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**வளிமண்டலவியல் திணைக்களம்**  
**DEPARTMENT OF METEOROLOGY**  
ශ්‍රී ලංකාව இலங்கை SRI LANKA

**Consensus Seasonal Weather Outlook**  
**November, December and January (NDJ)**  
**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

As compared to the last month, cooling of SSTs is observed over most parts of Pacific Ocean. Equatorial sea surface temperatures (SST) were below average across most of the Pacific Ocean, and were above average in the western Pacific Ocean during the last four weeks. Further, Warmer than normal SSTs were observed over most parts of the north and south Pacific Ocean. (CPC-USA) (Fig.1 & 2) (Fig.1b).

### 1.1 El Nino and La Nina update

La Niña conditions were observed and the tropical Pacific atmosphere is consistent with La Niña conditions. And also the La Niña is expected to continue with an 87% chance on December 2021- February 2022. Since the month of March the cool SST anomaly from Nino 3.4 region is expected to keep decreasing and the weakening of La Niña conditions can be expected until April 2022. (source-CPC-USA) (Fig.3a).

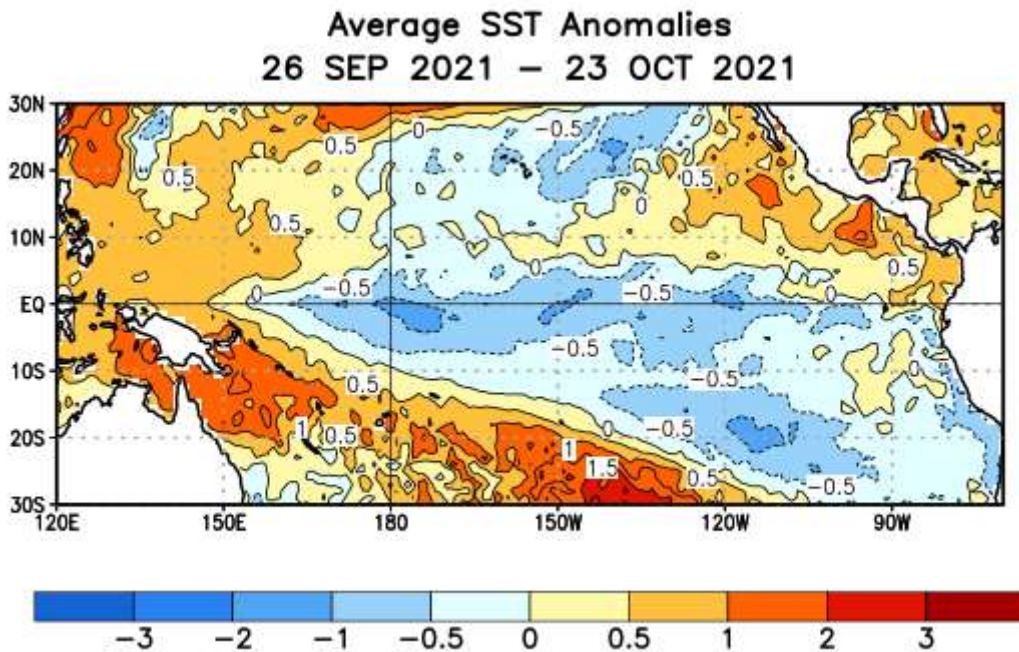


Fig 1: Observed Average sea surface temperature (SST) anomalies (°C)

## Weekly SST Anomalies (DEG C)

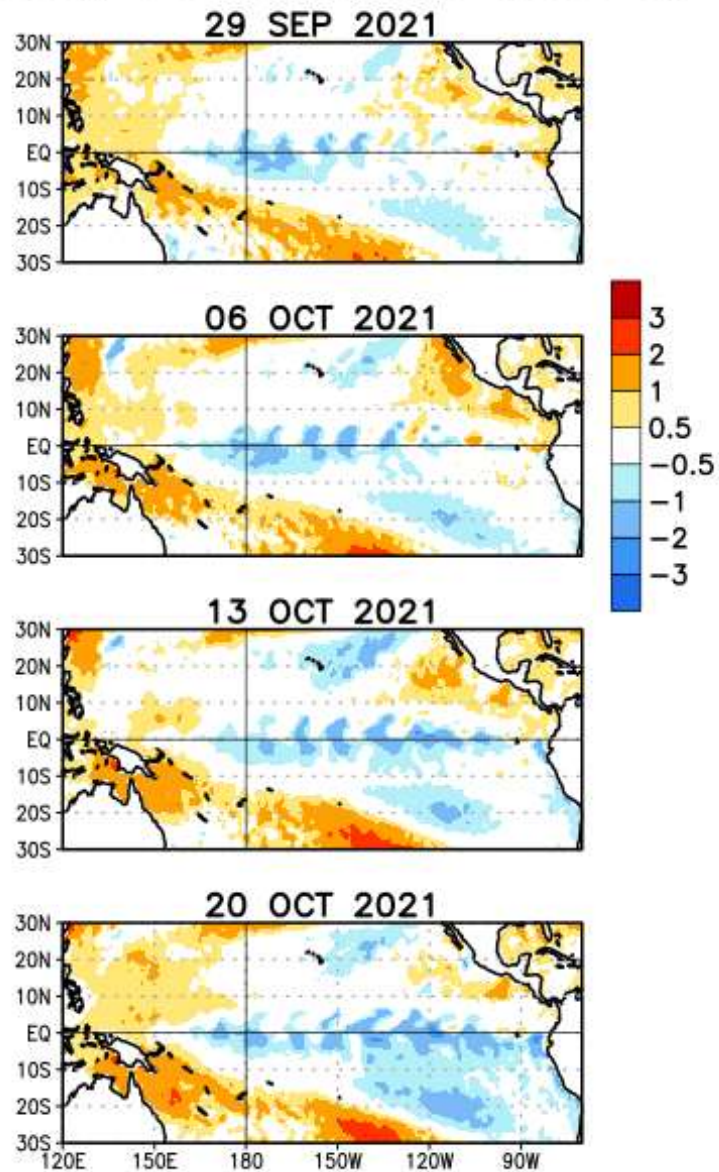


Fig 2: Weekly Observed Average sea surface temperature (SST) anomalies (°C)

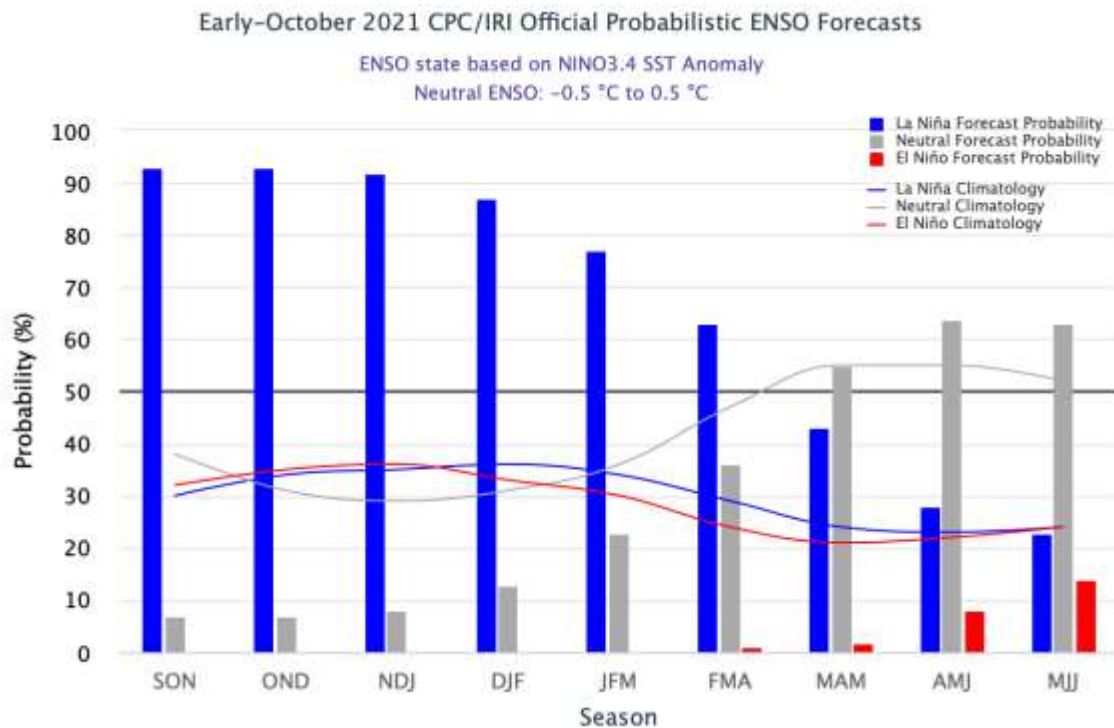


Fig 3a: ENSO forecast from Climate Prediction Center (CPC)/ IRI Forecast

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

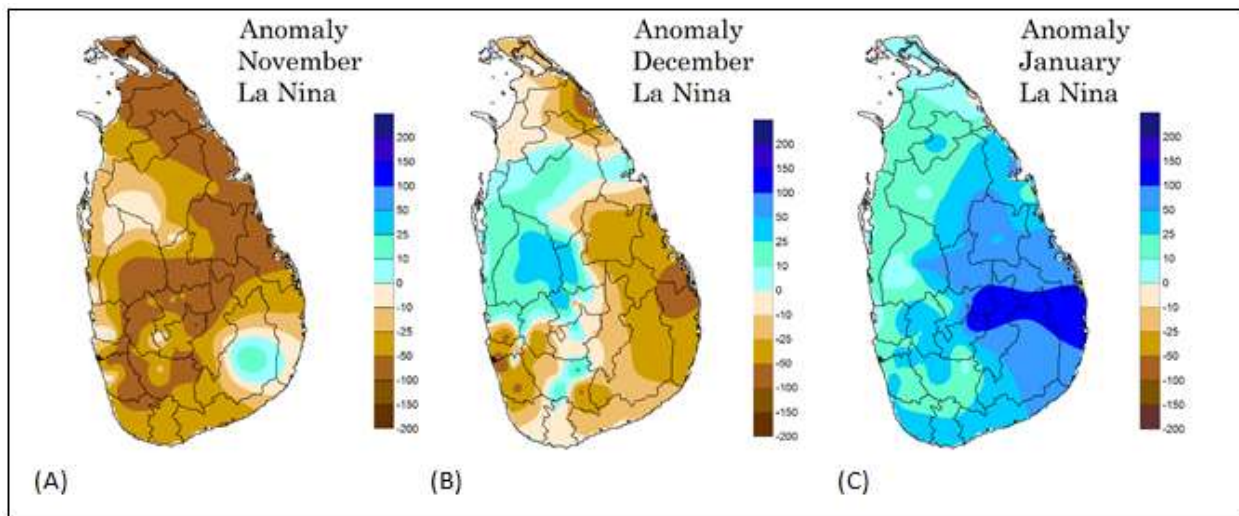


Fig 3b: Monthly Rainfall Anomaly maps of the months of November (A), December (B) and January (C) during La-Nina years (Hapuarachchi et al 2016)

Previous studies conducted by the Department of Meteorology, identified that, during La-Nina years, it is evident that Below normal rainfalls over most parts of the country except some parts of Monaragala District where above normal rainfall was observed during the month of

November (Fig 3b-A). Below normal rainfall were observed in some parts of Eastern, Uva, Southern and western provinces and in Mulative and Pollonnaruwa districts and above normal rainfall in remaining areas of the country, during the month of December (Fig 3b-B). During the month of January, it can be expected above normal rainfall over the country specially in eastern parts (Fig 3b-C).

## 1.2 The Indian Ocean Dipole (IOD) update

Near normal Sea surface temperatures (SSTs) were observed over most parts of the Indian Ocean including Arabian Sea and Bay of Bengal except some pockets from eastern Bay of Bengal and south Indian Ocean below the equator where warmer than normal SSTs were observed. The negative Indian Ocean Dipole (IOD) event persists. The latest weekly value of the Indian Ocean Dipole (IOD) index to 24 October 2021 was  $-0.57\text{ }^{\circ}\text{C}$ . However, four of the five international climate models surveyed by the BoM indicate the monthly IOD value for November will be within the neutral range, and thereafter, enhanced probability for neutral IOD conditions are likely to continue until April 2022. (Source-Bureau of Meteorology, Australia).

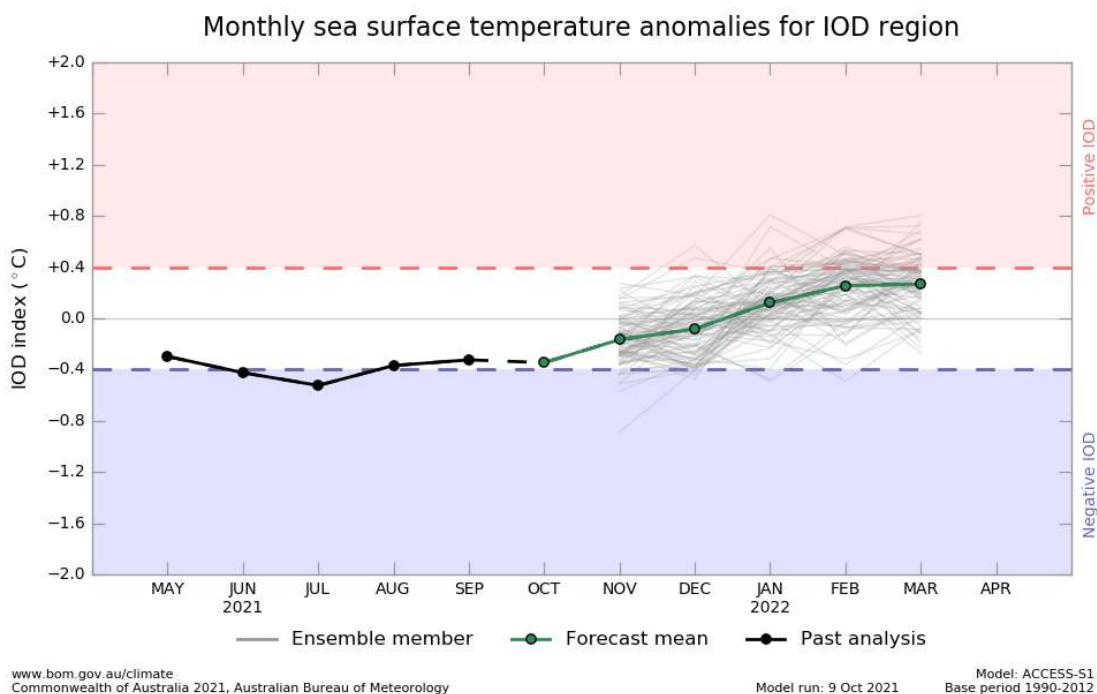


Figure 4a: IOD forecast from Australian Bureau of Meteorology .

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

### 2.1 November to January (NDJ) 2021/2022 season

Figure 5 shows the probabilistic multi model ensemble forecast which prepared by using dynamical models from 13 Global Producing Centers (GPC) for NDJ season. According to that above normal rainfall can be expected over most parts of the country except Southern part, where no clear signal indicated. Accordingly below, about or above normal rainfall can be expected over Southern part during November -January(NDJ) 2021/2022season.

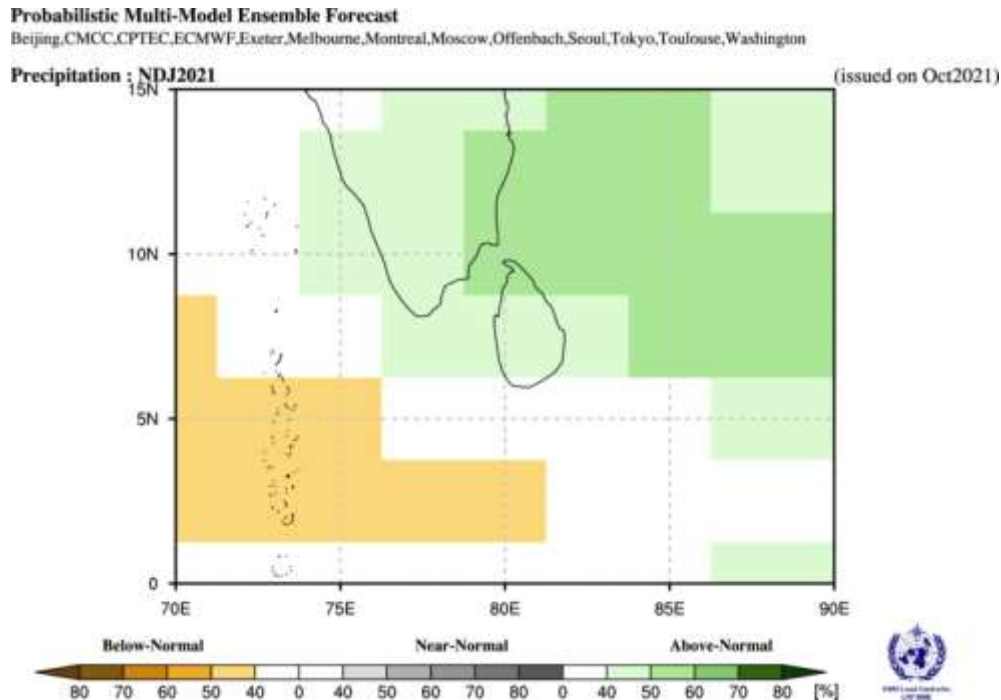


Fig 5: Probabilistic multi model ensemble forecast for NDJ using dynamical models from 13 WMO global producing centers (GPC).

Figure 6 depicts individual forecasts provided by same GPC centers for the NDJ season. Out of 12 GPC individual models, 4 models predicted above normal rainfall over the country and another 3 models predicted above normal over most parts except southern part where there is no clear signal. Three GPC models predicted a below normal rainfalls over Sri Lanka while remaining models did not indicate clear signals. Accordingly, there is a probability for above normal rainfalls over most parts of the country except Southern part, where equal chances for having below, about or above normal rainfall, during NDJ 2021 season.

Lat : 0~15, Lon : 70~90  
Precipitation : NDJ2021

[Unit : mm]  
(issued on Oct2021)

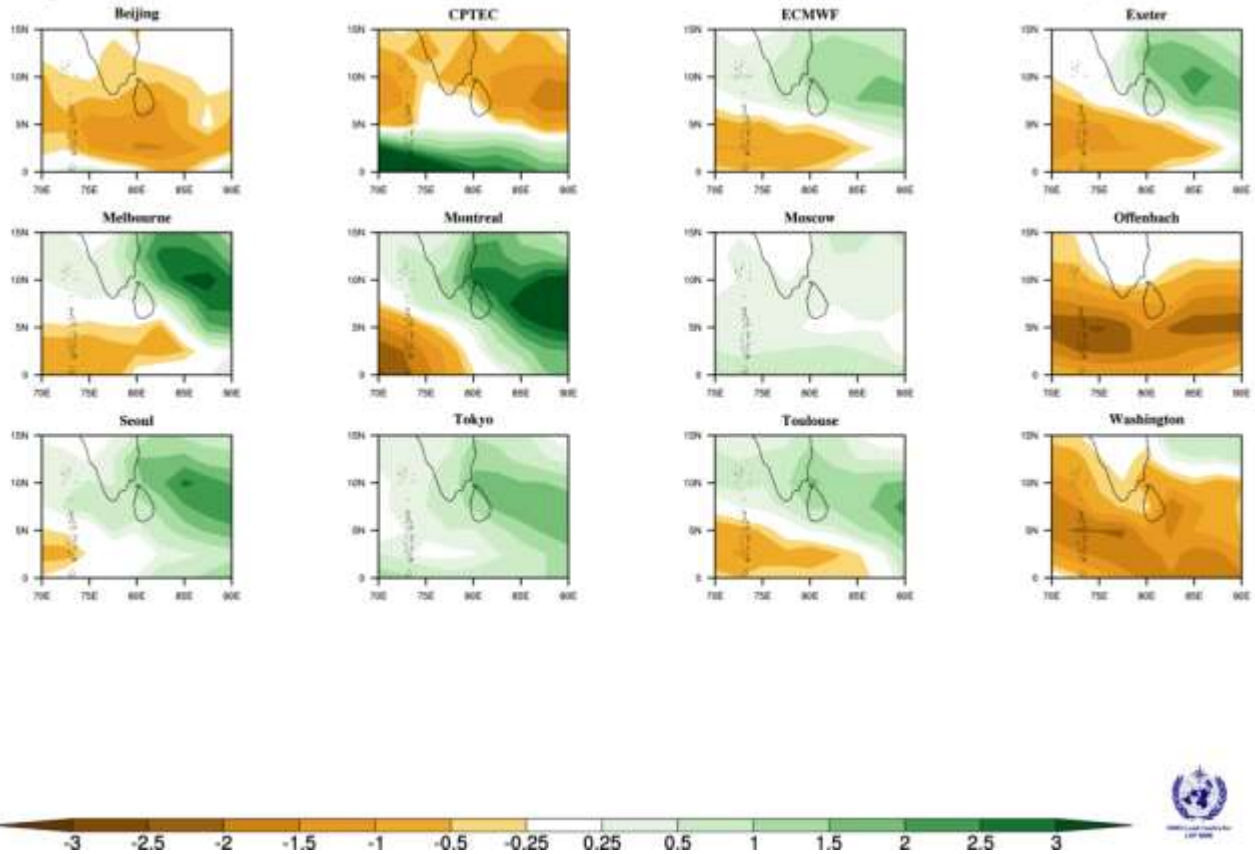


Fig 6: Individual forecasts for NDJ 2021 season by dynamical models from 12 WMO global producing centers (GPC).

## 2.2 Monthly Forecast for November, December 2021 and January 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 November, December 2021 and January 2022. According to that it can be expected slightly above normal rainfall over northern part and no clear signal indicate over remaining parts of the country during November 2021. During the month of December there is a possibility of having above normal rainfall over northern part, below normal rainfall in southern part and there is no clear signal in remaining areas. Accordingly below, about or above normal rainfall can be expected over no signal areas for the months of November, December 2021. During the month of January 2022 above normal rainfall can be expected over the country.

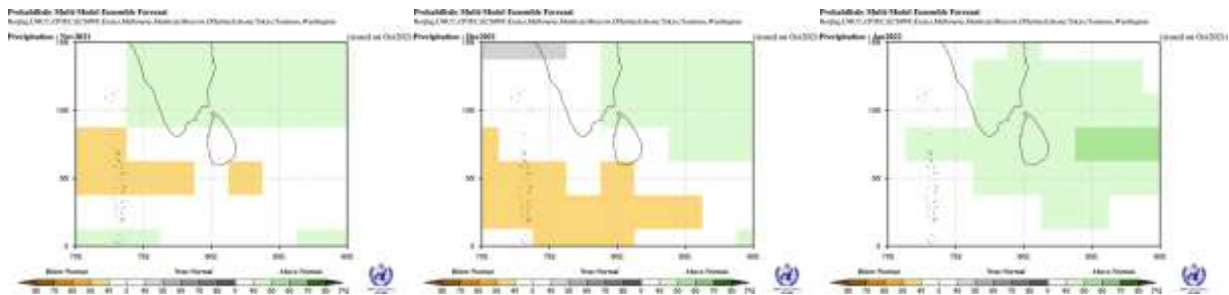


Fig 7: Probabilistic multi model ensemble forecast for November (left), December (middle) 2021 and January 2022 (right) using dynamical models from 13 WMO global producing centers (GPC).

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

[Unit : mm]  
(issued on Oct2021)

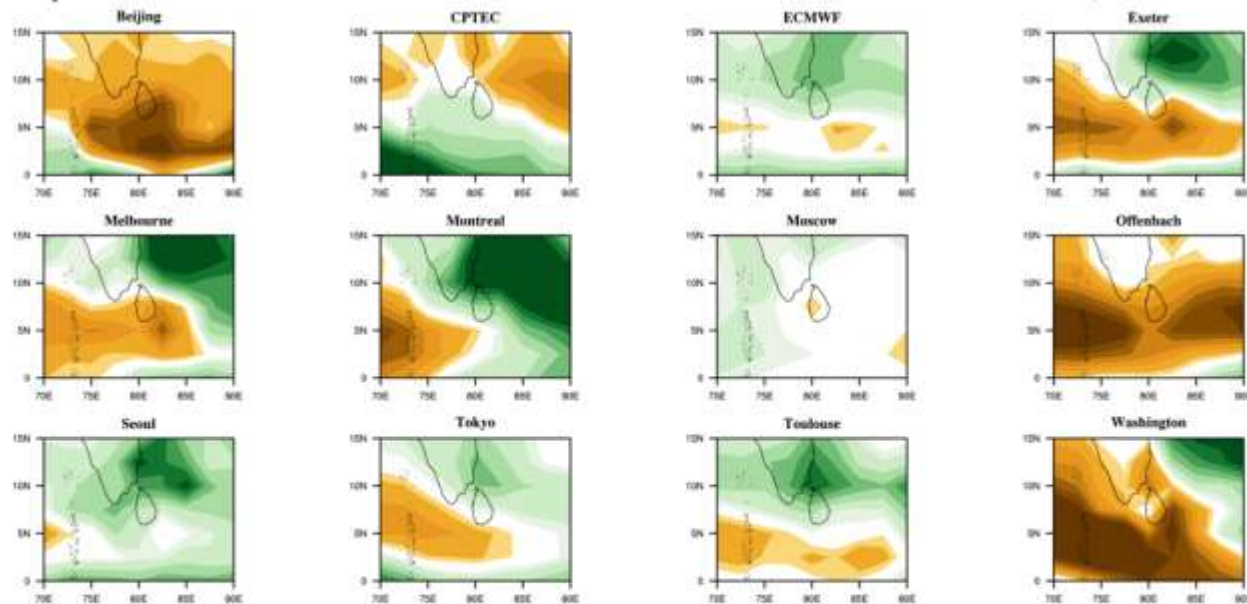


Fig 8: Individual forecast for November 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 8 shows the 12 monthly forecasts from individual global producing centers (GPC) for November 2021. Out of 12 GPC forecasts, 4 GPC models predicted slightly above normal rainfall and 2 models predicted below normal rainfall over most parts of the country and there is



no clear signals indicated in 6 GPC models. Accordingly, below, about or above normal rainfall can be expected over the country, during the month of November 2021.

Lat : 0~15, Lon : 70~90  
Precipitation : Dec2021

[Unit : mm]  
(issued on Oct2021)

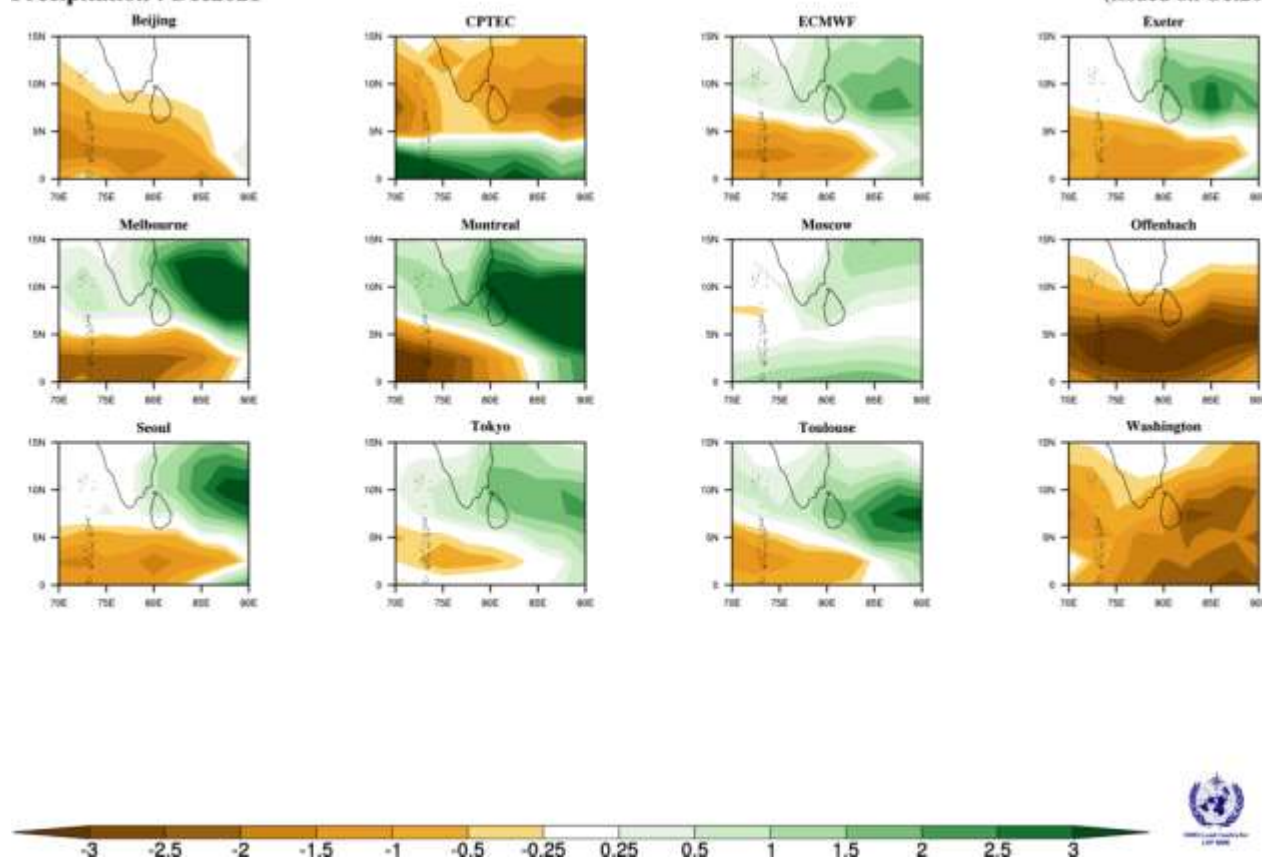


Fig 9: Individual forecast for December 2021 by dynamical models from 12 WMO global producing centers (GPC).

Figure 9 shows the monthly forecasts from individual global producing centers (GPC) for December 2021. Out of 12 GPC forecasts, 5 GPC models predicted above normal rainfall over the country, another 2 GPC models predicted above normal rainfall except southern part and 3 GPC models predicted below normal rainfall. There is no clear signal in 2 GPC models for the month of December 2021. Accordingly, there is a chance of having above normal rainfall over the country except southern part during the month of December 2021.

Lat : 0~15, Lon : 70~90  
 Precipitation : Jan2022

[Unit : mm]  
 (issued on Oct2021)

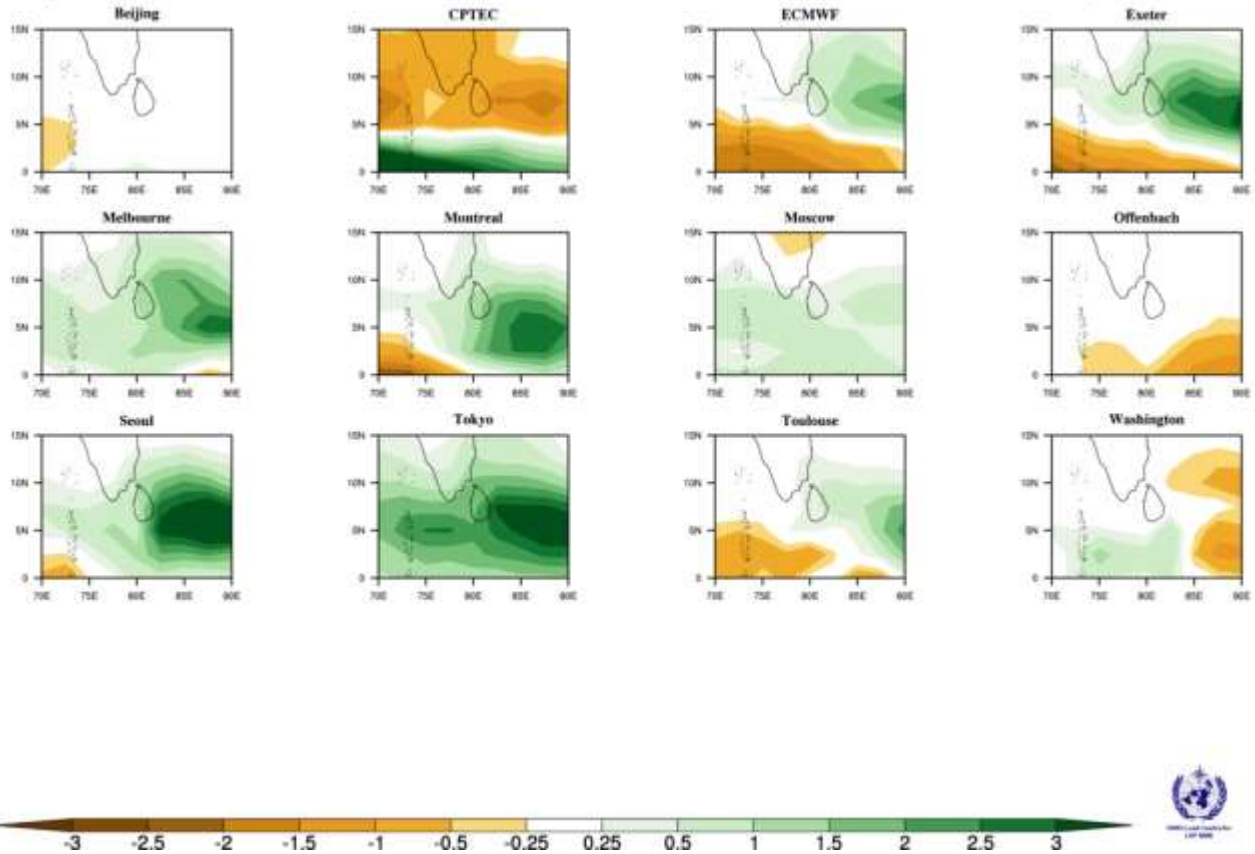


Fig 10: Individual forecast for January 2022 by dynamical models from 12 WMO global producing centers (GPC).

Figure 10 shows the monthly forecasts from 12 individual global producing centers (GPC) for January 2022. Out of 12 GPC forecasts, 6 GPC models indicate above normal rainfall and 1 GPC model predicted below normal rainfall over the country. There is no clear signal from 5 GPC models for the month of January 2022. Accordingly above normal rainfall can be expected over the country during the month of January 2022 .

### 3. Statistical downscaling of CFSv2 global forecast output

#### 3.1 Probabilistic rainfall forecast for NDJ season 2021/2022 using Climate Predictability tool (CPT)

The following district wise probabilistic rainfall forecasts for the season of NDJ 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 NDJ 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) –NDJ	Probability%		
		Below	Normal	Above
Colombo	609.8	40	20	40
Kalutara	783.8	50	20	30
Galle	745.5	40	25	35
Matara	697.7	20	20	60
Hambantota	452.6	20	20	60
Ampara	832.5	55	20	25
Batticaloa	885.5	45	25	30
Trincomalee	766.1	35	25	40
Mullaithivu	680.6	25	25	50
Jaffna	652.9	25	25	50
Killinochchi	680.3	25	25	50
Mannar	503.1	30	25	45
Puttalam	406.3	30	30	40
Gampaha	507.9	30	30	40
Kegalle	660.0	30	25	45
Ratnapura	718.7	20	20	60
Monaragala	672.8	30	25	45
Badulla	915.8	60	20	20
Pollonnaruwa	826.5	45	25	30
Vavuniya	603.1	30	20	50
Anuradapura	557.8	40	25	35
Kurunegala	483.8	45	25	30
Matale	868.7	60	20	20
Kandy	811.1	60	20	20
Nuwaraeliya	694.3	40	35	25

**Table 1:** Probabilistic Rainfall Forecast for NDJ season 2021/2022 using CPT



Fig 11: Probabilistic rainfall forecast for November -January 2021/2022 using CPT

According to the CPT (Fig 11 and table 01), above normal rainfalls can be expected in 10 districts and below normal rainfall can be expected over 8 districts out of 25. There is no clear signal for Puttalam, Anuradhapura, Trincomalee, Colombo, Gampaha, Galle and Nuwara Eliya districts for NDJ season 2021/2022. Therefore equal chances exist of receiving below normal, about normal or above normal rainfall over those districts for NDJ Season 2021/2022.

### **3.2 Probabilistic rainfall forecast for NDJ 2021/2022 season using RIMES FOCUS System**

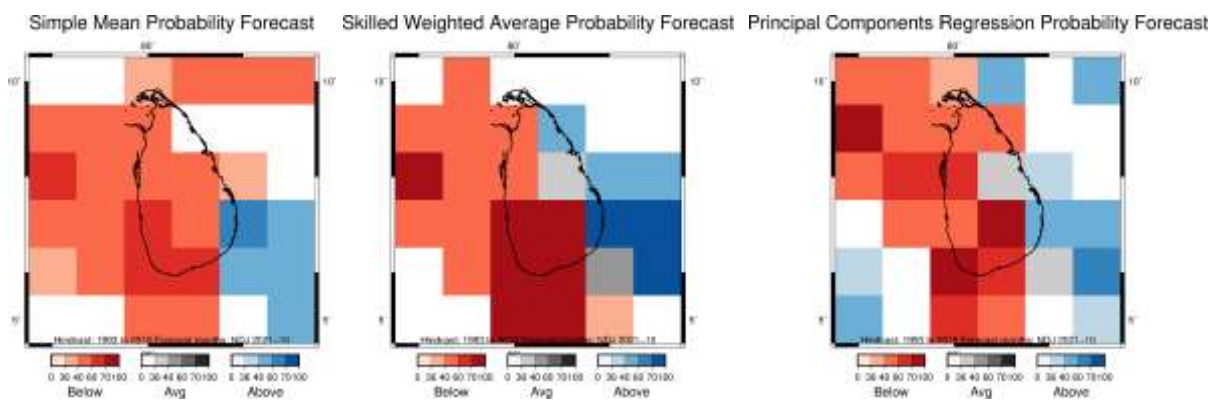


Fig 12. Probabilistic rainfall forecast for November-January 2021/2022 using RIMES FOCUS System

Figure 12 depicts the Probabilistic rainfall forecast for NDJ 2021/2022 season, which has been prepared by using RIMES FOCUS System.

According to the model outputs it can be expected below normal rainfalls over most parts of the country except eastern part, where above normal rainfall can be expected during NDJ season 2021/2022.

#### 4. SUMMARY :

SUMMARY of MODEL FORECAST for NDJ 2021/2022 season for SRI LANKA						
Season	WMO LC MME	WMO GPC	CPT	FOCUS	Impact of Global conditions	Final
NDJ season 2021/2022	No Signal- Southern part AN- Elsewhere	<b>No Signal-</b> Southern part  AN-Elsewhere	AN- Northern province and Rathnapura, Kegalle, Monaragala, Mathara, Hambantota BN- Batticaloa, Polonnaruwa, Kurunegala, Mathale, Kandy, Ampara, Badulla, Kaluthara <b>No Signal-</b> Elsewhere	AN- Eastern part  BN- Remaining areas	La Nina condition is prevailing in the Pacific ocean.	<b>Slightly above normal rainfalls are likely over Northern, Northcentral provinces and in Trincomalee district</b> <b>No signal for other area.</b>
November 2021	AN-Northern part  <b>No Signal -</b> Elsewhere	<b>No Signal</b>	BN- Anuradhapura, Polonnaruwa, Kurunegala, Mathale, Kandy, Ampara, Badulla, Colombo and Kaluthara <b>No Signal -</b> Elsewhere		Below normal rainfalls were observed over the country particularly over Northern, Eastern and Central provinces during the La Nina yeras	<b>Near normal rainfalls in Northern province and no signal for other areas</b>
December 2021	AN-Northern part  BN- Southern part  <b>No Signal -</b> Elsewhere	<b>No Signal-</b> Southern part  AN-Elsewhere			Above normal rainfalls in Northwestern province and in some parts of Matale, Nuwara Eliya, Rathnapura and Gampaha dsitrcits and below normal elsewhere were observed during LaNina years	<b>Slightly above normal rainfalls are likely over Northern, Eastern NorthCentral and Uva provinces and no clear signal for other areas..</b>
January 2022	AN	AN			Above normal rainfalls were reported over most parts during La Nina yeras	<b>Above normal rainfalls are likely over most parts of the country.</b>

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

**Table 2:** Summery of Model Forecasts for NDJ season 2021/2022

#### 4.1 Summery of Prevailing global climate conditions

- La Niña conditions were observed and the tropical Pacific atmosphere is consistent with La Niña conditions. And also the La Niña is expected to continue with an 87% chance on December 2021- February 2022. Since the month of March the cool SST anomaly from Nino 3.4 region is expected to keep decreasing and the weakening of La Niña conditions can be expected until April 2022. (source-CPC-USA)
- However, four of the five international climate models surveyed by the BoM indicate the monthly IOD value for November will be within the neutral range, and thereafter,

enhanced probability for neutral IOD conditions are likely to continue until April 2022.  
(Source-Bureau of Meteorology, Australia).

## **5. Consensus Seasonal outlook for November, December 2021 and January 2022**

Considering the prevailing global climate conditions, forecasts from different global climate models and statistical downscaling of GCM output using CPT, consensus forecasts for November 2021 to January 2022 are concluded as follows.

### **5.1 Rainfall forecast for November-December-January (NDJ)2021/2022 three months period**

Slightly above normal rainfalls are likely over Northern and North-central provinces and in Trincomalee district and no signal for other areas where there are equal probabilities of having above, near or below normal rainfalls, during NDJ 2021/2022 season(Fig. 13).

### **5.2 Rainfall forecast for November 2021**

There is a possibility for near normal rainfalls in Northern province and no clear signal for other areas, where there is equal probabilities for below, near and above normal rainfall during the month of November 2021.

In addition to that there is a possibility to develop low pressure systems and depressions over and vicinity of Sri Lanka, which could have enhanced the rainfall over the country, during the month of November.

### **5.3 Rainfall forecasts for December 2021**

There is a possibility for near or slightly above normal rainfalls over Northern, Eastern, Northcentral and Uva provinces and no clear signal for other areas where there are equal chances of receiving below, near or above normal rainfalls, during the month of December 2021.

In addition to that there is a possibility to develop low pressure systems and depressions over and vicinity of Sri Lanka, which could have enhanced the rainfall over the country during the month of December.

### **5.4 Rainfall forecasts for January 2022**

Above normal rainfalls are likely over most parts of the country during the month of January 2022.

Furthermore generally there is a possibility to develop wave type disturbances in the Bay of Bengal, which could enhanced the rainfall over the country during the month of January.

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 November 2021–January 2022