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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook
September, October and November (SON)
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

Near or below average sea surface temperatures (SST) were observed across most of the Pacific Ocean during the last four weeks. Further, sea surface temperature anomalies were negative across the east-central Pacific and were positive across the western and far eastern Pacific. (CPC-USA) (Fig.1 & 2)

1.1 El Niño and La Niña update

The El Niño–Southern Oscillation (ENSO) remains neutral and this ENSO-neutral is favored through the remainder of Northern Hemisphere summer (~60% chance in the July–September season), while La Niña is more likely starting in the August–October season and continuing through winter 2021–22 (~70% chance during November–January). (source-CPC-USA) (Fig.3a).

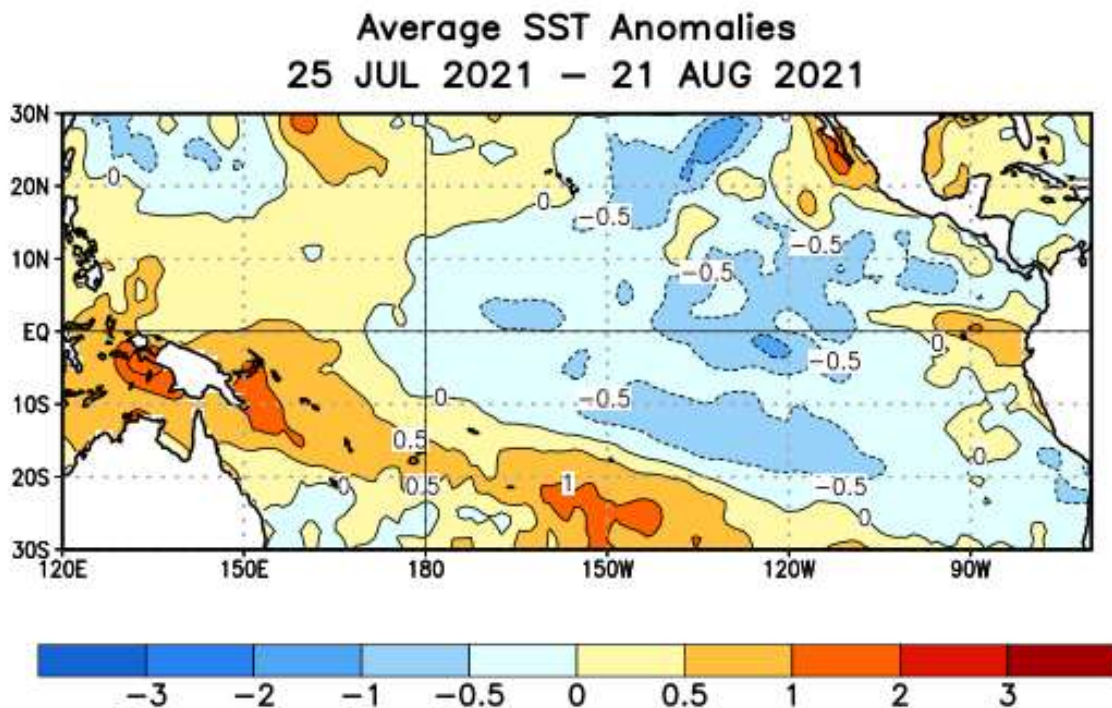


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

Weekly SST Anomalies (DEG C)

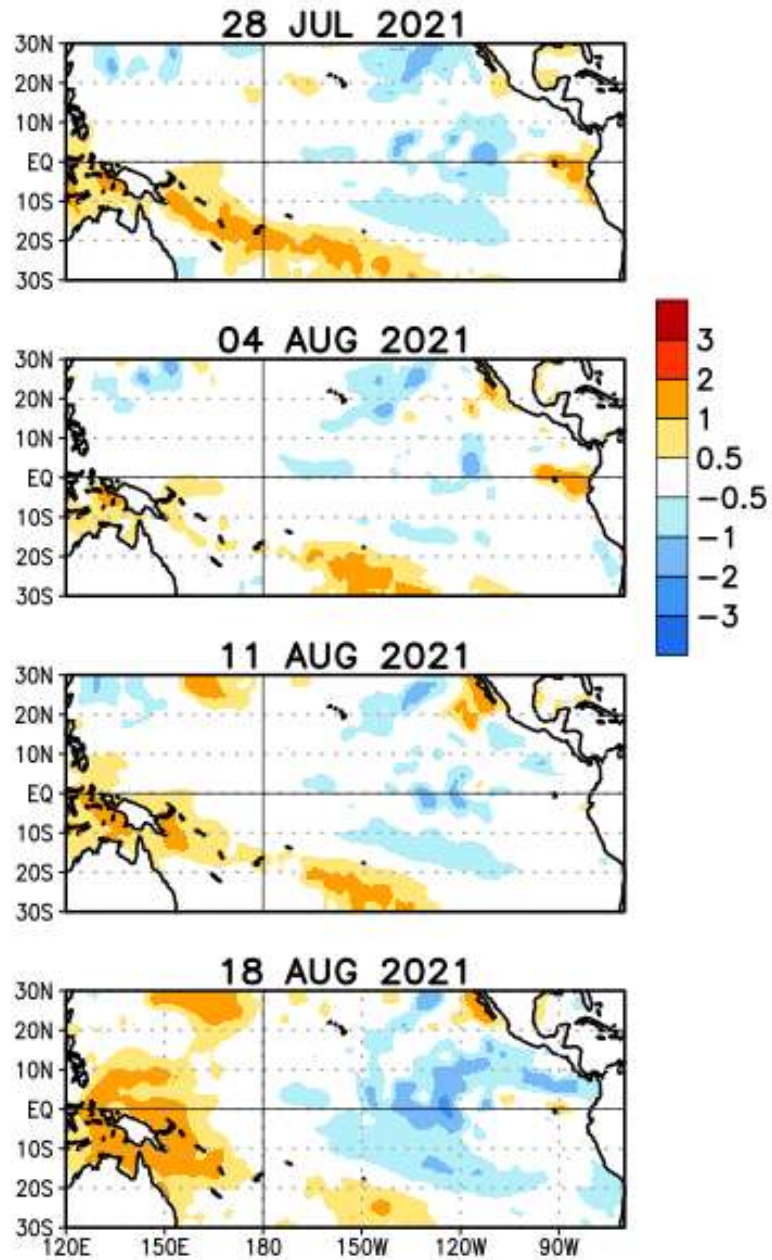


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

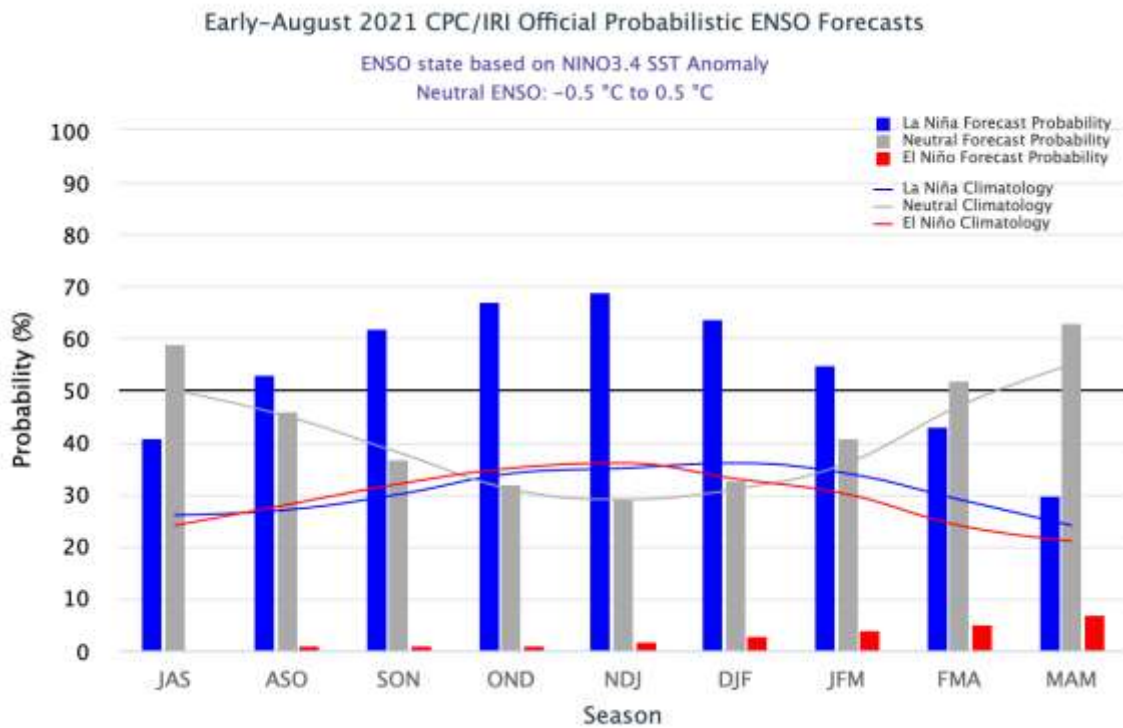


Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast

1.1.1 Impacts of La-Nina on monthly rainfall anomaly during September, October and November

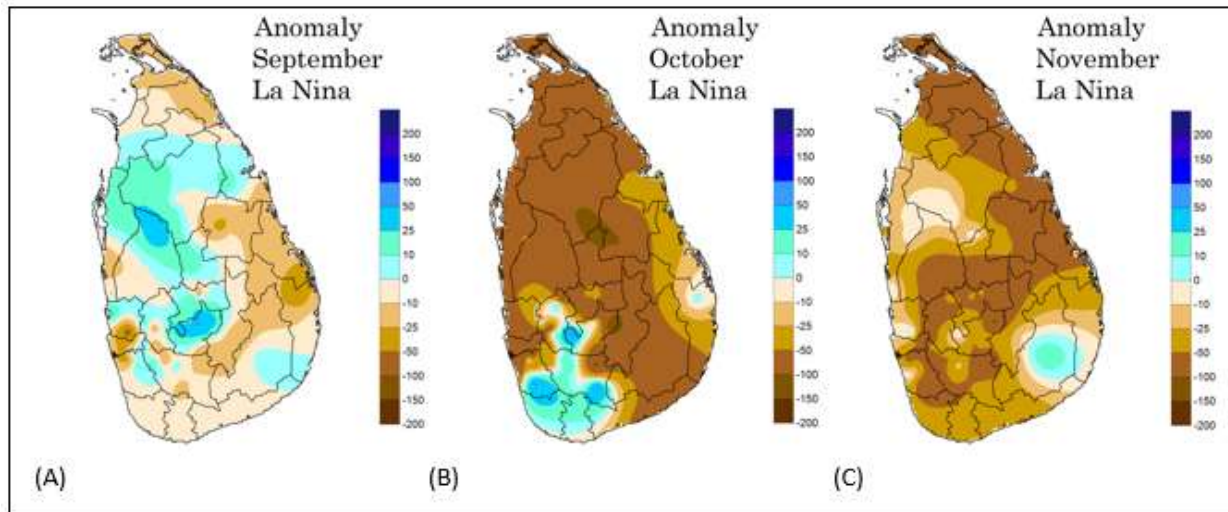


Fig 3b: Monthly Rainfall Anomaly maps of the months of September (A), October (B) and November (C) during La-Nina years (Hapuarachchi et al 2016)

Previous studies conducted by the Department of Meteorology, identified that, during La-Nina years, it is evident that above normal rainfalls over some areas in Mannar, Vavuniya,

Anuradhapura, Puttalam, Kurunegala, Matale, Kangy, Nuwara Eliya, Kegalle, Gampaha and Monaragala districts and below normal rainfall over remaining areas of the country during the month of January(Fig 3b-A). During the month of February it is evident below normal rainfall over most parts of the country except some areas in southwestern part of the country, where above normal rainfall can be expected (Fig 3b-B) and during the month of March below normal rainfall can be expected over most parts of the island except Monaragala district where above normal rainfall can be expected (Fig 3b-C).

1.2 The Indian Ocean Dipole (IOD) update

Sea surface temperatures (SSTs) in the Indian Ocean were warmer than average across much of the eastern half of the basin but have weakened compared to the past weeks. SSTs around the Horn of Africa and the Arabian Peninsula are mostly closed to average although small areas of cool anomalies persist close to the coastline. The IOD index has been below the negative IOD threshold ($-0.4\text{ }^{\circ}\text{C}$) since mid-May. IOD index will remain within negative thresholds until December 2021. (Source-Bureau of Meteorology, Australia).

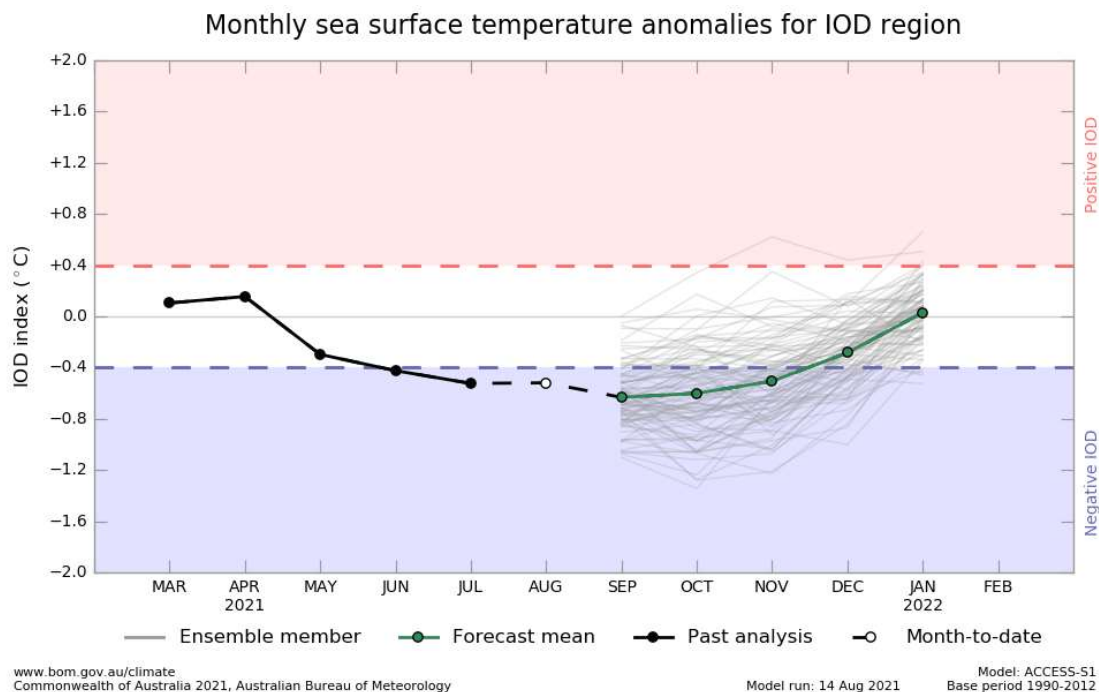


Figure 4a: IOD forecast from Australian Bureau of Meteorology .

Impacts of negative IOD on monthly rainfall anomaly during September, October and November

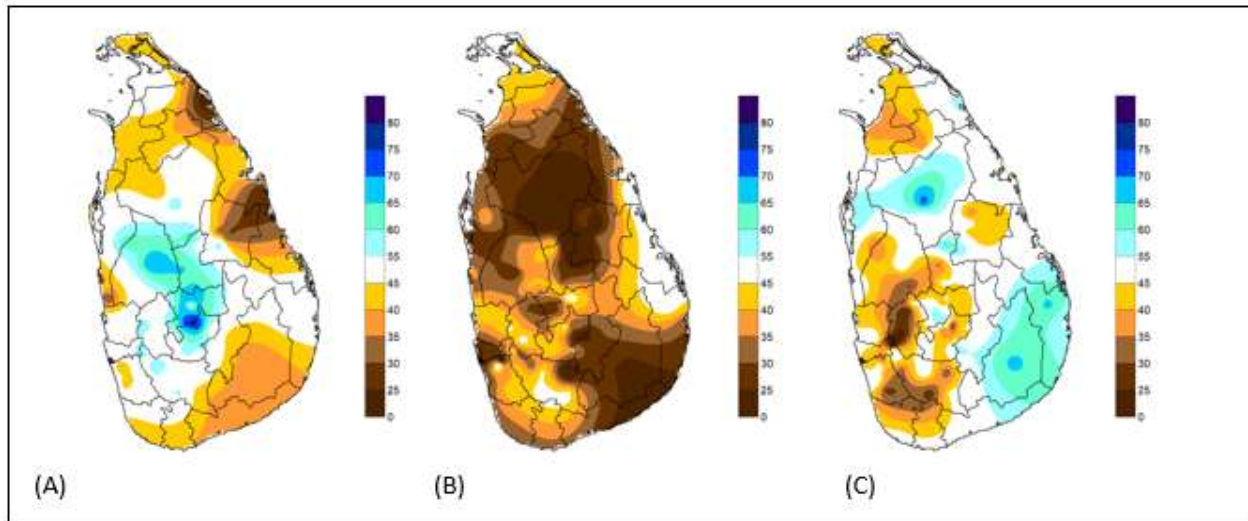


Fig 4b: Median Based Composite maps of Monthly Rainfall during September (A) October(B) and November (C) during IOD years (Hapuarachchi et al 2018)

Previous studies conducted by the Department of Meteorology, identified that there is a probability of getting below normal rainfall in some areas of Jaffna, Mullativu, Mannar, Puttalama, Vavuniya, Anuradhapura, Trincomalee, Batticaloa, Polonnaruwa, Ampara, Monaragala, Hambantota, Galle and Matara districts and near or above normal rainfall elsewhere of the country (Fig 4b (A)) under the negative IOD condition during the month of September. But in the month of October it is showing the higher probability of getting below normal rainfall over most parts of the country except some areas in Rathnapura, Jaffna, Ampara and Batticaloa where near normal rainfall can be expected (Fig 4b (B)). And there is a higher probability of getting below normal rainfall in some areas of Jaffna, Killinochchi, Mullativu, Vavuniya, Mannar, Kurunegala, Matale and Polonnaruwa districts and South western part of the country and it can be expected near or above normal rainfall in other areas of the country during the month of November (Fig 4b (C)) under the negative IOD conditions.

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

2.1 September to November (SON) 2021 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 12 Global Producing Centers (GPC) for SON season. According to that above normal rainfall can be expected over northern parts and below normal rainfall can be

expected in eastern and southern parts of the country and there is no signal indicate over the remaining parts of the country. Accordingly below, about or above normal rainfall can be expected over those parts during September -November 2021(SON) season.

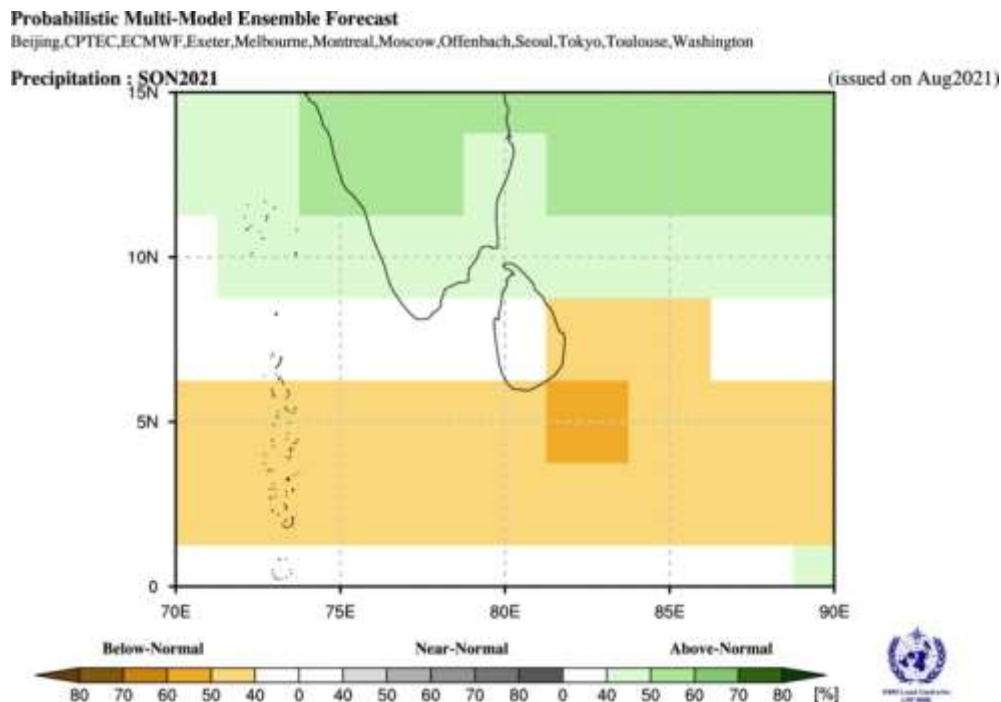


Fig 5: Probabilistic multi model ensemble forecast for SON using dynamical models from 12 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the SON season. Out of 12 GPC individual models, 2 models predicted slightly above normal rainfall and 4 models predicted below normal rainfall over most parts of the country. There is no clear signal indicated in 6 GPC models. Accordingly, there are equal chances for having below, about or above normal rainfall over the country during SON 2021 season.

Lat : 0~15, Lon : 70~90
 Precipitation : SON2021

[Unit : mm]
 (issued on Aug2021)

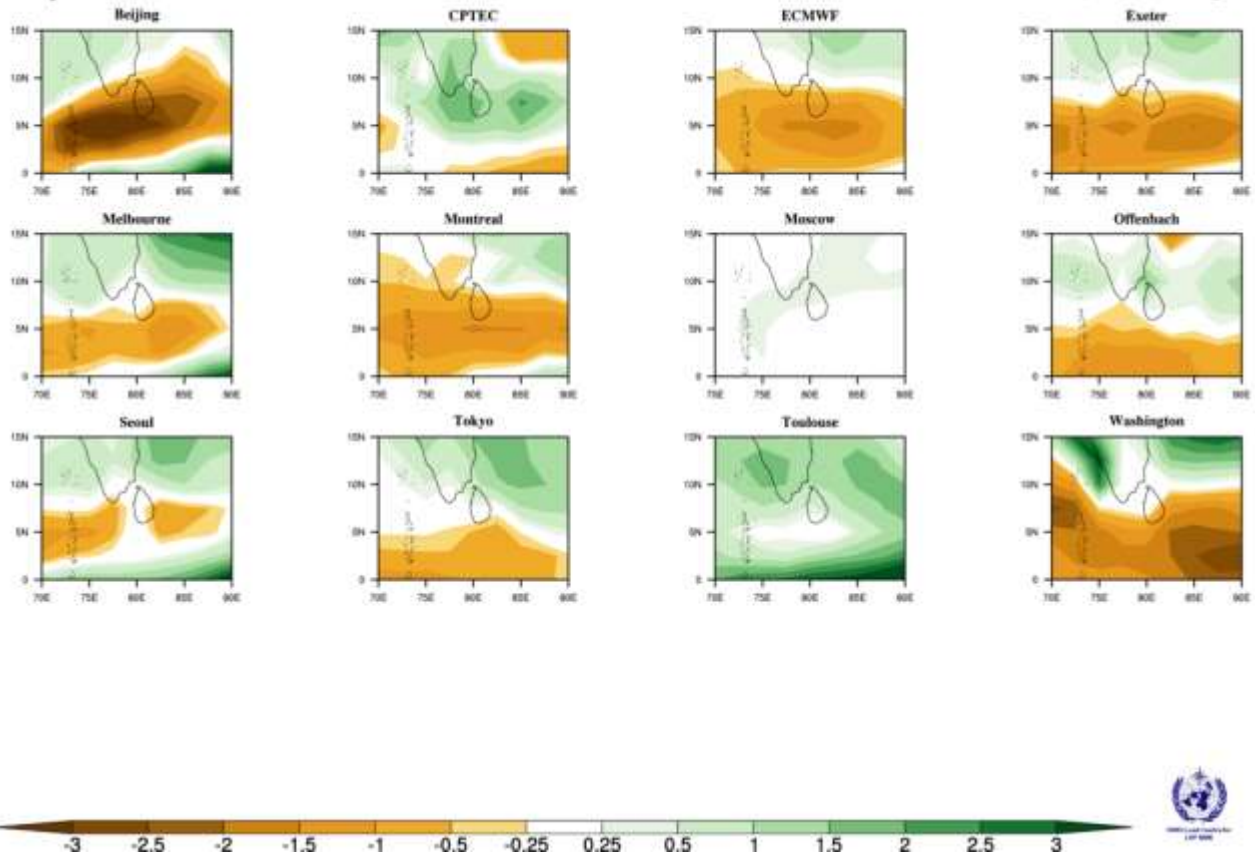


Fig 6: Individual forecasts for SON 2021 season by dynamical models from 12 WMO global producing centers (GPC).

2.2 Monthly Forecast for September, October and November 2021

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 September, October and November 2021. According to that it can be expected slightly above normal rainfall over the country except southern part, where no clear signal indicate during September 2021. During the month of October there is a possibility of having below normal rainfall over eastern part and no clear signal in remaining areas. During the month of November 2021 below normal rainfall can be expected in eastern and southern parts. There is no clear signal indicate over remaining areas of the country. Accordingly below, about or above normal rainfall can be expected over no signal areas for the months of September and November 2021.

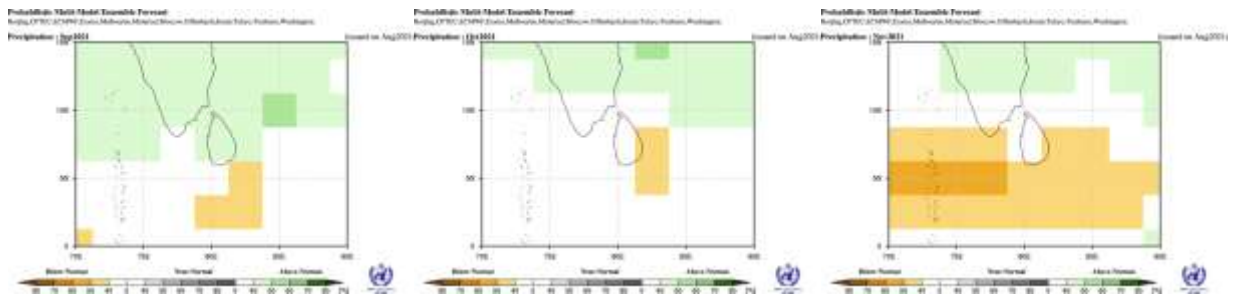


Fig 7: Probabilistic multi model ensemble forecast for September (left), October (middle) and November 2021 (right) using dynamical models from 12 WMO global producing centers (GPC).

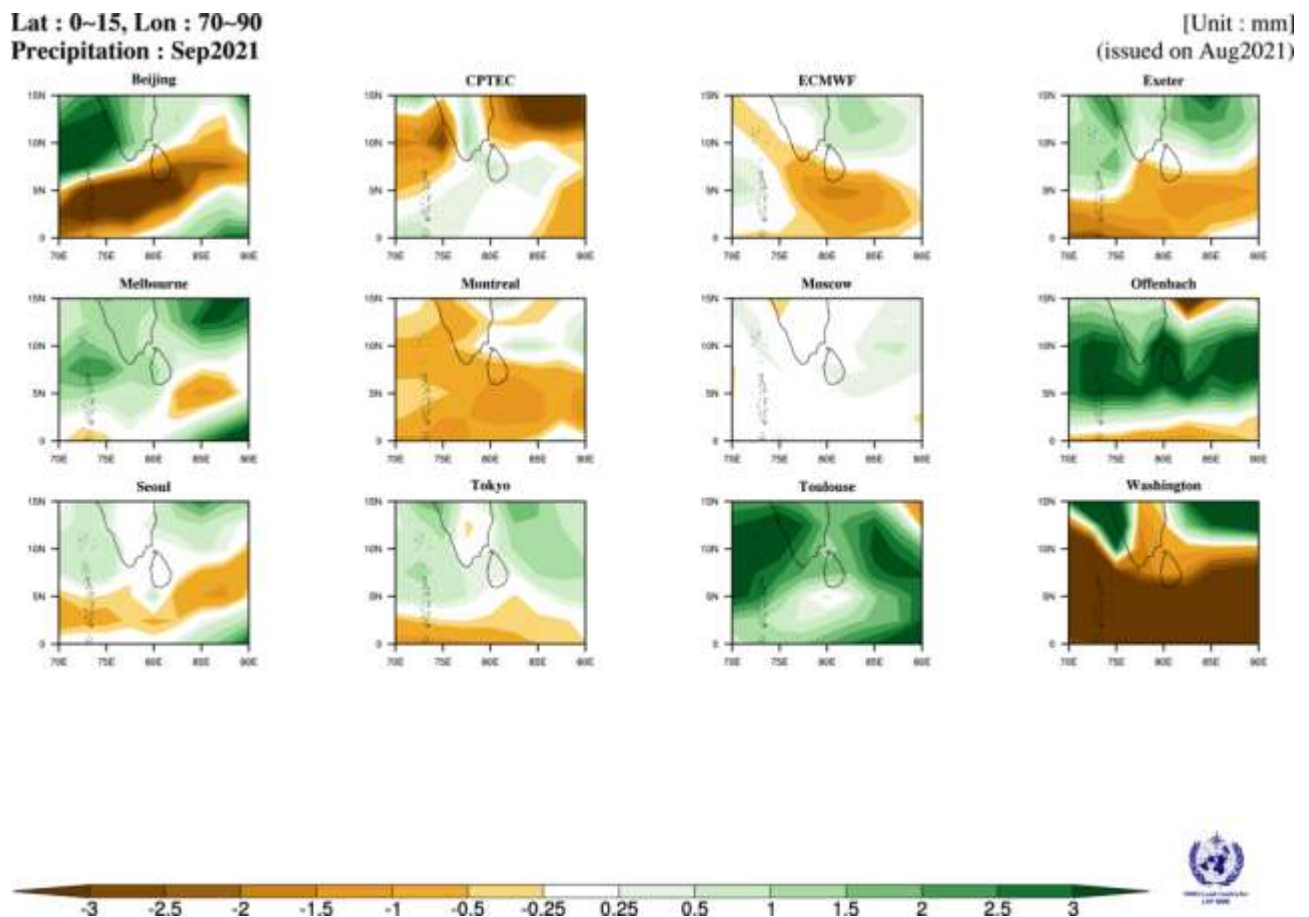


Fig 8: Individual forecast for September 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 8 shows the 12 monthly forecasts from individual global producing centers (GPC) for September 2021. Out of 12 GPC forecasts, 3 GPC models predicted slightly above normal and 3 models predicted below normal rainfall over most parts of the country and there is no clear signals indicated in 6 GPC models. Accordingly, there are equal chances for having below, about

or above normal rainfall over the country, during the month of September 2021.

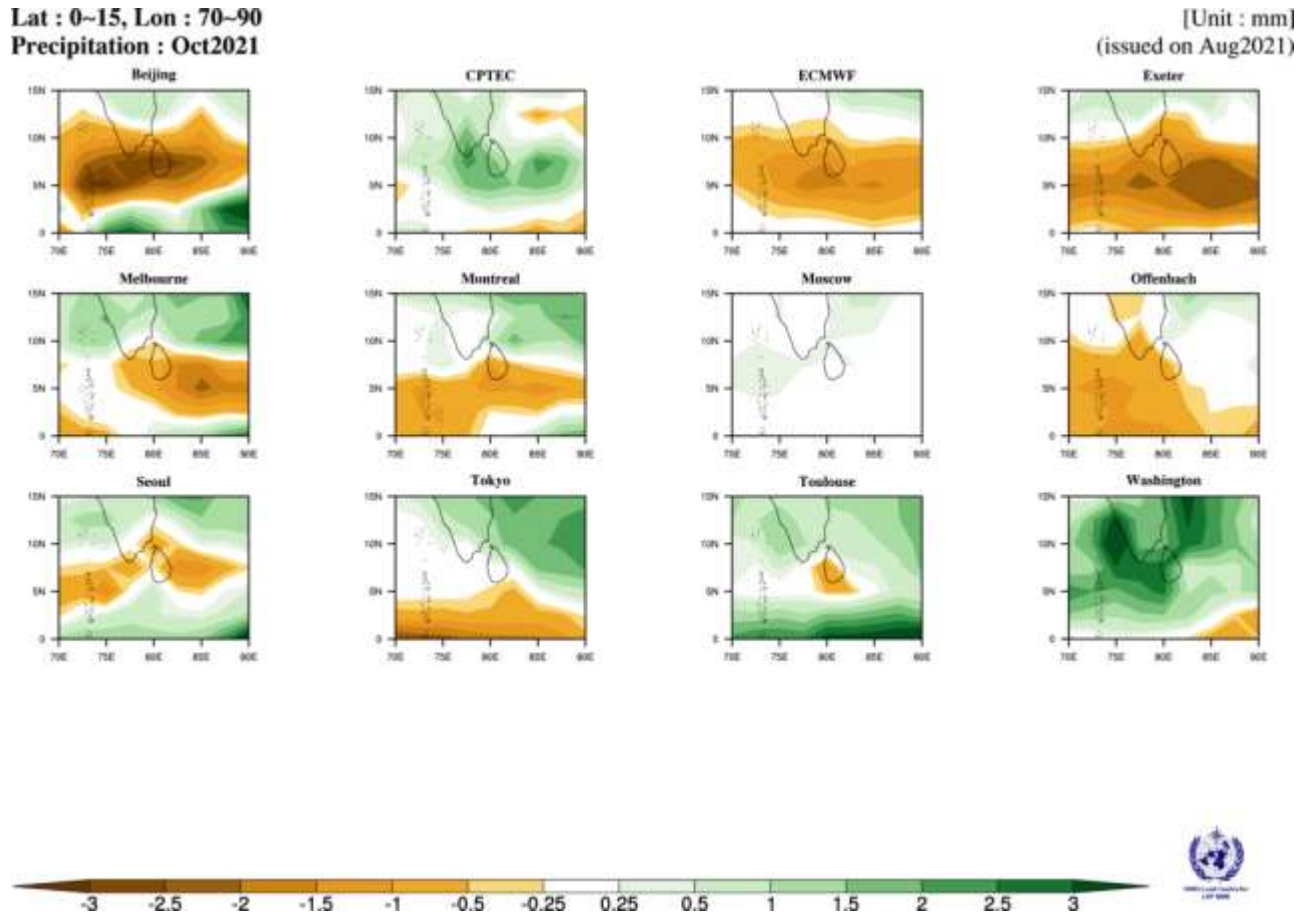


Fig 9: Individual forecast for October 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for October 2021. Out of 12 GPC forecasts, 2 GPC models predicted above normal rainfall and 4 GPC models predicted below normal rainfall over the country. There is no clear signal in 6 GPC models for the month of October 2021. Accordingly, there are equal chances for having below, about or above normal rainfall over the country during the month of October 2021.

Lat : 0~15, Lon : 70~90
Precipitation : Nov2021

[Unit : mm]
(issued on Aug2021)

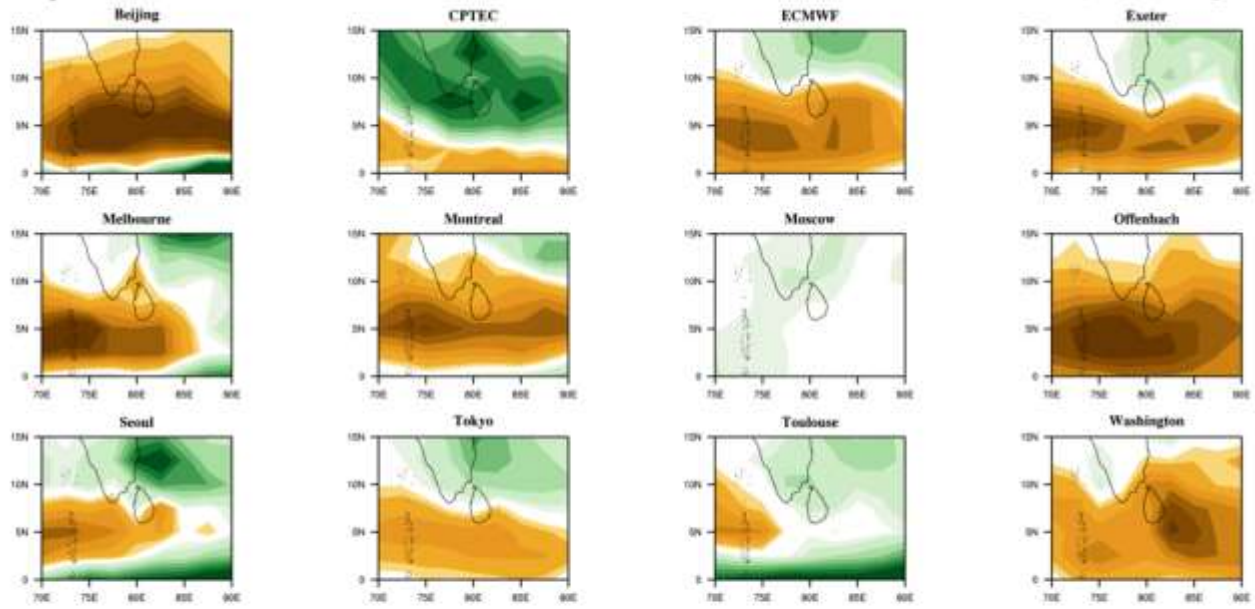


Fig 10: Individual forecast for November 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from 12 individual global producing centers (GPC) for November 2021. Out of 12 GPC forecasts, 2 GPC models indicate above normal rainfall and 6 GPC models predicted below normal rainfall over the country. There is no clear signal from 4 GPC models for the month of November 2021. Accordingly it can be expected below normal rainfall over the country during the month of November 2021 .

3. Statistical downscaling of CFSv2 global forecast output

3.1 Probabilistic rainfall forecast for SON season 2021 using Climate Predictability tool (CPT)

The following district wise probabilistic rainfall forecasts for the season of SON 2021 have been prepared with the multi model ensemble method to downscale ,SST data of CFSv2, CCSM4, and ECMWF by using CPT.

The district wise 30 year average rainfalls during SON 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) -SON	Probability%		
		Below	Normal	Above
Colombo	1022.3	50	25	25
Kalutara	1254.9	50	25	25
Galle	1140.4	50	25	25
Matara	939.6	25	25	50
Hambantota	469.3	25	25	50
Ampara	521.5	35	30	35
Batticaloa	571.9	40	30	30
Trincomalee	621.1	45	25	30
Mullaithivu	596.6	45	25	30
Jaffna	615.2	45	25	30
Killinochchi	601.5	35	25	40
Mannar	474.3	50	25	25
Puttalam	531.9	45	25	30
Gampaha	907.8	50	25	25
Kegalle	1215.6	45	25	30
Ratnapura	1025.8	25	20	55
Monaragala	610.7	30	30	40
Badulla	716.5	40	30	30
Pollonnaruwa	610.9	45	30	25
Vavuniya	598.1	55	25	20
Anuradapura	549.5	55	25	20
Kurunegala	675.2	55	25	20
Matale	663.8	60	20	20
Kandy	841.8	40	30	30
Nuwaraeliya	872.3	20	25	55

Table 1: Probabilistic Rainfall Forecast for SON season 2021 using CPT



Fig 11: Probabilistic rainfall forecast for September -November 2021 using CPT

According to the CPT (Fig 11 and table 01), below normal rainfalls can be expected in 15 districts out of 25. Above normal rainfall can be expected in Matara, Hambantota, Rathnapura and Nuwara Eliya districts. There is no clear signal for Kandy, Badulla, Monaragala, Ampara, Batticaloa and Killinochchi districts for SON season 2021. Therefore equal chances exist of receiving below normal, about normal or above normal rainfall over those districts for SON Season 2021.

3.2 Probabilistic rainfall forecast for SON 2021 season using RIMES FOCUS System

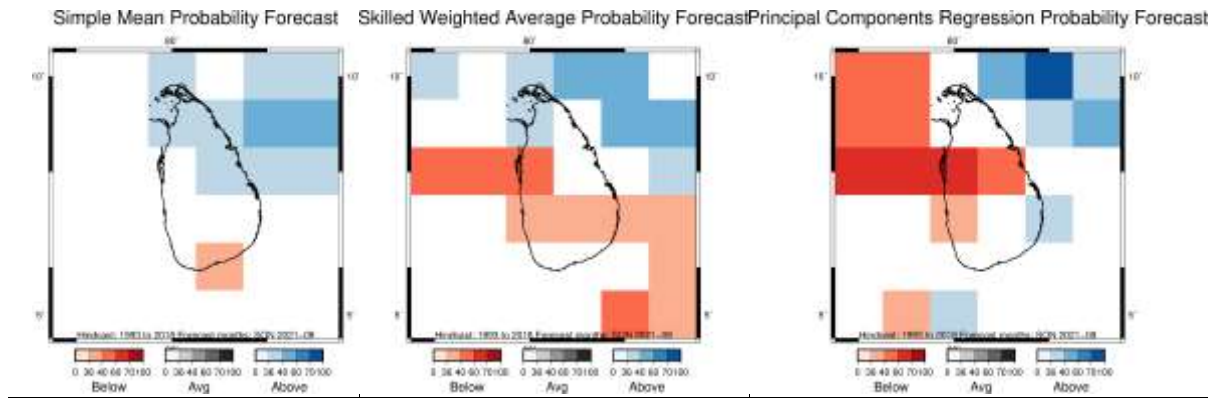


Fig 12. Probabilistic rainfall forecast for September-November 2021 using RIMES FOCUS System

Figure 12 depicts the Probabilistic rainfall forecast for SON 2021 season, which has been prepared by using RIMES FOCUS System.

According to the model outputs it can be expected near or slightly above normal rainfalls over northern part and no signal for the remaining areas of the country during SON season 2021.

4. SUMMARY :

SUMMARY of MODEL FORECAST for SON 2021 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final
SON season 2021	AN-Northern part BN-Eastern and Southern parts No Signal - Elsewhere	No Signal	AN-Nuwara Eliya, Rathnapura, Mathara, Hambantota No Signal-Kandy, Badulla, Monaragala, Ampara, Batticaloa and Killinochchi BN-Elsewhere	AN- Northern part No Signal- Elsewhere	Negative IOD conditions prevails and La Nina is likely to emerge again during August-October season and continuing through winter 2021-22(~70% chance during November-January).	Below normal
September 2021	No Signal- Southern part AN- Elsewhere	No Signal	AN- Jaffna, Killinochchi, Mannar, Kandy, Nuwara Eliya, Rathnapura, Matara, Hambantota No Siganal- Badulla, Ampara BN- Elsewhere			Near Normal
October 2021	BN- Eastern part No Signal - Elsewhere	No Signal				Below Normal
November 2021	BN-Eastern and Southern part No Siganal- Elsewhere	BN				Below normal

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

Table 2: Summery of Model Forecasts for SON season 2021

4.1 Summery of Prevailing global climate conditions

The El Niño–Southern Oscillation (ENSO) remains neutral and this ENSO-neutral is favored through the remainder of Northern Hemisphere summer(~60% chance in the July-September season), while La Niña is more likely starting in the August-October season and continuing through winter 2021-22(~70% chance during November-January).

The IOD index has been below the negative IOD threshold ($-0.4\text{ }^{\circ}\text{C}$) since mid-May. IOD index is likely to remain within negative thresholds until December 2021.

5. Consensus Seasonal outlook for September, October and November 2021

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, consensus forecasts for September to November 2021 are concluded as follows.

5.1 Rainfall forecast for September-October-November (SON) three months period

Below normal rainfalls are likely over most parts of the island with a slight possibility for near

normal in Northern province during SON 2021 season (Fig. 13)

5.2 Rainfall forecast for the month of September 2021

There is a possibility for near normal rainfalls over most parts of the country during the month of September 2021.

5.3 Rainfall forecasts for October 2021

There is a higher possibility for below normal rainfalls over most parts of the country during the month of October 2021. However there is a possibility to develop low pressure systems over and vicinity of Sri Lanka, which enhance the rainfall over the country during the month of October.

5.4 Rainfall forecasts for November 2021

Below normal rainfalls are likely during the month of November 2021. However there is a possibility to develop low pressure systems over and vicinity of Sri Lanka, which enhance the rainfall over the country during the month of November.

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.



Fig 13. Consensus Probabilistic rainfall forecast for September-October–November 2021

5.5 Probabilistic Temperature Forecast from September to November 2021 (SON)

The probabilistic Temperature forecast for September, October and November season (SON) 2021 for Sri Lanka as given below.

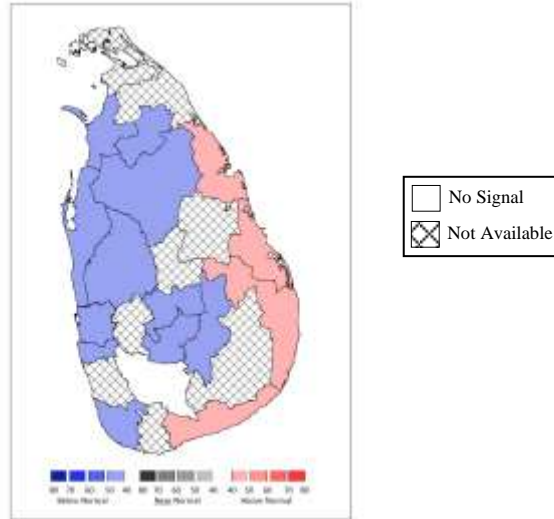


Fig 14: Probabilistic forecast for Maximum Temperatures for SON season 2021

Fig 14 and Table 3 show the probabilistic forecast for Maximum Temperatures during SON season 2021.

There is a higher chance of experiencing slightly below the normal Maximum Temperatures in Vavunia, Mannar, Anuradhapura, Kurunegala, Puttlum, Gampaha, Colombo, Galle, Kandy, Nuwara Eliya and Badulla districts and slightly above the normal Maximum Temperatures in Batticaloa, Ampara Trincomalee, and Hambantota Districts (Fig 14) for the SON season 2021.

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 (°C) – (SON)	Probability %		
		Below	Normal	Above
Anuradhapura	31.8	40	30	30
Badulla	28.6	45	30	25
Batticaloa	30.8	30	25	45
Colombo	30.1	40	30	30
Galle	28.7	45	25	30
Hambantota	29.9	30	25	45
Katugastota	28.4	45	25	30
Katunayake	30.7	40	30	30
Mannar	30.3	40	30	30
MahaIlluppallama	31.8	40	30	30
NuwaraEliya	19.6	40	35	25
Pottuvil	32.3	30	30	40
Puttalam	31.0	40	25	35
Ratnapura	31.3	30	35	35
Ratmalana	30.2	40	30	30
Trincomalee	31.7	30	25	45
Vavuniya	31.9	40	30	30
Kurunegala	31.2	40	30	30
Bandarawela	24.5	40	35	25

Table 3: probabilistic forecast for Maximum Temperature for SON season 2021

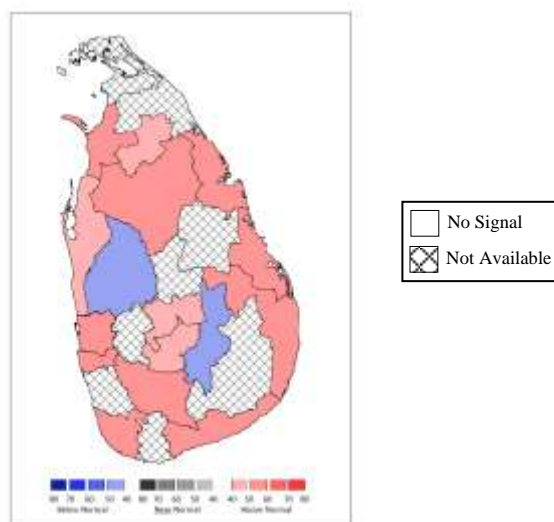


Fig 15: Probabilistic forecast for Minimum Temperatures for SON season 2021

Fig 15 and Table 4 provide the probabilistic forecast for Minimum Temperatures during SON season 2021.

Accordingly, there is a higher chance of experiencing slightly above the normal Minimum Temperatures in Mannar, Vavunia, Anuradhapura, Puttalam, Gampaha, Colombo, Galle, Hambantota, Rathnapura, Kandy, Nuwara Eliya, Ampara, Batticaloa and Trincomalee districts and slightly below the normal Minimum Temperatures in Kurunegala and Badulla districts (Fig 15) during SON season 2021

District	Average Minimum Temperature (°C) – (SON)	Probability %		
		Below	Normal	Above
Anuradhapura	23.9	30	20	50
Badulla	18.5	40	30	30
Batticaloa	24.7	25	25	50
Colombo	24.6	25	25	50
Galle	24.5	20	30	50
Hambantota	25.4	25	25	50
Katugastota	20.4	25	30	45
Katunayake	24.2	25	25	50
Mannar	25.9	20	30	50
Mahalluppallama	23.7	20	30	50
NuwaraEliya	12.3	25	30	45
Pottuvil	24.0	20	30	50
Puttalam	25.0	30	30	40
Ratnapura	23.1	20	25	55
Ratmalana	24.4	30	20	50
Trincomalee	25.1	20	25	55
Vavuniya	23.6	30	30	40
Kurunegala	23.2	40	30	30
Bandarawela	16.1	40	30	30

Table 4: Probabilistic forecast for Minimum Temperatures for SON season 2021

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