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வளிமண்டலவியல் திணைக்களம்
DEPARTMENT OF METEOROLOGY
ශ්‍රී ලංකාව இலங்கை SRI LANKA

Consensus Seasonal Weather Outlook

December 2020, January and February (DJF) 2021

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) are below average from the Date line to the eastern Pacific Ocean (Fig 1). Further, during the last four weeks, equatorial SSTs were below average from west of the Date Line to the eastern Pacific Ocean, and were above average in the far western Pacific Ocean (CPC-USA).

El Nino and La Nina update

Prevailing La Niña conditions are strenghten futher and likely to continue through the Northern Hemisphere winter (January to March) 2020-21 (~95% chance) and into spring 2021 (~65% chance during March-May). Most models suggest La Niña will peak in December 2020 or January 2021 at moderate to strong levels. (Source CPC-USA, BoM) (Fig 3 A).
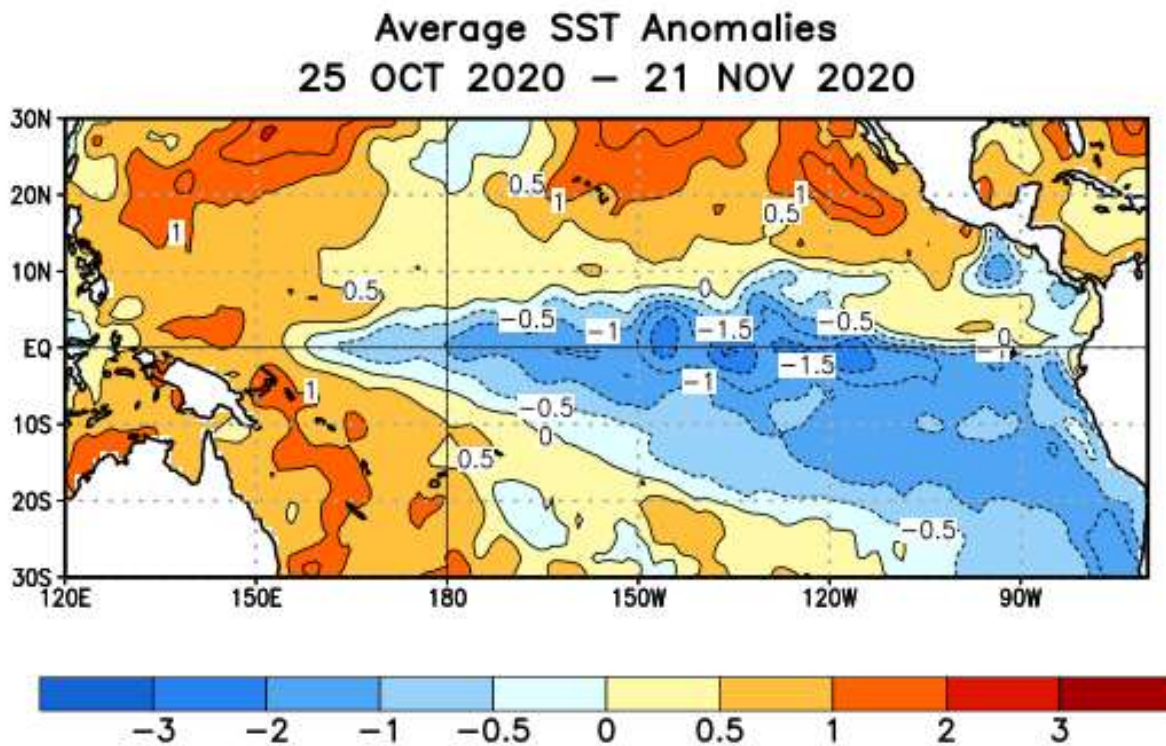
Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)
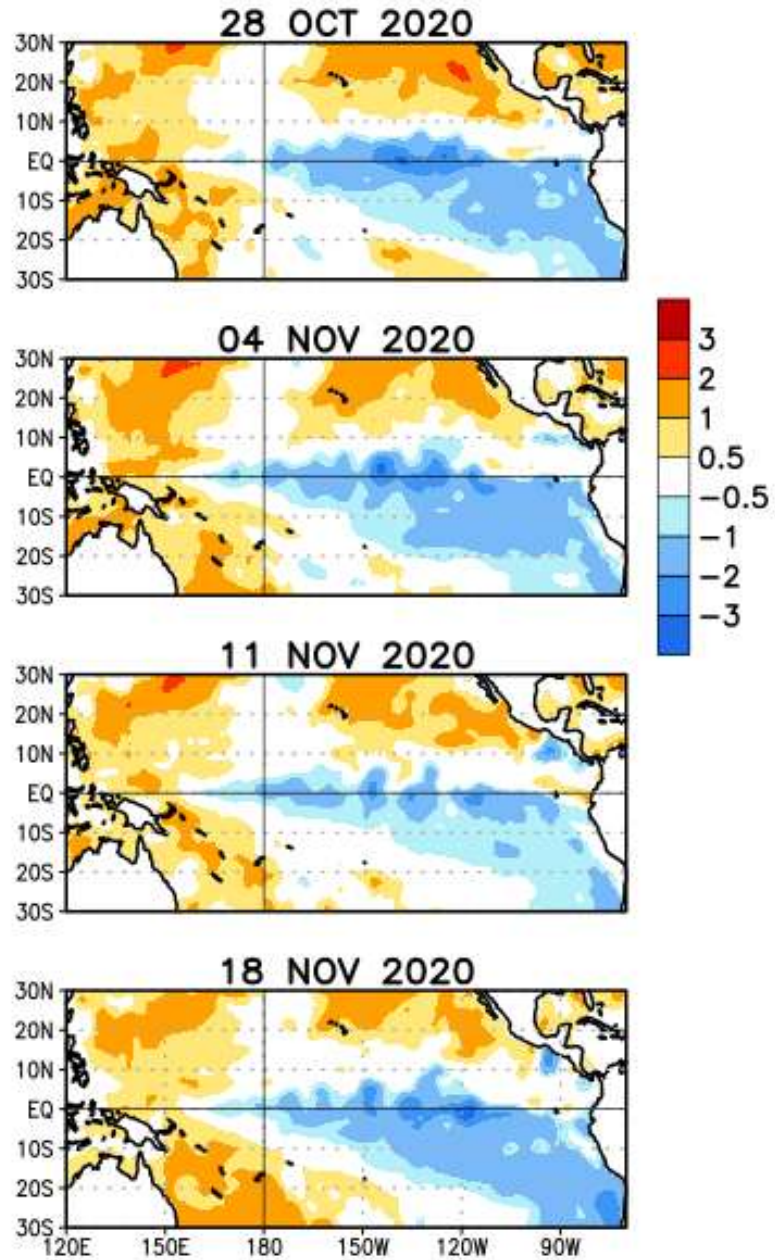
Weekly SST Anomalies (DEG C)

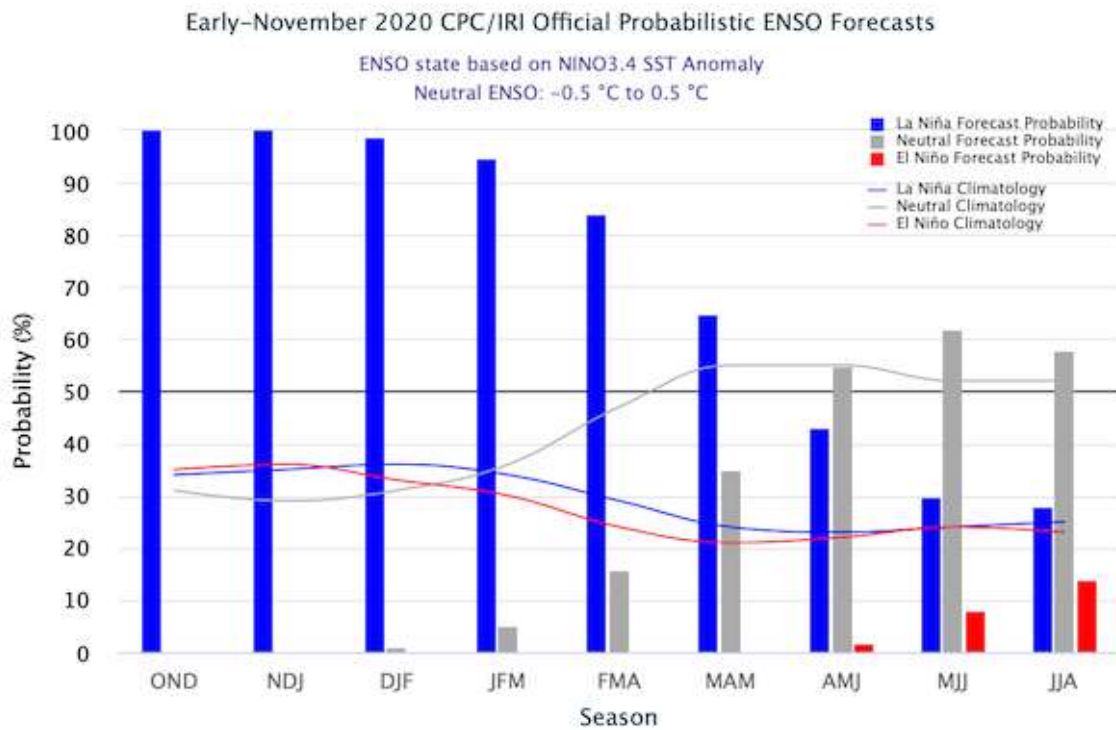Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

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

1.1.1 Impacts of La-Nina on monthly rainfall anomaly during December, January and February
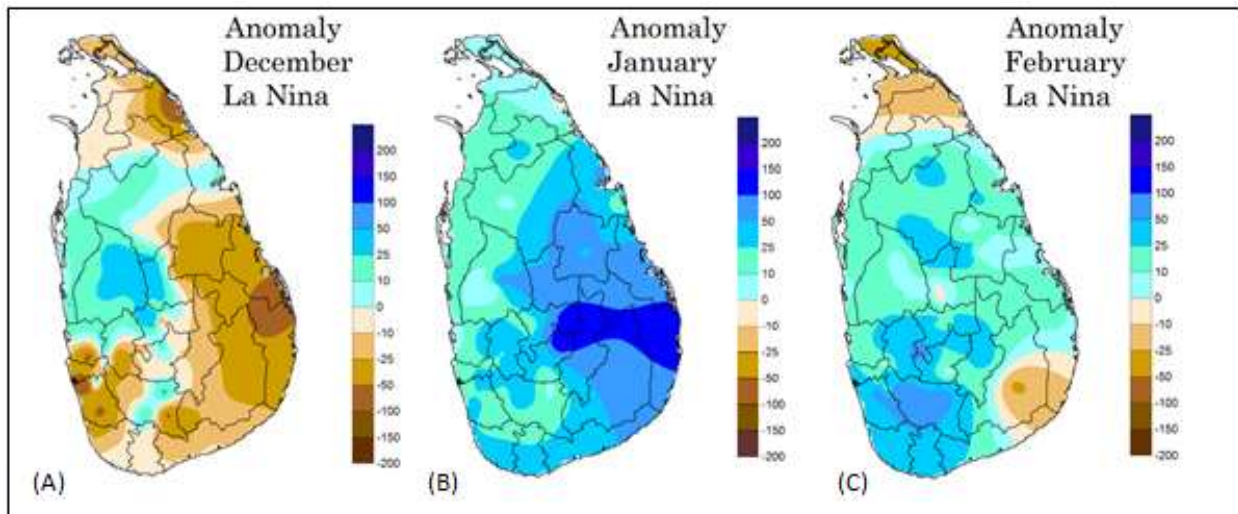

Fig 4: Monthly Rainfall Anomaly maps of the months of December (A), January (B) and February (C) during La-Nina years (Hapuarachchi et al 2016)

Previous studies conducted by the Department of Meteorology, identified that, during La-nina years it is evident that above normal rainfalls over some parts of Kurunegala, Gampaha, Kegalle, Puttalam, Anuradhapura, Trincomalee, Kandy and Rathnapura districts and below

normal elsewhere during the month of December(Fig 4-A). During the month of January it is evident above normal rainfall over the country(Fig 4-B) and during the month of February below normal rainfall can be expected in Northern parts and south eastern parts and above normal elsewhere of the country (Fig 4-C).

1.2 The Indian Ocean Dipole (IOD) update

Though, there has been significant cooling across the far west of the Indian Ocean and to the south of the basin, large parts of the Indian Ocean are warmer than average, but the Indian Ocean Dipole (IOD) is currently neutral. Most of the models show this IOD neutral condition will continue until February - May 2021. (Figure 5). (Source-Bureau of Meteorology, Australia).
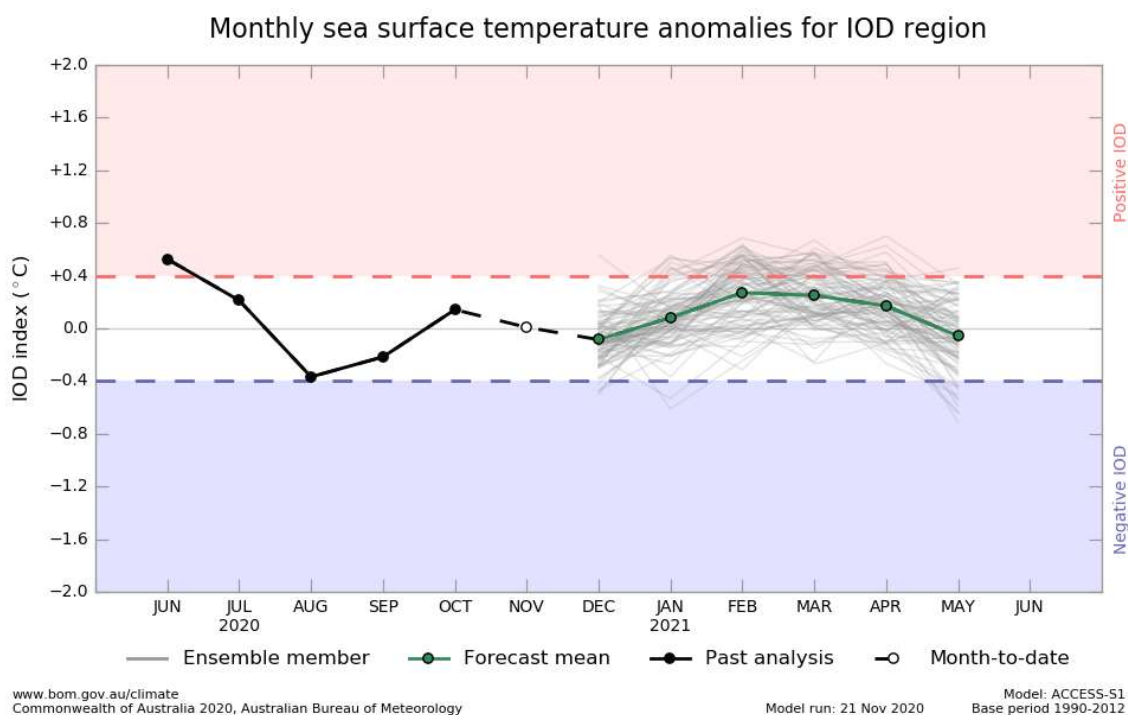

Figure 5: IOD forecast from Australian Bureau of Meteorology .

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

3.1 December to February (DJF) 2020 season

Figure 6 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 12 Global Producing Centers (GPC) for DJF season. According to that

above normal rainfall can be expected over the country during December 2020 _February 2021(DJF) season.

Probabilistic Multi-Model Ensemble Forecast
Beijing,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington
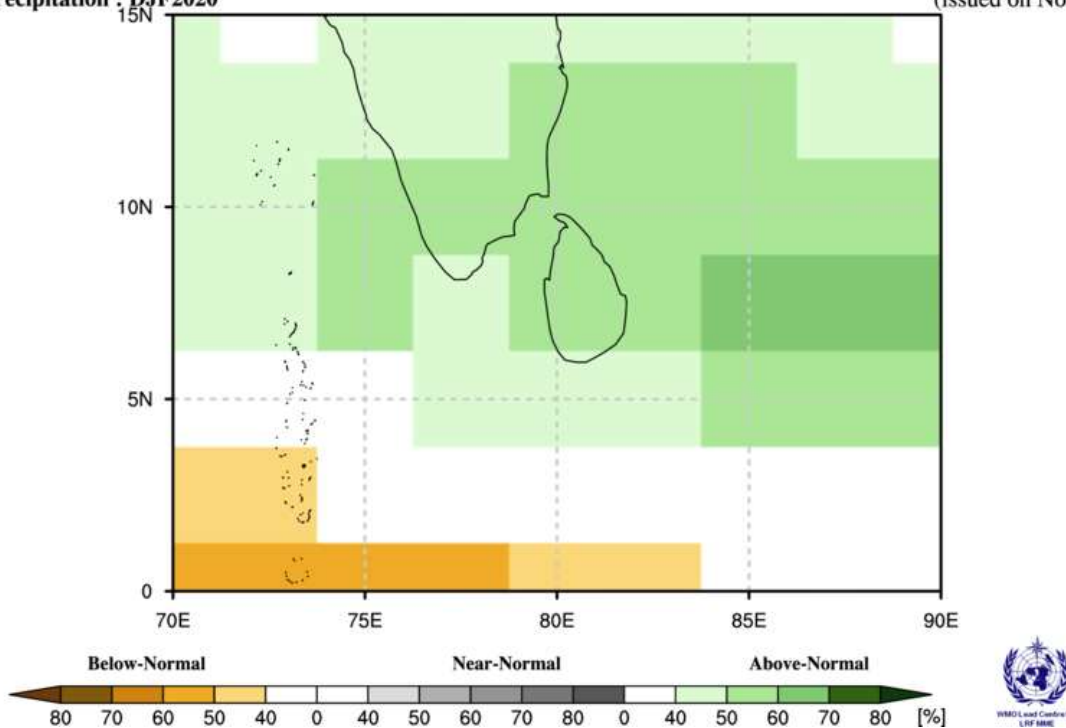
Fig 6: Probabilistic multi model ensemble forecast for DJF using dynamical models from 12 WMO global producing centers (GPC).

Figure 7 depicts individual forecasts provided by same GPC centers for the DJF season. Out of 12 GPC individual models, 9 predicted above normal rainfall and 1 GPC model predicted below normal rainfall over the country. There is no clear signal indicated in 2 GPC models. Accordingly, there is a enhance probability for above normal rainfall over most parts of the country during DJF 2020 season.

Lat : 0~15, Lon : 70~90
Precipitation : DJF2020

[Unit : mm]
(issued on Nov2020)

Fig 7: Individual forecasts for DJF 2020 season by dynamical models from 11 WMO global producing centers (GPC).

3.2 Monthly Forecast for December, January and February 2020

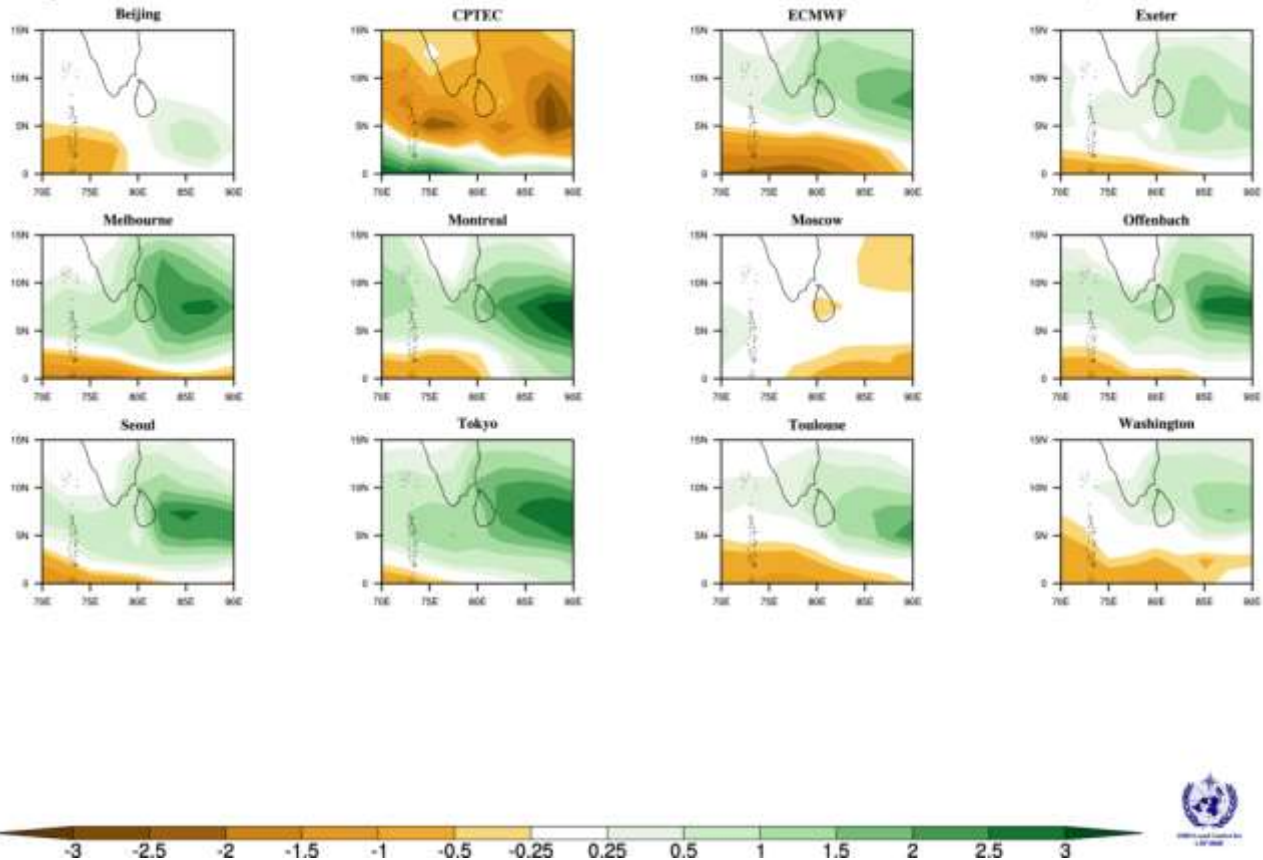Figure 8 shows the probabilistic multi model ensemble forecasts, which are prepared by using dynamical models from 12 global producing centers (GPC), for the months of December, January and February 2020. According to that above normal rainfall can be expected over most parts except extream South of the country during the month of December 2020. There is no clear signal over southern costal areas and accordingly it can be expected below normal, about normal or above normal rainfall over those areas during the month of December. During the months of January and February of 2021 it can be expected above normal rainfall over the country.
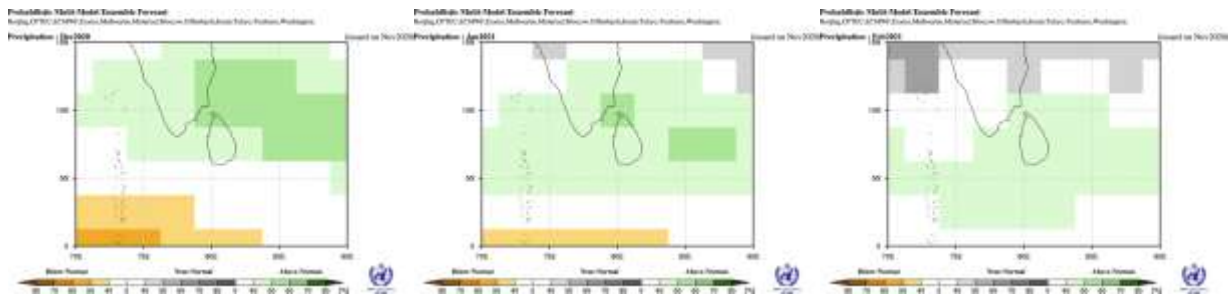
Fig 8: Probabilistic multi model ensemble forecast for December (left), January (middle) and February 2021 (right) using dynamical models from 12 WMO global producing centers (GPC).

Fig 9: Individual forecast for December 2020 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the 12 monthly forecasts from individual global producing centers (GPC) for December 2020. Out of 12 GPC forecasts, 6 GPC models predicted above normal rainfall over the country and another 3 GPC models predicted above normal rainfalls over most parts of the country except southern parts of the country. Another 2 GPC models predicted below normal

rainfall and there is no clear signal indicated in 1 GPC model. Accordingly, there is a enhance probability for slightly above normal rainfalls in most parts of the country during the month of December 2020.
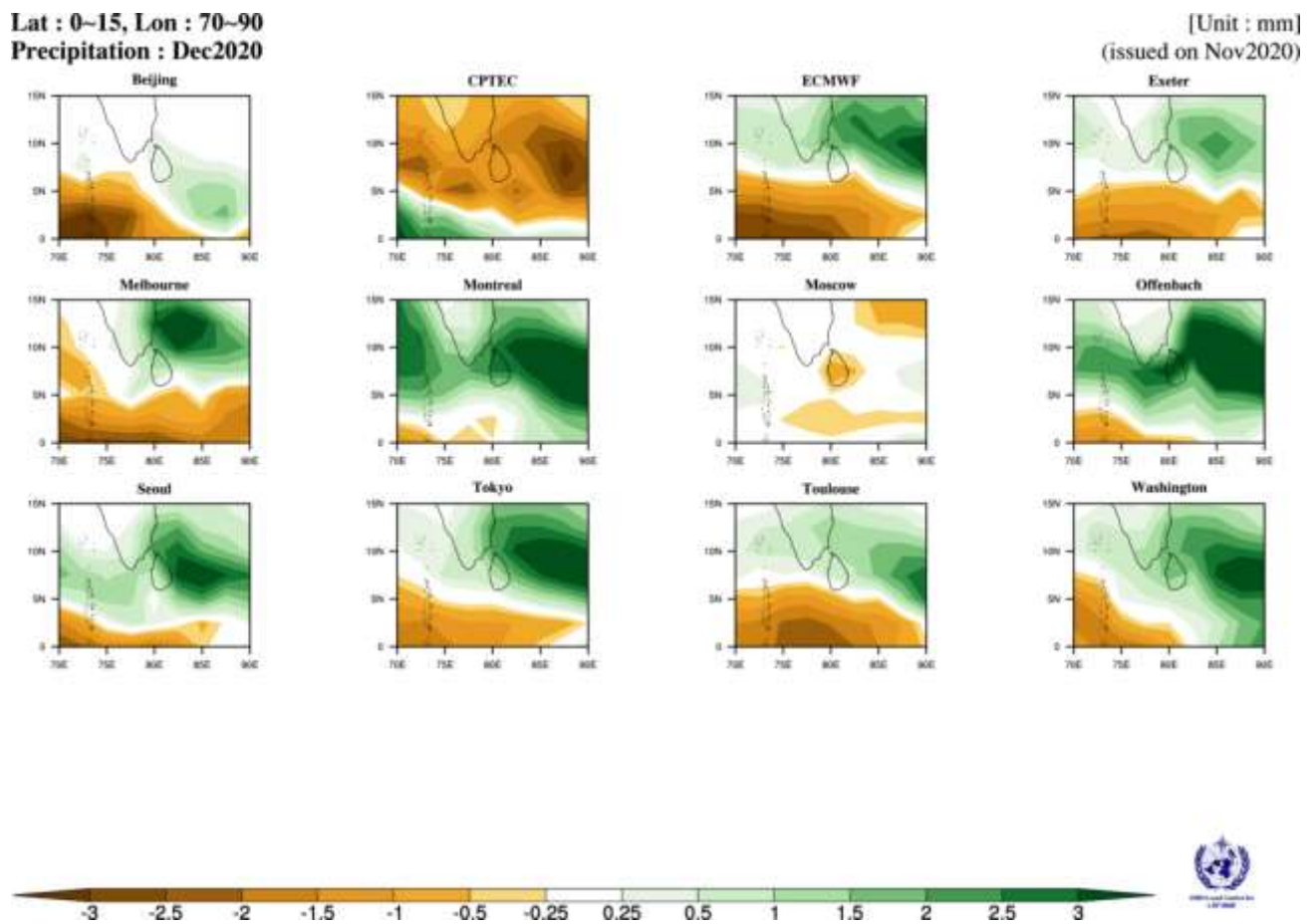

Fig 10: Individual forecast for January 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from individual global producing centers (GPC) for January 2021. Out of 12 GPC forecasts, 7 GPC models predicted above normal rainfall and 2 GPC models predicted below normal rainfall. There is no clear signal in 3 GPC models for the month of January 2021. Accordingly, above normal rainfalls can be expected over moast parts of the country during the month of January 2021.

Lat : 0~15, Lon : 70~90
Precipitation : Feb2021

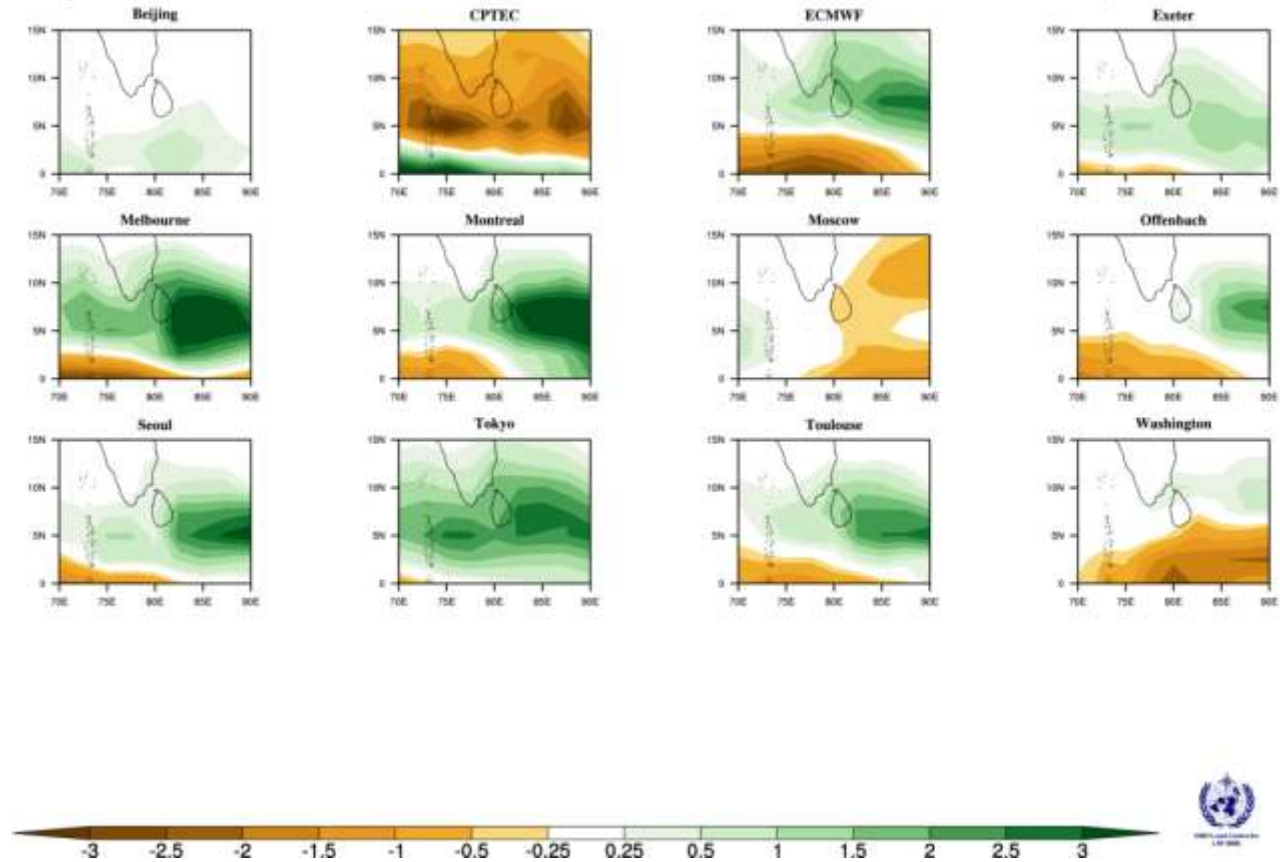[Unit : mm]
(issued on Nov2020)
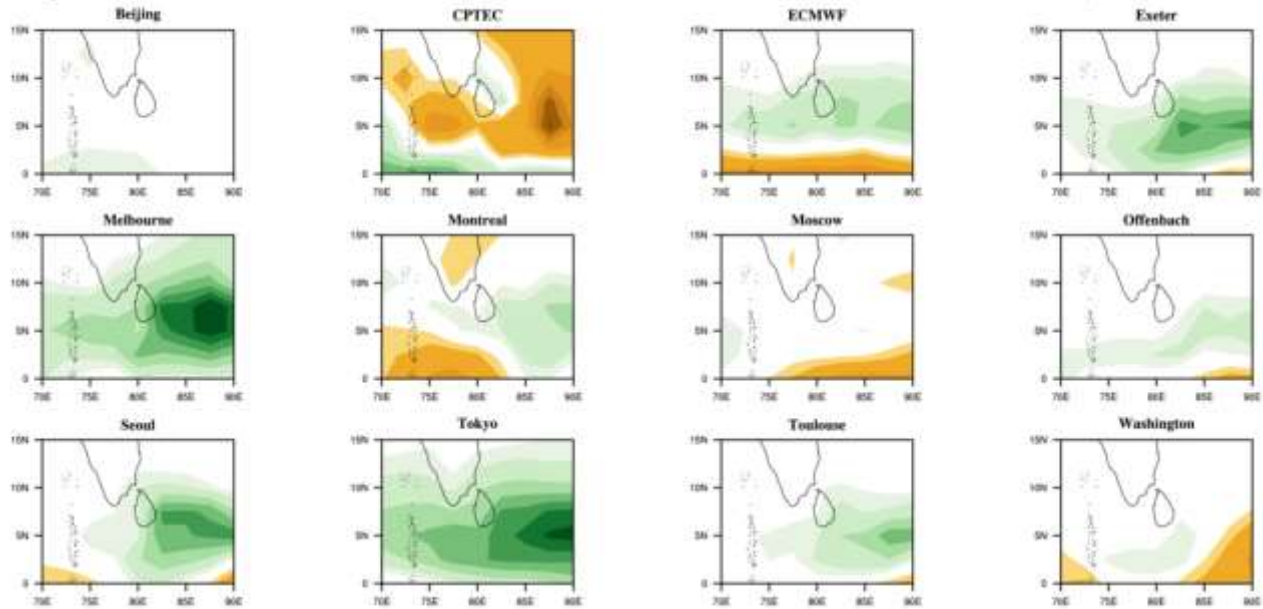
Fig 11: Individual forecast for February 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 11 shows the monthly forecasts from 12 individual global producing centers (GPC) for February 2021. Out of 12 GPC forecasts, 4 GPC models indicate above normal rainfall and there is no clear signal from 8 GPC models for the month of February 2021. Where the probability for equal chances to have below, near or above normal rainfalls over the country during the month of February 2021.

4. Statistical downscaling of CFSv2 global forecast output

4.1 Probabilistic rainfall forecast for DJF season 2020 using Climate Predictability tool (CPT)

The following district wise probabilistic rainfall forecasts for the season of DJF 2020 have been prepared with the multi model ensemble method to downscale ,SST data of CFSv2, CCSM4, GFDL and ECMWF by using CPT.

The district wise 30 year average rainfalls during DJF 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 table1.

District	Average rainfall (mm) – DJF		Probability%	
		Below	Normal	Above
Colombo	358.6	25	25	50
Kalutara	499.9	30	30	40
Galle	484.7	30	30	40
Matara	444.8	20	20	60
Hambantota	293.8	20	20	60
Ampara	705.5	25	30	45
Batticaloa	704.2	25	25	50
Trincomalee	545.4	25	30	45
Mullaithivu	428.1	25	25	50
Jaffna	360.5	25	30	45
Killinochchi	400.9	25	30	45
Mannar	308.6	30	25	45
Puttalam	211.6	25	30	45
Gampaha	271.6	20	30	50
Kegalle	364.2	20	25	55
Ratnapura	466.4	20	25	55
Monaragala	493.6	20	25	55
Badulla	749.0	30	30	40
Pollonnaruwa	639.8	25	30	45
Vavuniya	384.6	25	30	45
Anuradapura	373.2	25	30	45
Kurunegala	276.2	25	25	50
Matale	681.2	35	30	35
Kandy	586.9	30	30	40
Nuwaraeliya	493.2	25	30	45

Table 1: Probabilistic Rainfall Forecast for DJF season 2020 using CPT
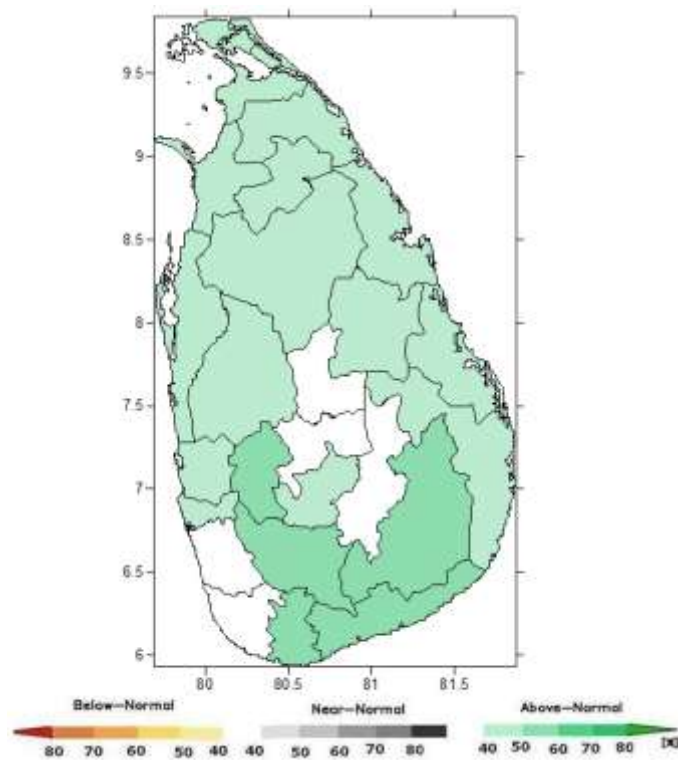
Fig 12: Probabilistic rainfall forecast for December 2020-February 2021 using CPT

According to the CPT (Fig 12 and table 01), above normal rainfalls can be expected in 20 districts out of 25. There is no clear signal for Mathale, Kandy, Nuwara Eliya, Colombo and Gampaha districts. for DJF season 2020. Therefore equal chances exist of receiving below normal, about normal or above normal rainfall over those districts for DJF Season 2020

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4.2 Probabilistic rainfall forecast for DJF 2020 season using RIMES FOCUS System

PROBABILITY-FCST-MME2_PCR-ZONE-NOV-DJF-2020

PB(13%)
PN(33%)
PA(54%)

36 40 50 60 70
Below Normal

36 40 50 60 70
Normal

36 40 50 60 70
Above Normal
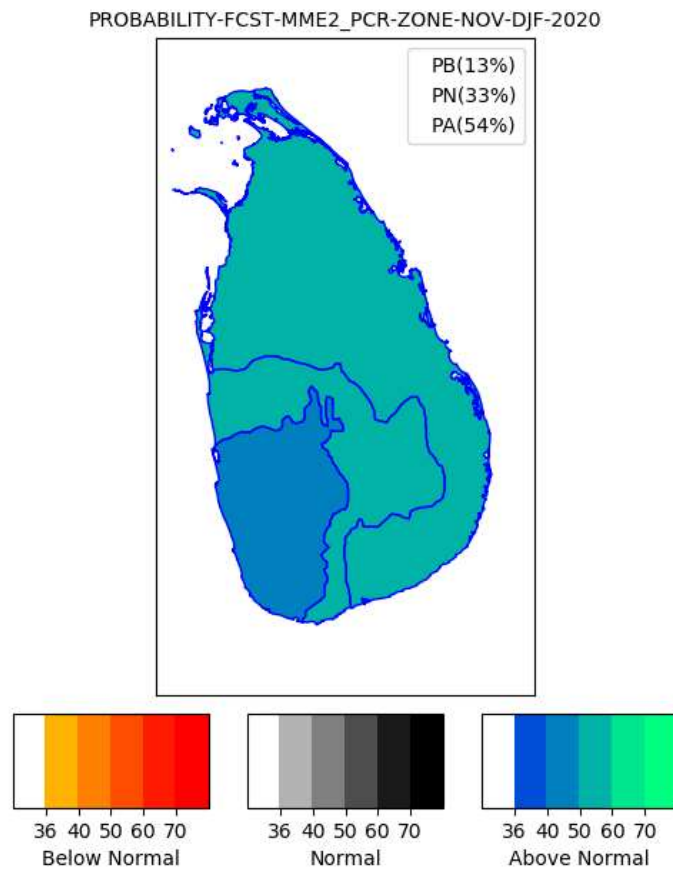
Fig 13. Probabilistic rainfall forecast for December2020-February 2021 using RIMES FOCUS System

Figure 13 depicts the Probabilistic rainfall forecast for climatic zones for DJF 2020-2021 season, which has been prepared by using RIMES FOCUS System. According to the model there is a enhanced probability for above normal rainfall over all climatic zones, particulary intermediate and Dry zones of the country during DJF 2020-2021 season.

5. **SUMMARY :**

SUMMARY of MODEL FORECAST for DJF 2020 season for SRI LANKA

Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final
DJF season 2020	AN	AN	AN- most parts No signal- Mathale, Kandy, Nuwara Eliya, Colombo and Gampaha	AN	LaNina condition	AN
December 2020	AN No signal-	AN	AN-Puttalam, Gampaha, Kegalle, Rathnapura, Monaragala, Matara, Hambantota BN- Mathale No signal- elsewhere	AN	LaNina condition	AN
January 2020	AN	AN			LaNina condition	AN
February 2020	AN	No signal			LaNina condition	AN

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

5.1 Summery of Prevailing global climate conditions

Prevailing La Niña conditions are likely to continue through the Northern Hemisphere winter (January to February) 2020-21 (~85% chance) and into spring 2021 (~60% chance during February-April). Most models suggest La Niña will peak in January, with around half the models anticipating a strong event. (Source CPC-USA, BoM) (Fig 3 A).

Large parts of the Indian Ocean are warmer than average, but the Indian Ocean Dipole (IOD) is currently neutral. Most of the models shows this IOD neutral condition will continue until February - March 2021. (Figure 5). (Source-Bureau of Meteorology, Australia).

6. Consensus Seasonal outlook for December 2020, January and February 2021

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, consensus forecasts for December 2020 to February 2021 are concluded as follows.

6.1 Rainfall forecast for December-January- February (DJF) three months period

There is an enhanced probability for above normal rainfalls over most parts of the country, particularly in Northern, Eastern, Uva and northcentral provinces during DJF 2020-2021 season as a whole.

6.2 Rainfall forecast for the month of December 2020

There is a chance to receive above normal rainfalls over most pars, particulalr in Northern,Eastern,Northcentral and Uva provinces, during December 2020.

6.3 Rainfall forecasts for January 2021

During the month of January 2021 there is a higher chance to receive above normal rainfalls over most parts of the country, particularly in Northern, Eastern, Uva and Northcentral provinces.

6.4 Rainfall forecasts for February 2021

There is a enhanced probability for above normal rainfalls over most parts of the country, particularly in Northern, Eastern, Uva and Northcentral provinces during the month of February 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 which are more common in the months of December and January. Intraseasonal Oscillations such as Madden Julian Oscillations (MJO) is also another atmospheric phenomina which can't be underestimated.

Fig 15. Consensus Probabilistic rainfall forecast for December 2020 –February 2021

6.4 Probabilistic Temperature Forecast for December 2020–February 2021 (DJF)

The probabilistic Temperature forecast for December, January and February season (DJF)2020-2021 for Sri Lanka as given below.
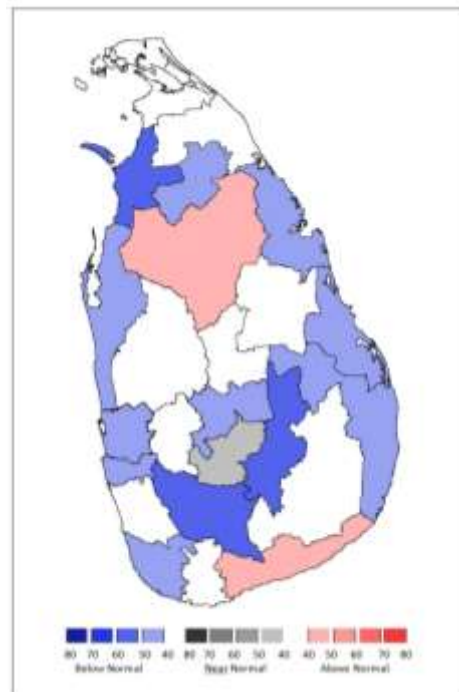

Fig 16: Probabilistic forecast for Maximum Temperatures for DJF 2020-2021 season

Fig 16 and Table 3 show the probabilistic forecast for Maximum Temperatures during DJF 2020-2021 season.

There is a higher chance of experiencing slightly above the normal Maximum Temperatures in Anuradhapura and Hambanthota districts, below the normal Maximum temperatures in Mannar, Vavuniya, Puttalam, Trincomalee, Batticaloa, Ampara, Gampaha, Colombo, Galle, Rathnapura, Kandy and Badulla districts and about the normal Maximum temperatures in Nuwara Eliya district (Fig 16) for the DJF 2020 -2021 season.

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) – (DJF)	Probability %		
		Below	Normal	Above
Anuradhapura	30.1	30	30	40
Badulla	25.7	55	20	25
Batticaloa	28.2	40	30	30
Colombo	30.8	45	30	25
Galle	29.3	40	30	30
Hambantota	29.9	35	20	45
Katugastota	28.7	40	30	30
Katunayake	31.9	45	25	30
Mannar	29.3	20	25	55
MahaIlluppallama	30.0	30	30	40
NuwaraEliya	20.2	25	45	30
Pottuvil	29.5	40	30	30
Puttalam	30.8	40	30	30
Ratnapura	32.8	50	25	25
Ratmalana	31.0	40	25	35
Trincomalee	28.3	40	30	30
Vavuniya	29.7	40	25	35
Kurunegala	31.3	35	35	30
Bandarawela	23.0	50	20	30

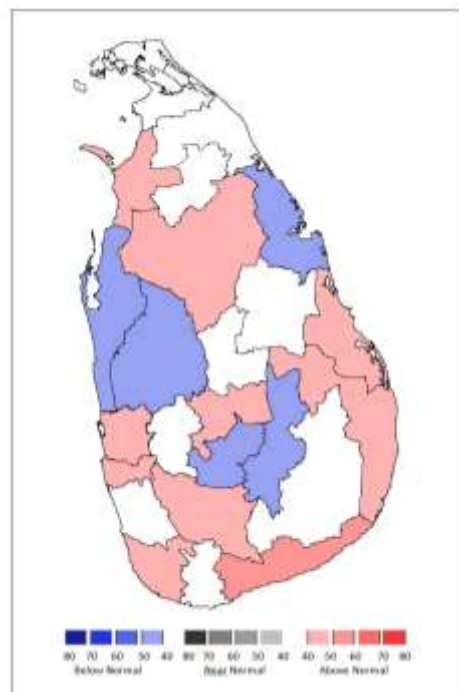Table 3: probabilistic forecast for Maximum Temperature for DJF 2020-2021 season

Fig 17: Probabilistic forecast for Minimum Temperatures for DJF 2020-2021 season

Fig 17 and Table 4 provide the probabilistic forecast for Minimum Temperatures during DJF 2020-2021 season.

Accordingly, there is a higher chance of experiencing slightly above the normal Minimum Temperatures in Mannar, Anuradhapura, Batticaloa, Ampara, Gampaha, Colombo, Kandy, Rathnapura, Galle and Hambantota districts and below the normal Minimum temperaturs in Puttalam, Kurunegala, Trincomalee, Nuwara Eliya and Badulla Districts during DJF 2020-2021season.

District	Average Minimum Temperature (^{0}C) – (DJF)	Probability %		
		Below	Normal	Above
Anuradhapura	21.4	30	30	40
Badulla	17.7	45	35	20
Batticaloa	23.4	30	30	40
Colombo	22.6	25	30	45
Galle	23.0	30	30	40
Hambantota	23.0	25	20	55
Katugastota	18.8	30	30	40
Katunayake	22.0	30	25	45
Mannar	23.7	30	25	45
MahaIlluppallama	20.8	30	30	40
NuwaraEliya	10.0	45	25	30
Pottuvil	22.3	30	30	40
Puttalam	21.5	40	30	30
Ratnapura	21.9	30	30	40
Ratmalana	22.1	35	20	45
Trincomalee	24.3	40	30	30
Vavuniya	20.6	35	30	35
Kurunegala	21.1	45	35	20
Bandarawela	14.3	40	35	25

Table 4: Probabilistic forecast for Minimum Temperatures for DJF 2020-2021 season

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