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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook

June, July and August (JJA)

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

Equatorial sea surface temperatures (SSTs) were below average across most of the 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 Northern Pacific ocean. (CPC-USA) (Fig.1 & 2)

1.1 El Nino and La Nina update

The tropical Pacific atmosphere is consistent with La Niña conditions. A majority of the statistical and dynamical models predict La Niña is favored to continue through Northern Hemisphers summer 2022. Further, La Niña is likely to continue into the Northern Hemisphere summer with a 58 % chance during August – October 2022 before slightly increasing through the Northern Hemisphere fall and early winter 2022 with the 61% chance. (source-CPC-USA) (Fig.3a).

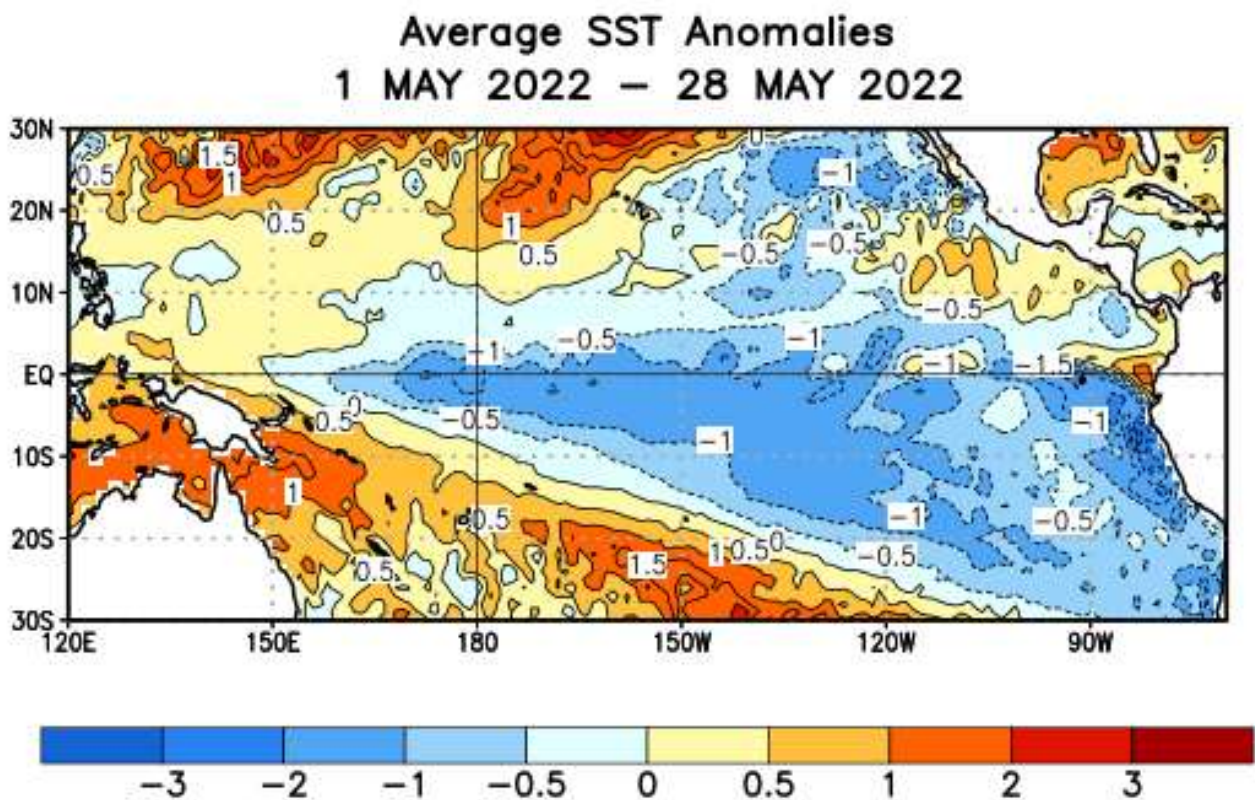


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

Weekly SST Anomalies (DEG C)

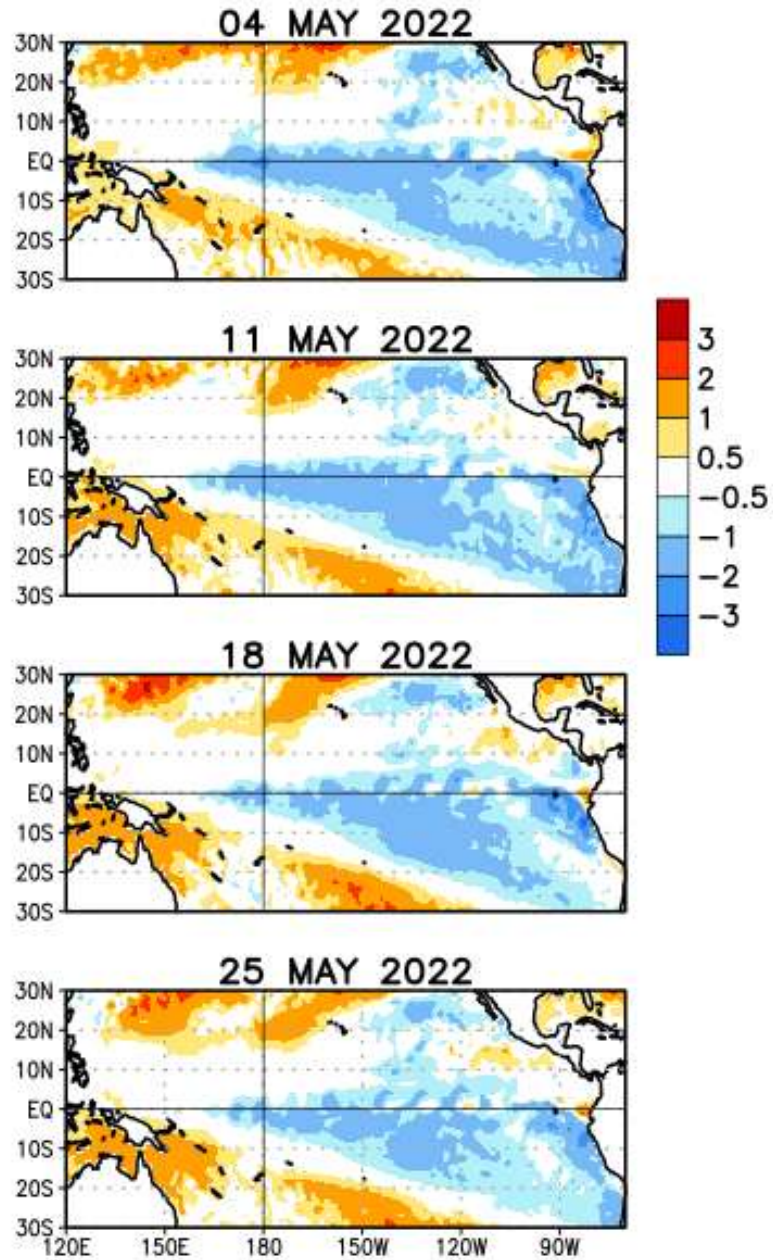


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

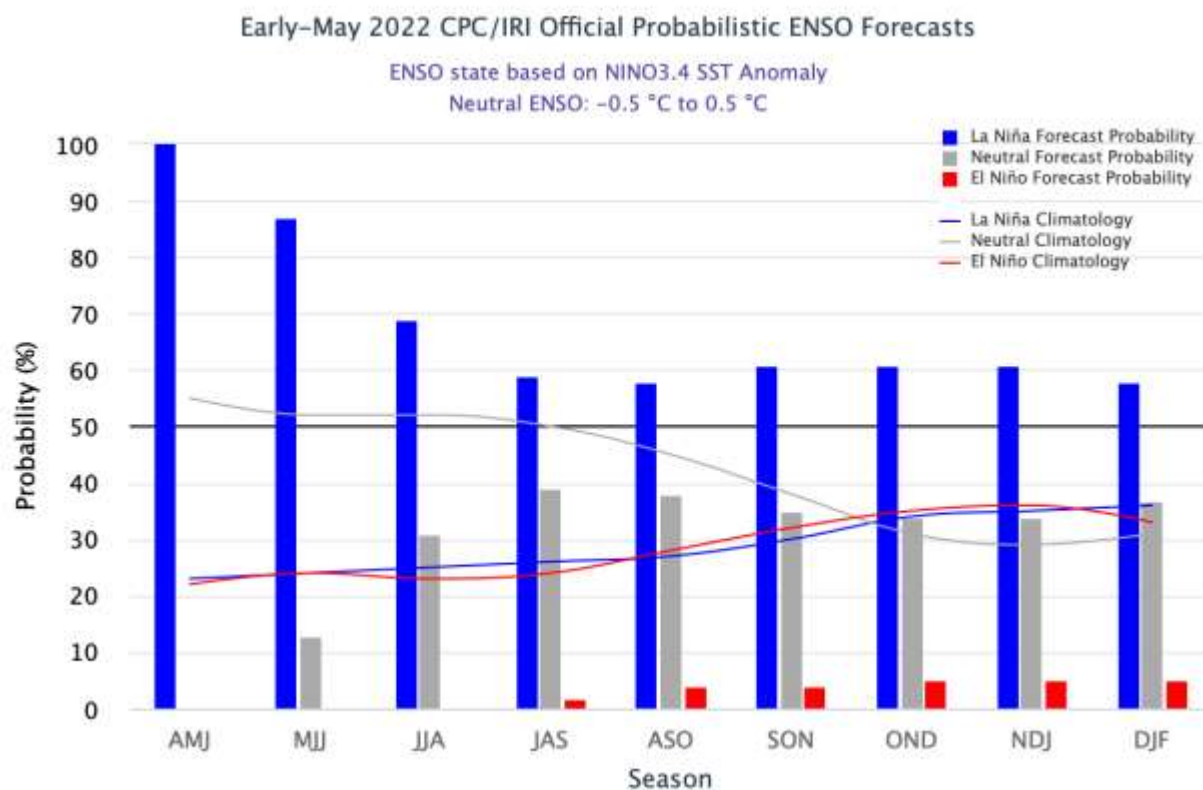


Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast

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

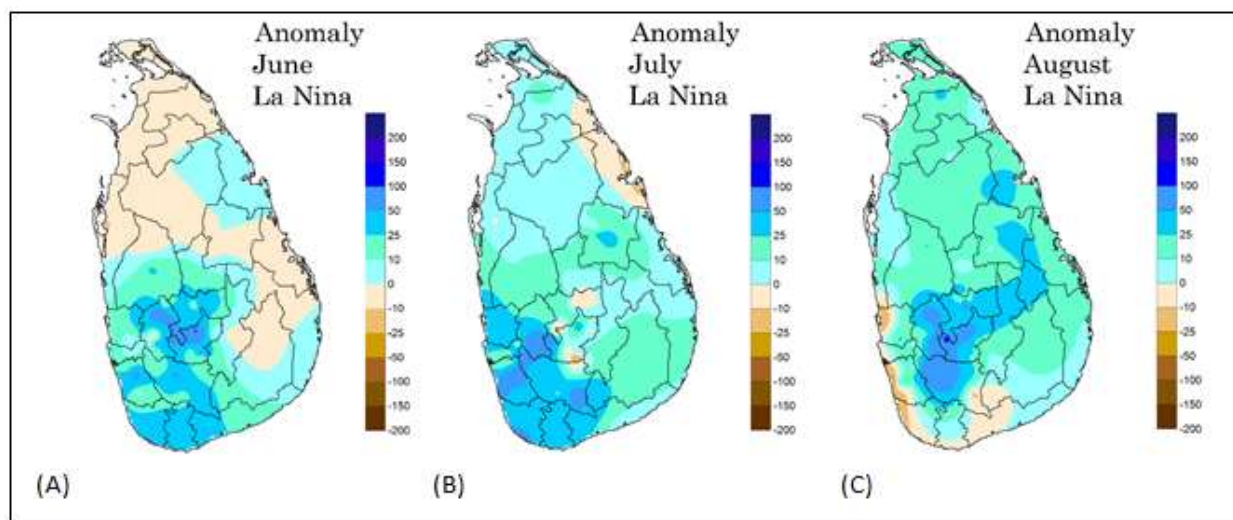


Fig 3b: Monthly Rainfall Anomaly maps of the months of June (A), July (B) and August (C) during La-Nina years (Hapuarachchi et al 2016)

Previous studies conducted by the Department of Meteorology, identified that, during La-Nina years, above or near normal rainfalls over most parts of the country during the months of June, July and August (Fig 3b).

1.2 The Indian Ocean Dipole (IOD) update

Overall, slightly above normal Sea surface temperatures (SSTs) were observed over the Indian Ocean. However the Indian Ocean Dipole (IOD) is persists within neutral bounds. The latest weekly value of the Indian Ocean Dipole (IOD) index to 22nd May was -0.55°C . All five international climate models surveyed by the BoM indicate a negative IOD event during the coming months and most of the models show strongest negative IOD by the month of August. (Source-Bureau of Meteorology, Australia).

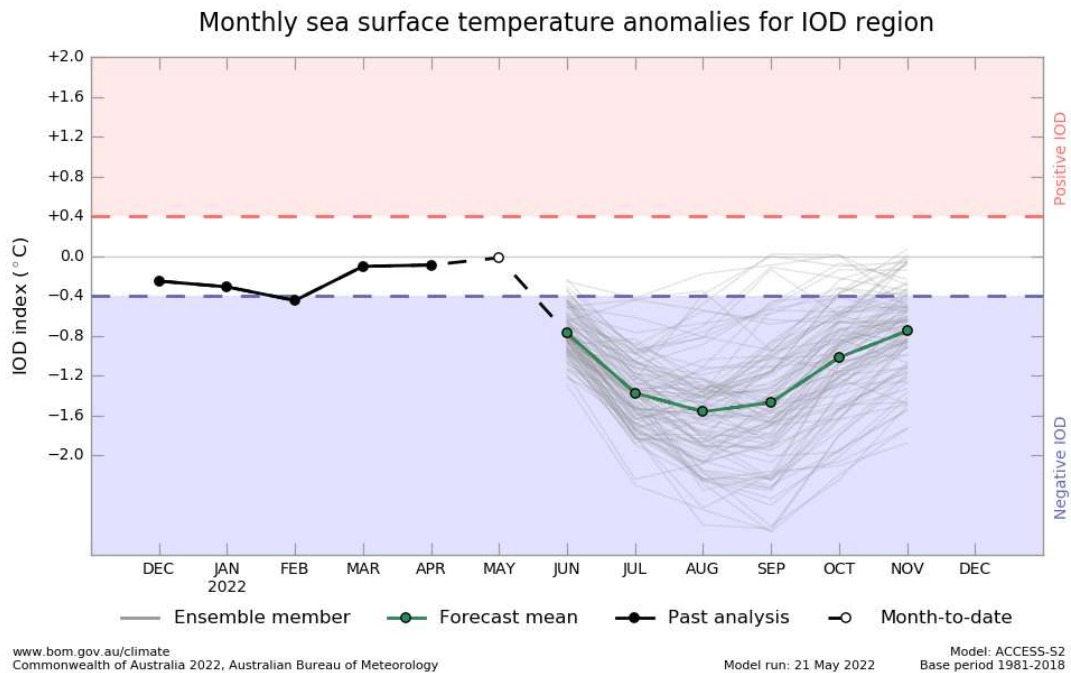


Figure 4a: IOD forecast from Australian Bureau of Meteorology .

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

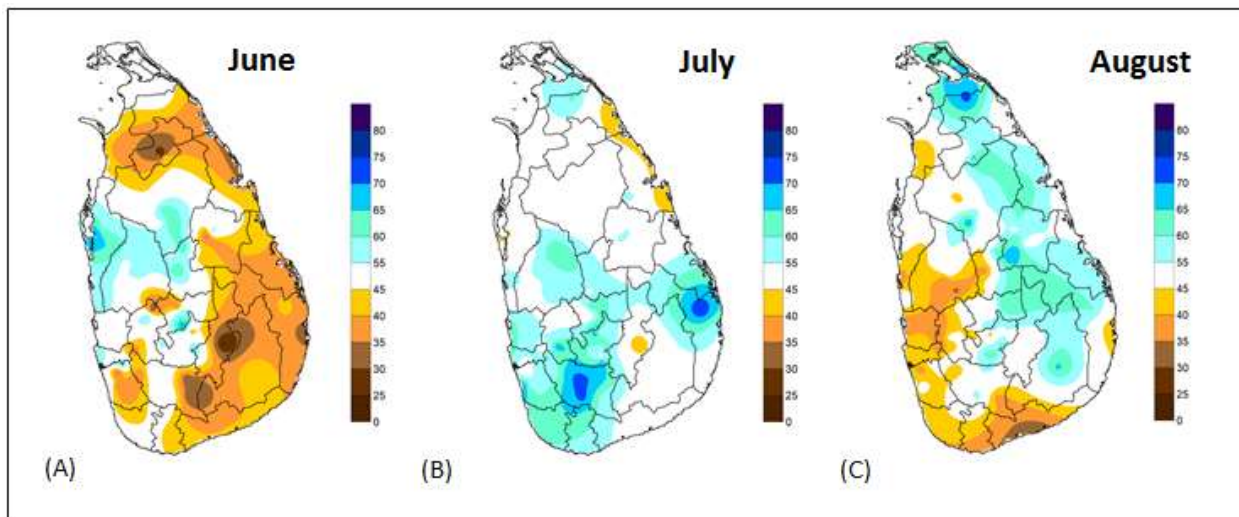


Fig 4b: Median Based Composite maps of Monthly Rainfall during June (A) July(B) and August (C) during Negative IOD years (Hapuarachchi et al 2018)

Previous studies conducted by the Department of Meteorology identified that there is a higher probability of getting below normal rainfall over 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 under the negative IOD condition during the month of June. But in the month of July it is showing the higher probability of getting above normal rainfall over south western part of the country and Batticaloa, Ampara, Matale and Kurunegala districts (Fig 3b (B)). And there is a higher probability of getting below normal rainfall over some parts of Mannar, Puttalam, Kurunegala, Gampaha, Colombo, Galle, Matara, Rathnapura, Monaragala and Hambantota districts and near or above normal rainfall over other parts of the country during the month of August (Fig 3b (C)) under the negative IOD condition.

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

2.1 June to August (JJA) 2022 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 13 Global Producing Centers (GPC) for JJA 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 June–August

(JJA) 2022 season.

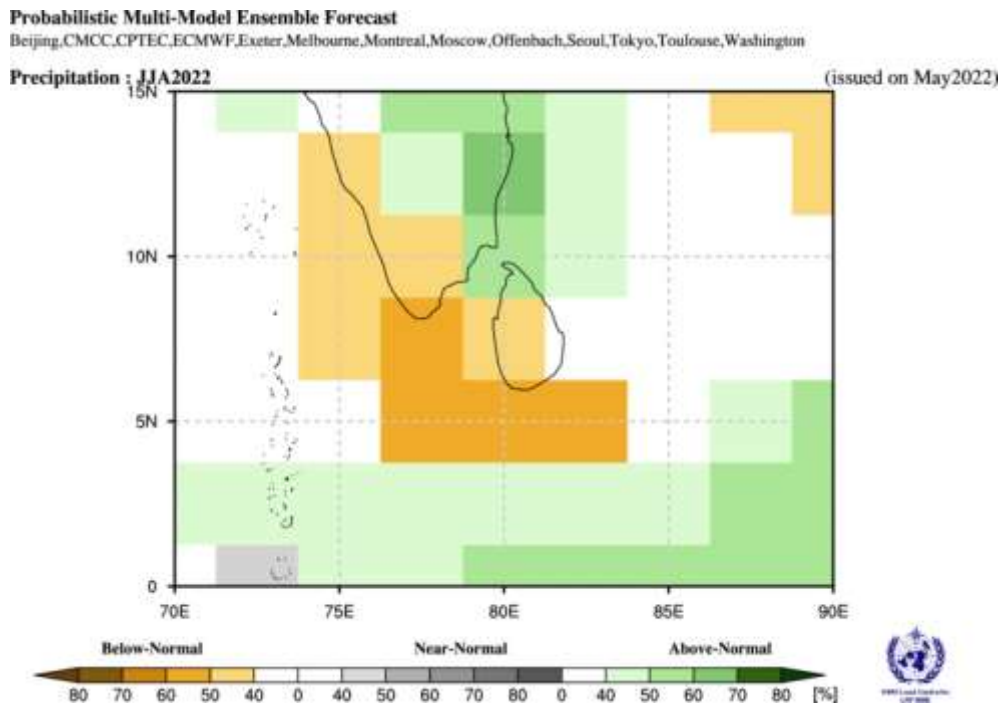


Fig 5: Probabilistic multi model ensemble forecast for JJA using dynamical models from 13 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the JJA 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 JJA 2022 season.

Lat : 0~15, Lon : 70~90
Precipitation : JJA2022

[Unit : mm]
(issued on May2022)

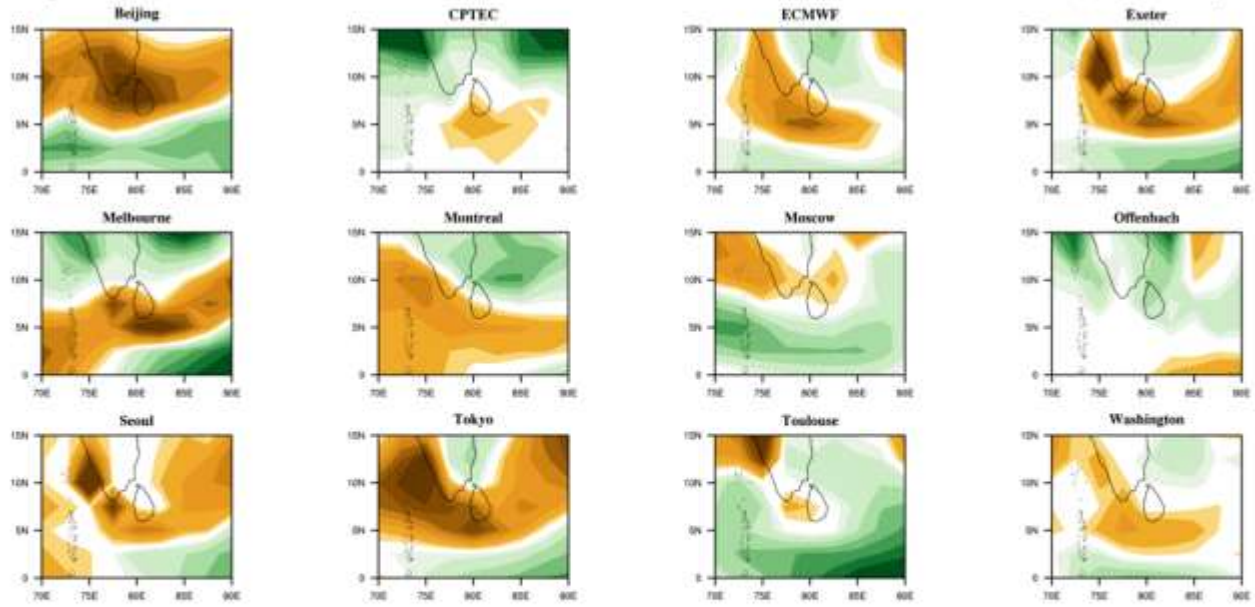


Fig 6: Individual forecasts for JJA 2022 season by dynamical models from 12 WMO global producing centers (GPC).

2.2 Monthly Forecast for June, July and August 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 June, July and August 2022. According to that during the month of June, it can be expected slightly above normal rainfall over Northern parts of the country while no signal indicated over other parts. During the months of July and August, it can be expected below normal rainfall over most of the parts of the country except northern and eastern parts. Above normal rainfall can be expected in northern part and no clear signal indicated over eastern part. Accordingly below or about or above normal rainfall can be expected over no signal areas during the season.

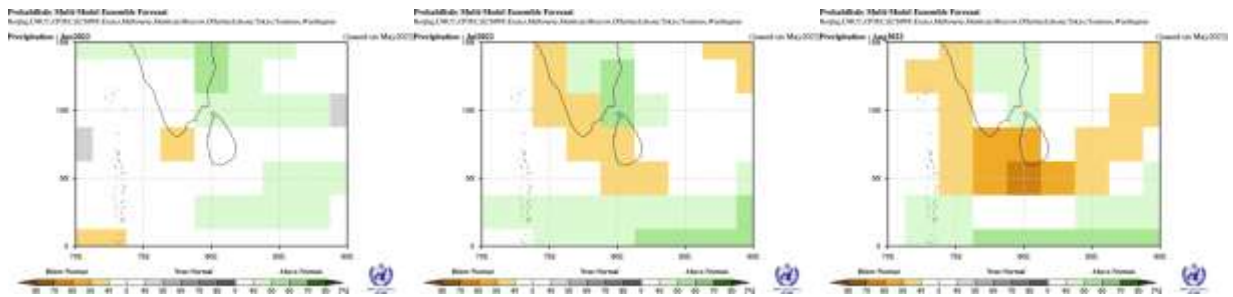


Fig 7: Probabilistic multi model ensemble forecast for June (left), July (middle) and August (right) 2022 using dynamical models from 13 WMO global producing centers (GPC).

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

[Unit : mm]
(issued on May2022)

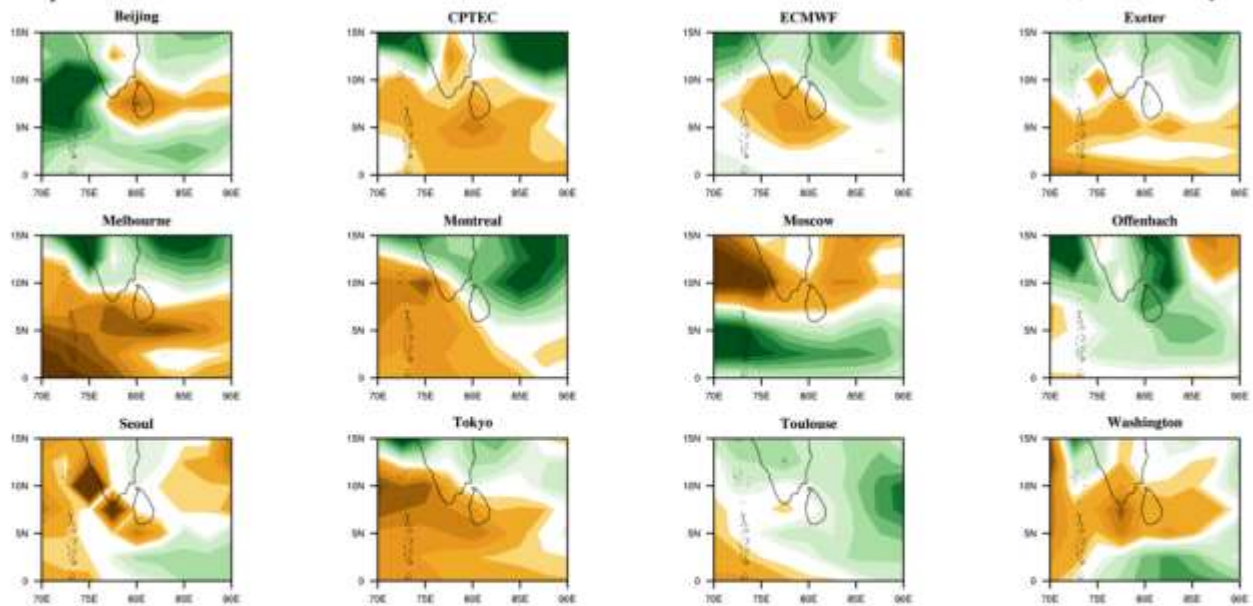


Fig 8: Individual forecast for June 2022 by dynamical models from 12 WMO global producing centers (GPC).

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

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

[Unit : mm]
(issued on May2022)

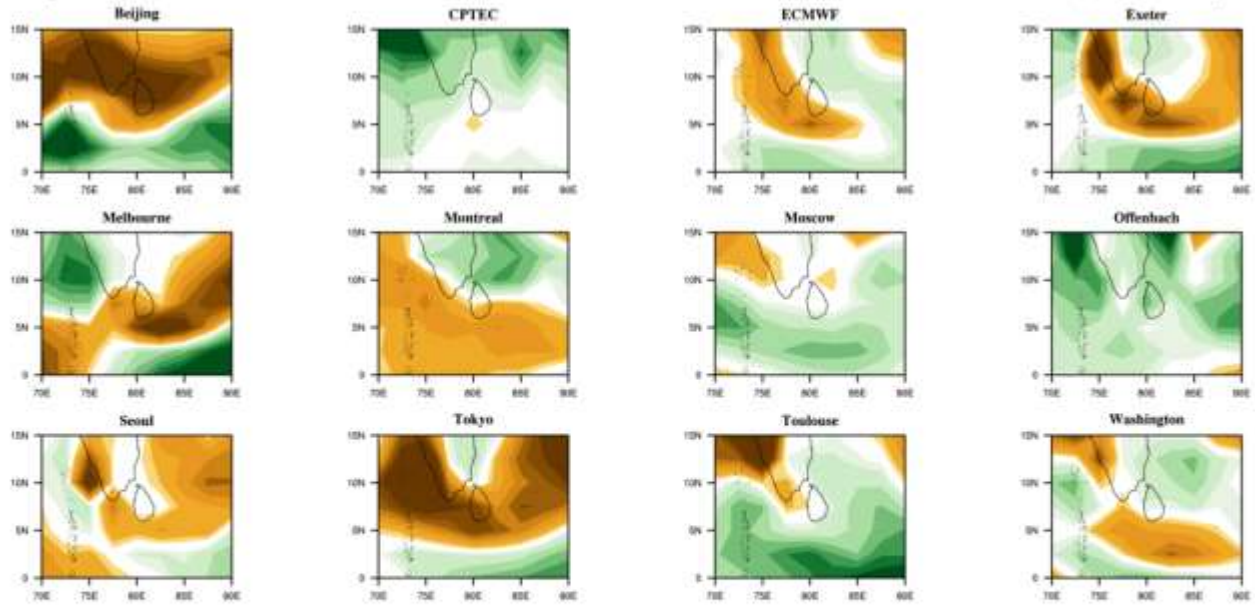


Fig 9: Individual forecast for July 2022 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for July 2022. Out of 12 GPC forecasts, 3 GPC models predicted slightly below normal rainfall over the country and one model predicted above normal rainfall over the country. There is no clear signal indicated in 8 GPC models, where there are equal chances for below or near or above normal rainfall during the month of July 2022.

Lat : 0~15, Lon : 70~90
 Precipitation : Aug2022

[Unit : mm]
 (issued on May2022)

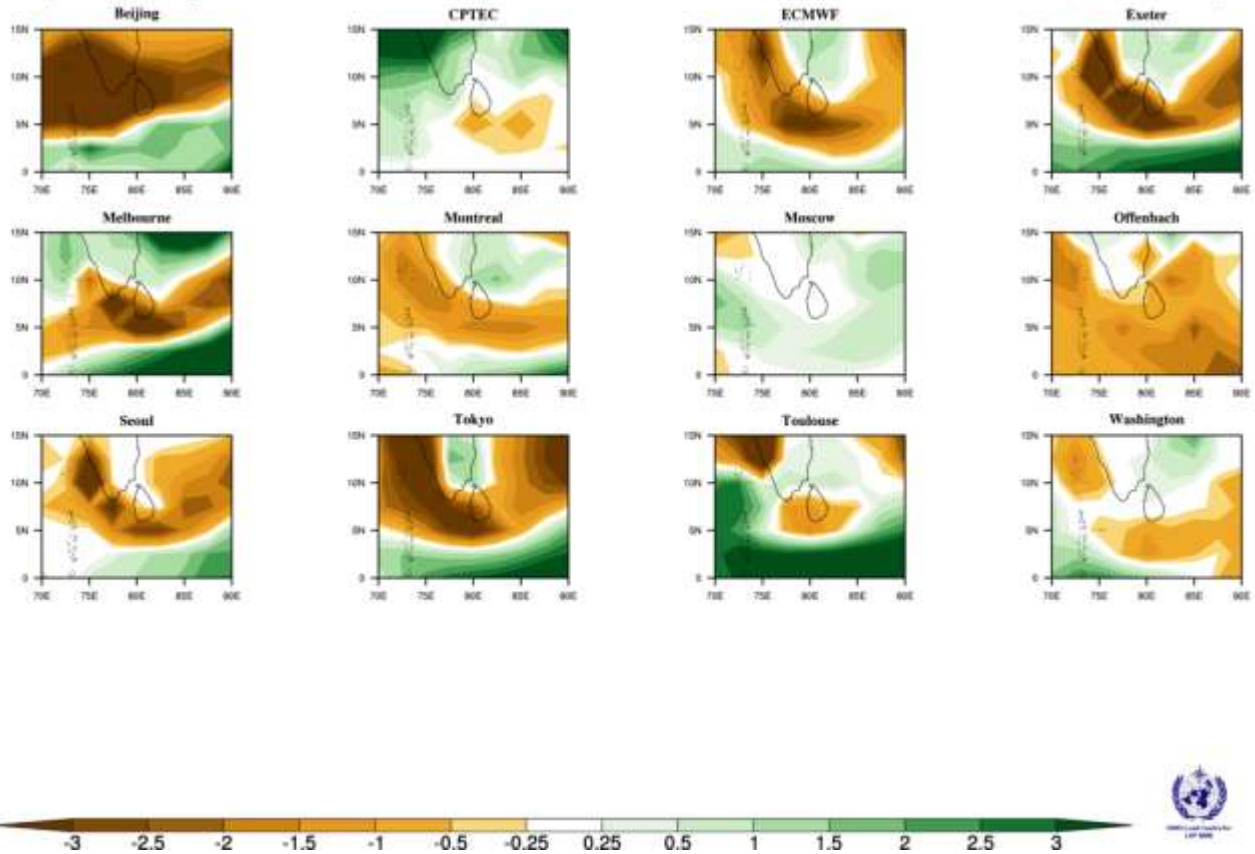


Fig 10: Individual forecast for August 2022 by dynamical models from 12 WMO global producing centers (GPC).

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

3. Statistical downscaling of CFSv2 global forecast output

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

The following district wise probabilistic rainfall forecasts for the season of JJA 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 JJA 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) –JJA	Probability%		
		Below	Normal	Above
Colombo	590.1	45	30	25
Kalutara	861.5	50	30	20
Galle	771.0	45	30	25
Matara	604.3	20	20	60
Hambantota	146.9	20	20	60
Ampara	131.5	20	20	60
Batticaloa	141.2	20	20	60
Trincomalee	168.8	25	25	50
Mullaithivu	99.5	25	25	50
Jaffna	71.6	20	20	60
Killinochchi	57.1	20	20	60
Mannar	40.3	25	25	50
Puttalam	98.4	30	25	45
Gampaha	478.5	40	30	30
Kegalle	934.8	40	30	30
Ratnapura	675.1	20	20	60
Monaragala	125.9	20	20	60
Badulla	183.7	20	20	60
Pollonnaruwa	128.9	20	20	60
Vavuniya	109.8	30	30	40
Anuradapura	89.7	20	20	60
Kurunegala	212.4	20	20	60
Matale	163.5	20	20	60
Kandy	497.6	20	20	60
Nuwaraeliya	767.1	20	20	60

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



Fig 11: Probabilistic rainfall forecast for June -August 2022 using CPT

According to the CPT (Fig 11 and table 01), above normal rainfalls can be expected in 19 districts out of 25. Below normal rainfall can be expected in Colombo, Kalutara and Galle districts. There is no clear signal for Vavuniya, Kegalle and Gampaha districts for JJA season 2022. Therefore equal chances exist of receiving below, about or above normal rainfall over Vavuniya, Kegalle and Gampaha districts for JJA Season 2022.

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

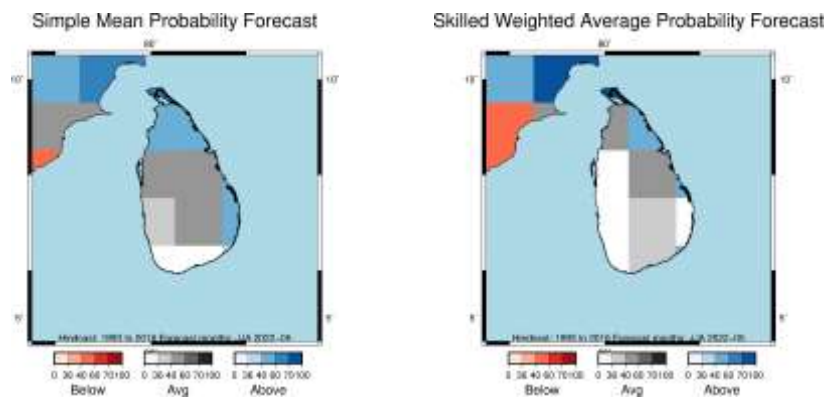


Fig 12. Probabilistic rainfall forecast for June-August 2022 using RIMES FOCUS System

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

According to the model outputs above or about normal rainfalls are indicated over most of the parts of the country during JJA season 2022.

4. SUMMARY :

SUMMARY of MODEL FORECAST for JJA 2022 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final Rainfall Forecast
JJA season 2022	AN-Northern part No Signal- Eastern part BN- Remaining areas	BN-Southern and South western part	BN- Colombo, Kalutara and Galle No Signal-Gampaha, Kegalle and Vavuniya AN- Elsewhere	AN or NN over most parts of the country NN-SW parts AN- elsewhere	Lanina Condition AN – SW parts	Near normal rainfalls in Western,Sabaragamuwa, Northwestern, and central provinces and in Galle and Matara disticts AN – Northern province and below normal over Hambantota district and no signal for other areas
June 2022	AN-Northern part No Signal- Elsewhere	No Signal	BN- Colombo, Kalutara, Galle AN-Kegalle, Rathnapura, Monaragala, Badulla, Polonnaruwa, Kurunegala, Puttalam, Mathale, Kandy, Nuwara Eliya, Batticaloa, Ampara and Hambantota No Signal- Elsewhere		Lanina Condition AN – SW parts	Near Normal over Western, Sabaragamuwa, Northwestern, and central and northern provinces and in Galle and Matara disticts and no signal for other areas
July 2022	AN-Northern part No Signal- Eastern part BN-Elsewhere	No Signal			Lanina Condition AN – SW parts	Near Normal over Western, Sabaragamuwa, Northwestern, central and northern provinces and in Galle and Matara disticts and no signal for other areas
August 2022	AN-Northern part No Signal- Eastern part BN-Elsewhere	BN- Southern and South-western parts			Lanina Condition AN – SW parts	Near normal over central and sabaragamuwa provinces and slightly below normal western northwestern and southern provinnces ,above normal in northern and no signal for remaining areas

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

Table 2: Summery of Model Forecasts for JJA season 2022

4.1 Summery of Prevailing global climate conditions

The tropical Pacific atmosphere is consistent with La Niña conditions. A majority of the statistical and dynamical models predict La Niña is favored to continue through Northern Hemesphers summer 2022. Further, La Niña is likely to continue into the Northern Hemisphere

summer with a 58 % chance during August – October 2022 before slightly increasing through the Northern Hemisphere fall and early winter 2022 with the 61% chance. (source-CPC-USA) (Fig.3a).

Overall, slightly above normal Sea surface temperatures (SSTs) were observed over the Indian Ocean. However the Indian Ocean Dipole (IOD) is persists within neutral bounds. The latest weekly value of the Indian Ocean Dipole (IOD) index to 22nd May was -0.55 °C. All five international climate models surveyed by the BoM indicate a negative IOD event during the coming months and most of the models show strongest negative IOD by the month of August. (Source-Bureau of Meteorology, Australia).

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

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

5.1 Rainfall forecast for June-July-August (JJA) 2022 three months period

Near normal rainfalls are expected in Western, Sabaragamuwa, Northwestern and central provinces and in Galle and Mathara districts and slightly above normal in Northern province with below normal rainfall possibility for Hambantota district. There is no clear signal for remaining areas of the country for the season of JJA 2022. (Fig. 13).

5.2 Rainfall forecast for June 2022

There is a possibility for near normal rainfalls over Western, Sabaragamuwa, Northwestern, Central and Northern provinces and in Galle and Matara districts. There is clear signal for other areas where there are equal probability of having above or near or below normal rainfalls during the month of June 2022.

5.3 Rainfall forecasts for July 2022

There is a probability for near normal rainfall over Western, Sabaragamuwa, Northwestern, Central and Northern provinces and in Galle and Matara districts and no clear signal for remaining areas of the country for the month of July 2022.

5.4 Rainfall forecasts for August 2022

There is a possibility for near normal rainfalls over Central and Sabaragamuwa provinces, slightly below normal rainfalls over Western, Northwestern and Southern provinces with a chance of above normal in Northern province. No clear signal for other areas of the country

where exist equal probabilities for below or near or above normal rainfalls over the country during the month of August 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 June–August 2022

5.5 Probabilistic Temperature Forecast from June to August 2022 (JJA)

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

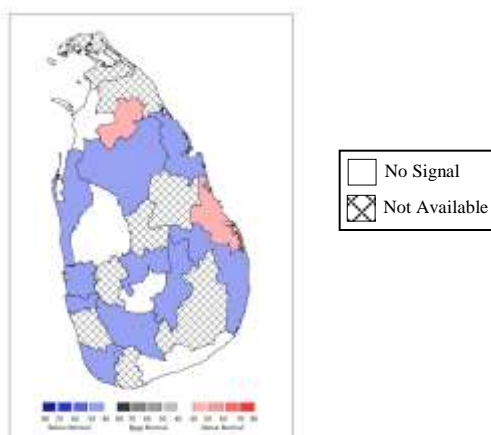


Fig 14: Probabilistic forecast for Maximum Temperatures for JJA season 2022

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

There is a higher chance of experiencing slightly below the normal Maximum Temperatures in Anuradhapura, Puttalam, Gampaha, Colombo, Galle, Rathnapura, Kandy, Badulla, Ampara and Trincomalee districts and above the normal Maximum temperatures in Batticaloa and Vavuniya districts (Fig 14) for the JJA 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 (⁰ C) – (JJA)	Probability %		
		Below	Normal	Above
Anuradhapura	33.0	40	30	30
Badulla	30.6	40	30	30
Batticaloa	33.5	30	30	40
Colombo	30.1	40	30	30
Galle	28.7	45	25	30
Hambantota	30.3	30	35	35
Katugastota	28.0	40	30	30
Katunayake	30.5	45	35	20
Mannar	30.8	30	35	35
MahaIlluppallama	32.8	40	30	30
NuwaraEliya	18.7	30	35	35
Pottuvil	31.4	40	30	30
Puttalam	31.5	40	30	30
Ratnapura	30.8	40	35	25
Ratmalana	30.3	40	30	30
Trincomalee	34.5	45	30	25
Vavuniya	33.9	30	30	40
Kurunegala	30.9	35	30	35
Bandarawela	25.8	40	30	30

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

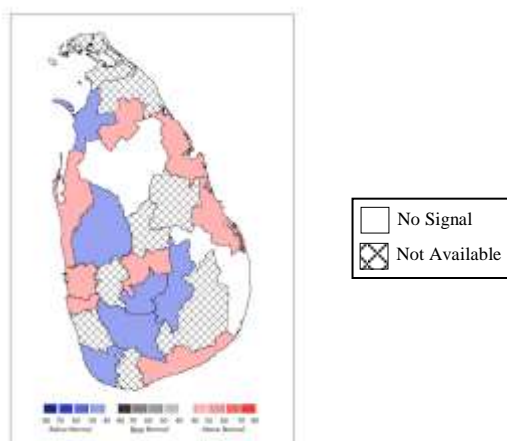


Fig 15: Probabilistic forecast for Minimum Temperatures for JJA season 2022

District	Average Minimum Temperature ($^{\circ}\text{C}$) – (JJA)	Probability %		
		Below	Normal	Above
Anuradhapura	24.6	35	35	30
Badulla	18.6	40	30	30
Batticaloa	25.3	30	30	40
Colombo	25.3	30	25	45
Galle	24.9	45	25	30
Hambantota	24.8	30	30	40
Katugastota	21.1	30	30	40
Katunayake	24.9	25	35	40
Mannar	26.7	40	30	30
MahaIlluppallama	24.4	35	35	30
NuwaraEliya	12.9	40	30	30
Pottuvil	23.0	35	30	35
Puttalam	25.8	30	30	40
Ratnapura	23.5	40	30	30
Ratmalana	25.0	25	30	45
Trincomalee	25.9	35	20	45
Vavuniya	24.4	30	30	40
Kurunegala	23.8	40	30	30
Bandarawela	16.7	40	30	30

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

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

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