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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook

May, June and July (MJJ)

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

Below average sea surface temperatures (SST) were observed over the Central and the South-Eastern tropical Pacific Ocean during the last four weeks. Further, negative sea surface temperature anomalies persisted in the central and South-Eastern Pacific Ocean while positive sea surface temperatures persisted in the parts of North Pacific ocean and near the South American coastal area. (CPC-USA) (Fig.1 & 2)

1.1 El Nino and La Nina update

The tropical Pacific atmosphere is consist with La Niña conditions. A majority of the statistical and dynamical models predict La Niña is favored to continue through Northern Hemisphere summer 2022 and transition to ENSO neutral thereafter. Further, La Niña is likely to continue in to the Northern Hemisphere summer with 53% chance during June – August 2022 and then transition to ENSO-neutral thereafter with 40-50% . (source-CPC-USA) (Fig.3a).

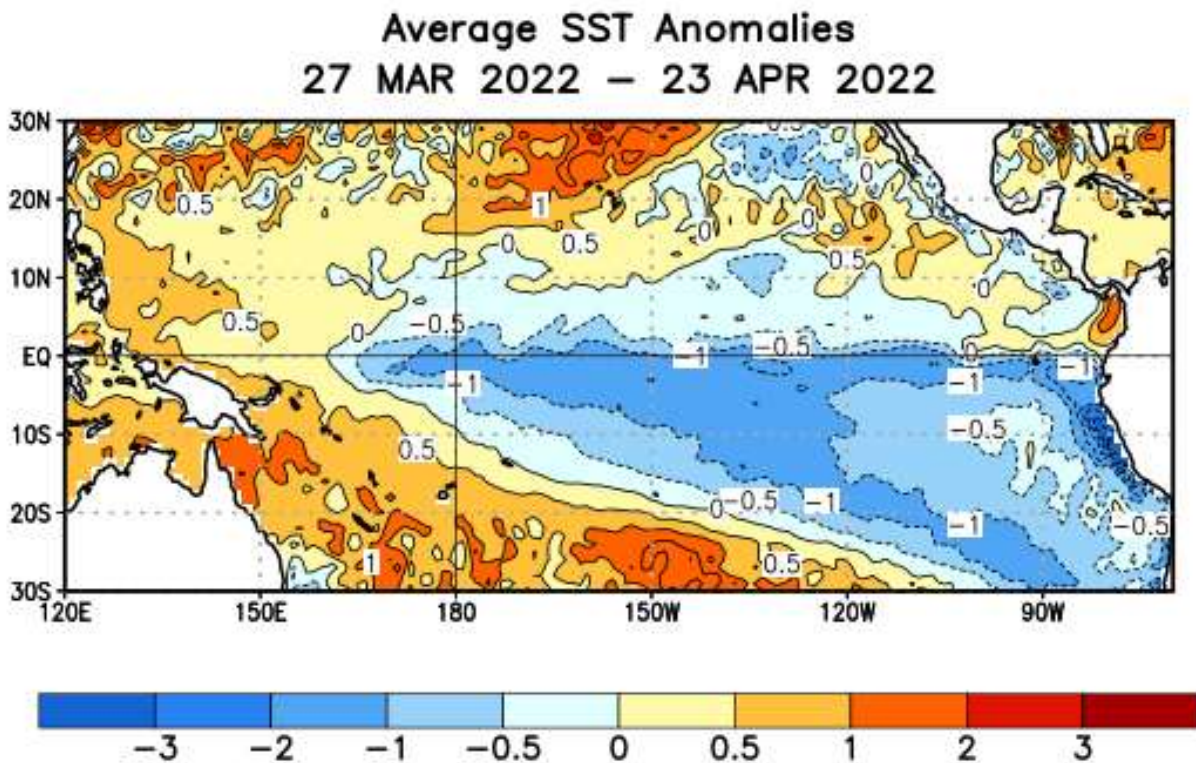


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

Weekly SST Anomalies (DEG C)

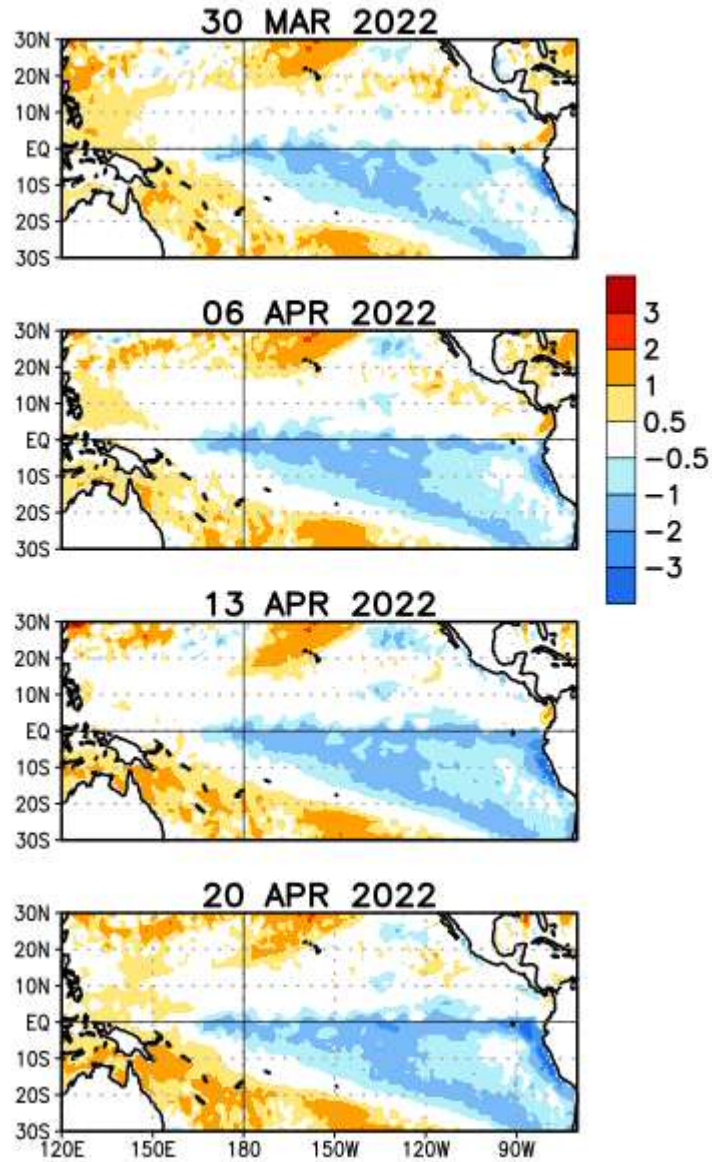


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies ($^{\circ}\text{C}$)

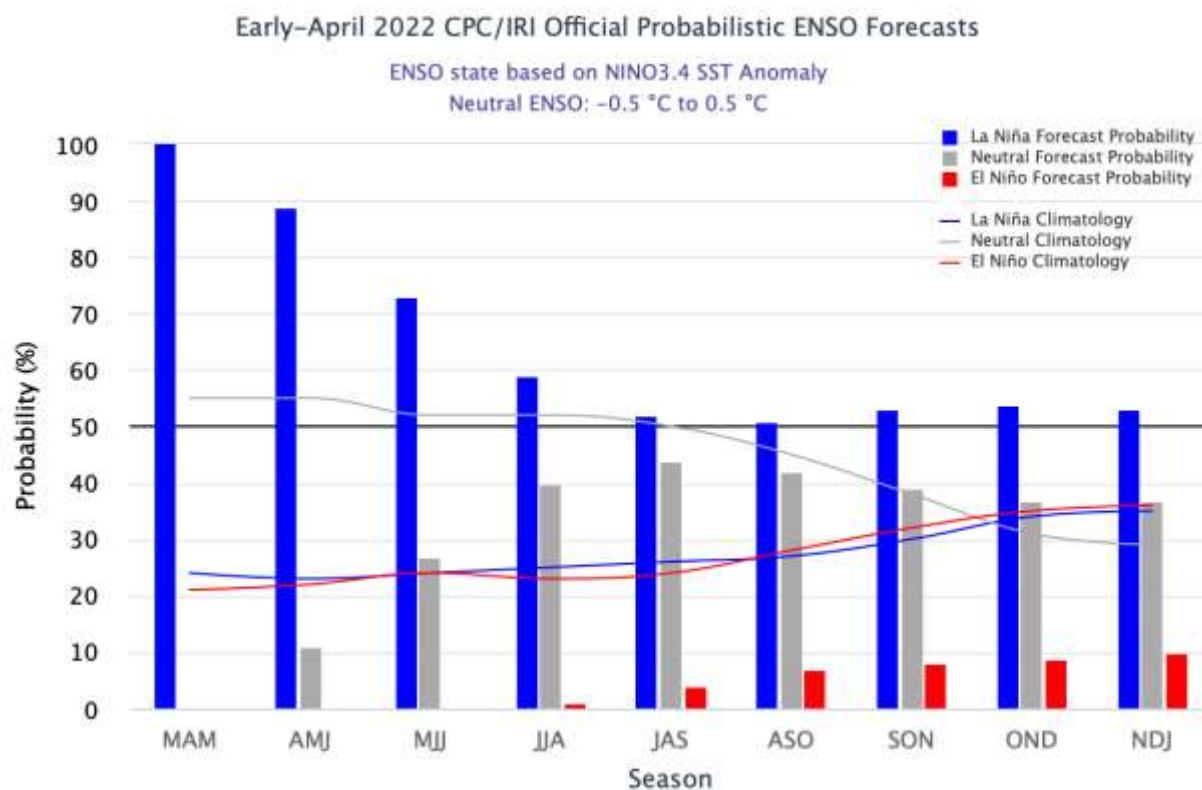


Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast

1.1.1 Impacts of La-Nina on monthly rainfall anomaly during May, June and July

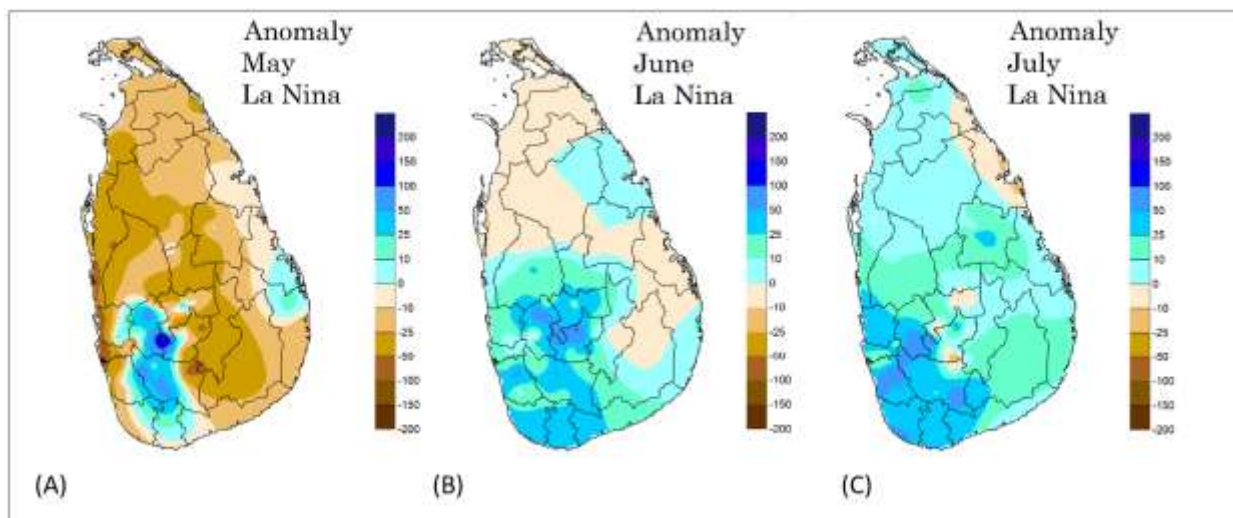


Fig 3b: Monthly Rainfall Anomaly maps of the months of May (A), June (B) and July (C) during La-Nina years (Hapuarachchi et al 2016)

Previous studies conducted by the Department of Meteorology, identified that, during La-Nina years, above normal rainfalls over some areas of southwestern part and Batticaloa and Ampara

districts. Below normal rainfalls are expected over remaining areas of the country during the month of May (Fig 3b-A). During the month of June it was observed that near or slightly above normal rainfalls (Fig 3b-B) over most parts of the country. During the month of July, it could be seen slightly above normal rainfalls over most parts of the country (Fig 3b-C).

1.2 The Indian Ocean Dipole (IOD) update

Overall, Sea surface temperatures (SSTs) were near average in the tropical Indian Ocean in March 2022. Further, SST anomalies were small in the tropical Indian Ocean and the Indian Ocean Dipole (IOD) is persists within neutral bounds. The latest weekly value of the Indian Ocean Dipole (IOD) index to 24th March was +0.01 °C. However, all five international climate models surveyed by the BoM indicate the possibility of negative IOD development in May and continue coming months in 2022. (Source-Bureau of Meteorology, Australia).

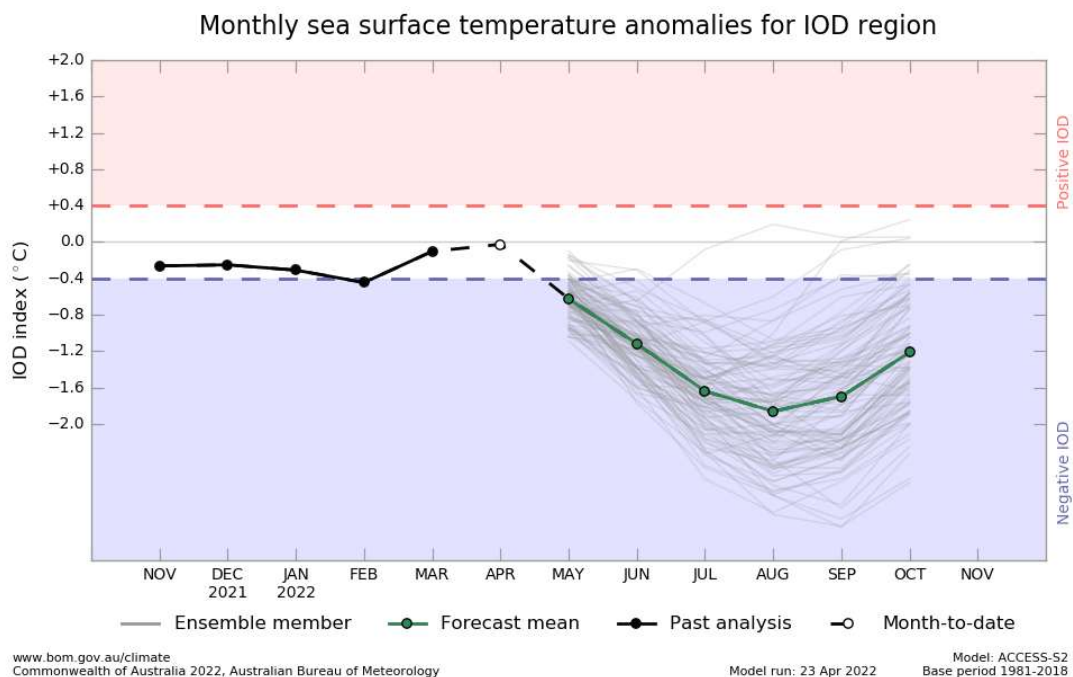


Figure 4a: IOD forecast from Australian Bureau of Meteorology .

1.2.1 Impacts of negative IOD on monthly rainfall anomaly during May, June and July

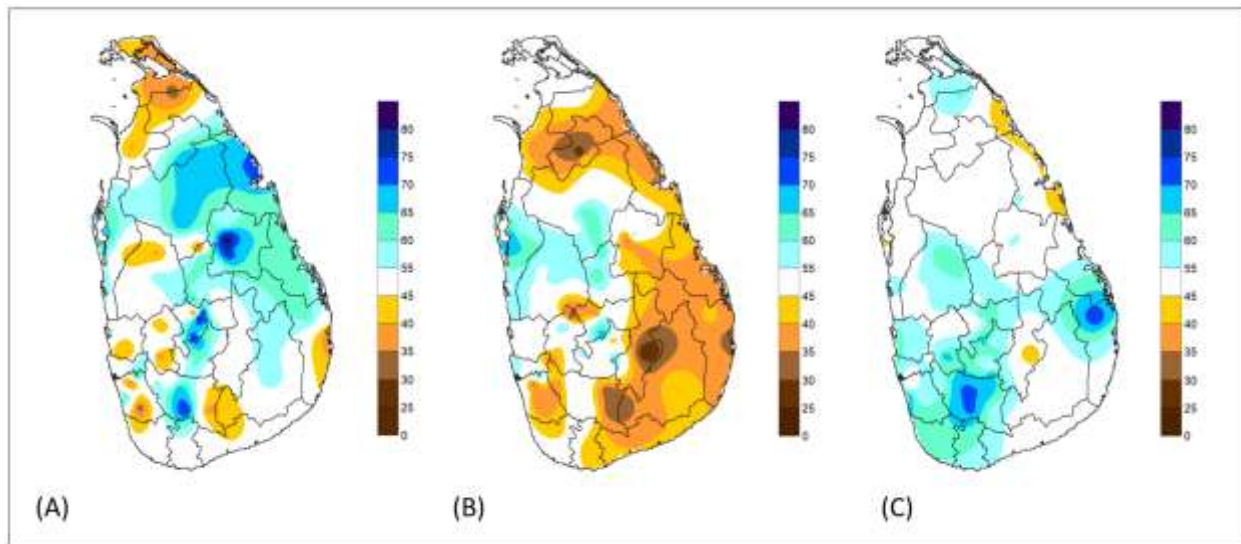


Fig 4b: Median Based Composite maps of Monthly Rainfall during May (A) June(B) and July (C) during Negative IOD years (Hapuarachchi et al 2018)

Previous studies conducted by the Department of Meteorology identified that there is a higher probability of getting below normal rainfall over northern part of the country (Fig 4b (A)) and above normal rainfall over some areas in Anuradhapura, Polonnaruwa, Matale, Trincomalee, Batticaloa, Ampara, Monaragala, Kandy, Nuwara Eliya and Rathnapura districts under the negative IOD condition during the month of May. But in the month of June it is showing the higher probability of getting below normal rainfall over Mannar, Vavuniya, Mulativu, Trincomalee, Batticaloa and South eastern part of the country and above normal rainfall over some parts in Puttalam, Kurunegala, Matale and Anuradhapura districts (Fig 3b (B)). And there is a higher probability of getting above normal rainfall over south western part of the country and Batticaloa, Ampara, Matale and Kurunegala districts during the month of July (Fig 3b (C)) under the negative IOD condition.

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

2.1 May to July (MJJ) 2022 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 13 Global Producing Centers (GPC) for MJJ season. According to that above normal rainfall can be expected over Northern province. Below normal rainfalls can be

expected over remaining parts except eastern part where no clear signal indicated. Accordingly below, about or above normal rainfalls can be expected over no signal areas during May–July (MJJ) 2022 season.

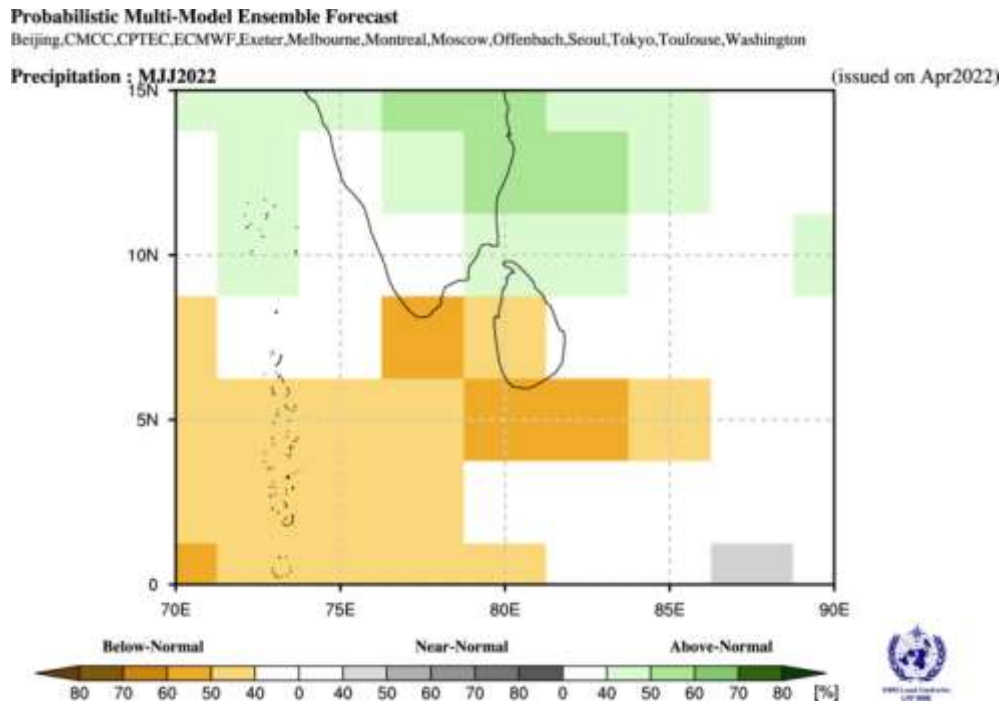


Fig 5: Probabilistic multi model ensemble forecast for MJJ using dynamical models from 13 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the MJJ season. Out of 12 GPC individual models, 8 models predicted slightly below normal rainfall over southern and south western part of the country. There is no clear signal indicated over remaining parts of the country, where there is a equal probability for below or near or above normal rainfalls during MJJ 2022 season.

Lat : 0~15, Lon : 70~90
Precipitation : MJJ2022

[Unit : mm]
(issued on Apr2022)

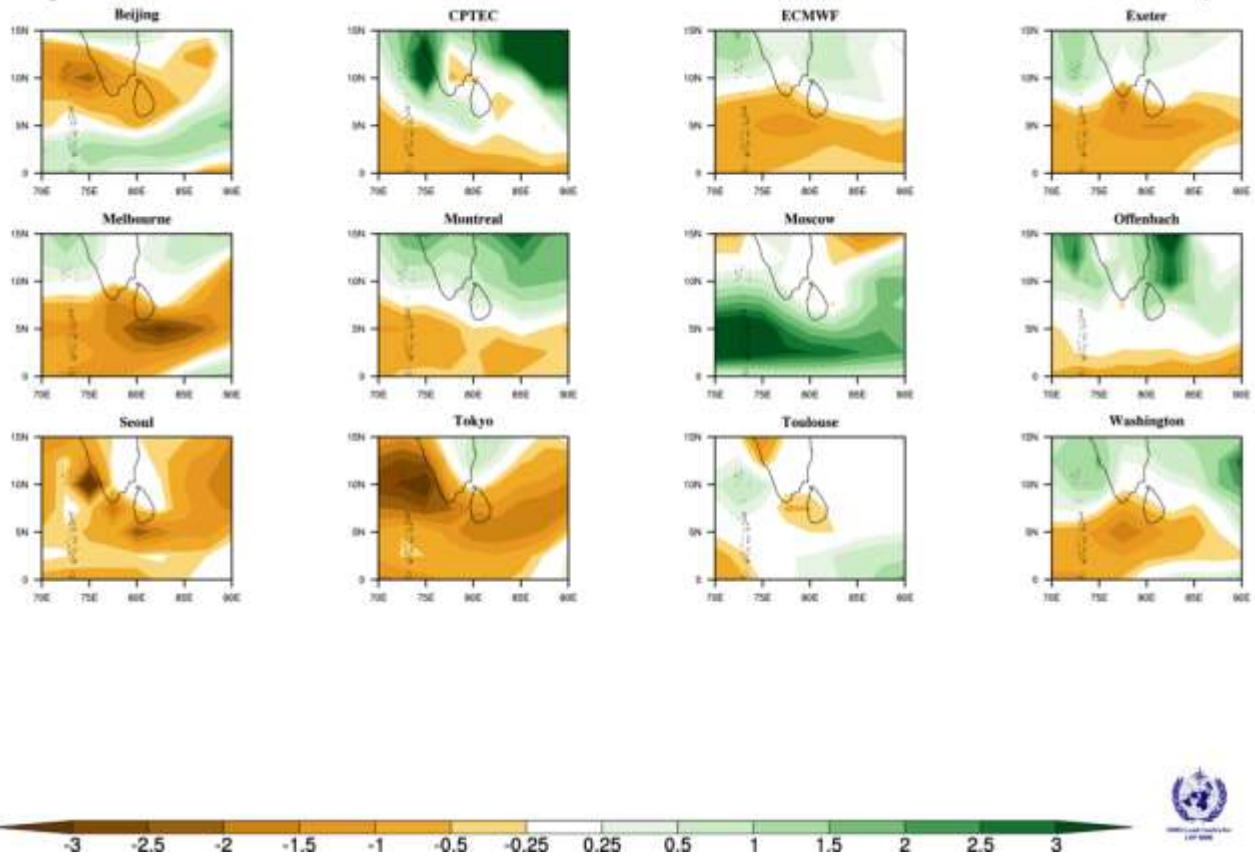


Fig 6: Individual forecasts for MJJ 2022 season by dynamical models from 12 WMO global producing centers (GPC).

2.2 Monthly Forecast for May, June and July 2022

Figure 7 shows the probabilistic multi model ensemble forecasts, which are prepared by using dynamical models from 13 global producing centers (GPC), for the months of May, June and July 2022. According to that during the months of May it can be expected slightly above normal rainfall over Northern parts of the country while no signal indicated other parts. During the months of June it can be expected below normal rainfall over most of the parts of the country except northern part where no clear signal indicated. During the month of July it can be expected slightly above normal rainfall over the northern part and below normal rainfall over remaining areas except eastern part where no clear signal indicated. Accordingly below or about or above normal rainfall can be expected over no signal areas during the season.

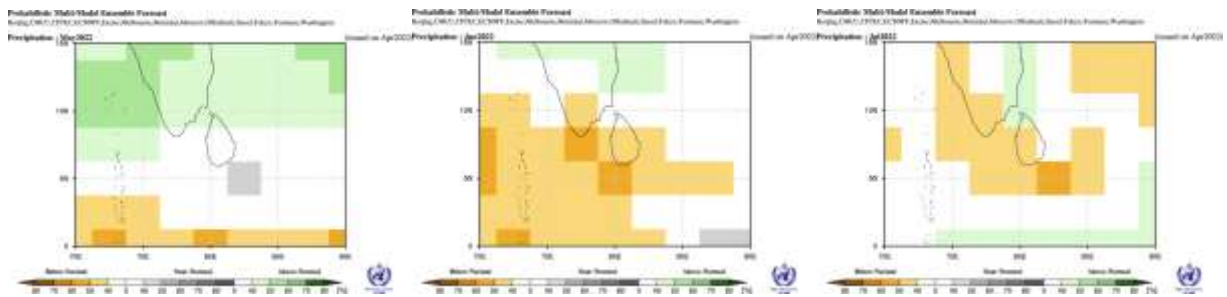


Fig 7: Probabilistic multi model ensemble forecast for May (left), June (middle) and July (right) 2022 using dynamical models from 13 WMO global producing centers (GPC).

Lat : 0~15, Lon : 70~90
Precipitation : May2022

[Unit : mm]
(issued on Apr2022)

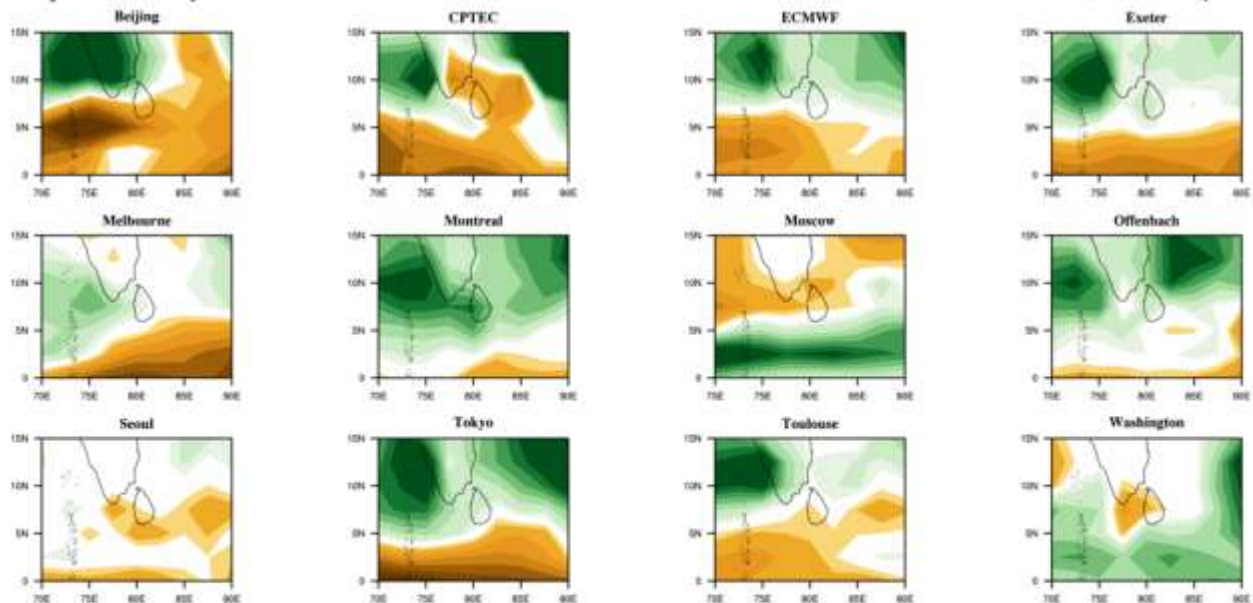


Fig 8: Individual forecast for May 2022 by dynamical models from 12 WMO global producing centers (GPC).

Figure 8 shows the 12 monthly forecasts from individual global producing centers (GPC) for May 2022. Out of 12 GPC forecasts, 3 GPC models predicted near or slightly above normal rainfall over the country and there is no clear signals indicated in 9 GPC models. Accordingly below, near or above normal rainfalls can be expected over the country during the month of May

2022.

Lat : 0~15, Lon : 70~90
Precipitation : Jun2022

[Unit : mm]
(issued on Apr2022)

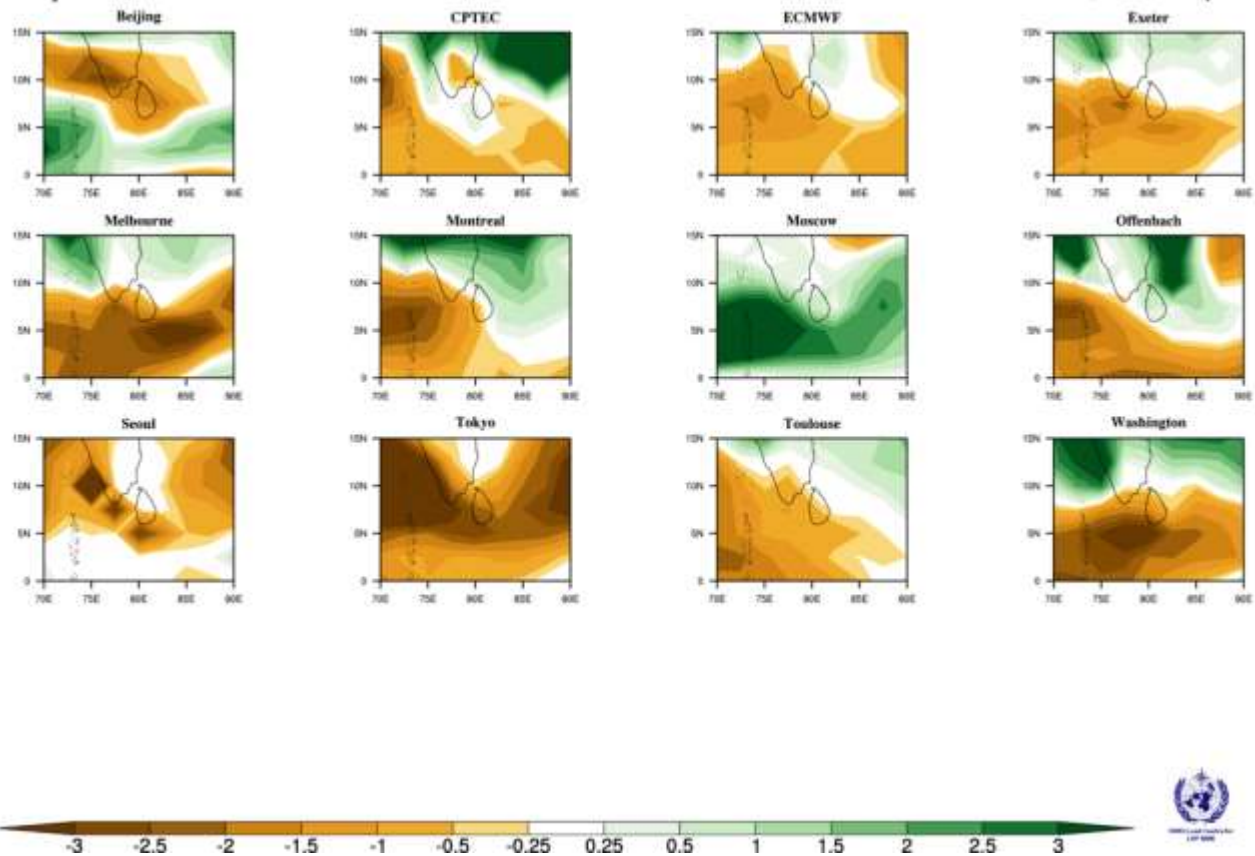


Fig 9: Individual forecast for June 2022 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for June 2022. Out of 12 GPC forecasts, 9 GPC models predicted slightly below normal rainfall over southern and south western parts of the country and there is no clear over remaining parts of the country, where there are equal chances for below or near or above normal rainfall during the month of June 2022.

Lat : 0~15, Lon : 70~90
Precipitation : Jul2022

[Unit : mm]
(issued on Apr2022)

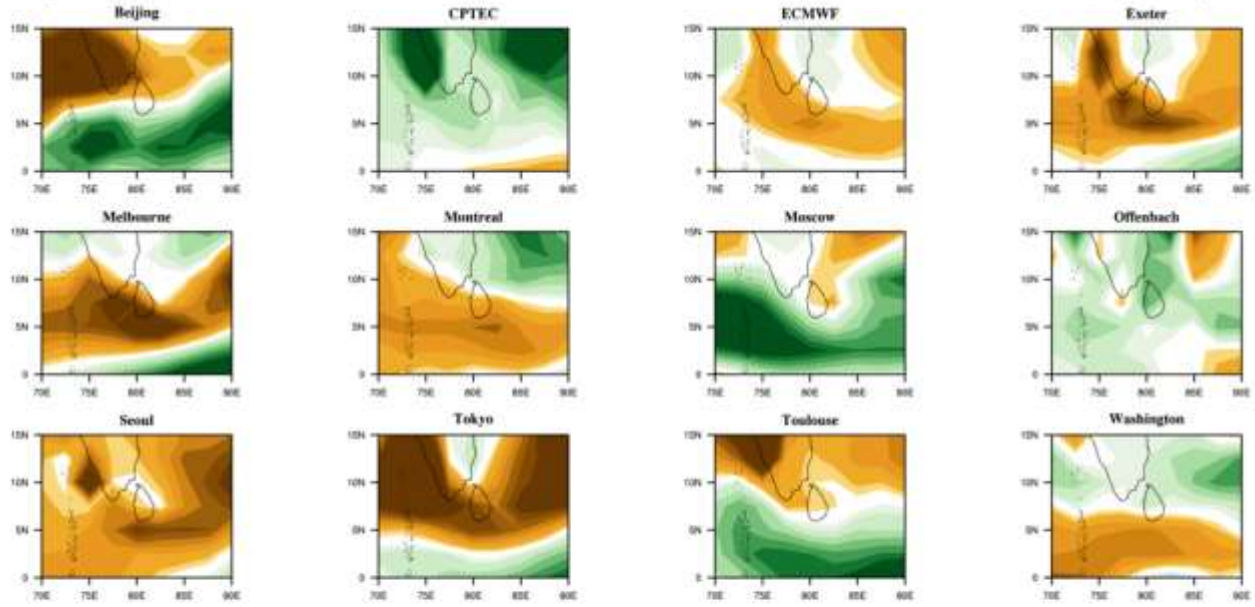


Fig 10: Individual forecast for July 2022 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from 12 individual global producing centers (GPC) for July 2022. Out of 12 GPC forecasts, 2 GPC models indicate slightly above normal rainfall and 2 GPC models indicated below normal rainfall over the country. There is no clear signal from 8 GPC models for the month of July 2022. Accordingly there are equal chances for below or near or above normal rainfall during the month of July 2022.

3. Statistical downscaling of CFSv2 global forecast output

3.1 Probabilistic rainfall forecast for MJJ season 2022 using Climate Predictability tool (CPT)

The following district wise probabilistic rainfall forecasts for the season of MJJ 2022 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 MJJ 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) –MJJ	Probability%		
		Below	Normal	Above
Colombo	840.9	45	30	25
Kalutara	1140.6	55	25	20
Galle	954.6	45	25	30
Matara	714.0	20	20	60
Hambantota	185.9	20	20	60
Ampara	133.9	20	20	60
Batticaloa	138.0	20	20	60
Trincomalee	148.3	20	25	55
Mullaithivu	111.2	20	25	55
Jaffna	84.6	20	20	60
Killinochchi	82.1	20	25	55
Mannar	79.4	25	25	50
Puttalam	187.8	30	25	45
Gampaha	691.6	40	25	35
Kegalle	1090.9	35	25	40
Ratnapura	833.5	20	20	60
Monaragala	169.7	20	20	60
Badulla	221.3	20	20	60
Pollonnaruwa	145.7	20	20	60
Vavuniya	120.4	20	30	50
Anuradapura	124.0	20	20	60
Kurunegala	297.8	20	20	60
Matale	205.6	20	20	60
Kandy	520.7	20	20	60
Nuwaraeliya	799.9	20	20	60

Table 1: Probabilistic Rainfall Forecast for MJJ season 2022 using CPT



Fig 11: Probabilistic rainfall forecast for May -July 2022 using CPT

According to the CPT (Fig 11 and table 01), above normal rainfalls can be expected in 20 districts out of 25. Below normal rainfall can be expected in Colombo, Kalutara and Galle districts. There is no clear signal for Kegalle and Gampaha districts for MJJ season 2022. Therefore equal chances exist of receiving below, about or above normal rainfall over Kegalle and Gampaha districts for MJJ Season 2022.

3.2 Probabilistic rainfall forecast for MJJ 2022 season using RIMES FOCUS System

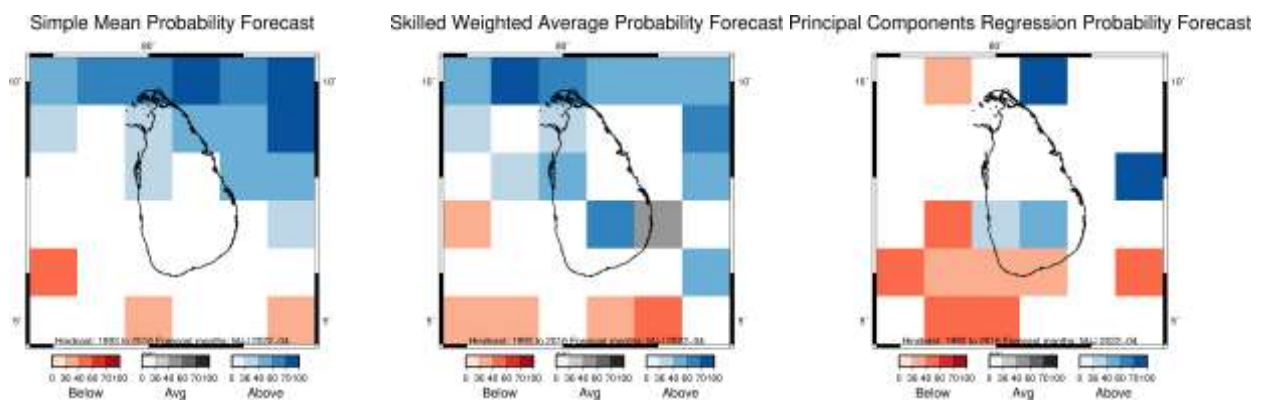


Fig 12. Probabilistic rainfall forecast for May-July 2022 using RIMES FOCUS System

Figure 12 depicts the Probabilistic rainfall forecast for MJJ 2022 season, which has been prepared by using RIMES FOCUS System.

According to the model outputs slightly above normal rainfalls are indicated over Northern and Northwestern parts of the country. No clear signal indicated over other parts of the country and equal chances are exists for below or about or above normal rainfalls during MJJ season 2022.

4. SUMMARY :

SUMMARY of MODEL FORECAST for MJJ 2022 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final Rainfall Forecast
MJJ season 2022	AN-Northern part No Signal- Eastern part BN- Remaining areas	BN- Southern and South western part No Signal- Remaining areas	BN-Colombo, Kalutara, Galle No Signal-Gampaha, Kegalle AN- Remaining areas	No Signal	Lanina condition is likely to continue. (Fig 3b) Negative IOD conditions is predicted form month of May and likely to continue during the season (Fig 4b)	Below normal in Southern and Southwestern parts and no signal for remaining areas.
May 2022	AN-Northern part No Signal- Remaining areas	No Signal				Above normal in Northern province and no signal over remaining areas
June 2022	No Signal- Northern part BN-Remaining areas	No Signal				Below normal in Southern and Southwestern parts and no signal for remaining areas.
July 2022	AN-Northern part No Signal- Eastern part BN-Remaining areas	No Signal				No Signal

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

Table 2: Summery of Model Forecasts for MJJ season 2022

4.1 Summery of Prevailing global climate conditions

The tropical Pacific atmosphere is consist with La Niña conditions. A majority of the statistical and dynamical models predict La Niña is favored to continue through Northern Hemisphere summer 2022 and transition to ENSO neutral thereafter. Further, La Niña is likely to continue in to the Northern Hemisphere summer with 53% chance during June – August 2022 and then transition to ENSO-neutral thereafter with 40-50% .

Overall, Sea surface temperatures (SSTs) were near average in the tropical Indian Ocean in March 2022. Further, SST anomalies were small in the tropical Indian Ocean and the Indian Ocean Dipole (IOD) is persists within neutral bounds. The latest weekly value of the Indian

Ocean Dipole (IOD) index to 24th March was +0.01 °C. However, all five international climate models surveyed by the BoM indicate the possibility of negative IOD development in May and continue coming months in 2022.

5. Consensus Seasonal outlook for May, June and July 2022

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, consensus forecasts for May to July 2022 are concluded as follows.

5.1 Rainfall forecast for May-June-July (MJJ) 2022 three months period

Below normal rainfalls are expected in Southern and Southwestern parts and no clear signal for remaining areas of the country for the season of MJJ 2022. (Fig. 13).

5.2 Rainfall forecast for May 2022

There is a possibility for slightly above normal rainfalls over Northern province and no clear signal for other areas where there are equal probability of having above or near or below normal rainfalls during the month of May 2022.

5.3 Rainfall forecasts for June 2022

There is a probability for below normal rainfall over Southern and Southwestern parts and no clear signal for remaining areas of the country for the month of June 2022.

5.4 Rainfall forecasts for July 2022

There is no clear signal and there exist equal probabilities for below or near or above normal rainfalls over the country during the month of July 2022.

**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 May–July 2022

5.5 Probabilistic Temperature Forecast from May to July 2022 (MJJ)

The probabilistic Temperature forecast for May, June and July season (MJJ) 2022 for Sri Lanka as given below.

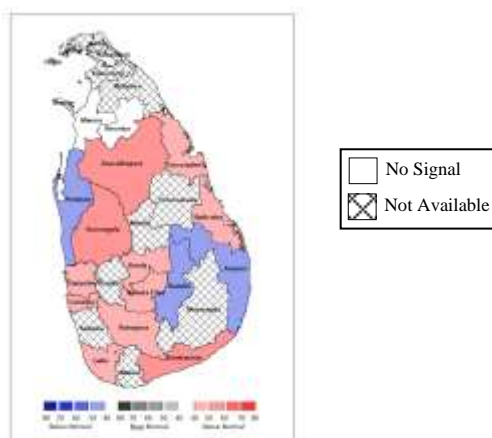


Fig 14: Probabilistic forecast for Maximum Temperatures for MJJ season 2022

Fig 14 and Table 3 show the probabilistic forecast for Maximum Temperatures during MJJ season 2022.

There is a higher chance of experiencing slightly above the normal Maximum Temperatures in Anuradhapura, Kurunegala, Gampaha, Colombo, Galle, Hambantota, Rathnapura, Kandy, Nuwara Eliya, Trincomalee and Batticaloa districts and below the normal Maximum temperatures in Puttalam, Badulla and Ampara districts (Fig 14) for the MJJ season 2022.

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) – (MJJ)	Probability %		
		Below	Normal	Above
Anuradhapura	32.9	25	25	50
Badulla	30.6	40	30	30
Batticaloa	33.5	30	30	40
Colombo	30.5	30	30	40
Galle	29.1	25	30	45
Hambantota	30.5	25	25	50
Katugastota	28.6	30	30	40
Katunayake	30.8	30	30	40
Mannar	31.3	30	35	35
Mahalluppallama	32.7	25	25	50
NuwaraEliya	19.6	30	30	40
Pottuvil	31.7	40	30	30
Puttalam	31.7	40	30	30
Ratnapura	31.2	30	30	40
Ratmalana	30.3	30	30	40
Trincomalee	34.6	25	30	45
Vavuniya	33.8	35	30	35
Kurunegala	31.4	25	25	50
Bandarawela	26.0	40	30	30

Table 3: probabilistic forecast for Maximum Temperature for MJJ season 2022

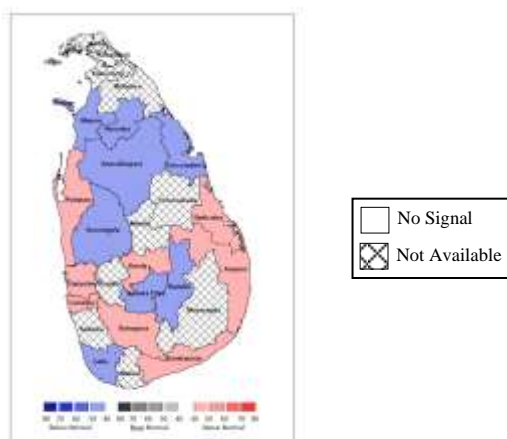


Fig 15: Probabilistic forecast for Minimum Temperatures for MJJ season 2022

District	Average Minimum Temperature ($^{\circ}\text{C}$) – (MJJ)	Probability %		
		Below	Normal	Above
Anuradhapura	24.7	45	35	20
Badulla	18.9	40	30	30
Batticaloa	25.5	30	30	40
Colombo	25.4	30	25	45
Galle	25.2	45	25	30
Hambantota	25.1	30	30	40
Katugastota	21.3	30	30	40
Katunayake	25.0	25	35	40
Mannar	27.0	40	30	30
Mahalluppallama	24.5	40	30	30
NuwaraEliya	12.9	40	30	30
Pottuvil	23.4	35	20	45
Puttalam	25.7	30	30	40
Ratnapura	23.7	30	30	40
Ratmalana	25.1	25	30	45
Trincomalee	25.9	45	20	35
Vavuniya	24.5	40	30	30
Kurunegala	24.2	40	30	30
Bandarawela	16.8	40	30	30

Table 4: Probabilistic forecast for Minimum Temperatures for MJJ season 2022

Fig 15 and Table 4 provide the probabilistic forecast for Minimum Temperatures during MJJ season 2022.

Accordingly, there is a higher possibility of experiencing slightly below the normal Minimum Temperatures in Mannar, Vavuniya, Anuradhapura, Trincomalee, Kurunegala, Nuwara Eliya, Badulla and Galle districts and slightly above the normal Minimum Temperatures in Puttalam, Colombo, Gampaha, Rathnapura, Hambantota, Kandy, Ampara and Batticaloa districts (Fig 15) during MJJ season 2022.

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