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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook

October, November and December (OND)

Seasonal Rainfall and Temperature for Sri Lanka

This forecast was prepared using

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

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And

Research Division

Prevailing global climate conditions

ENSO-neutral conditions are continued in September 2019. Equatorial sea surface temperatures (SSTs) are above average across the western Pacific Ocean and are below average in the eastern Pacific (Figs 1and 2) consistent with ENSO-neutral.

ENSO-neutral is favored during the OND 2019 (~75% chance), continuing through early 2020 (55-60% chance) (Fig 3 A) (Climate Prediction Center, USA).

Positive IOD values are likely to persist for next several months (Fig 3 B). Majority of models predict positive IOD are likely to be dominant driver until end of this year (BoM, Australia).
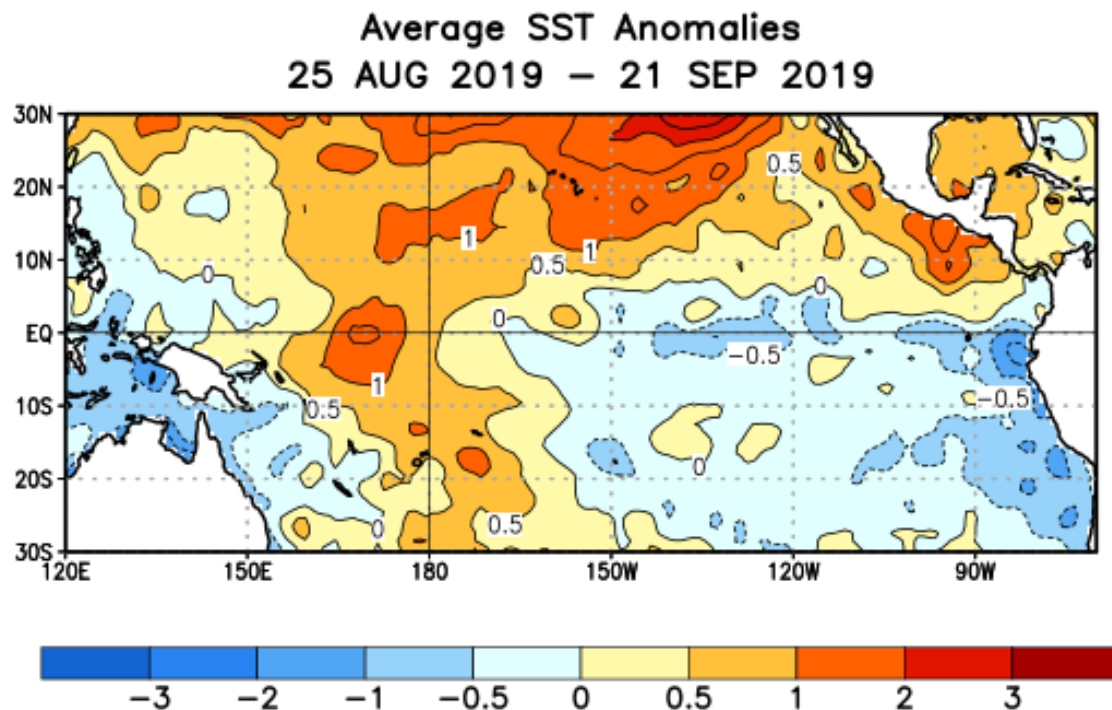

Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)
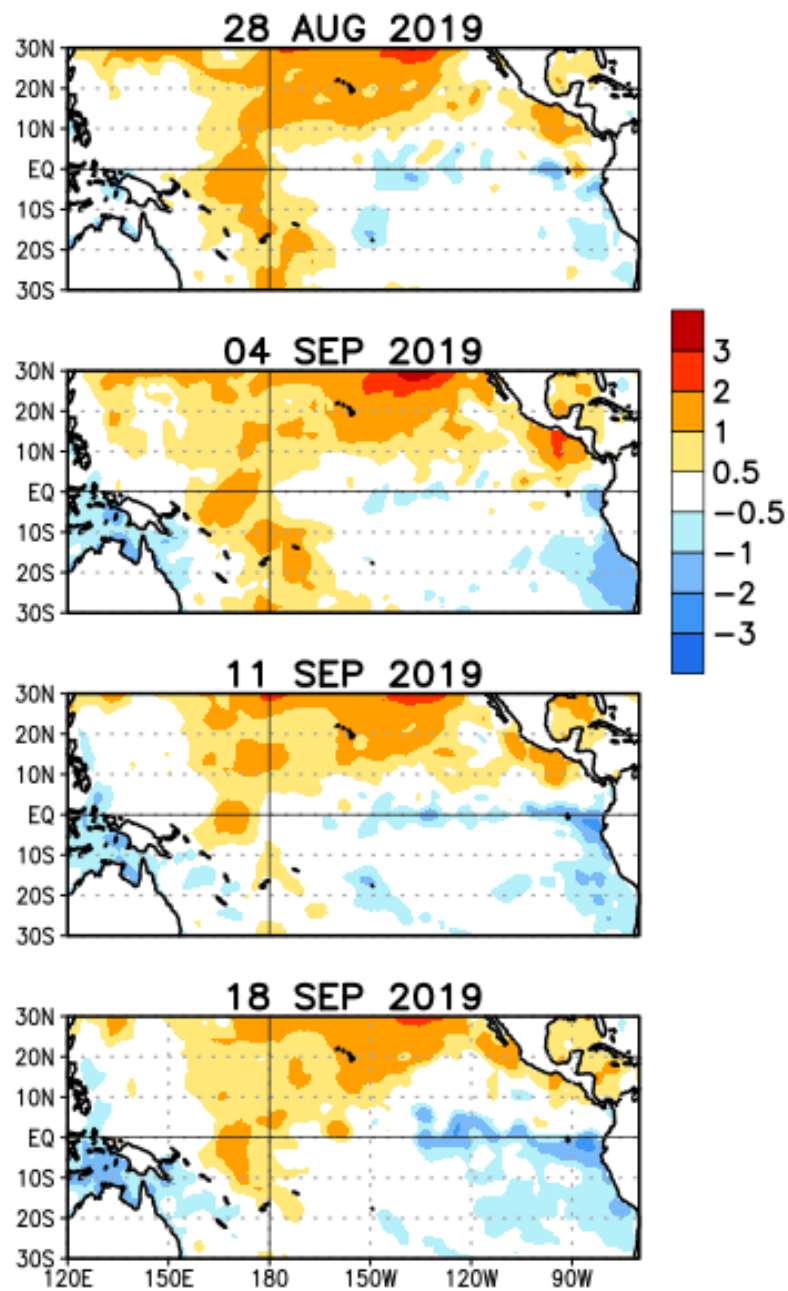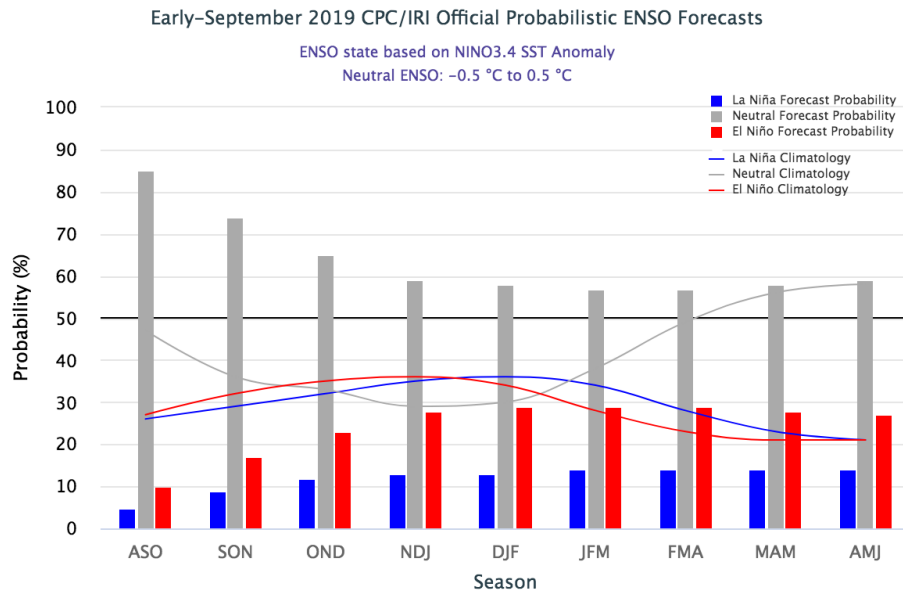
Weekly SST Anomalies (DEG C)

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

(A)

Early–September 2019 CPC/IRI Official Probabilistic ENSO Forecasts

ENSO state based on NINO3.4 SST Anomaly
Neutral ENSO: −0.5 °C to 0.5 °C

(B)

Monthly sea surface temperature anomalies for IOD region

Model run: 14 Sep 2019
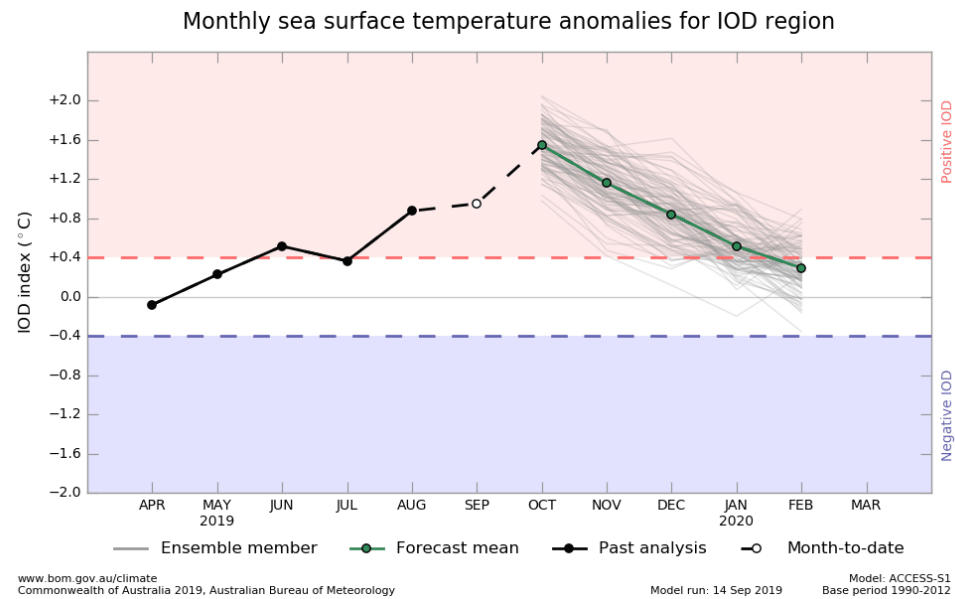
Model: ACCESS-S1
Base period 1990-2012

Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast (A) and IOD forecast from Australian Bureau of Meteorology (B).

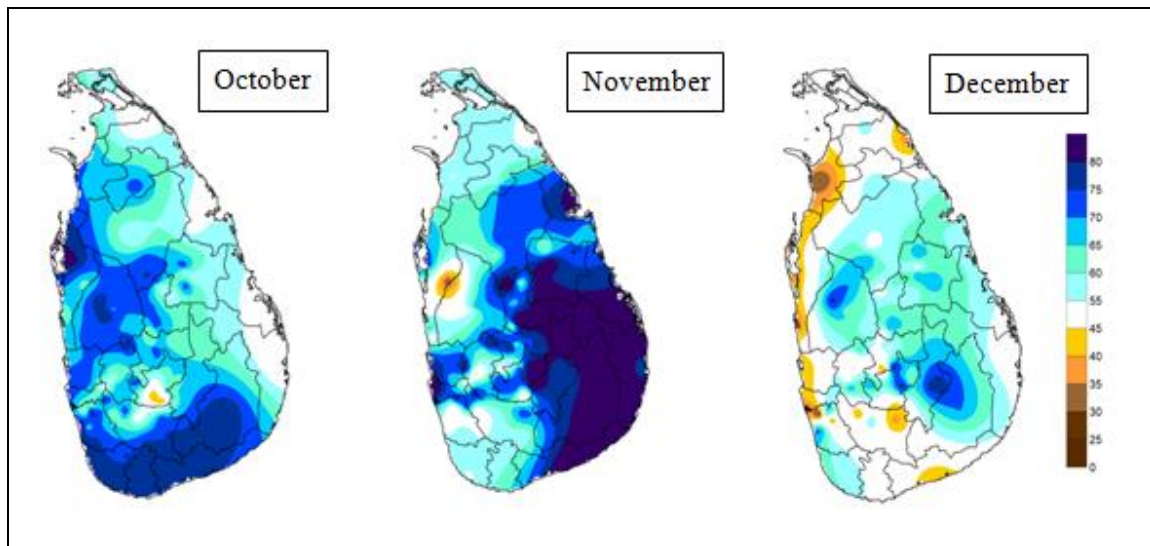**Impact of positive Indian Ocean Dipole (+IOD) on October, November and December Rainfall in Sri Lanka**

Fig3b: Composite maps of Probability of receiving above median Monthly Rainfall during October (A), November (B) and December(C) during Positive IOD years (Hapuarachchi et al Unpublished)

Previous studies conducted by the Department of Meteorology, identified that increase of rainfall in southern and western parts of the Island in October. Enhance rainfall is evident especially in eastern parts of the Island in November Slightly enhanced rainfall is evident in month of December except along western and north western coastal areas where negative rainfall is apparent (Fig 3b) for positive IOD years. Predicted global climate conditions, such as positive IOD in October, November and December 2019 favor above normal rainfall during the season.

(a) Forecasts from different climate models from around the world.

(a.1) For OND 2019 season

Figure 4 shows the probabilistic multi model ensemble forecast using dynamical models from 12 global producing centers (GPC) for OND season. According to the figure there is a possibility of receiving slightly above normal rainfall except northern parts of Sri Lanka during OND 2019

Probabilistic Multi-Model Ensemble Forecast
CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Pretoria,Seoul,Tokyo,Toulouse,Washington

Precipitation : OND2019   (issued on Sep2019)
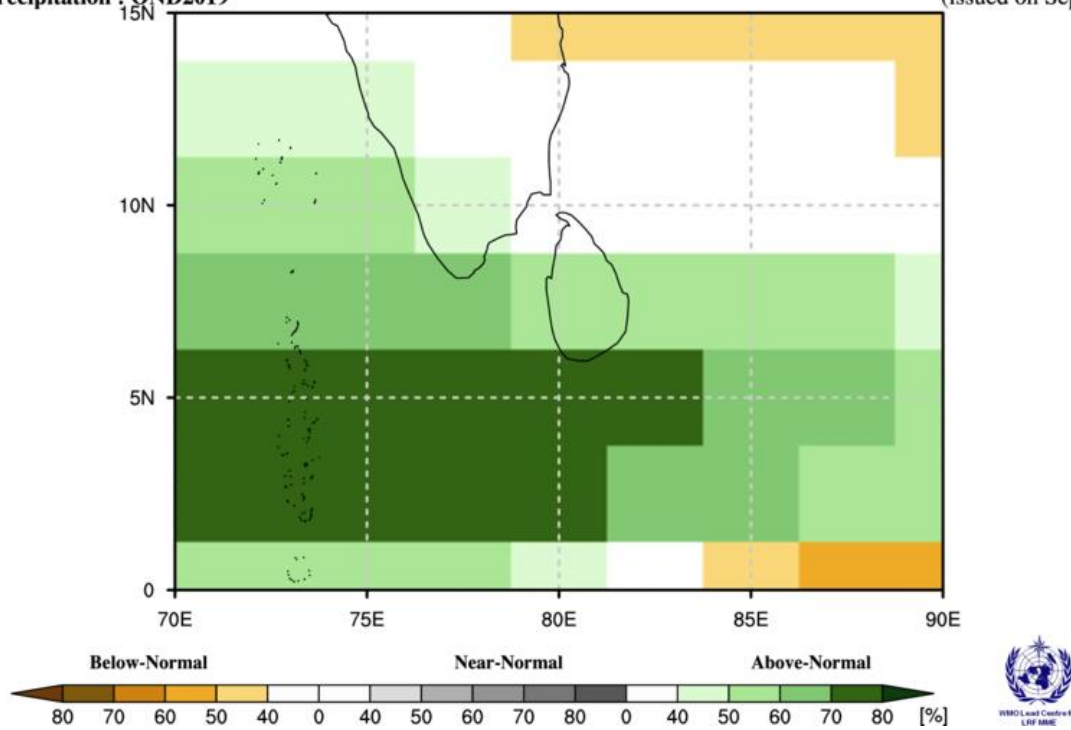

Fig 4: Probabilistic multi model ensemble forecast for OND using dynamical models from 10 WMO global producing centers (GPC).

Out of 12 GPC individual models 8 predicted above normal rainfall during the OND season (Fig.5). Accordingly there is a higher probability of receiving above normal rainfall for Sri Lanka while the 4 GPC predict no signal during the OND season.

Lat : 0~15, Lon : 70~90
Precipitation : OND2019
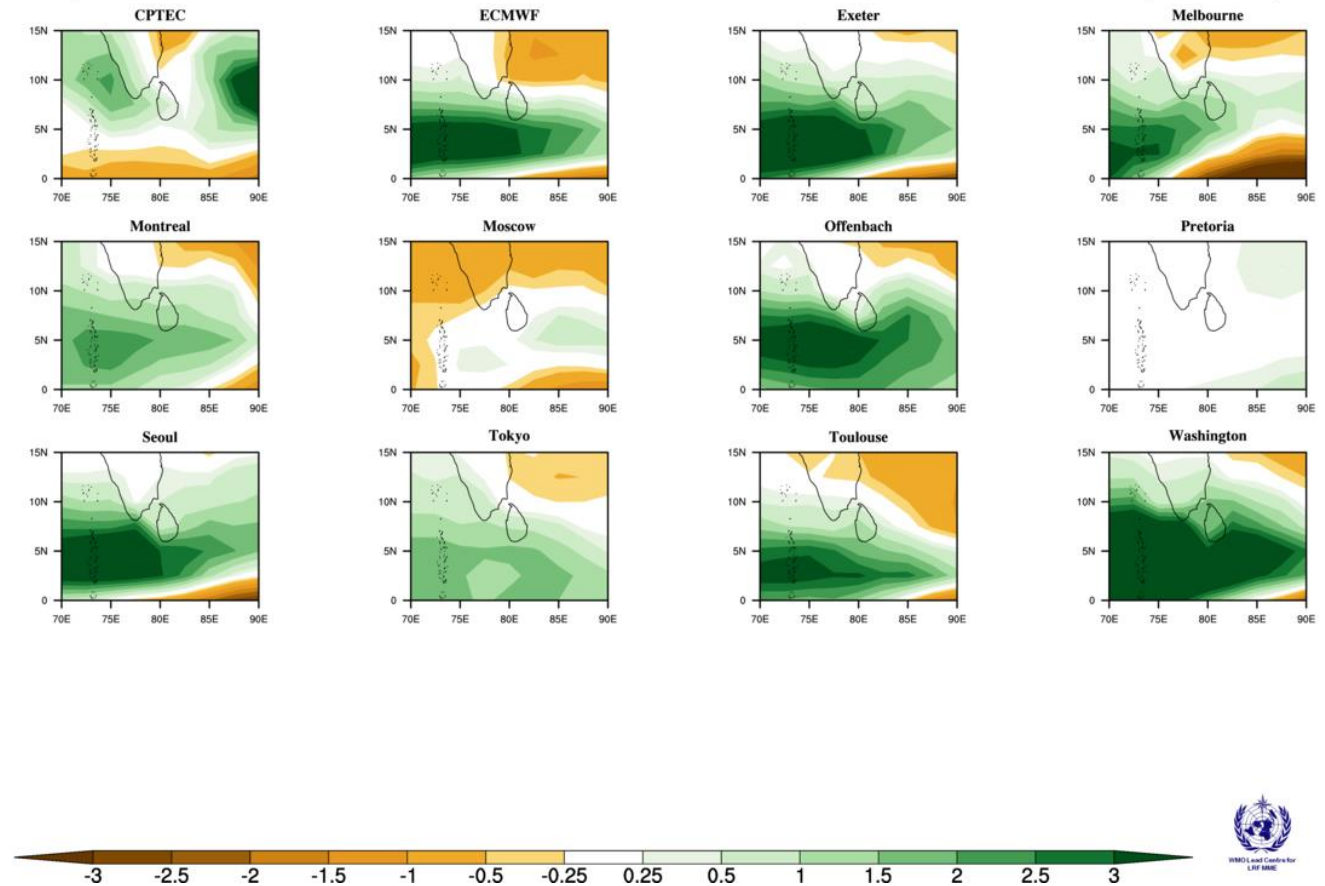
[Unit : mm]
(issued on Sep2019)

Fig 5: Individual forecast for OND season by dynamical models from 13 WMO global producing centers (GPC).

(a.2) Forecast for October, November and December 2019

Figure 6 shows the probabilistic multi model ensemble forecast by using dynamical models from 12 global producing centers (GPC) for the months of October, November and December 2019. According to Figure 6, above normal rainfall can be expected during the months of October and November. There is no signal for the month of December 2019. It indicates equal chances of receiving below normal, about normal or above normal rainfall over the Island during December 2019 (Fig 6).
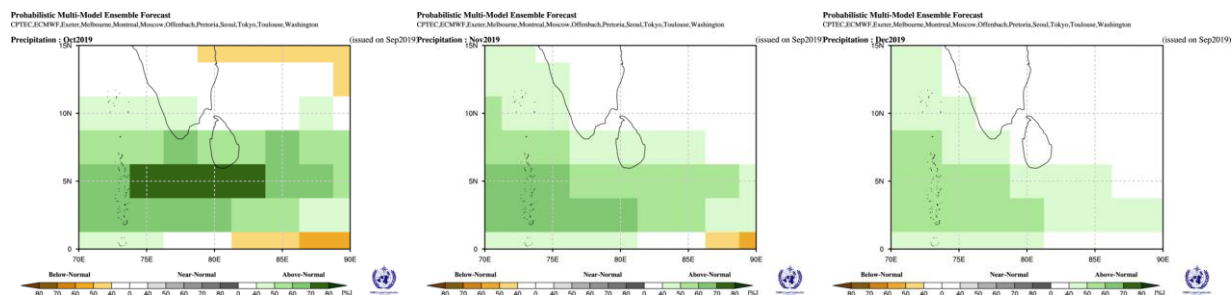
Fig 6: Probabilistic multi model ensemble forecast for October (left), November(middle) and December 2019 (right) using dynamical models from 10 WMO global producing centers (GPC).
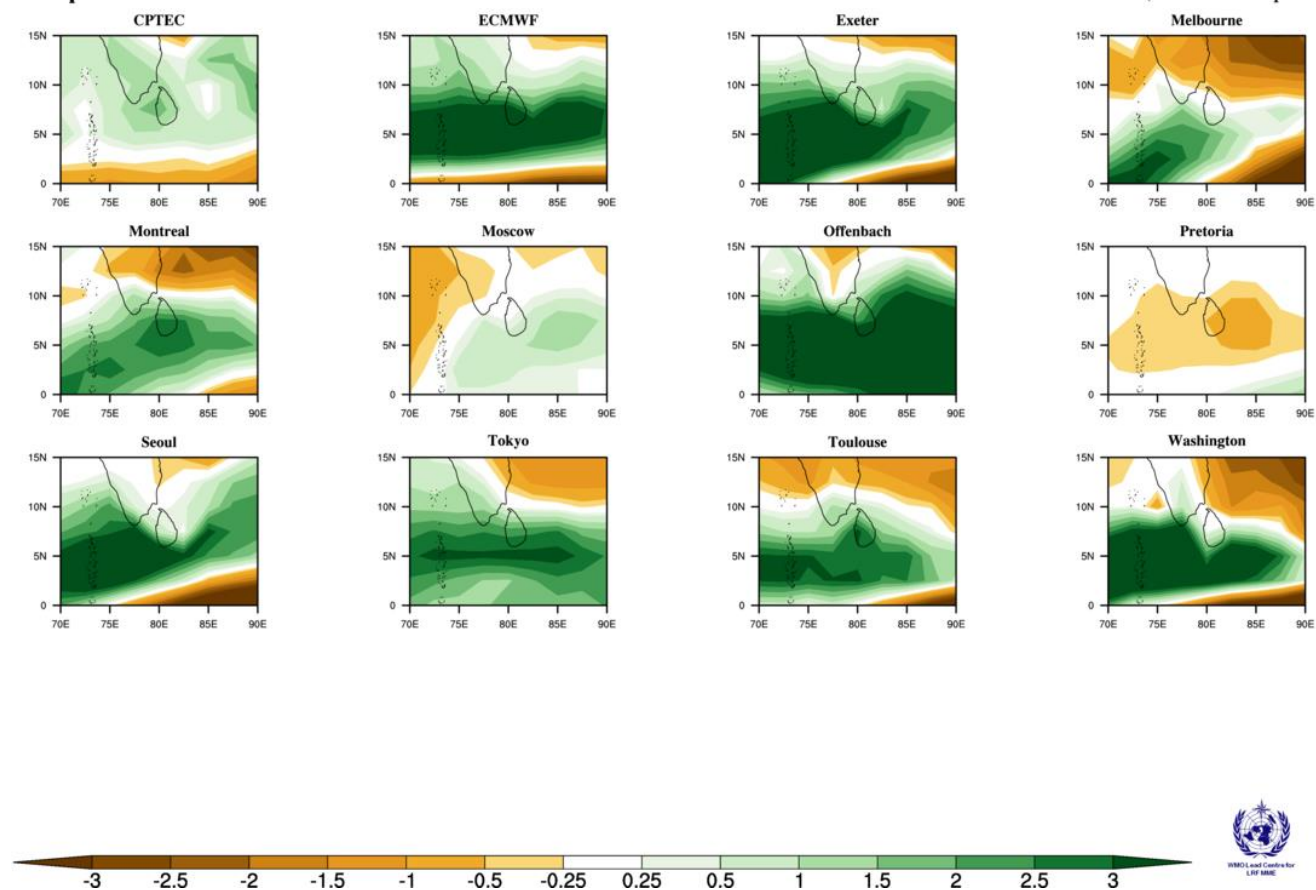

Fig 7: Individual forecast for October 2019 by dynamical models from 12 WMO global producing centers (GPC).

Lat : 0~15, Lon : 70~90
Precipitation : Nov2019
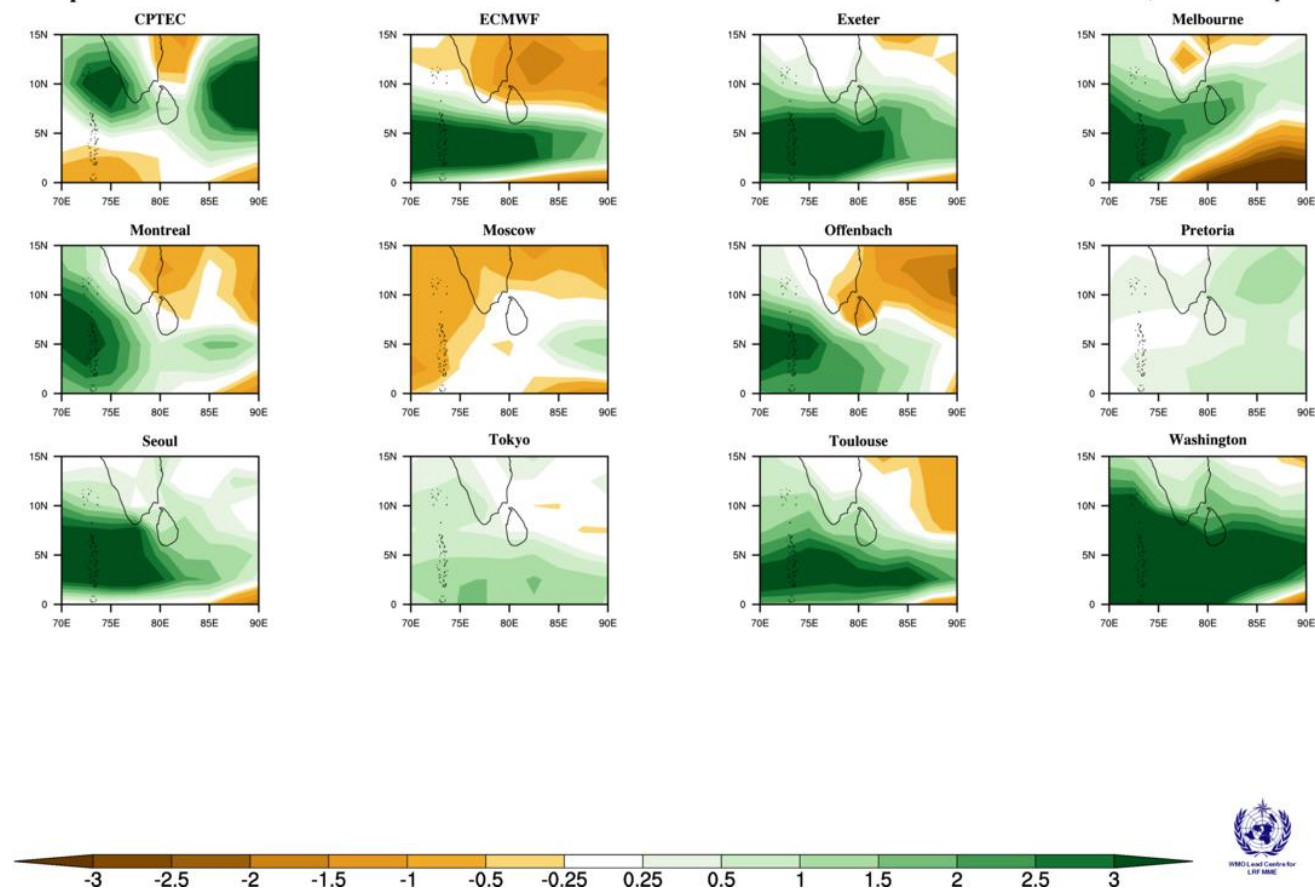
[Unit : mm]
(issued on Sep2019)

Fig 8: Individual forecast for November 2019 by dynamical models from 12 WMO global producing centers (GPC).

Figures 7, 8 and 9 show the monthly forecast from individual global producing centers (GPC) for October, November and December 2019 respectively.

Out of 12 GPC forecasts 8 GPC models predicted above normal rainfall and 1 GPC model predicted below normal rainfall for October (Fig 7). There is no signal for October over Sri Lanka from 3 GPC models (Fig 7). Accordingly above normal rainfall can be expected over the island during the month of October 2019.

Out of 12 GPC forecasts 7 GPC models predicted above normal rainfall over Sri Lanka during the month of November 2019 (Fig 8). There is no signal over Sri Lanka from 5 GPC models (Fig 8) during the month of November 2019. Accordingly slightly above normal rainfall can be expected over Sri Lanka during the month of November 2019.

Out of 12 GPC forecasts 5 GPC models predicted above normal rainfall and 3 GPC models predicted below normal rainfall for December 2019 (Fig 9). There is no signal for December 2019 over Sri Lanka from 4 GPC models. Accordingly there is no signal for December indicating equal chances of receiving below normal, near normal or above normal rainfall for Sri Lanka during December 2019.

Lat : 0~15, Lon : 70~90
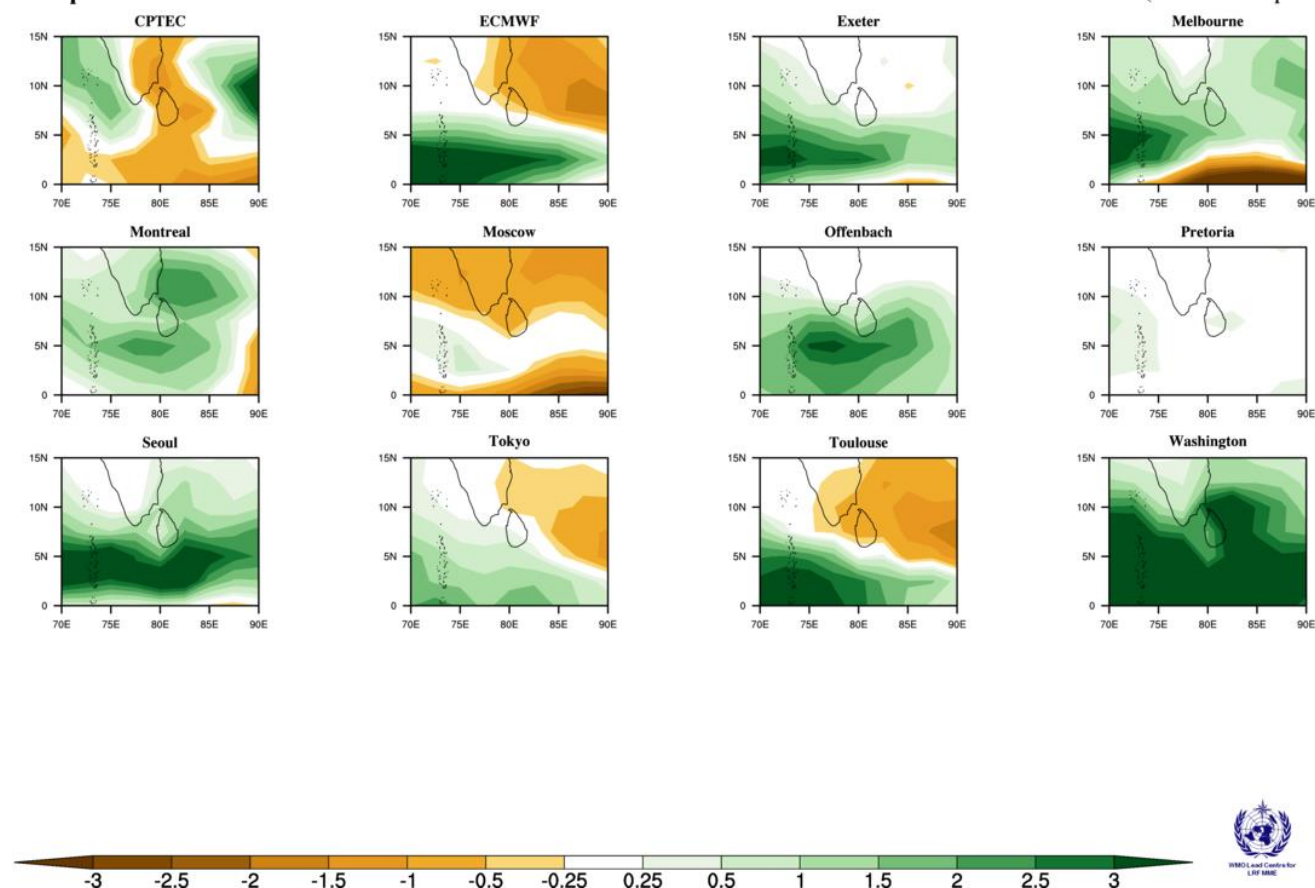**Precipitation : Dec2019**

[Unit : mm]
(issued on Sep2019)

Fig 9: Individual forecast for December 2019 by dynamical models from 12 WMO global producing centers (GPC).

(b) Statistical downscaling of CFSv2 global forecast output

(b.1) Probabilistic Forecast for OND season 2019 using Climate Predictability tool (CPT)

The probabilistic rainfall forecast for OND 2019 for Sri Lanka has prepared using multi model ensemble method by downscaling of SST data of CFSv2, CCMS4, GFDL and ECMWF using CPT is given below.

The district wise average rainfall is 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 table1. According to CPT there is a higher chance of receiving above normal rainfall over most of the districts.

There is no signal over Colombo, Kalutara, Galle and Mathale districts indicating equal chances of receiving below normal, near normal or above normal rainfall for those districts during OND 2019.

Table 1 : Probabilistic Rainfall Forecast for OND season 2019 using CPT

| District	Average rainfall (mm) –OND	Probability%		
		Below	Normal	Above
Colombo	924.3	30	30	40
Kalutara	1124.8	40	30	30
Galle	1038.8	40	30	30
Matara	900.8	20	25	55
Hambantota	556.1	20	20	60
Ampara	794.8	20	25	55
Batticaloa	873.4	20	20	60
Trincomalee	846.8	25	25	50
Mullaithivu	804.2	25	25	50
Jaffna	809.5	30	25	45
Killinochchi	814.6	25	25	50
Mannar	634.5	30	25	45
Puttalam	590.6	20	30	50
Gampaha	816.7	25	30	45
Kegalle	1043.5	25	30	45
Ratnapura	973.2	20	20	60
Monaragala	780.5	20	20	60
Badulla	954.4	20	25	55
Pollonnaruwa	880.1	20	20	60
Vavuniya	757.2	30	25	45
Anuradapura	699.3	30	25	45
Kurunegala	708.8	25	30	45
Matale	927.2	30	30	40
Kandy	961.0	20	20	60
Nuwaraeliya	871.7	20	20	60
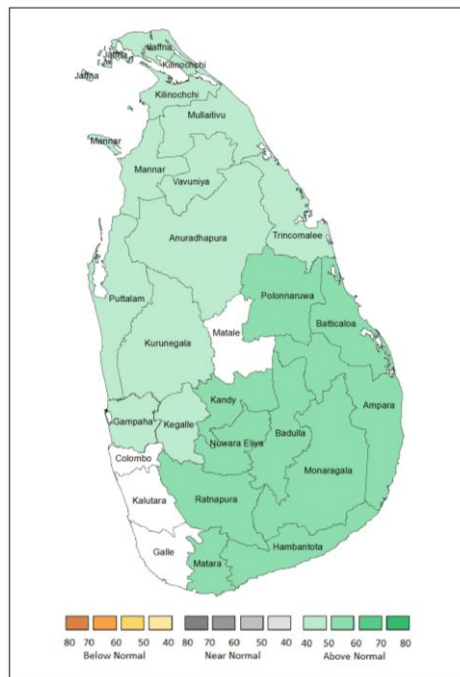
Fig 10: Probabilistic rainfall forecast for October-December2019 using CPT

(b.2) Probabilistic Forecast for OND season 2019 using RIMES FOCUS System

PROBABILISTIC-FORECAST-SEP-OND-2019-467$_3$
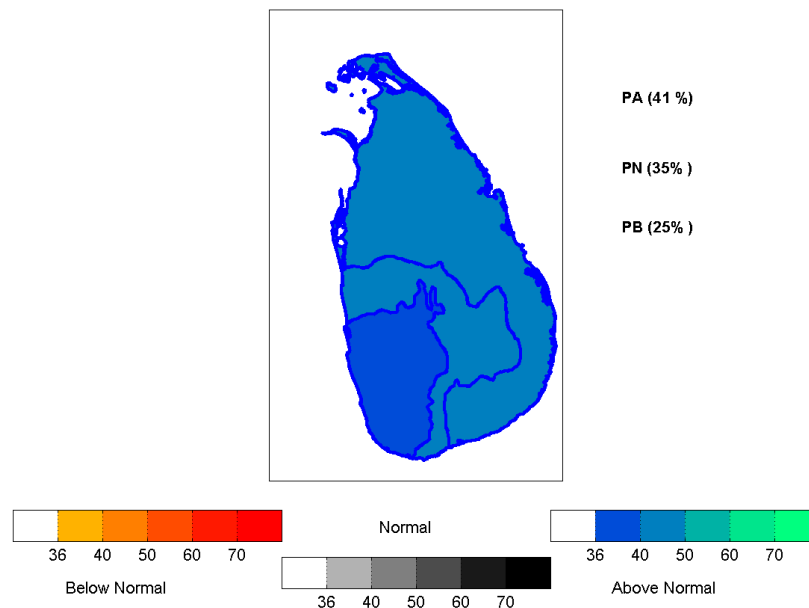

PA (41 %)

PN (35%)

PB (25%)

Fig 11. Probabilistic rainfall forecast for October-December2019 using RIMES FOCUS System

The probabilistic rainfall forecast for OND 2019 for Sri Lanka by downscaling for 3 climatic zones (Fig 11) indicates above normal rainfall in wet zone, intermediate zone as well as dry zone for OND 2019.

(b.3) Probabilistic Forecast for OND season 2019 using a regression model

The probabilistic rainfall forecast for OND 2019 using a regression model developed with guidance provided by Tokyo Climate Center (TCC) given below.

According to the model there is a higher possibility of receiving above normal rainfall in Killinochchi, Vavuniya, Mannar, Mulativu, Anuradhapura, Kurunegala, Kegalle, Colombo, Rarhnapura, Badulla and Ampara districts during the period of OND 2019. About normal rainfall can be expected in Gampaha, Kalutara, Galle and Kandy districts and below normal rainfall can be expected in Jaffna, Puttalam, Trincomalee, Polonnaruwa, Mathale, Matara and Hambantota districts. There is no signal in Batticaloa, Nuwara eliya and Monaragala districts for OND season 2019(Fig 12).
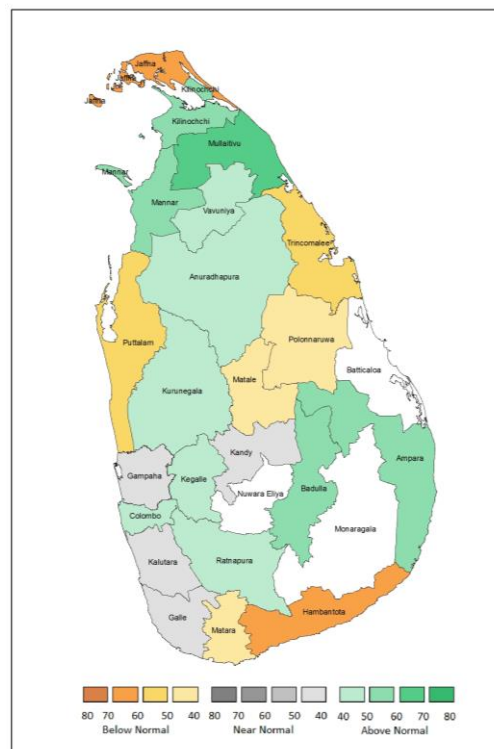

Fig 12: Probabilistic Forecast for OND season 2019 using a regression model

(b.4) Probabilistic Forecast for OND season 2019 using Climate Information Toolkit

A climate information toolkit which has developed by APCC is used for following forecast. For the tool kit APCC has used Collection of Dynamic ensemble seasonal prediction data from National Meteorological and Hydrological Services and research institutes. This includes 14 operations and the models developed by institutes from 10 countries.

Areal rainfall data used as input data to ''CLIK'' toolkit and Downscaled to districts .SST selected as predictor for all the models. (APCC, NASA, NCEP, PNU, POAMA).
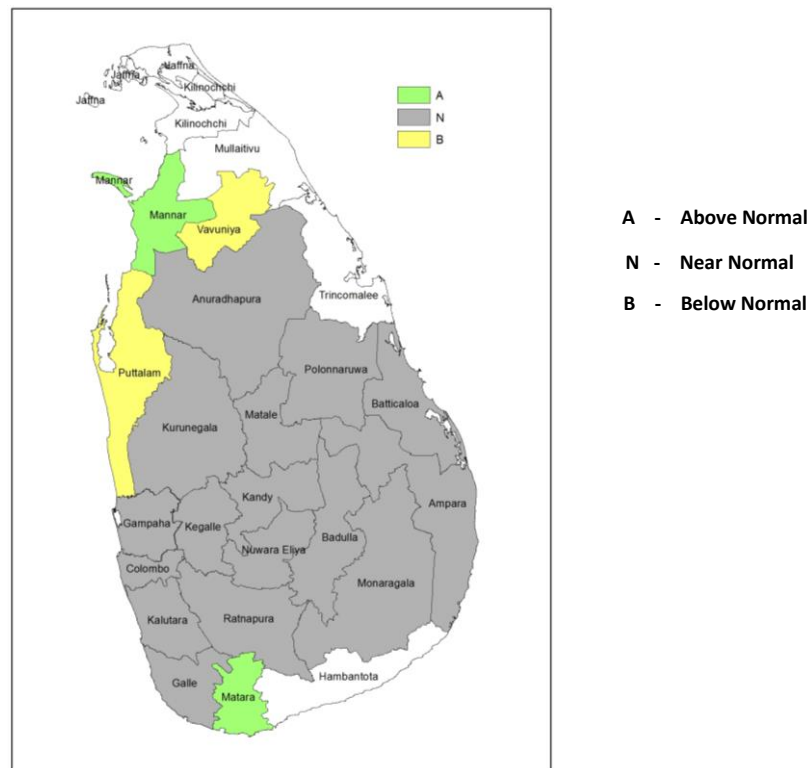

Fig 13: CLIK Multi model Ensemble Probabilistic Forecast for OND season 2019

According to the CLIK tool there is a higher chance of receiving above normal rainfall in Matara and Mannar districts (Fig.13). And there is a higher chance of receiving below normal rainfall in Vavuniya and Puttalam, districts. About normal rainfall can be expected in all other districts except Jaffna, Kilinochchi, Mulativu, Trincomalee and Hambantota. There is no signal in Jaffna, Kilinochchi, Mulativu, Trincomalee and Hambantota districts and it indicates equal chances of receiving below normal, near normal or above normal rainfall for these districts.

Summary : Consensus Seasonal Rainfall outlook for October, November and December 2019 (OND) Season.

Table 2: SUMMARY of MODEL FORECAST for OND season for SRI LANKA

SUMMARY of MODEL FORECASTfor OND season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final
OND season 2019	AN Except northern parts	AN	AN No signal in Colombo, Kalutara, Galle and Mathale districts	AN – Wet zone, intermediate zone, Dry zone	AN	AN
October 2019	AN Except northern parts	AN	AN No signal in Gampaha, Kegalle, Colombo, Kalutara, Galle, Kurunegala districts	BN- Wet zone AN- Intermediate zone No Signal- Dry zone	AN	AN
November 2019	AN Except northern parts	AN			AN	AN
December 2019	No Signal	No signal			No Signal	No signal

BN: Below Normal **NN**: Near Normal   **AN**: Above Normal **CP**: Climatological Probability

Consensus Forecast for Sri Lanka

According to most of the global models, there is a higher chance to receive above normal rainfall over Sri Lanka for OND season particularly in month of October and November.

Climate predictability tool predicts that there is chance of receiving above normal rainfall over most parts of the country except Southwestern coastal areas.

Positive IOD conditions, which is favorable for enhance rainfall in OND season and ENSO Neutral conditions are likely to continue until end of 2019. Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, there is higher chance of receiving above normal rainfall over the country for OND season 2019 (Fig 14).

However, 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 etc. and intraseasonal Oscillations such as Madden Julian Oscillations (MJO).
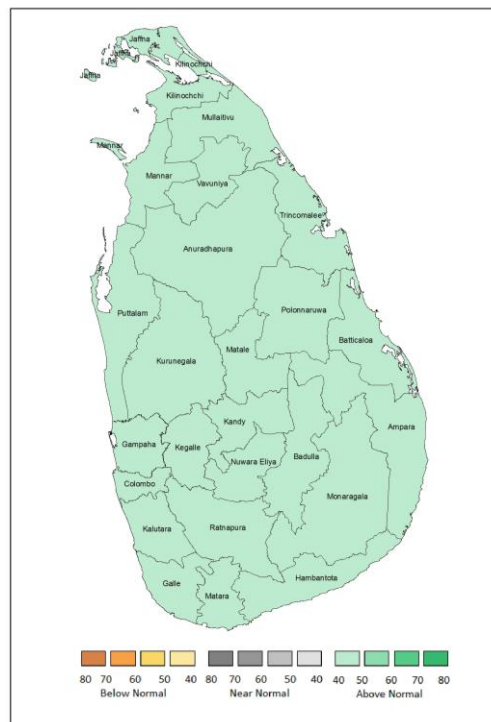
Fig 14.Consensus Probabilistic rainfall forecast for October–December2019

Probabilistic Temperature Forecast for October–December 2019 (OND)

The probabilistic Temperature forecast for October, November and December season(OND) 2019 for Sri Lanka as given below.

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

There is a higher chance of receiving slightly above average Maximum Temperatures in Mannar, Anuradhapura, Kurunegala, Gampaha, Colombo, Galle, Hambantota, Kandy and NuwaraEliya districts(Fig 15) for the OND season 2019.

There is a higher chance of receiving slightly above average Minimum Temperatures in Colombo, Gampaha, Galle, Nuwara Eliya, Ratnapura, Badulla, Kandy, Trincomalee, Batticoloa, Anuradhapura, Vavuniya, Puttlaum, Mannar, Hambantota, Pottuvil and Kurunegala Districts (Fig 16) for the OND season 2019.

The probabilistic forecast for Maximum Temperature and Minimum Temperatures for OND season 2019 for Sri Lanka is given below.

Table 3: probabilistic forecast for Maximum Temperature for OND season 2019

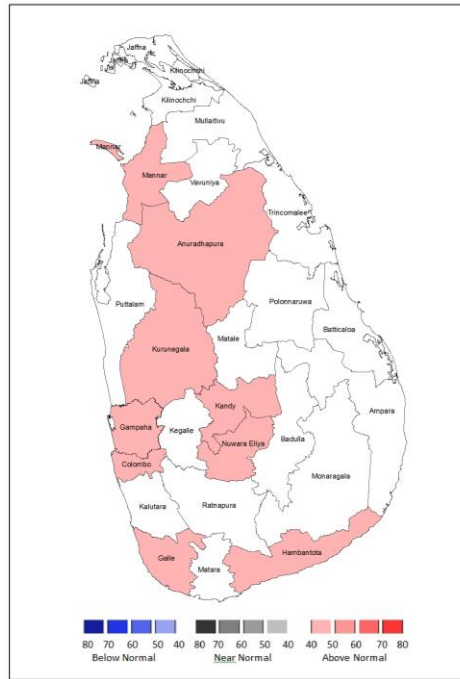| District	Average Maximum Temperature (^{0}C) –(OND)		Probability %	
		Below	Normal	Above
Anuradhapura	30.5	30	20	50
Badulla	27.1	40	35	25
Batticaloa	29.4	40	30	30
Colombo	30.1	30	20	50
Galle	28.9	25	25	50
Hambantota	29.8	25	25	50
Katugastota	28.3	20	30	50
Katunayake	30.9	25	25	50
Mannar	29.6	25	25	50
MahaIlluppallama	30.4	30	20	50
NuwaraEliya	19.6	25	25	50
Pottuvil	30.5	40	30	30
Puttalam	30.4	30	30	40
Ratnapura	31.6	40	30	30
Ratmalana	30.4	40	30	30
Trincomalee	29.7	40	30	30
Vavuniya	30.3	40	30	30
Kurunegala	30.7	20	30	50
Bandarawela	23.5	40	30	30

Fig 15: Probabilistic forecast for Maximum Temperatures for OND season 2019

Table 4: Probabilistic forecast for Minimum Temperatures for OND season 2019

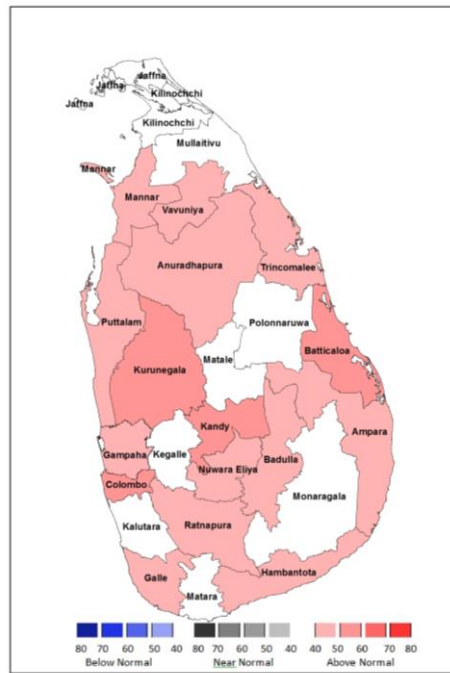| District	Average Minimum Temperature (^{0}C) – (OND)		Probability %	
		Below	Normal	Above
Anuradhapura	22.6	30	20	50
Badulla	18.7	30	20	50
Batticaloa	23.9	20	20	60
Colombo	23.3	20	20	60
Galle	23.6	25	25	50
Hambantota	23.7	20	30	50
Katugastota	19.9	20	20	60
Katunayake	22.9	25	25	50
Mannar	24.6	25	25	50
MahaIlluppallama	22.2	35	15	50
NuwaraEliya	11.4	20	30	50
Pottuvil	23.2	25	25	50
Puttalam	23.0	20	30	50
Ratnapura	22.6	20	30	50
Ratmalana	23.0	25	25	50
Trincomalee	24.3	25	25	50
Vavuniya	22.2	20	30	50
Kurunegala	22.2	20	20	60
Bandarawela	15.6	30	20	50

Fig 16: Probabilistic forecast for Minimum Temperatures for OND season 2019