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# **Consensus Seasonal Weather Outlook**

# March, April and May(MAM2024)

# Seasonal Rainfall and Temperature for Sri Lanka

# These forecasts are prepared using

- The prevailing global climate conditions.
- Forecasts from different climate models from around the world.
- Statistical downscaling of GCM output using CPT

Issued by Centre for Climate Change Studies (CCCS)

and

**Research Division** 

#### 1. Prevailing global climate conditions

During the last four weeks, equatorial SSTs were above average across most of the Pacific Ocean, the Indian Ocean, and the Atlantic Ocean(Fig 01) and above-average SSTs weakened across most of the equatorial Pacific Ocean(Fig 02). (NOAA CPC).

### El Nino and La Nina update

A transition from El Niño to ENSO-neutral is likely by April-June 2024 (79% chance), with increasing odds of La Niña developing in June-August 2024 (55% chance). Prevailing El Niño is expected to continue for the next several months, with ENSO-neutral favored during May-June 2024 (73% chance (Fig 3a)) (NOAA CPC).



Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)



Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)



Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast



1.1.1 Impacts of El-Niño on monthly rainfall anomaly during March, April and May

Fig 3b: Monthly Rainfall Anomaly maps of the months of March(A), April (B) and May (C) during El-Niño years (Hapuarachchi et al 2016)

A research conducted by the Department of Meteorology, it has been found that, most parts of the country had experienced below normal rainfall during the month of March and slightly above normal rainfalls were observed Anuradhpura, Trincomalee, Kilinochch, Jaffna and Kurunegala districts and below normal over remaining areas during the month of April. During the month of May it has been observed below normal rainfalls in some areas in Western, Southern and Central parts of the country and above normal rainfalls are possible in remaining areas during past El Nino conditions (Fig 3b(C)).

### 1.2 The Indian Ocean Dipole (IOD) update

The Indian Ocean Dipole (IOD) is currently neutral, with the IOD index being -0.05 °C for the week ending 18 February 2024. Most of the International climate models suggest IOD values will remain neutral until at least April.(source- BOM,Australia).



Figure 4a: IOD forecast from Australian Bureau of Meteorology

# 2. Forecasts from different climate models from around the world

### 2.1 March to May (MAM) 2024 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 12 Global Producing Centers (GPC) for MAM season. According to that there is no clear signal indicated for MAM 2024 season. Therefore it can be expected below or about or above normal rainfall during March–May (MAM) 2024 season.



Fig 5: Probabilistic multi model ensemble forecast for MAM using dynamical models from 12 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the MAM season. Out of 12 GPC individual models, 2 GPC models predicted below normal rainfall over the country and 1 GPC model predicted above normal rainfall and there is no clear signal indicated in 9 GPC models. Accordingly below, about or above normal rainfalls can be expected over the country during MAM 2024 season.



Fig 6: Individual forecasts for MAM 2024 season by dynamical models from 12 WMO global producing centers (GPC).

#### 2.2 Monthly Forecast for March, April and May 2024

Figure 7 shows the probabilistic multi model ensemble forecasts, which are prepared by using dynamical models from 12 global producing centers (GPC), for the months of March, April and May 2024. According to that during the month of March it can be expected below normal rainfall over the country. During the month of April near normal rainfalls are likely over Northwestern coastal areas and there is no clear signal indicated over remaining areas of the country. During the month of May it can be expected above normal rainfall over Southern, Sabaragamuwa, Central and Uva provinces and Ampara districts. There is no clear signal indicated over remaining areas of the country areas of the country. Accordingly above, about or below normal rainfall can be expected over no signal area during the season.



Fig 7: Probabilistic multi model ensemble forecast for March (left), April (middle) and May (right) 2024 using dynamical models from 12 WMO global producing centers (GPC).



Fig 8: Individual forecast for March 2024 by dynamical models from 12 WMO global producing centers (GPC).

Figure 8 shows the 12 monthly forecasts from individual global producing centers (GPC) for March 2024. Out of 12 GPC forecasts, 8 GPC models predicted below normal rainfalls over the country. There is no clear signal indicated in 4 GPC models. Accordingly below normal rainfalls are expedted over the country during the month of March 2024.



Fig 9: Individual forecast for April 2024 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for April 2024. Out of 12 GPC forecasts, 1 GPC model predicted below normal rainfalls and 1 model predicted above normal rainfall over the country. There is no clear signal indicated in 10 GPC models. Accordingly below, about or above normal rainfalls can be expected over the country during the month of April 2024.



Fig 10: Individual forecast for May 2024 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from 12 individual global producing centers (GPC) for May 2024. Out of 12 GPC forecasts, 2 GPC models indicate below normal rainfall and 7 GPC models indicate above normal rainfall over Southwestern parts of the country. There is no clear signal indicated in 3 GPC models. Accordingly it can be expected slightly above normal rainfall over the Southwestern parts of the country during the month of May 2024.

# 3. Statistical downscaling of CFSv2 global forecast output

# 3.1 <u>Probabilistic rainfall forecast for MAM season 2024 using Climate Predictability tool</u> (CPT)

The following district wise probabilistic rainfall forecasts for the season of MAM 2024 have been prepared with the multi model ensemble method to downscale, SST data of CFSv2, CCSM4, GFDL and ECMWF by using CPT.

The district wise 30 year average rainfalls during MAM season are given in the column 2 of the table 1. Chance (probability) of receiving below/about/above average is given in the columns 3, 4, and 5 respectively in the table 1.

District	Average rainfall (mm) –MAM (1981-2010)	Probability%		
		Below	Normal	Above
Colombo	757.9	50	30	20
Kalutara	990.1	60	25	15
Galle	865.9	50	30	20
Matara	651.7	20	20	60
Hambantota	256.4	20	20	60
Ampara	208.7	20	20	60
Batticaloa	172.9	20	20	60
Trincomalee	172.7	20	20	60
Mullaithivu	161.8	20	20	60
Jaffna	111.5	20	30	50
Killinochchi	137.4	20	25	55
Mannar	208.6	30	25	45
Puttalam	321.5	30	30	40
Gampaha	638.0	40	30	30
Kegalle	868.9	30	30	40
Ratnapura	847.6	20	20	60
Monaragala	333.6	20	20	60
Badulla	423.2	20	20	60
Pollonnaruwa	230.6	20	20	60
Vavuniya	200.4	20	20	60
Anuradapura	254.7	20	25	55
Kurunegala	408.8	25	30	45
Matale	356.0	20	20	60
Kandy	447.9	20	20	60
Nuwaraeliya	589.1	20	20	60

**Table 1:** Probabilistic Rainfall Forecast for MAM season 2024 using CPT



Fig 11: Probabilistic rainfall forecast for March -May 2024 using CPT

According to the CPT (Fig 11 and table 01), below normal rainfalls can be expected in Colombo, Kalutara and Galle districts. There is no clear signal indicated in Puttalam, Gampaha and Kegalle districts and above normal rainfalls are expected over remaining areas of the country. Accordingly equal chances exist of receiving below, about or above normal rainfall over no signal areas of the country for MAM Season 2024.

## 3.2 Multi-model ensemble mean forecast of NMME models

This probabilistic forecast is developed by combining direct Forecasts from 5 NMME models (CFS, CanSIPS, GFDL, COLA and NASA) with the forecasts obtained by statistically processing of each models.

According to the model above normal rainfalls are expected in most parts of the country (Figure 12) during the MAM 2024 season.



Fig 12. Average probability forecast of NMME models for MAM 2024

### 3.3 Probabilistic rainfall forecast for MAM 2024 season using RIMES FOCUS System



Fig 13. Probabilistic rainfall forecast for March-May 2024 using RIMES FOCUS System

Figure 13 depicts the Probabilistic rainfall forecast for MAM 2024 season, which has been prepared by using RIMES FOCUS System. According to the model outputs near or above normal rainfalls are likely over Southern, Eastern, Uva and Central parts of the country. No clear signal indicate for other areas of the country for MAM season 2024.

# 4. SUMMARY :

SUMMARY of MODEL FORECAST for MAM 2024 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	СРТ	FOCUS	Impact of Global conditions	Final Rainfall Forecast
MAM season 2024	No Signal	No Signal	BN- Colombo, Kalutara, Galle No Signal- Puttalam, Gampaha, Kegalle AN - Elsewhere	NN or AN – Southern and Southwestern parts BN- Elsewhere		Near normal over SW and no signal for other areas
March 2024	BN	BN	No Signal – Kalutara district AN - Elsewhere			Below normal rainfalls are likely over most parts
April 2024	NN – Northwestern coastal areas No Signal - Elsewhere	No Signal				Near normal over Western,Southern and Sabragamuwa provinces and No signal for other areas.
May 2024	AN-Southern, Sabaragamuwa, Central and Uva provinces and Ampara districts No Signal - Elsewhere	AN- Southwester n parts				Above normal rainfalls are likely over Western, Southern, Sabaragamuwa and Central provinces with a chance of near normal over Uva, Northcentral and Northwestern provinces and no signal for Northern and Eastern provinces.

Table 2: Summery of Model Forecasts for MAM season 2024

**BN**: Below Normal**NN**: Near Normal**AN**: Above Normal**4.1 Summery of prevailing global climate conditions** 

**CP**: Climatological Probability

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A transition from El Niño to ENSO-neutral is likely by April-June 2024 (79% chance), with increasing odds of La Niña developing in June-August 2024 (55% chance). Prevailing El Niño is expected to continue for the next several months, with ENSO-neutral favored during May-June 2024 (73% chance (Fig 3a)) (NOAA CPC).

The Indian Ocean Dipole (IOD) is currently neutral, with the IOD index being -0.05 °C for the week ending 18 February 2024. Most of the International climate models suggest IOD values will remain neutral until at least April.(source- BOM,Australia).

# 5. Consensus Seasonal outlook for March, April and May 2024

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, consensus forecasts for March to May 2024 season is concluded as follows.

## 5.1 Rainfall forecast for the three months period during March-April-May (MAM) 2024

Near normal rainfalls are likely over Southwestern parts and no clear signal indicated for other areas of the country during the March- May 2024 season. Equal probabilities are exist for having below or near or above normal rainfalls over the no signal indicated areas. (Fig. 14).



Fig 14. Consensus Probabilistic rainfall forecast for March-May 2024

# 5.2 Rainfall forecast for March 2024

There is a higher chance of having below normal rainfall over most parts of the country during the month of March 2024.

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#### 5.3 Rainfall forecasts for April 2024

There is a chance of having Near normal rainfall over Western, Southern and Sabragamuwa provinces and no clear signal indicated for remaining areas of the country during the month of April 2024.

### 5.4 Rainfall forecasts for May 2024

There is a possibility of having above normal rainfalls over Western, Southern, Sabaragamuwa and Central provinces with a chance of near normal rainfalls over Uva, Northcentral and Northwestern provinces. There is no clear signal indicated for Northern and Eastern provinces where having equal probability for below or near or above during the month of May 2024.

In addition to that, there is a possibility for developing atmospheric disturbances, low pressure areas or depressions over and vicinity of Sri lanka during the latter half of the month.

\*\*In addition, the predictability is also limited due to strong day-to-day atmospheric variability caused by the passage of the synoptic scale systems such as lows and depressions. Intraseasonal Oscillations such as Madden Julian Oscillations (MJO) is also another atmospheric phenomena which can't be underestimated.

## 5.5 Probabilistic Temperature Forecast from March to May 2024 (MAM 2024)

The probabilistic Temperature forecast for March, April and May 2024 (MAM 2024) season for Sri Lanka as given below.



No Signal
🚫 Not Available

Fig 15: Probabilistic forecast for Maximum Temperatures for MAM season 2024

Fig 15 and Table 3 show the probabilistic forecast for Maximum Temperatures during MAM season 2024.

There is a higher chance of experiencing slightly above the normal Maximum Temperatures in Vavuniya, Mannar, Anuradhapura, Puttalam, Kurunegala, Gampaha, Colombo, Galle, Hambantota,

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Ratnapura, Kandy, Nuwara Eliya, Ampara and Trincomalee districts and slightly below the normal Maximum Temperatures in Badulla district(Fig 15) for the MAM season 2024.

The district wise average Maximum Temperatures are given in the column 2 of the table 3 and the chance (probability) of receiving below/about/above averages are given in the columns 3, 4, and 5 respectively.

District	Average Maximum Temperature ( <sup>0</sup> C) – (MAM) (1981-2010)		Probability <sup>o</sup>	%
		Below	Normal	Above
Anuradhapura	34.5	30	30	40
Badulla	30.7	40	30	30
Batticaloa	32.1	35	35	30
Colombo	31.8	25	25	50
Galle	31.0	25	25	50
Hambantota	31.4	25	20	55
Katugastota	31.1	25	25	50
Katunayake	32.3	30	30	40
Mannar	32.7	30	30	40
MahaIlluppallama	33.7	30	30	40
NuwaraEliya	22.1	25	25	50
Pottuvil	33.0	30	30	40
Puttalam	32.9	30	30	40
Ratnapura	33.1	25	25	50
Ratmalana	32.5	30	20	50
Trincomalee	33.3	30	30	40
Vavuniya	34.6	30	30	40
Kurunegala	33.7	25	25	50
Bandarawela	26.5	40	30	30

Table 3: probabilistic forecast for Maximum Temperature for MAM season 2024



# No Signal

16:

Fig

District	Average Minimum Temperature ( <sup>0</sup> C) – (MAM) (1981-2010)	Probability %		
		Below	Normal	Above
Anuradhapura	24.4	25	25	50
Badulla	19.1	30	30	40
Batticaloa	25.2	25	25	50
Colombo	25.1	25	25	50
Galle	25.2	25	25	50
Hambantota	25.0	25	20	55
Katugastota	21.0	30	30	40
Katunayake	24.5	30	20	50
Mannar	26.0	30	30	40
Mahallluppallama	23.6	25	25	50
NuwaraEliya	12.0	30	25	45
Pottuvil	24.2	30	30	40
Puttalam	24.8	40	30	30
Ratnapura	23.5	25	25	50
Ratmalana	24.9	20	30	50
Trincomalee	25.7	30	30	40
Vavuniya	23.6	40	30	30
Kurunegala	23.6	40	30	30
Bandarawela	16.7	30	30	40

Probabilistic forecast for Minimum Temperatures for MAM season 2024

Table 4: Probabilistic forecast for Minimum Temperatures for MAM season 2024

Fig 16 and Table 4 provide the probabilistic forecast for Minimum Temperatures during MAM season 2024.

Accordingly, there is a higher chance of experiencing slightly above the normal Minimum Temperatures in Mannar, Anuradhapura, Gampaha, Colombo, Galle, Hambantota, Ratnapura, Kandy, Nuwara Eliya, Badulla, Ampara, Trincomalee and Batticaloa and slightly below the normal Minimum Temperatures in Puttalam, Kurunegala and Vavuniya districts (Fig 16) during MAM season 2024.

Note- Temperature forecasts are not available in Matara, Kegalle, Kalutara, Monaragala, Polonnaruwa, Jaffna, Killinochchi, Mullativu and Mathale districts due to unavailability of Climate data.