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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook
July, August and September (JAS)
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

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and

Research Division

1. Prevailing global climate conditions

Near average sea surface temperatures were observed across most of the equatorial Pacific Ocean during the last four weeks. Further, sea surface temperature anomalies were remained positive over the east of the date line while the rest of the Pacific ocean were below average. (CPC-USA) (Fig.1 & 2)

1.1 El Nino and La Nina update

The El Niño–Southern Oscillation (ENSO) remains neutral and this ENSO-neutral conditions are likely to continue through the Northern Hemisphere summer (78% chance in June - August 2021) and fall (50% chance for the September-November season). (source-CPC-USA) (Fig.3).

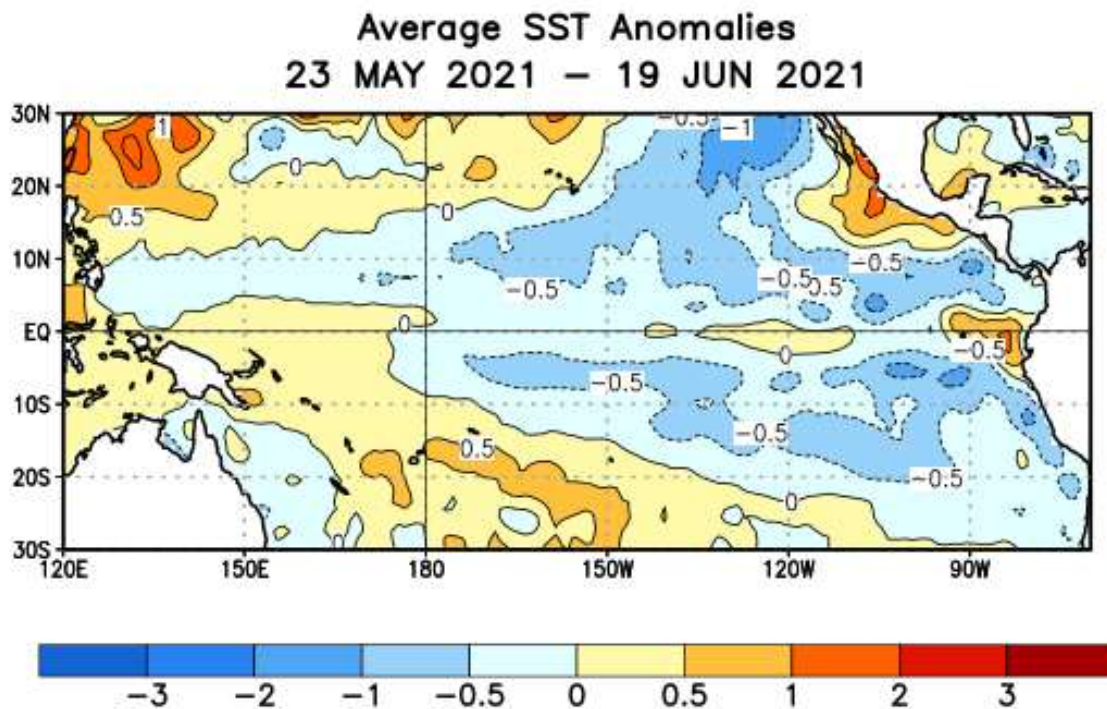


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

Weekly SST Anomalies (DEG C)

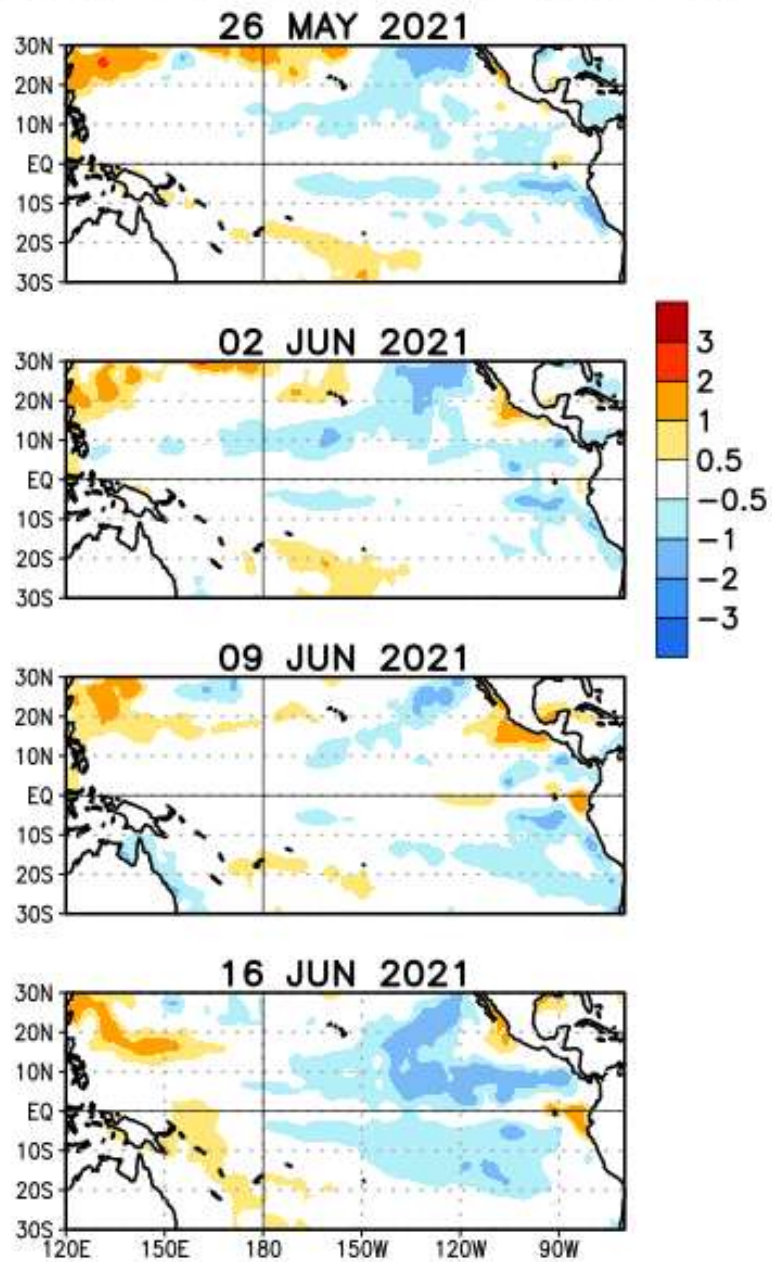


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

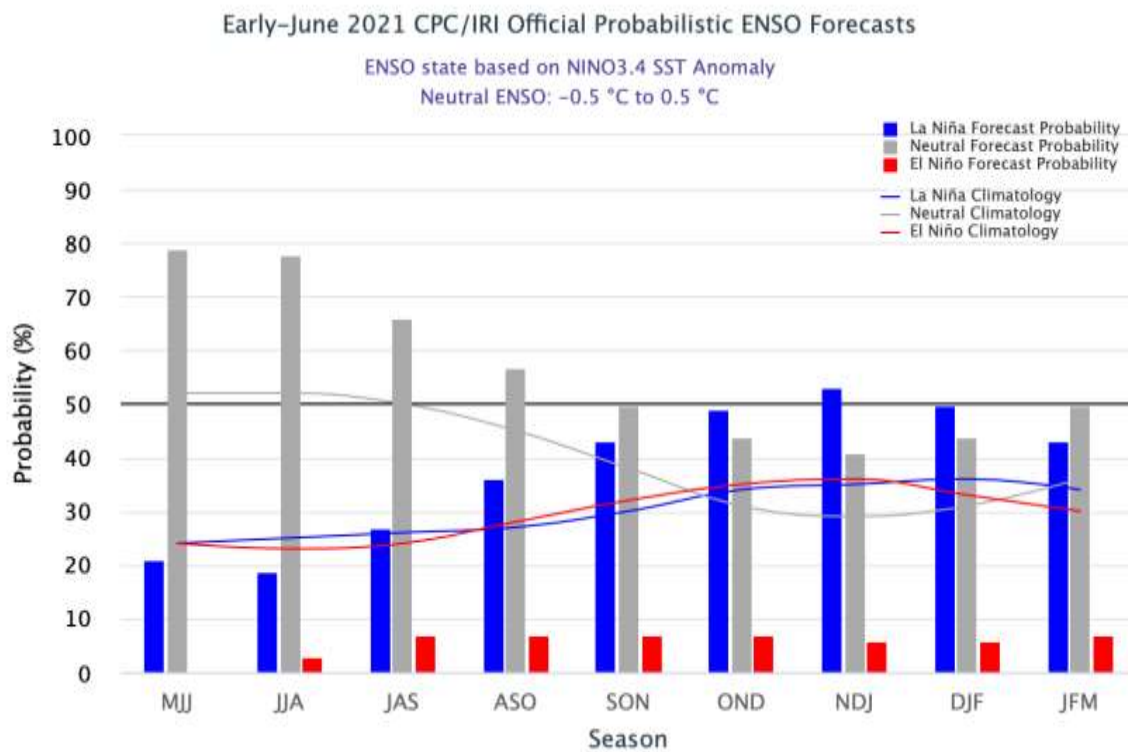


Fig 3: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast

1.2 The Indian Ocean Dipole (IOD) update

SSTs were below average in the western Indian Ocean and were above average in the eastern Indian Ocean and the Indian Ocean Dipole (IOD) index has been below the negative IOD threshold (-0.4 °C) for five consecutive weeks. Most of the five surveyed climate models anticipate values of the IOD index will remain within negative thresholds into the middle of spring. Four of five models predict negative IOD will persist until October, with two of these continuing into November. (Source-Bureau of Meteorology, Australia).

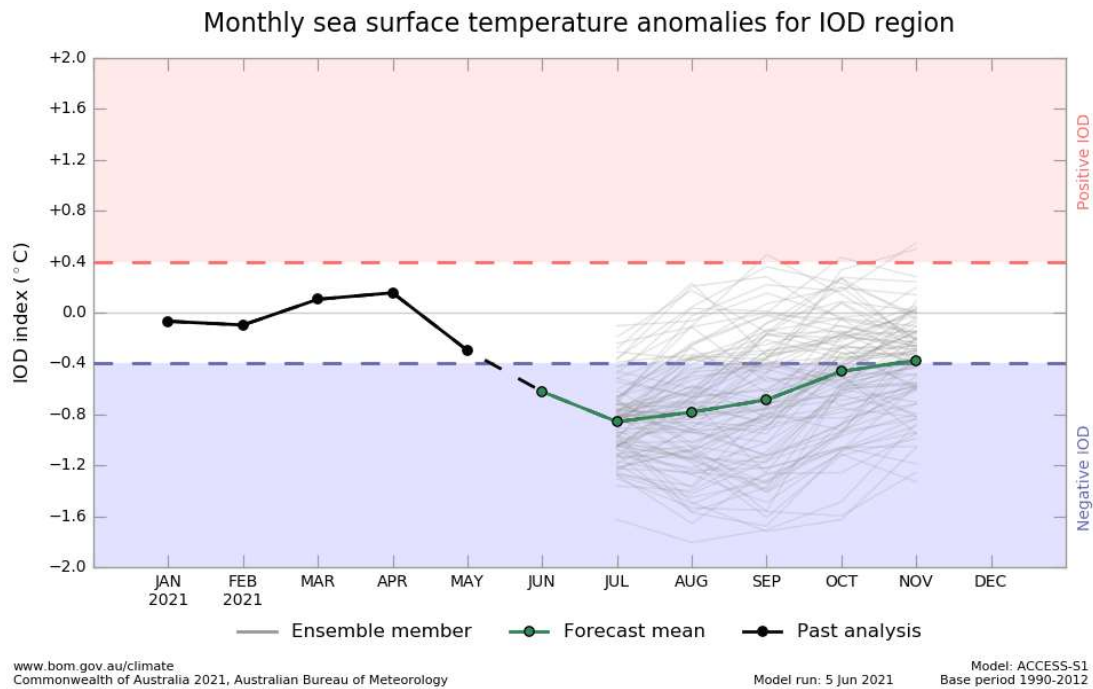


Figure 4a: IOD forecast from Australian Bureau of Meteorology .

Impacts of negative IOD on monthly rainfall anomaly during July, August and September

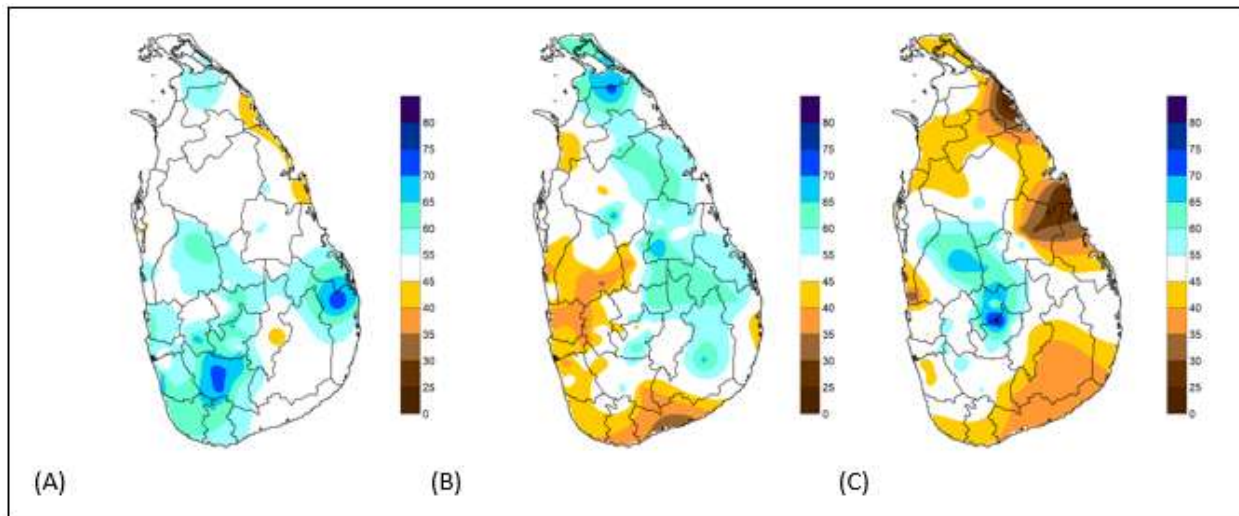


Fig 4b: Median Based Composite maps of Monthly Rainfall during July (A) August(B) and September (C) during IOD years (Hapuarachchi et al 2018)

Previous studies conducted by the Department of Meteorology, identified that there is a probability of getting above normal rainfall in Rathnapura and Ampara districts and western, Sabaragamuwa and over the country (Fig 4b (A)) under the negative IOD condition during the month of July. But in the month of August it is showing the higher probability of getting below normal rainfall at some places in Kurunegala, Gampaha, Kegalle, Colombo,

Kalutara, Galle, Matara and Hambantota districts and near or slightly above normal rainfall elsewhere of the country (Fig 4b (B)). And there is a higher 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 during the month of September (Fig 4b (C)).

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

2.1 July to September (JAS) 2021 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 12 Global Producing Centers (GPC) for JAS season. According to that near or above normal rainfall can be expected over most of the area of the country except eastern parts. There is no signal indicate over the eastern part of the country. Accordingly below, about or above normal rainfall can be expected over eastern part during July -September 2021(JAS) season.

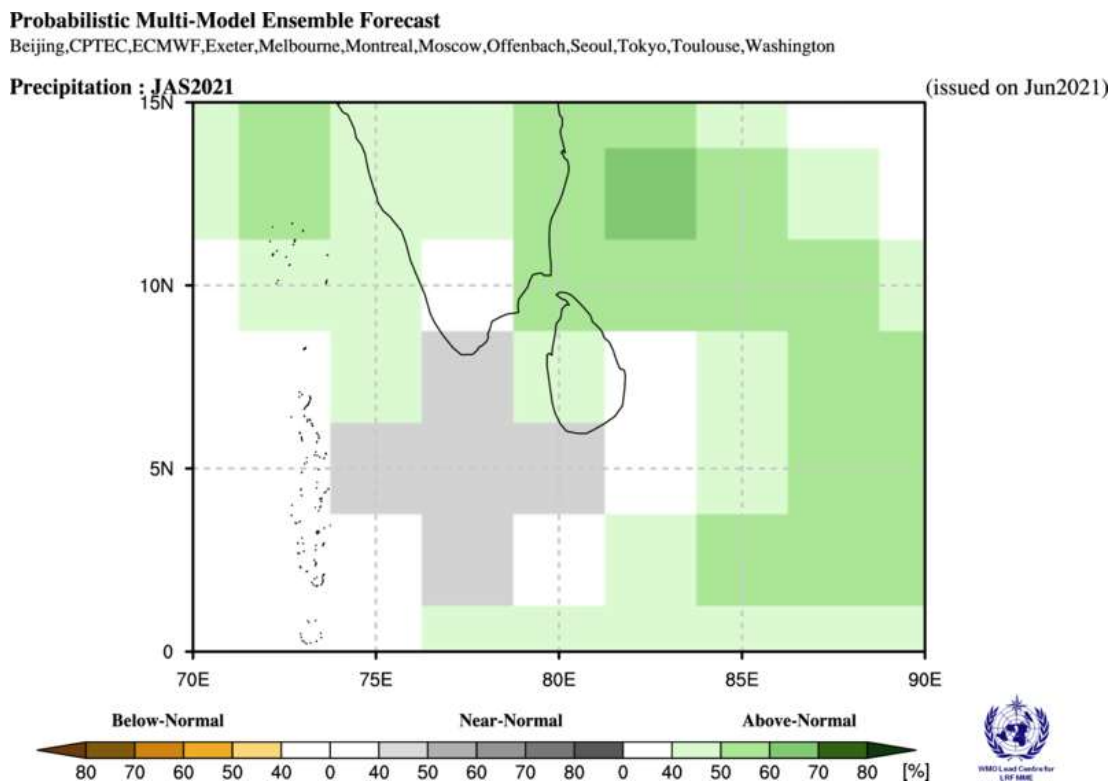


Fig 5: Probabilistic multi model ensemble forecast for JAS using dynamical models from 12 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the JAS season. Out of 12 GPC individual models, 4 predicted slightly above normal rainfall and 1 predicted below normal rainfall over the country. There is no clear signal indicated in 7 GPC models. Accordingly, there are equal chances for having below, about or above normal rainfall over the country during JAS 2021 season.

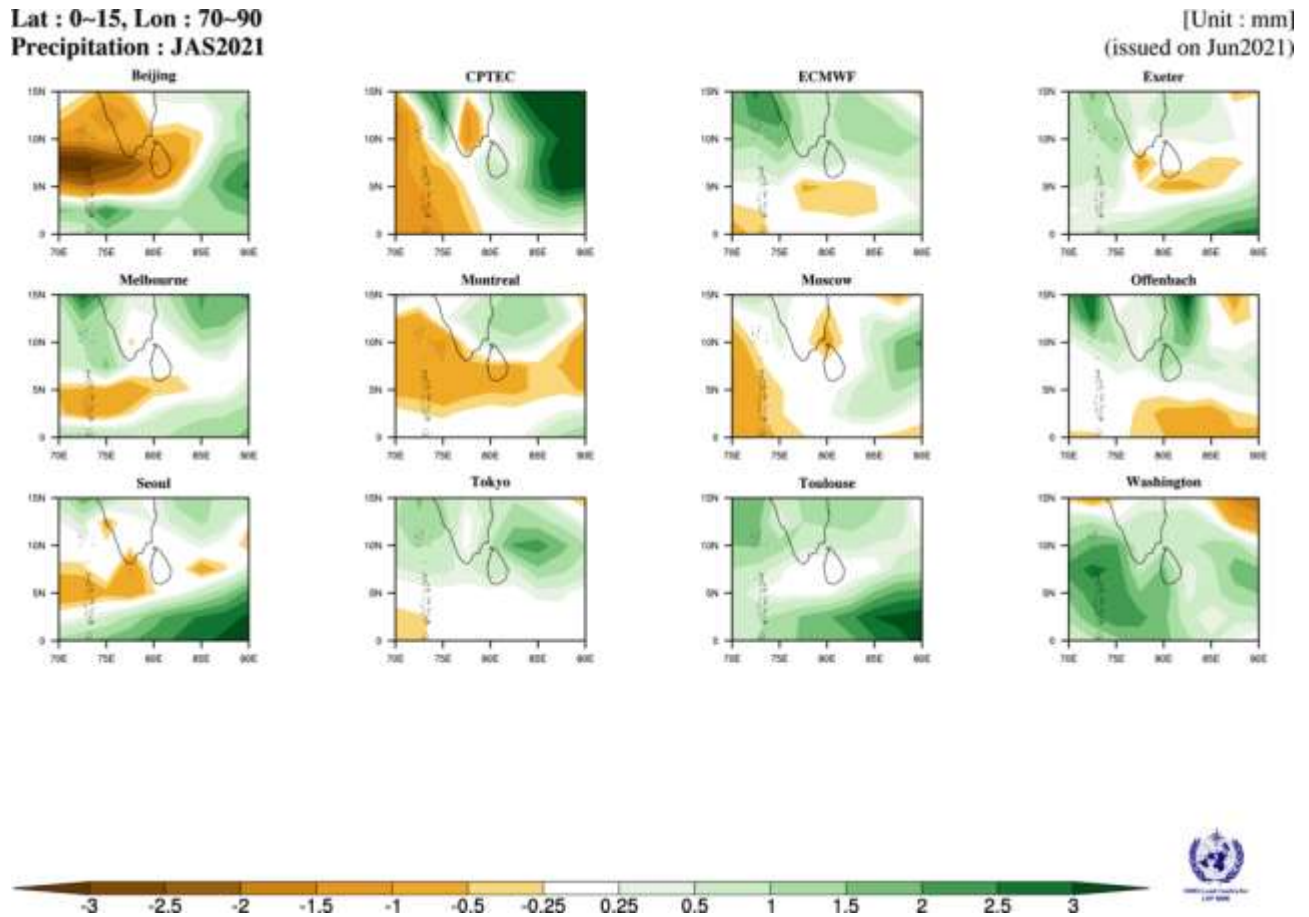


Fig 6: Individual forecasts for JAS 2021 season by dynamical models from 12 WMO global producing centers (GPC).

2.2 Monthly Forecast for July, August and September 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 July, August and September 2021. According to that it can be expected slightly above normal rainfall over the country during July. During the month of August there is a higher possibility of having above normal rainfall in northern part of the country and there is no clear signal over elsewhere of the

country. During the month of September above normal rainfall can be expected over most parts and there is no clear signal indicated over the eastern and southern areas of the country. Below, about or above normal rainfall can be expected over those areas.

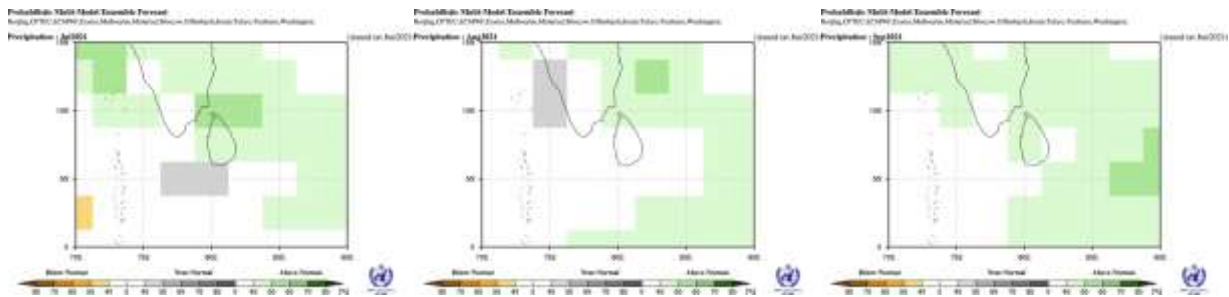


Fig 7: Probabilistic multi model ensemble forecast for July (left), August (middle) and September 2021 (right) using dynamical models from 12 WMO global producing centers (GPC).

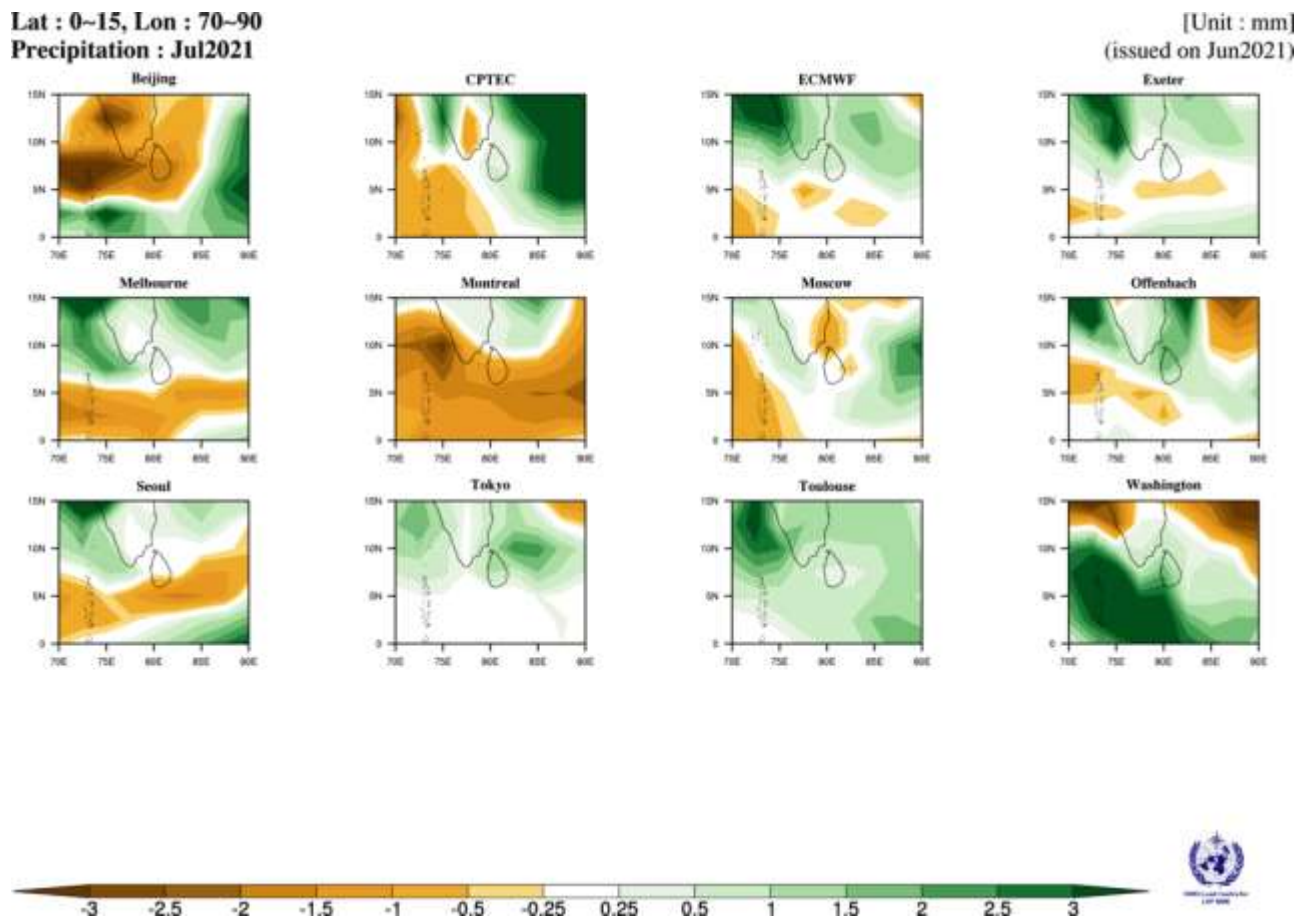


Fig 8: Individual forecast for July 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 8 shows the 12 monthly forecasts from individual global producing centers (GPC) for

July 2021. Out of 12 GPC forecasts, 5 GPC models predicted slightly above normal rainfall and 1 GPC model predicted below normal rainfall over the country. 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 July 2021.

Lat : 0~15, Lon : 70~90
 Precipitation : Aug2021

[Unit : mm]
 (issued on Jun2021)

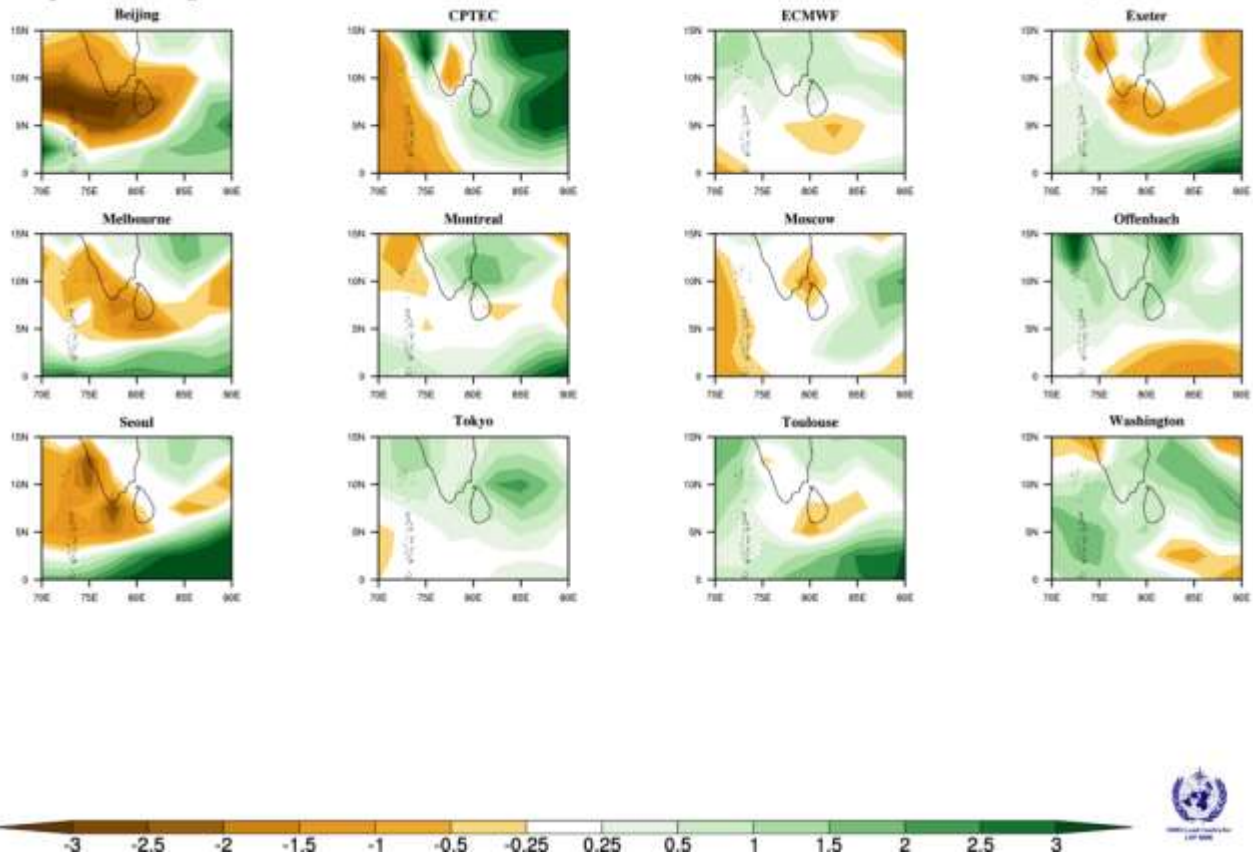


Fig 9: Individual forecast for August 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for August 2021. Out of 12 GPC forecasts, 4 GPC model predicted above normal rainfall and 1 GPC model predicted below normal rainfall over the country. There is no clear signal in 7 GPC models for the month of August 2021. Accordingly, there are equal chances for having below, about or above normal rainfalls over the country during the month of August 2021.

Lat : 0~15, Lon : 70~90
 Precipitation : Sep2021

[Unit : mm]
 (issued on Jun2021)

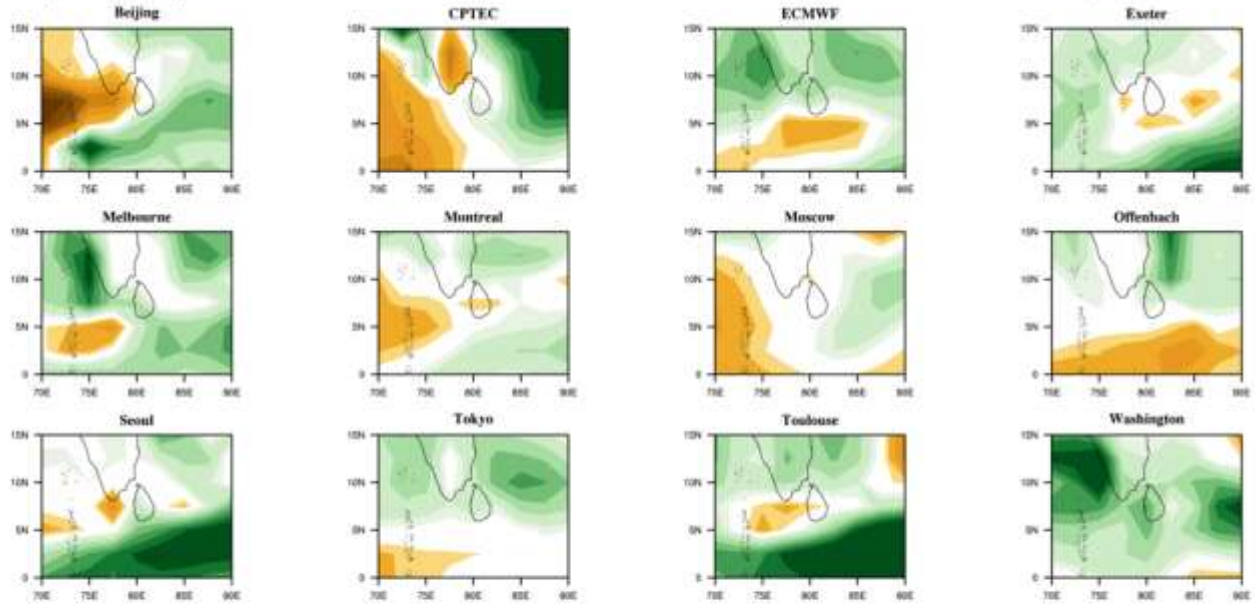


Fig 10: Individual forecast for September 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from 12 individual global producing centers (GPC) for September 2021. Out of 12 GPC forecasts, 2 GPC models indicate above normal rainfall and there is no clear signal from 10 GPC models for the month of September 2021. Accordingly it can be expected below normal, about normal or above normal rainfall during the month of September 2021 .

3. Statistical downscaling of CFSv2 global forecast output

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

The following district wise probabilistic rainfall forecasts for the season of JAS 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 JAS 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) -JAS	Probability%		
		Below	Normal	Above
Colombo	632.2	50	25	25
Kalutara	898.8	55	20	25
Galle	821.7	45	25	30
Matara	621.9	25	25	50
Hambantota	167.3	20	20	60
Ampara	184.4	20	20	60
Batticaloa	202.2	25	25	50
Trincomalee	256.1	35	30	35
Mullaithivu	170.4	30	30	40
Jaffna	120.9	30	30	40
Killinochchi	108.5	30	25	45
Mannar	79.3	30	20	50
Puttalam	119.3	30	30	40
Gampaha	497.9	45	25	30
Kegalle	922.8	45	25	30
Ratnapura	681.9	25	25	50
Monaragala	184.9	25	20	55
Badulla	266.5	20	20	60
Pollonnaruwa	211.3	30	30	40
Vavuniya	196.8	40	30	30
Anuradapura	161.3	30	30	40
Kurunegala	242.7	35	20	45
Matale	213.9	30	20	50
Kandy	514.5	30	20	50
Nuwaraeliya	747.7	20	25	55

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



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

According to the CPT (Fig 11 and table 01), above normal rainfalls can be expected in 13 districts out of 25. Below normal rainfall can be expected in Gampaha, Colombo, Kalutara, Galle and Kegalle. There is no clear signal for Jaffna, Mullativu, Vavuniya, Puttalam, Anuradhapura, Polonnaruwa and Trincomalee districts for JAS season 2021. Therefore equal chances exist of receiving below normal, about normal or above normal rainfall over those districts for JAS Season 2021.

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

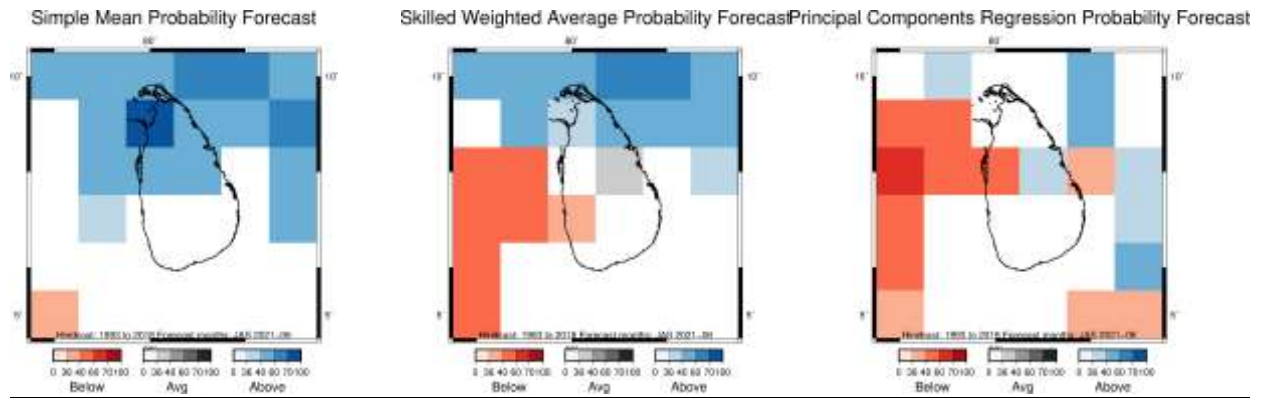


Fig 12. Probabilistic rainfall forecast for July-September 2021 using RIMES FOCUS System

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

According to the model outputs it can be expected above normal rainfall over northern parts of the country and there is no clear signal over remaining areas of the country. Therefore it can be expected below, about or above normal rainfall over those areas of the country during JAS season 2021.

4. SUMMARY :

SUMMARY of MODEL FORECAST for JAS 2021 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final
JAS season 2021	No Signal- Eastern part AN-Elsewhere	No Signal	BN- Gampaha, Kegalle, Colombo, Kalutara, Galle No signal- Trincomalee , Jaffna, Mullativu, Vavuniya, Anuradhapura, Puttalam, Polonnaruwa AN- Elsewhere	AN- Northern parts No Signal- Elsewhere	Possibility for Negative IOD conditions in Indian ocean	Near normal over most parts of the country
July 2021	AN	No Signal	AN-Badulla, Hambantota No Signal- Polonnaruwa, Batticaloa, Ampara, Nuwara Eliya, Matara , Monaragala BN- Elsewhere		Negative IOD,slightly above normal rainfalls in Sw part and Ampara distrct	Near normal over most parts with slightly above normal possibility in extrem north of Sri Lanka
August 2021	AN-Northern part No Signal- Elsewhere	No Signal			Negative IOD,below in SW and	Slightly below normal in Sw part of the country and near normal elsewhere
September 2021	No Signal – Eeastern and Southern part AN-Elsewhere	No Signal				No signal

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

Table 2: Summery of Model Forecasts for JAS season 2021

4.1 Summery of Prevailing global climate conditions

The El Niño–Southern Oscillation (ENSO) remains neutral and this ENSO-neutral conditions are likely to continue through the Northern Hemisphere summer (78% chance in June - August 2021) and fall (50% chance for the September-November season).

Most of the five surveyed climate models anticipate values of the IOD index will remain within negative thresholds into the middle of spring. Four of five models predict negative IOD will persist until October, with two of these continuing into November.

5. Consensus Seasonal outlook for July, August and September 2021

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

5.1 Rainfall forecast for July-August-September (JAS) three months period

Near normal rainfalls are likely over most parts of the country during JAS 2021 season (Fig. 13)

5.2 Rainfall forecast for the month of July 2021

There is a probability for near normal rainfalls over most parts of the country with a possibility for slightly above normal rainfalls in Northern province during the month of July 2021. However climatological amount (normal) of rainfall is not significant in Northern province during the month of July.

5.3 Rainfall forecasts for August 2021

There is a higher possibility for near normal rainfalls over most parts of the country during the month of August 2021. However there is possibility for slightly below normal rainfalls in Southwestern parts of the country.

5.4 Rainfall forecasts for September 2021

There is a no clear signal for the rainfall forecast of month of September 2021. Therefore there are equal chances to receive below, near of above normal rainfalls in the month of September 2021

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 July-August–September 2021

5.5 Probabilistic Temperature Forecast from July to September 2021 (JAS)

The probabilistic Temperature forecast for July, August and September season (JAS) 2021 for Sri Lanka as given below.

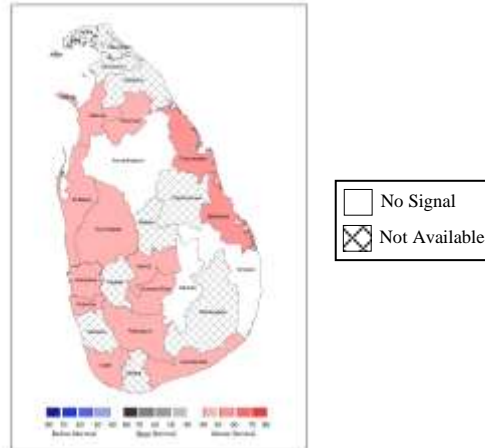


Fig 14: Probabilistic forecast for Maximum Temperatures for JAS season 2021

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

There is a higher chance of experiencing slightly above the normal Maximum Temperatures in Vavunia, Mannar, Kurunegala, Puttalam, Gampaha, Colombo, Galle, Hambantota, Rathnapura, Kandy, Nuwara Eliya, Batticaloa and Trincomalee districts (Fig 14) for the JAS 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) – (JAS)	Probability %		
		Below	Normal	Above
Anuradhapura	33.1	30	35	35
Badulla	30.4	35	35	30
Batticaloa	32.9	25	25	50
Colombo	30.1	25	30	45
Galle	28.5	35	20	45
Hambantota	30.2	25	35	40
Katugastota	28.0	25	25	50
Katunayake	30.5	30	30	40
Mannar	30.7	30	30	40
MahaIlluppallama	33.0	35	30	35
NuwaraEliya	18.8	35	25	40
Pottuvil	33.9	30	35	35
Puttalam	31.5	25	35	40
Ratnapura	30.8	25	30	45
Ratmalana	30.2	30	30	40
Trincomalee	34.3	20	25	55
Vavuniya	33.8	35	25	40
Kurunegala	31.1	30	30	40
Bandarawela	25.6	35	30	35

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

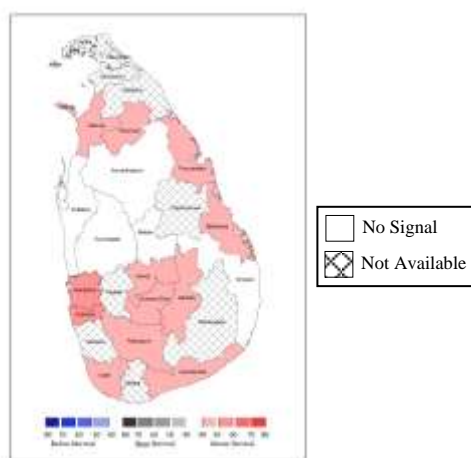


Fig 15: Probabilistic forecast for Minimum Temperatures for JAS season 2021

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

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

District	Average Minimum Temperature (°C) – (JAS)	Probability %		
		Below	Normal	Above
Anuradhapura	24.3	30	35	35
Badulla	18.5	35	25	40
Batticaloa	25.1	25	35	40
Colombo	25.0	25	25	50
Galle	24.7	30	25	45
Hambantota	24.6	20	30	50
Katugastota	20.7	30	30	40
Katunayake	24.7	25	25	50
Mannar	26.3	30	30	40
Mahalluppallama	24.2	30	35	35
NuwaraEliya	12.6	30	30	40
Pottuvil	24.8	35	35	30
Puttalam	25.5	35	30	35
Ratnapura	23.3	30	30	40
Ratmalana	24.8	25	25	50
Trincomalee	25.5	30	30	40
Vavuniya	24.1	25	30	45
Kurunegala	23.6	35	30	35
Bandarawela	16.4	30	30	40

Table 4: Probabilistic forecast for Minimum Temperatures for JAS 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.