

# ANNUAL CLIMATE SUMMARY 2019

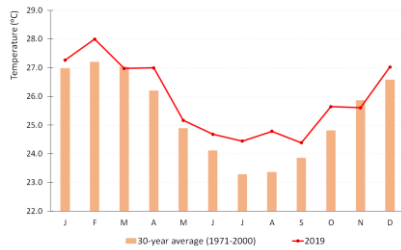
## FIJI



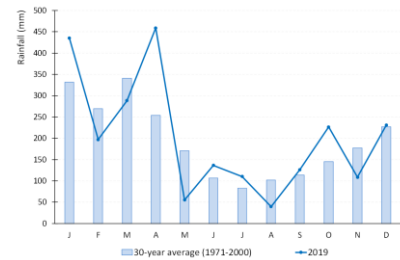
**FIJI METEOROLOGICAL SERVICE**

**MINISTRY OF INFRASTRUCTURE AND METEOROLOGICAL SERVICE**

# Fiji's Climate in 2019



Monthly mean temperature in 2019 in comparison with the long-term average.



Monthly mean rainfall in 2019 in comparison with the long-term average.

In 2019, Fiji continued to record above-average annual temperature of 25.9°C, 0.6°C higher than the 1971-2000 long-term average. The recent decade (2010-2019) is the warmest on record.

Fiji recorded above-average temperatures throughout 2019, except for the month of November when Fiji observed a cool spell. On the other hand, August was notably warm and recorded the largest monthly anomaly.

In 2019, Fiji's rainfall varied significantly with the long-term average from month to month. The above-average rainfall recorded in January and April were due to the passage of TC Mona and active troughs of low-pressure system.

## EXTREMES IN 2019

NB: All extreme temperature and rainfall data are all new high records.



# Large-scale Climate Variability in 2019

## El-Niño Southern Oscillation (ENSO)

In 2019, the status of El-Niño Southern Oscillation (ENSO) changed from weak El-Niño conditions during the first half of the year to ENSO-Neutral conditions in the second half of 2019. In Fig 1, Ocean Niño Index (ONI) values indicated the establishment of a weak El Niño event in the tropical Pacific Ocean from January to June followed by an ENSO-neutral state from July until November. Towards year end, ONI value for December was leaning towards a weak El Niño event.

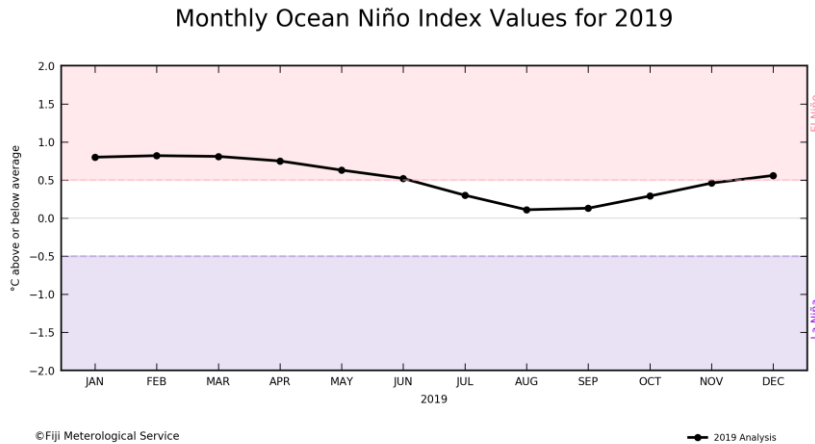


Figure 1: Monthly Ocean Niño Index (ONI) for 2019.

The underlying atmosphere showed monthly fluctuations of the area of enhanced convection (Outgoing Longwave Radiation - OLR anomalies) during the first six months of 2019. In February (Fig 2a), strong negative OLR anomalies (in green) were observed over Central-equatorial Pacific, showing El Niño (Modoki) like conditions. This phenomenon

gained momentum in March with negative OLR anomalies strengthening and extending towards the Eastern-equatorial Pacific but lost its strength and aerial extend in April (Fig 2b). In June (Fig 2c), the event completely lost its El Niño like conditions, returning to ENSO-neutral.

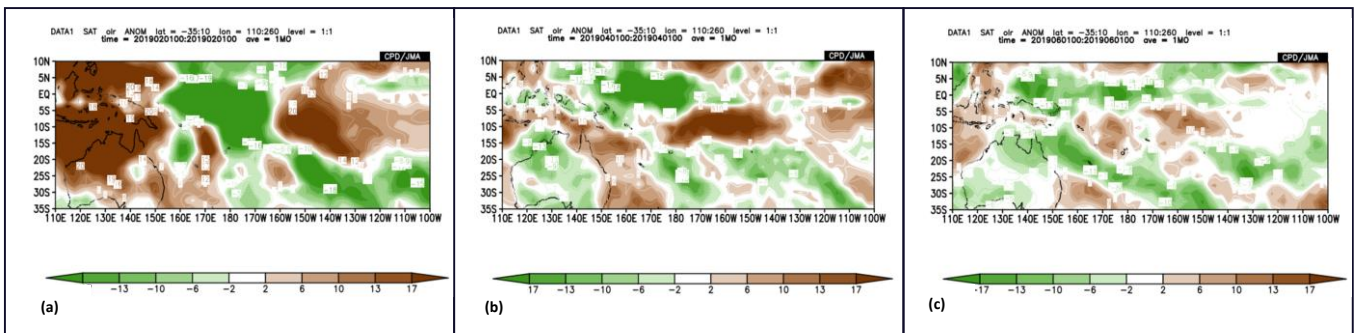


Figure 2: Monthly Outgoing-longwave radiation (200hPa - OLR) anomalies for (a). February, (b) April & (c) Jun, for 2019.

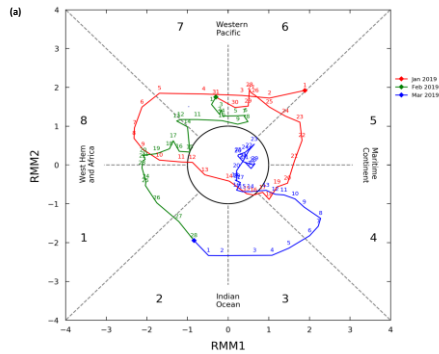
During October and early November, ONI values approached El Niño thresholds. Same trend continued for the month of December with ONI values crossing the El Niño thresholds. However, most tropical Pacific atmospheric indicators remained neutral, preventing development of a fully coupled El Niño event.

Fiji’s rainfall patterns during the year were mixed, consistent with an ENSO-neutral state. However, some months in the Northern and Western Divisions displayed typical El Niño like conditions, with drier than average climate. Dry months were interspersed by months with notable rainfall events, preventing establishment of significant rainfall deficiencies.

## Madden-Julian Oscillation (MJO)

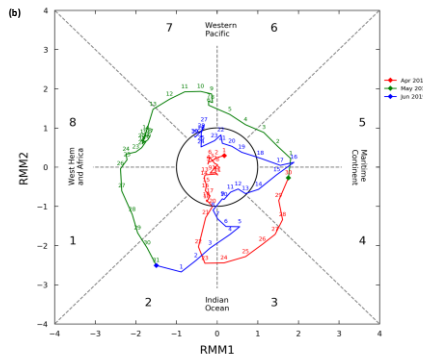
Apart from the ENSO phenomenon, which influences year-to-year rainfall variability across the Southwest Pacific region, the Madden-Julian Oscillation (MJO) is another important event that affects rainfall on a shorter timescale (weekly to monthly). MJO contains an enhanced and a suppressed phase which greatly influences Fiji’s rainfall, especially during the enhanced convection mode.

(RMM1, RMM2) phase space for 01-Jan-2019 to 31-Mar-2019



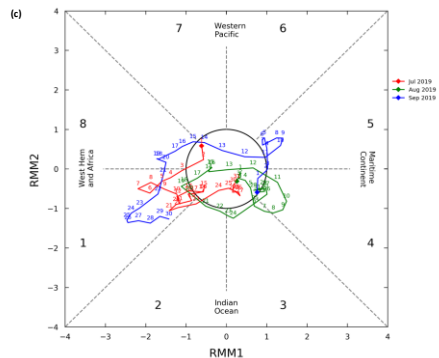
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(RMM1, RMM2) phase space for 01-Apr-2019 to 30-Jun-2019



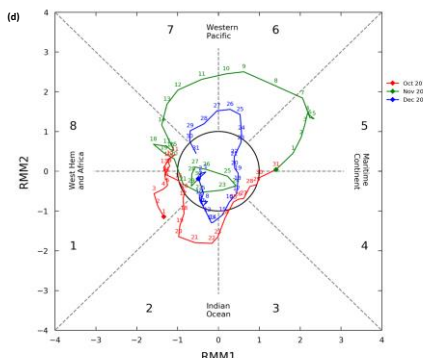
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(RMM1, RMM2) phase space for 01-Jul-2019 to 30-Sep-2019



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(RMM1, RMM2) phase space for 01-Oct-2019 to 31-Dec-2019



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Figure 3: MJO propagation and phases from (a) January – March, (b) April – June, (c) July – September & (d) October – December, 2019. MJO development is monitored using the Real-time Multivariate MJO (RMM) index. It shows the position and intensity of the MJO. The dates are the numbers and lines, labelled in different colors.

Pacific in the first half of April (Fig 3b). Consequently, April recorded another wet month. During the dry season, the active phase of the MJO affected Fiji’s rainfall (wetter period) in June and September. The active pulse in June and September were both weak and slow moving in the Western Pacific region (Fig 3b & 3c). The last active MJO pulse was towards the end of December (Fig 3d) which triggered TC Sarai and brought significant amount of rainfall over Fiji.

In 2019, the MJO passed through the Fiji region on several occasions. At the beginning of January and during the month of May, November and December, the MJO signal was significant as it passed over the Western Pacific region (Phase 6 & 7).

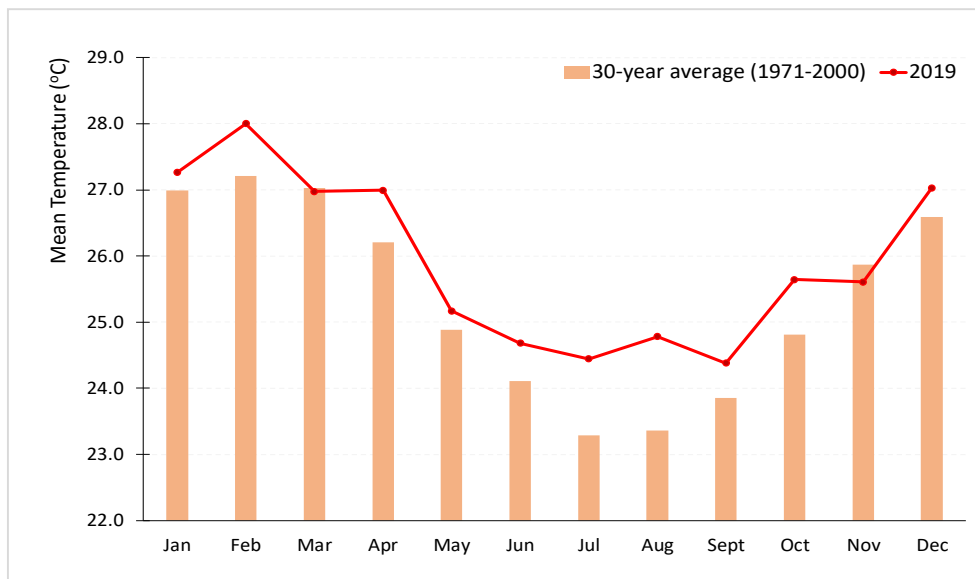
The year started with an active MJO pulse passing over the Western Pacific in January (Fig 3a). Towards month end, the second active pulse moved across Fiji which was consistent with a wetter January. February and March are quite months in terms of MJO activities. A weak slow moving MJO pulse transversed the Western

# Fiji's Climate in 2019

## Temperature in 2019

In 2019, Fiji continued to observe above-average temperature of 25.9°C, which was 0.6°C warmer than the long-term average (1971-2000). This ranks 2019 as the sixth warmest year since Fiji's temperature records started in 1959, with 2007 as the warmest year on record (Fig 5).

Fiji's highest 10<sup>th</sup> warmest years on record all happened in the 21<sup>st</sup> century (2001-2019). The national mean annual temperature has increased by 0.9°C (statistically significant) from 1959 to 2019. Similarly, temperature record showed that the recent decade (2010 to 2019) is the warmest decade on record. The annual and decadal trends showed signs of continuous long-term warming in the Fiji region (Fig 6).



In 2019, above-average temperatures were recorded throughout the year except for November. Fiji encountered a cool spell from 1<sup>st</sup> to 7<sup>th</sup> November. In contrast, August was notably a warm month with a temperature of 24.8°C, 1.4°C warmer than the long-term average (Fig 4).

Figure 4: Monthly mean temperatures in 2019 compared with the long-term average.

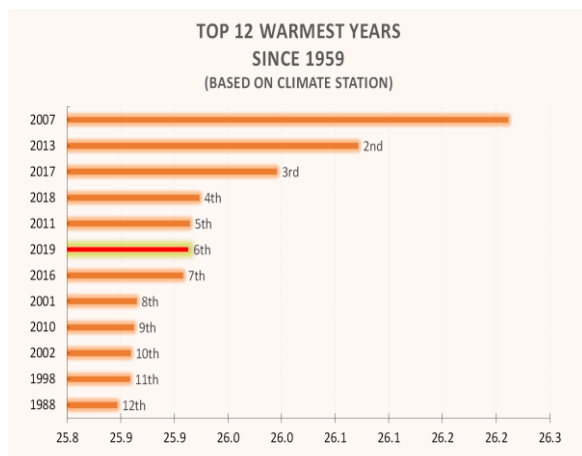


Figure 5: Annual ranking of temperature in Fiji.

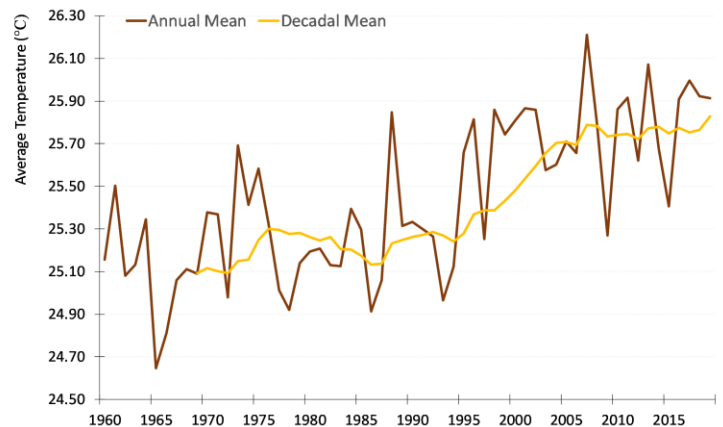


Figure 6: Annual mean and decadal mean temperature changing with time over Fiji.

The warmest station on average during 2019 was Labasa Airport with the annual mean maximum air temperature of 32.0°C, followed by Seaqaqa with 31.9°C and Keiyasi with 31.8°C. In contrast, the coolest annual mean maximum air temperature was registered at Monasavu with 24.1°C, followed by Nadarivatu with 24.9°C and Ono-i-Lau with 28.4°C. In addition, Keiyasi recorded the highest daily maximum air temperature during 2019 with 36.4°C and 36.1°C, on December 10<sup>th</sup> and February 10<sup>th</sup> respectively, followed by Nacocolevu with 35.8°C on March 22<sup>nd</sup> and Keiyasi with 35.6°C on March 3<sup>rd</sup> and October 12<sup>th</sup>.

### Maximum & Minimum Air Temperature in 2019

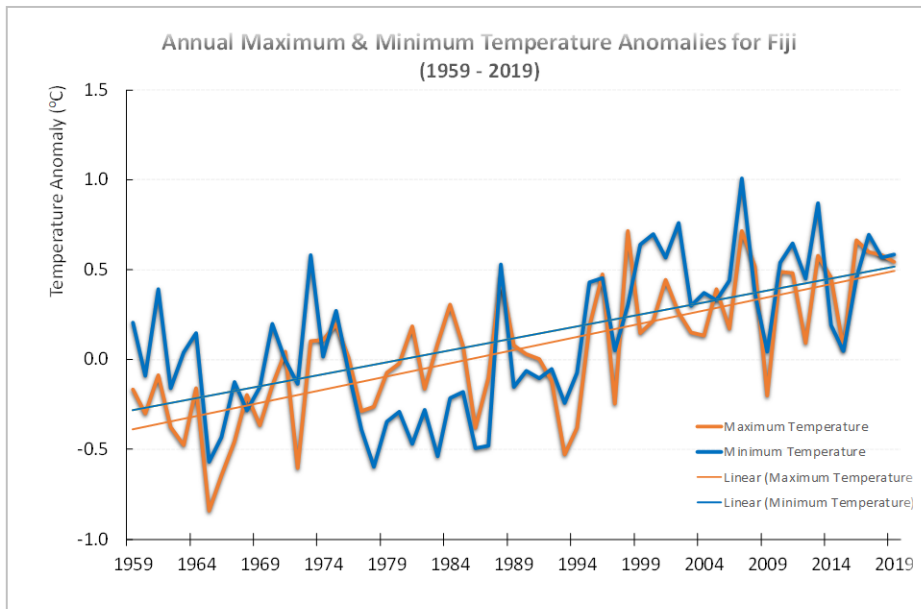


Figure 7: Annual maximum & minimum temperature anomalies for Fiji from 1959-2019.

The national average annual maximum air temperature during 2019 was 29.7°C, which was 0.5°C warmer than the *normal* and has increased (statistically significant) by 0.9°C between 1959 and 2019 (Fig 7). This ranked 2019 as the 7<sup>th</sup> warmest annual maximum air temperature on record. The year 1998 was the warmest on record, followed by 2007, 2016 and 2017.

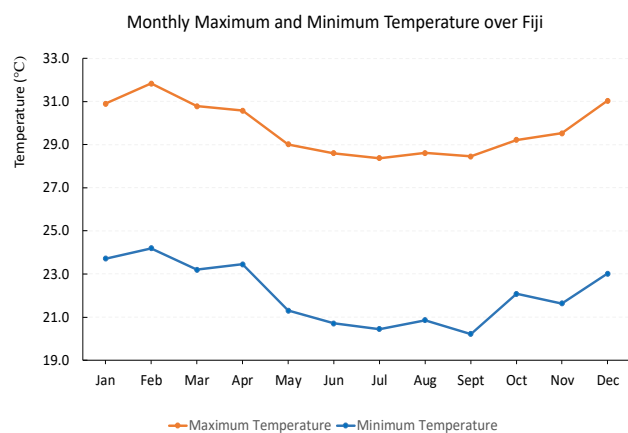


Figure 8: Monthly maximum & minimum temperatures in 2019 over Fiji.

For minimum air temperature, the national average during 2019 was 22.1°C, 0.6°C warmer than the normal. This ranked 2019 as the 8<sup>th</sup> warmest annual minimum air temperature since 1959. On record, 2007 was the warmest followed by 2013, 2002 and 2000. The national average minimum air temperature has increased (*statistically significant*) by 0.8°C between 1959 and 2019.

Furthermore, the coolest night on average during 2019 was recorded at Nadarivatu with a temperature of 17.3°C, followed by Monasavu

(17.9°C), Labasa Airport (19.9°C) and Keiyasi (20.6°C).

In contrast, the warmest night on average was at Rotuma (24.8°C), followed by Yasawa-i-Rara, Viwa and Udu Point (all with 23.8°C), Savusavu Airfield (23.6°C) and Lakeba (23.5°C). On separate occasions (9<sup>th</sup> September & 23<sup>rd</sup> July), Nadarivatu recorded the lowest daily air temperature of 9.8°C and 10.5°C whereas Monasavu recorded its lowest of 11.0°C and 11.5°C.

## New Temperature Records

In 2019, a total of eighteen (18) new high temperature records were established around the country (Fig 9). The highest number of new temperature records were observed in April with a total of four (4) records.

On a daily timescale, a total of six (6) daily air temperature records were set in 2019. Four (4) extreme daily maximum temperature records were established including two (2) new extreme daily minimum temperature records.

In addition, a total of twelve (12) new monthly records were established in 2019, of which five (5) were for mean maximum air temperature and seven (7) for mean minimum air temperature.



Figure 9: Map of new high temperature records around Fiji in 2019.

## Rainfall in 2019

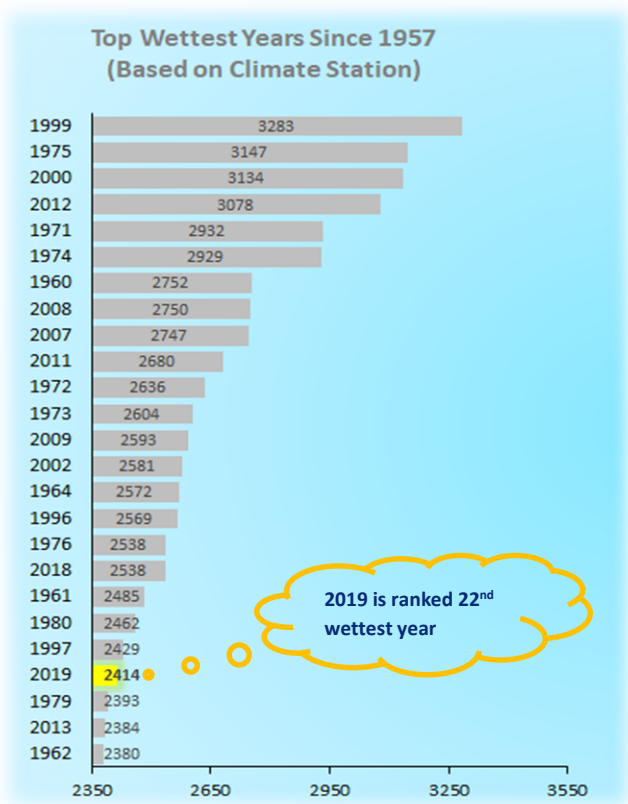


Figure 10: Annual ranking of rainfall in Fiji.

Fiji's average rainfall recorded during 2019 was 2414mm, 104% of the long-term average. This ranks 2019 as the 22<sup>nd</sup> wettest year on record (Fig 10).

Since 1957 to date, rainfall is highly variable with no clear and significant trend on the decadal and annual timescale (Fig 11).

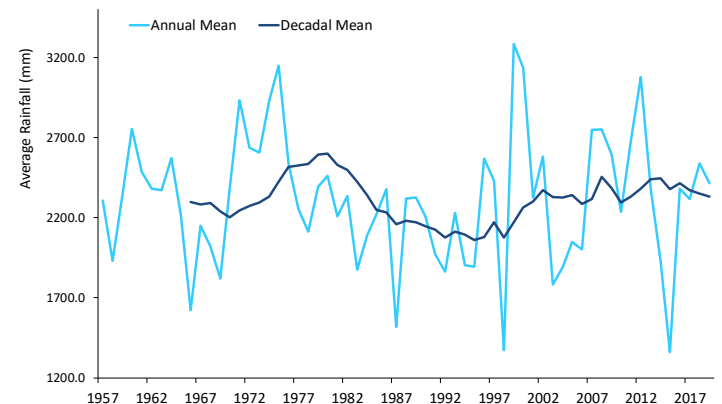


Figure 11: Annual and decadal mean rainfall over Fiji from 1957-2019.

In 2019, significant rainfall deficiencies were observed during February, March, May, August and November. In contrast, January, April, June, July, September and October all recorded above-average rainfall (Fig 12). Fiji observed significant rainfall in the month of January, April and October which further lead to landslide and flooding (Notable weather events).

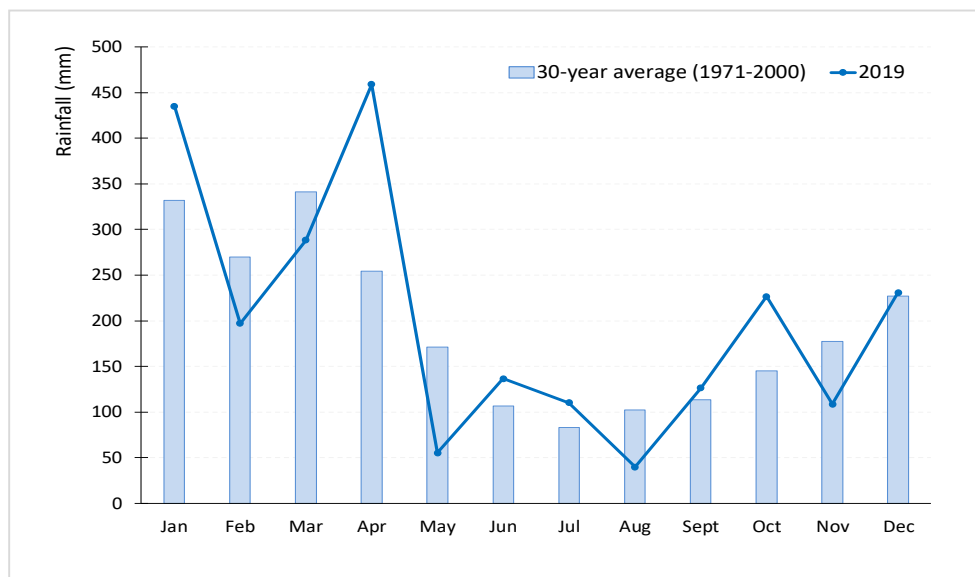
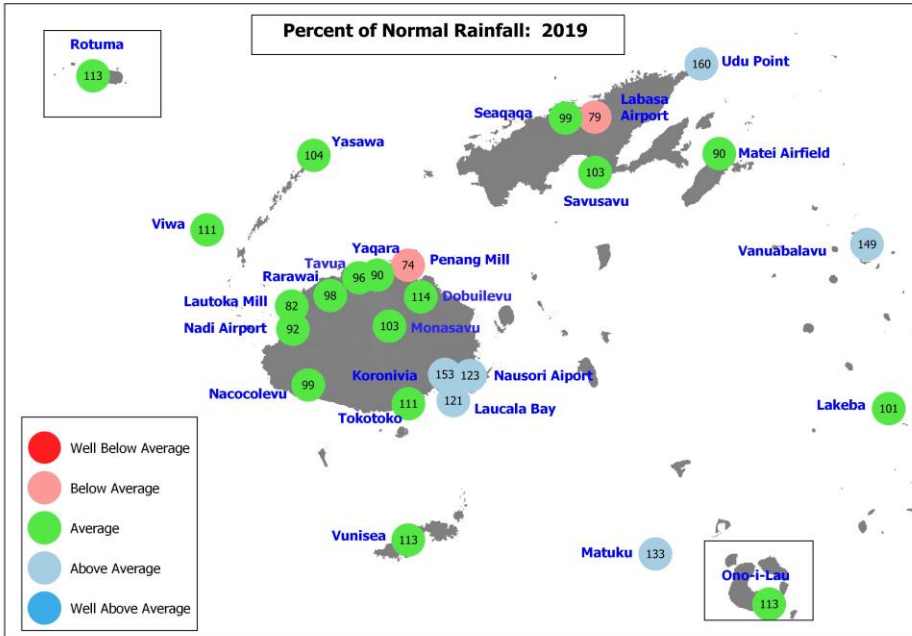


Figure 12: Monthly mean rainfall in 2019 compared with the long-term average (1971-2000).

The wettest location during 2019 was from Monasavu (5035mm), followed by Koronivia (4660mm), Lomaivuna (4047mm), RKS Lodon (4044mm) and Navua (3959mm). On the other hand, Momi was the driest site with 1432mm of rainfall, followed by Lautoka Mill (1594mm), Nadi (1724mm), Tavua (1726mm) and Yaqara (1730mm).



The dry season significantly proliferated in terms of low rainfall activity. During May, extended period of dry conditions was experienced in certain parts of the country, especially in the Western Division and northern parts of Vanua Levu. In addition to no rainfall being registered, Tavua, Yaqara and Momi experienced only one (1) rain day, followed by Labasa Airport and Lautoka Mill with only two (2) rain days and Vaturekuka with three (3) rain days. On a similar note, August was another dry month with Viti Levu, most of Vanua Levu, the Yasawa and Mamanuca Group including majority of the Eastern Division experienced significantly drier conditions.



Rainfall recorded during 2019 was *average to above average* at most stations around the country. Out of the 26 rainfall monitoring sites, 6 registered *above average* rainfall, 18 *average* rainfall, while Penang Mill and Labasa Airport were the only two stations that recorded *below average* rainfall (Fig 13).

Figure 13: Percent of normal annual rainfall during 2019.

### New Rainfall Records

A total of seven (7) new high rainfall records were observed in 2019 (Fig 14). There were three (3) new high daily rainfall and four (4) new high total monthly rainfall records.

Similarly, the highest number of new rainfall records was observed in April with three (3) records.



Figure 14: Map of new high rainfall records around Fiji in 2019.

## Sunshine in 2019

In total, Fiji Meteorological Service has twelve (12) sunshine recording stations. Due to incomplete and missing data, only five (5) sunshine stations were used in this report. In 2019, the variation in annual sunshine hours amongst the various stations was not significant. All (5) stations received between 906 hours to 2483 hours of sunshine, which were within 71% to 97% of normal. Nadi Airport received the most amount of sunshine in 2019, with 2483 hours, followed by Doboilevu with 1774 hours of sunshine, 1735 hours at Laucala Bay (Suva), 1551 hours of sunshine at Koronivia and 906 hours at Monasavu (Fig 15).

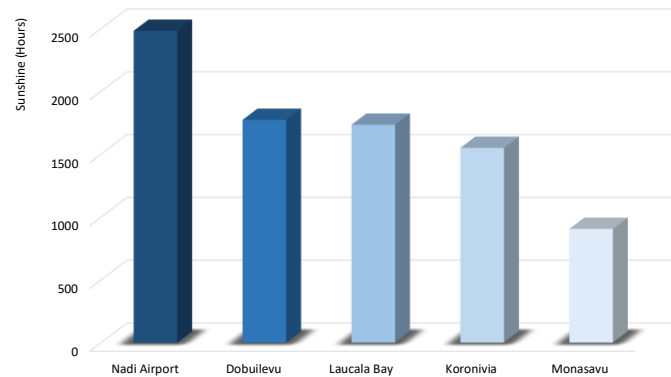


Figure 15: Annual sunshine hours around Fiji in 2019.

In the **Western Division**, Nadi Airport and Doboilevu recorded annual sunshine of 97% and 92% of the *normal* sunshine hours respectively in 2019. Throughout the year, Nadi Airport recorded *below normal* sunshine hours in January, October and November, *near normal* during March, April and December and *above normal* during the rest of the year. For Nadi airport, the highest percentage normal was observed in May (115%) with 241-hours as the sunniest month, while the least hours of sunshine were recorded in April (178-hours). However, in Doboilevu, *normal* to *above normal* sunshine hours were recorded during May, June, August and September, whereas the rest of the months recorded *below normal* sunshine hours. May was the sunniest month with 196.3-hours, while January recorded the lowest sunshine with 119-hours.

In the **Central Division**, the annual total sunshine ranged from 88% to 90% of the *normal*. Laucala Bay recorded *above normal* sunshine hours in May and July, and *below normal* sunshine hours during the other ten months. In addition, Laucala Bay received the most sunshine in May with 166.0-hours and least sunshine in August with 120.2-hours. In contrast, Koronivia recorded *near normal* sunshine hours in May, July and December, and *below normal* sunshine hours in other months. The highest sunshine hours were received during December with 197.1-hours and lowest sunshine hours were recorded in November with 79.8-hours.

For the **interior of Viti Levu**, Monasavu recorded 71% of normal annual sunshine hours, with *below normal* to *above normal* sunshine hours observed throughout 2019. May was the sunniest month at Monasavu, with 131.7 sunshine hours observed while September reported the lowest hours of sunshine during the year. August month had missing sunshine records.

## Wind in 2019

In 2019, the highest mean annual 10-minutes average wind speed was recorded at Yaswa-i-Rara with 22.9km/hr, followed by Rakiraki with 22.0km/hr, Ono-i-Lau and Udu-Point with 19.9km/hr. On the other hand, Keiyasi registered lightest winds with annual mean 10-minutes average wind of 4.1km/hr, followed by Lomaivuna with 5.7km/hr and RKS Lodoni with 5.9km/hr (Fig 16). Winds from the east to the southeast were the dominant wind directions at most of the sites.

Tropical cyclone Pola resulted in gale force winds over the Southern Lau Group in February 2019, with Ono-i-Lau registering maximum sustained wind of 64km/hr and gust of up to 96km/hr in the morning of the 28<sup>th</sup>. Later in the year, tropical cyclone Sarai brought storm to gale force winds at several places in Fiji between December 27<sup>th</sup> and 29<sup>th</sup>. The highest observed sustained wind was at Yasawa-i-Rara with 89km/hr, closely followed by Vunisea with 75 km/hr, Ono-i-Lau with 73km/hr and Nadi Airport with 71km/hr. The highest wind gust during the passage of Sarai was at Vunisea with 117km/hr, followed by Yasawa-i-Rara with 113km/hr, Nadarivatu with 112km/hr and Nadi Airport with 107km/hr.

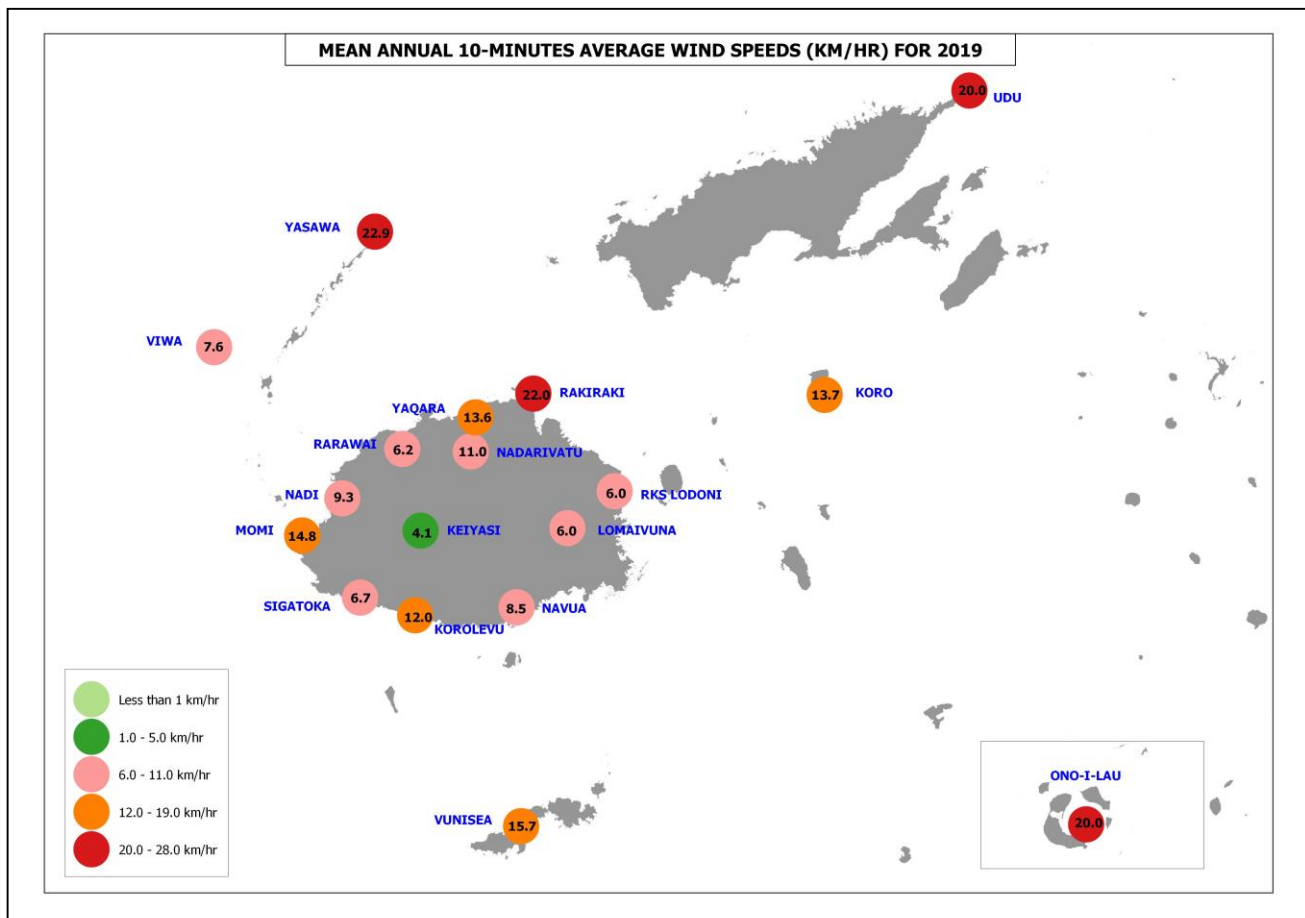
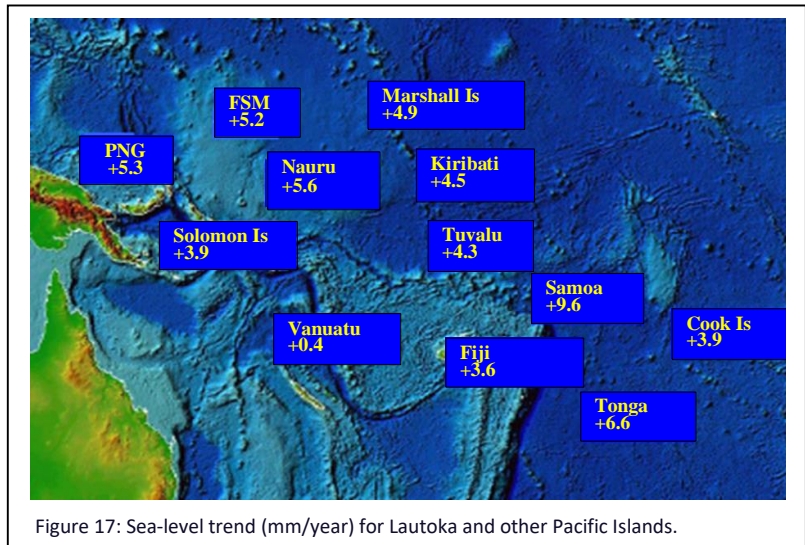


Figure 16: Mean annual 10-minute average wind speeds (km/hr) in 2019.

## Sea-level in 2019

The sea level at the Lautoka SEAFRAME station for the period October 1992 to December 2019 showed an increasing trend of +3.6mm/year which is statistically significant (95% confidence level). Similar trends were also observed in other Pacific Islands in the region (Fig 17). In 2019, the monthly mean sea level recorded in Lautoka for all months are higher than the long-term mean (Fig 18). However, caution should be exercised in interpreting the overall rate of movement of sea level since the records were too short to be inferring long-term trends and have not been corrected for land movement or other parameters that may influence the reported rates. The rates are relative to the SEAFRAME sensor benchmark.



### Lautoka Station

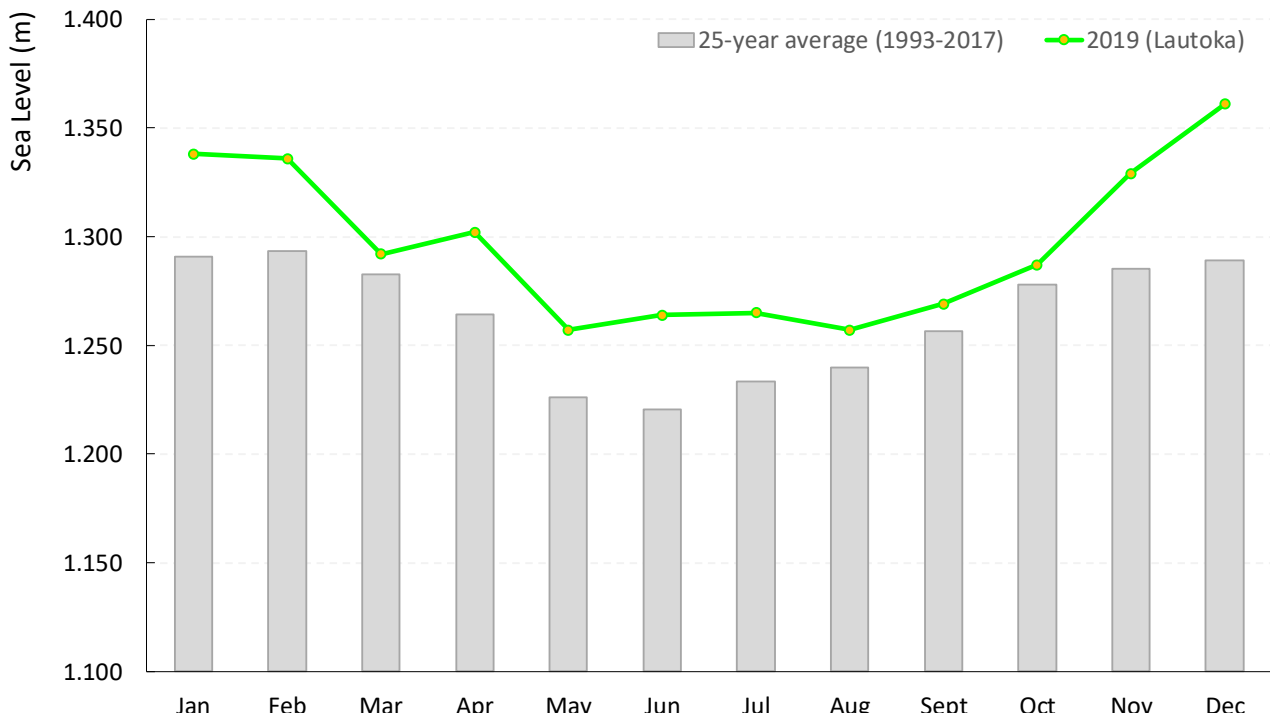
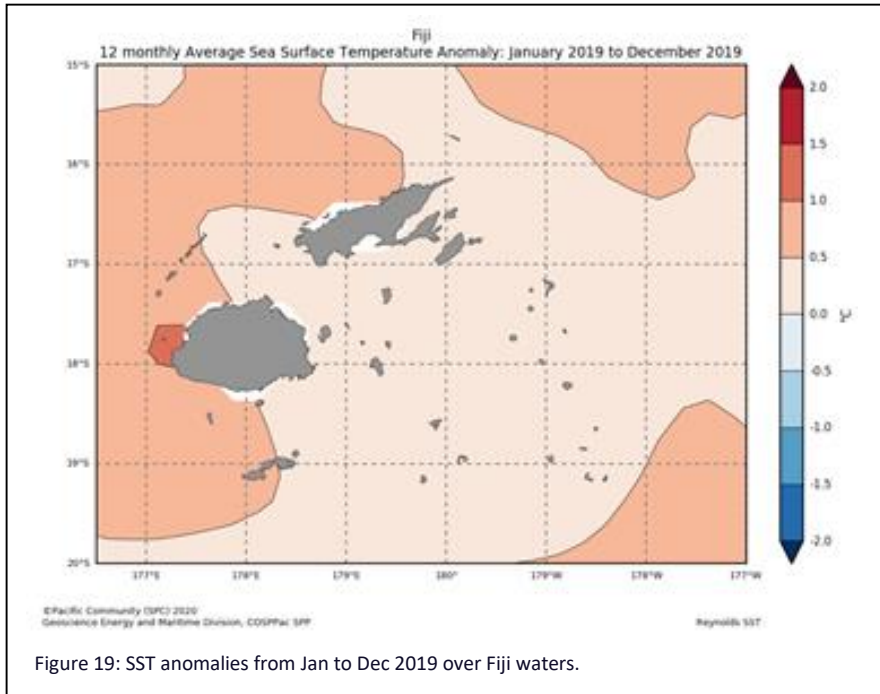


Figure 18: Monthly mean Sea level (Lautoka) in 2019 compared with the long-term average.

## Sea Surface Temperature in 2019

The year started with El-Niño Southern Oscillation neutral conditions and sea surface temperatures (SST) to the west of the International Date Line were warmer than average. In 2019, annual SST anomalies over Fiji waters were positive, particularly over the western, northern and Southern Lau waters (Fig 19).



On average, the annual (2019) SSTs range from 26°C to 29°C whereas the monthly SSTs range from 26.5°C to 33°C over Fiji waters. From January to April, average to above average SST anomalies were observed over Fiji waters. Positive SST anomalies slightly reduced for the month of May across the group. In June, these positive SST anomalies increased again from the western part of Fiji waters, further intensified and spread eastwards in July. A weakening trend was obvious in August. However, these positive SST anomalies intensified in September and reached its maximum in the month of October. A weakening trend was recorded thereafter.

## Tropical Cyclone Activities in 2019

In 2019, six tropical cyclones (TCs) formed in the Regional Specialized Meteorological Centre Nadi (RSMC-Nadi) area of responsibility (Fig 20). Three TCs (Pola, Oma & Rita) further developed and attained Category 3 intensity, two (2) Category 2 TCs and one Category 1 TC.

Out of the six, three TCs (Mona, Pola & Sarai) had direct and significant impact over Fiji. Storm and gale force winds, heavy rain, flooding and landslides were felt around the country during the passage of these TCs. Two casualties, associated with TC Sarai were recorded, which were drowning related incidents.

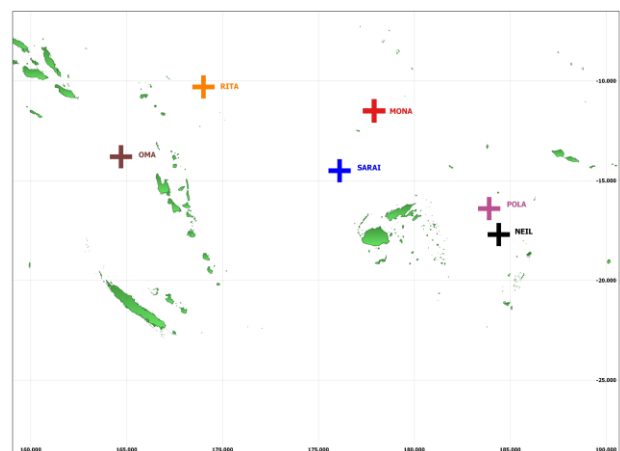


Figure 20: Points of TC Genesis for all TCs formed in 2019.

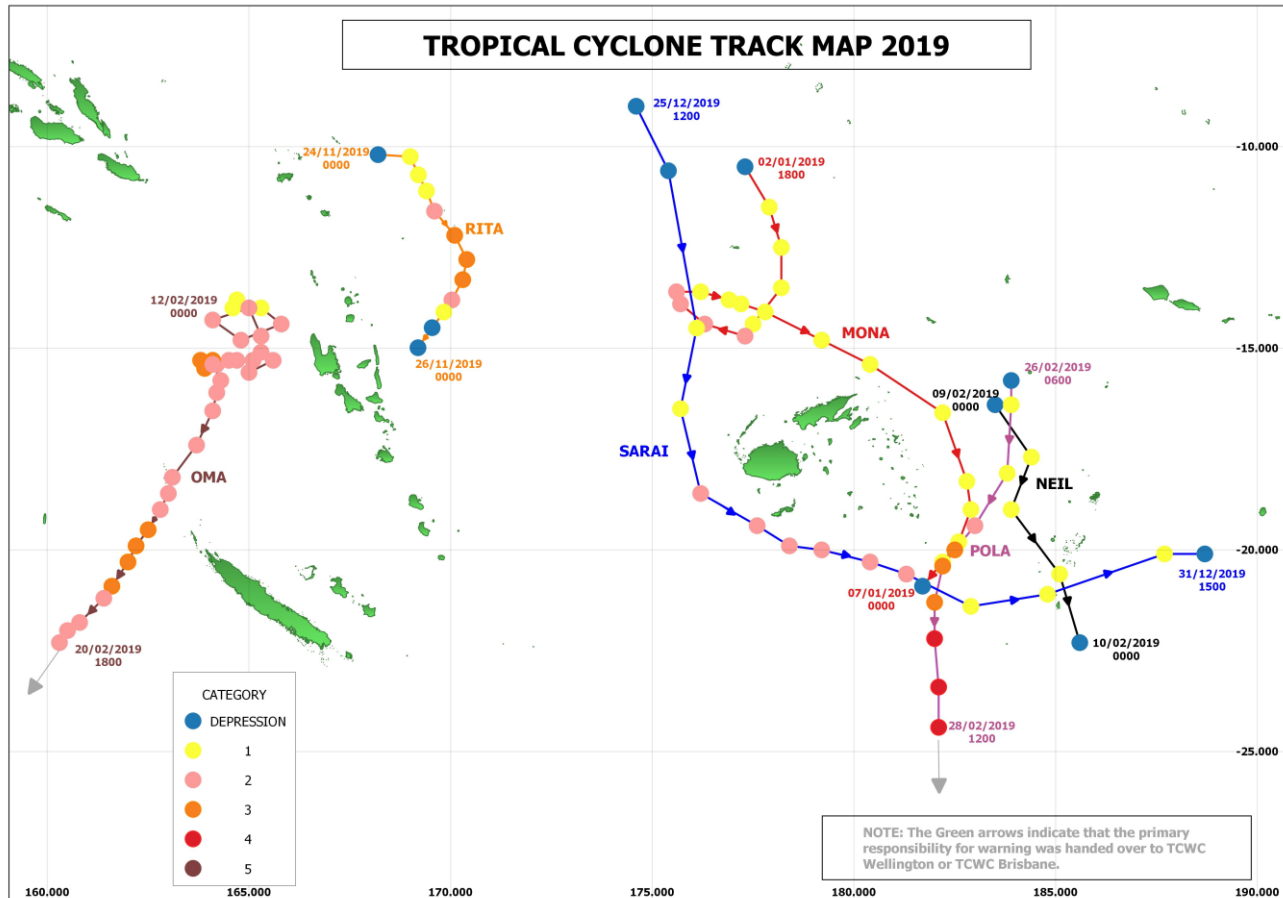


Figure 21: Tracks of all TCs monitored by RSMC-Nadi during 2019. A total of six (6) TCs (Mona, Neil, Oma, Pola, Rita & Sarai).

**TC Mona** was the first tropical cyclone (TC) to form in the 2018-19 TC season. Mona developed on January 3<sup>rd</sup>, attained maximum intensity of a Category 2 system with sustained winds of 50 knots and gusts of 70 knots. The system was named when it was to the northeast of Rotuma. It moved southward, intensified to a Category 2 system as it made a clockwise loop. Mona lived for 18-hours before showing signs of initial weakening and continued to track south-eastward. On January 5<sup>th</sup>, the system continued to weaken and finally lost its tropical cyclone status on the 7<sup>th</sup>. It continued to track southwards, away from the Fiji group. Mona including other tropical depressions (TD04F & TD05F) inflicted heavy rain which resulted in flooding and landslides around the country. No casualties were reported during this event.

In early February (9<sup>th</sup>), **TC Neil** was named while located between Fiji and Tonga. Neil was a Category 1 system as it tracked over southern Tonga. However, the system lived for only 18-hours before being downgraded to depression stage, south of Tongatapu. It did not have any significant and direct impact on Fiji with no casualties reported during the passage of Neil.

Few days later (February 12<sup>th</sup>), **Severe TC Oma** was named just to the west of Vanuatu. Oma was a slow moving system at this time and further intensified to a Category 2 system on February 13<sup>th</sup>. It lingered to the northwest of Vanuatu as a Category 2 system till midday on the 16<sup>th</sup>. On the same day (16<sup>th</sup>), between 0600UTC and 1800UTC, Oma further strengthened and attained a Category 3 system during this period. It then briefly weakened on February 17<sup>th</sup> before it strengthened into a severe TC (Cat 3) on February 19<sup>th</sup> while to the west of New Caledonia. Oma continued its southwest track, exited

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RSMC-Nadi area of responsibility (AoR) and returned to Australian region as a Category 2 system on February 21<sup>st</sup>. On February 22<sup>nd</sup>, Oma traversed again in RSMC-Nadi AoR, transitioned into a subtropical cyclone and continue tracking northeastward. It weakened further to a subtropical depression on February 25<sup>th</sup> and subsequently dissipated on February 28<sup>th</sup> near Vanuatu.

Towards February end (February 26<sup>th</sup>), the fourth (4<sup>th</sup>) TC was formed and named **Pola (Severe TC Pola)**. It was located within the vicinity of the Niuafo'ou group in Tonga. Pola was a midget cyclone and lived for almost 3 days. Upon formation, Pola tracked southward, between Fiji and Tonga, turned southwest and tracked very close to the Southern Lau group on February 27<sup>th</sup>. At this time, the system rapidly intensified and reached a Category 3 system within 12-hours. On February 28<sup>th</sup>, Pola turned southward and further intensified as it moved out of RSMC-Nadi's AoR. Severe TC Pola mainly affected the Southern Lau group, particularly the island of Ono-i-Lau and Vatoa, with torrential rainfall and storm force winds reported.

**Severe TC Rita** was the first tropical cyclone to be named in the 2019-20 season. Rita reached tropical cyclone intensity on November 24<sup>th</sup> at 0600UTC near the Santa Cruz Islands. It continued to intensify under favorable atmospheric conditions, attained a Category 2 strength on November 25<sup>th</sup> at 0000UTC and rapidly intensified to a Category 3 system six hours later. It continued to slowly track south-eastward and moved into an unfavorable area of high wind shear and cool dry air. As a result, Rita rapidly weakened and downgraded to a tropical depression on November 26<sup>th</sup> as it moved closer to the northern part of Vanuatu. Rita had no significant impact on the Solomon Islands and Vanuatu as it spent its lifetime over open waters.

**TC Sarai** formed towards the end of December and was named at midnight on the 26<sup>th</sup>, while it was 240km south-southwest of Rotuma. Sarai continued to track southward, to the west of the Fiji group at this time. At midnight on December 27<sup>th</sup>, the system further intensified into a Category 2 system and was located about 220km west of Nadi. At this point, Sarai took a southeast track and passed just to the south of Kadavu. It continued its southeast path as a Category 2 system through the southern Lau Group, before exiting the Fiji Waters on December 30<sup>th</sup>. During Sarai's passage, significant rainfall was observed which led to flooding in some parts of Fiji. There were two casualties reported during this event, one in Naitasiri and the other in Kadavu, both victims of drowning.

# Notable Weather Events in 2019

## A. Flooding & Landslides due to Tropical Cyclone Mona – January

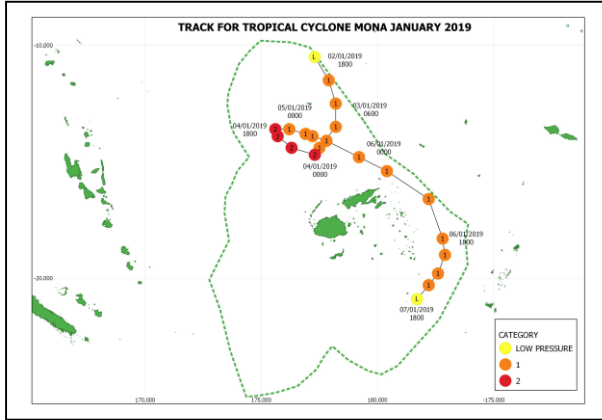


Figure 22: Best track for Tropical Cyclone Mona, 2<sup>nd</sup> to 7<sup>th</sup> Jan, 2019.

The year 2019 started with an active South Pacific Convergence Zone with three Tropical Disturbances (TD03F, TD04F & TD05F) embedded in it. On January 1<sup>st</sup>, TD03F was lingering close to Fiji with significant rainfall recorded over Northern and Eastern parts of the country.

On January 3<sup>rd</sup>, TD04F further intensified, upgraded to Tropical Cyclone (TC) status and named TC ‘Mona’ when it was located to the northeast of Rotuma. It gradually moved south and tracked just to the northeast of the Fiji group (Fig 22).

As a result, heavy rainfall was recorded across the country during the passage of TC Mona (Fig 23). The highest 24-hour rainfall was observed at Lakeba with 159.0mm on the 4<sup>th</sup>, followed by Udu Point on the 2<sup>nd</sup>, Korolevu on the 4<sup>th</sup> and Savusavu Airfield on the 6<sup>th</sup>, all recorded 146.0mm. Similarly, near-gale force winds of 53km/hr, gusting to 81km/hr was recorded in Vanuabalavu and sustained winds of 59km/hr, gusting to 90km/hr in Ono-i-lau during the passage of Mona.

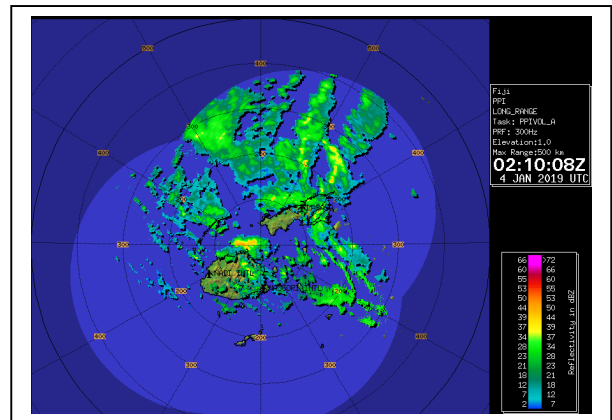


Figure 23: Weather radar image on 4<sup>th</sup> January 2019 showing widespread rain across the Fiji group.

Furthermore, heavy rainfall associated with TC Mona leads to flooding of low lying areas, crossings in the Northern, Central and Eastern divisions including some landslides (Fig 24 a, b, c).



Figure 24: Flood pictures at (a) Korotari crossing on Jan 5<sup>th</sup>, (b) Vunika settlement in Labasa, Jan 6<sup>th</sup> & (c) Land slide in Savusavu on Jan 4<sup>th</sup> 2019.



## B. Flooding due to a slow moving Trough - October

A trough of low pressure moved over Fiji from the west on October 6<sup>th</sup> and brought showers over most places. This trough intensified while lingering over the group which resulted in periods of heavy rain and thunderstorms observed on October 7<sup>th</sup>, particularly over the eastern part of Viti-levu. During this event, Suva recorded the highest 24-hour rainfall of 255.0mm on the 7<sup>th</sup> followed by RKS Lodon with 229.5mm and Nausori Airport with 169.5mm on the 6<sup>th</sup>. Localized flooding was experienced, especially along the Suva-Nausori corridor.

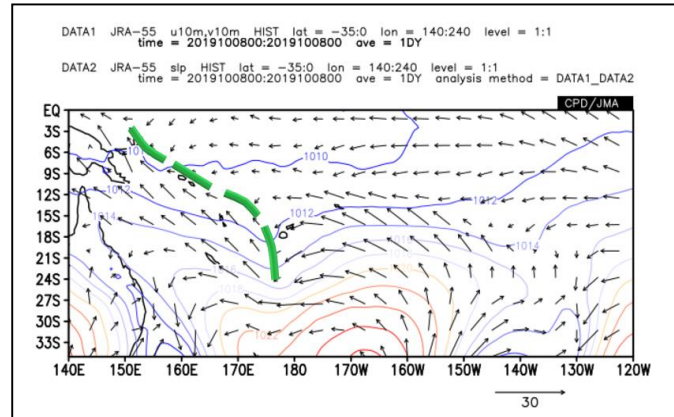


Figure 25: A composite image of surface winds (u,v) and sea-level pressure on October 8<sup>th</sup>, 2019 from JRA-55.

Local media reported Laqere River bursting its banks on October 7<sup>th</sup>, 2019 and flooding of low-lying areas including roads (Fig 26). Few households in Veriaisi were evacuated as a precautionary measure due to flooding.



Figure 26: Laqere River burst its banks on October 7, 2019 as heavy rain continued to affect Fiji. Photo: Facebook/Josateki Cama.



Figure 27: Flooding at Vuci Irrigation road on October 8, 2019. Photo: Supplied to Fiji Times.

## Fiji Meteorological Service Observational Network

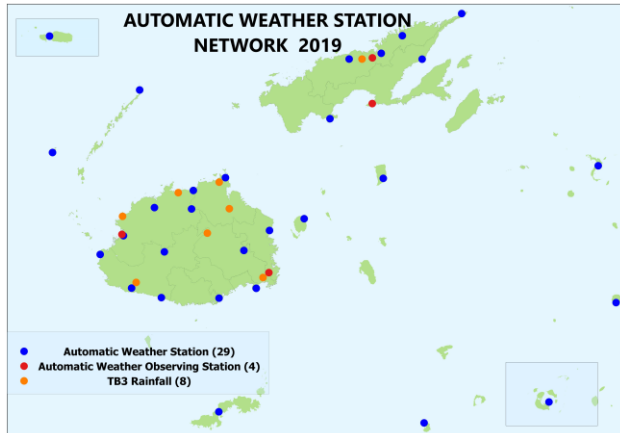


Figure 28: Network of Automatic Weather Stations as of Dec 2019.

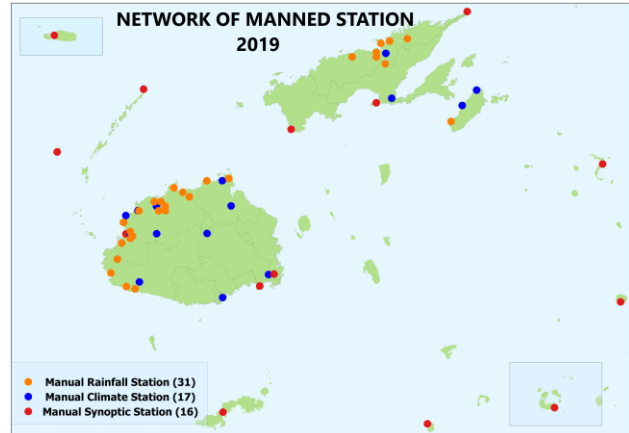


Figure 29: Network of Manned Weather Stations as of Dec 2019.

Fiji Meteorological Service (FMS) currently operates an observation network of 64 manned observation stations, 41 automatic weather stations (AWS) and one upper air observatory. All AWS measure rainfall and 80% of AWS measure other meteorological elements such as temperature, wind, pressure, relative humidity, etc. This observation network forms the basis of climate data used to compile this report.



Figure 30: Sample old record from Rarawai

Amongst the FMS observation network, Rarawai station is one of Fiji's oldest and longest serving station which is located at the Rarawai Sugar-cane Research Centre. Since its establishment in 1887, observers like Amit Raj Singh (Scientific Officer at the Research Centre) had taken monthly records of temperature and rainfall continuously. Daily readings started in 1905 to date.

The AWS network came into existence in October 2010 which significantly expanded the network coverage of weather and climate observations in Fiji. However, due to the recurring faults of the AWS systems, FMS continue to rely on data from the Climate, Synoptic and Rainfall manual stations.

Finally, with the focus of analyzing long-term climate trends and establishing climatological averages, only stations with continuous long-term (at least 30 years) records were used. In total, eight (8) stations were used to for this purpose.

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This Summary 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 Summary and its contents. The contents of the Summary 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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