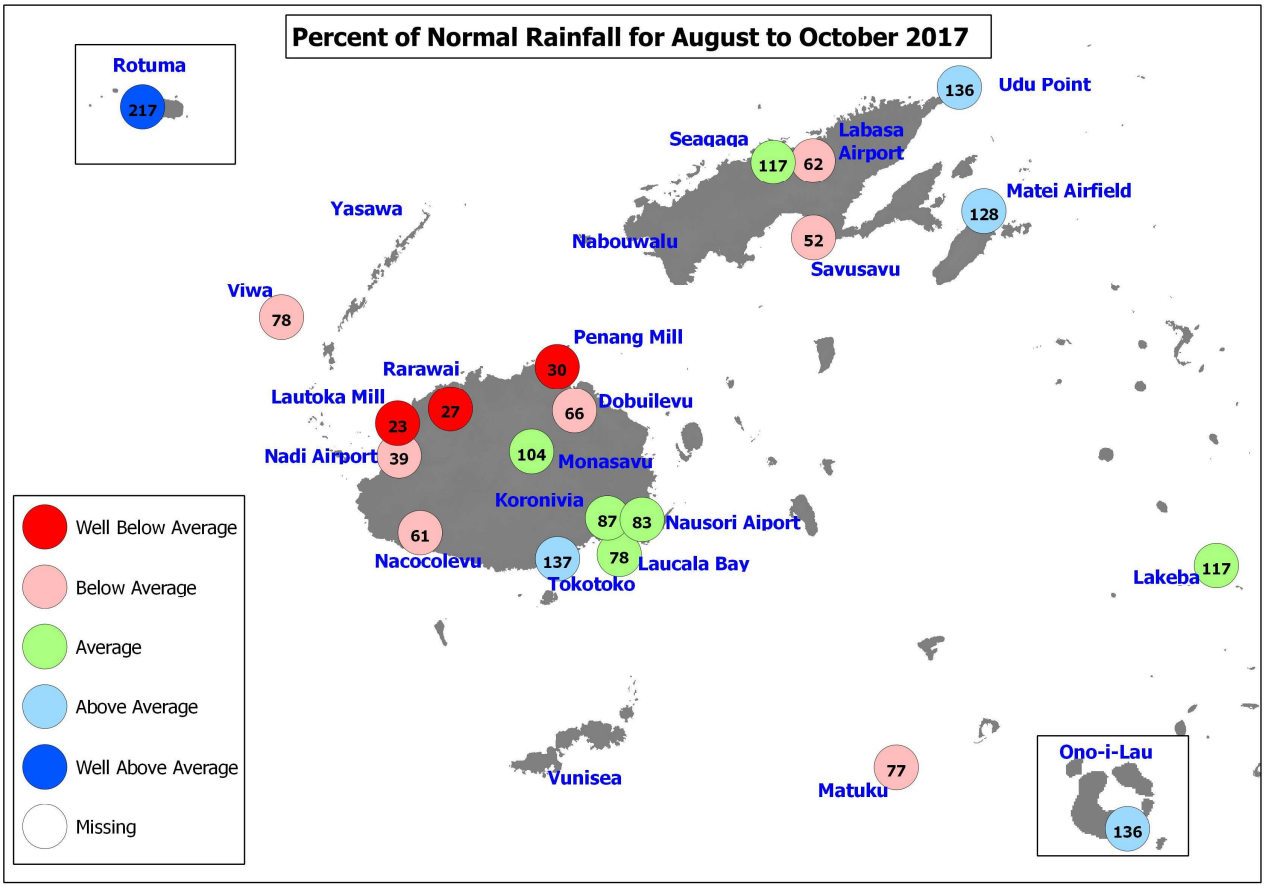
Observations of Previous Three Months

The weather over the August to October period was dominated by broad south east trade winds, frontal systems and low pressure systems. *Normal* to *wetter than normal* conditions were experienced at majority of the sites during August while September and October were considerably dry.

The accumulated rainfall over the past three months (August to October 2017) was *well below average* at 3 sites, *below average* at 7 sites, *average* at 6 sites, *above average* at 4 sites and *well above average* at Rotuma. The stations in the Western Division were significantly dry with rainfall ranging from *below average* to *well below average*, a trend which has been persisting since April 2017.

Consequently, as at end of October majority of the sites were still experiencing meteorological drought conditions affecting shallow rooted plants and small water bodies, such as, creeks and streams. However the rainfall activity has picked up in November and by mid November all the stations have already surpassed their *normal* rainfall threshold.

Figure 1



Rainfall and Temperature Outlook

Average or *above average* rainfall favoured at most parts of the country through November 2017 to January 2018 period. The recently surveyed global climate models favours *above average* rainfall in the Fiji region over the same period. Considering the onset of wet season and the likely chances of La Niña developing by the end of 2017, rainfall activity within the Fiji region is likely to increase and the current Wet Season to be wetter than usual.

The maximum and minimum air temperatures are likely to fluctuate around *normal* during both the November 2017 to January 2018 and the February to March 2018 periods. However, hot and humid conditions are likely on occasions in the coming months.

The sea surface temperatures within the Fiji region is favoured to be *normal* to *above normal* during the November 2017 to January 2018 period.

Weak La Niña conditions favoured

Table 1: Rainfall Distribution for August to October 2017

Stations	August 2017 Rainfall (mm)	September 2017 Rainfall (mm)	October 2017 Rainfall (mm)	August to October 2017 Total Rainfall (mm)
Nadi Airport	60.6	4.3	28.2	93.1
Nacocolevu, Nadroga	57.3	30.4	80.4	168.1
Lautoka Mill	28.7	2.1	24.5	55.3
Viwa	93.5	12.2	40.7	146.4
Yasawa-i-Rara	127.0	29.6	60.0	216.6
Dobuilevu	94.0	97.5	42.5	234.0
Rarawai Mill, Ba	40.0	9.0	16.8	65.8
Penang Mill	48.7	28.6	7.1	84.4
Monasavu	203.7	168.7	295.7	668.1
Nabouwalu	102.5	32.4	Missing	Missing
Dreketi	Missing	Missing	Missing	Missing
Seaqaqa	42.0	56.5	58.0	156.5
Labasa Airfield	80.2	40.8	47.0	168
Udu Point	142.4	142.7	159.7	444.8
Savusavu Airport	86.8	35.7	80.7	203.2
Matei, Taveuni	187.2	271.1	96.8	555.1
Tokotoko, Navua	149.6	184.1	235.0	568.7
Koronivia	193.1	169.4	142.0	504.5
Laucala Bay, Suva	149.8	118.4	150.2	418.4
Nausori Airport	169.4	122.5	125.5	417.4
Lakeba	81.6	58.1	72.6	212.3
Ono-I-Lau	214.4	91.4	131.8	437.6
Matuku	103.5	15.7	112.1	231.3
Vunisea	122.9	Missing	Missing	Missing
Rotuma	220.8	175.6	625.1	1021.5

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 in Meteorological Drought	Sites currently in Meteorological Drought Warning Status	Sites currently in Meteorological Drought Watch
3-month	Dobuilevu, Lakeba, Lautoka, Monasavu, Nadi, Penang (Rakiraki), Rarawai (Ba) and Savusavu	Matuku, Nacocolevu and Seaqaqa	Koronivia, Labasa, Taveuni, Nausori, Navua and Suva
6-month	Dobuilevu, Lakeba, Lautoka, Matuku, Monasavu, Nacocolevu, Nadi, Penang (Rakiraki), Rarawai (Ba), Savusavu, Tavua and Yasawa	Labasa, Nausori, Navua and Ono-i-Lau	Suva
12-month	-	Penang and Savusavu	Taveuni

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.

Drought status for 24 sites are provided in Table 2. 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.*

For more information, contact:
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All correspondences must be addressed to the Director of Meteorology.