



Mekong River Commission

**Weekly Dry Season Situation Report in
the Lower Mekong River Basin
23–29 November 2021**

Prepared by
The Regional Flood and Drought Management Centre
30 November 2021

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Key Messages

Key messages for this weekly report are presented below.

Rainfall and its forecast

- During November 23-29, rainfall focused in the areas from Stung Treng in Cambodia to Tan Chau and Chau Doc in Viet Nam, including the 3S area in Cambodia and Viet Nam, varying from 18.20 millimetres (mm) to 54.00 mm.
- There will be low-average rainfalls for the next 7 days over the Mekong region from 30 Nov to 12 Dec 2021 because there is still a low-pressure dominating the Mekong region.

Water level and its forecast

- According to MRC's observed water level at Jinghong showed a slight increase of about 0.04 m from 535.21 m on 23 Nov to 535.25 on 29 Nov 2021 (recorded on 7:00 am), and stayed about 0.49 m lower than its two-average (2020-2021) value. The outflow was up from 796.00 m³/s on 23 Nov to 819.00 m³/s on 22 Nov 2021.
- Along with the increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also increased about 0.06 m from 23 to 29 Nov 2021. However, from Chiang Khan in Thailand to Paksane in Lao PDR, water levels decreased about 0.55 m from Nov 23 to 29 due to less rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were also decreasing about 0.25 m. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia, moreover, were decreasing, due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).
- The water volume of the Tonle Sap Lake in 2021 was lower than its LTA but higher than the levels in 2019 and 2020 during the same period from 23 to 29 November 2021, and still considered critical.
- Over the next seven days, the water levels across most monitoring stations are expected to go down and remain lower than their long-term average value in most stations.

Drought condition and its forecast

- Drought condition of the LMB from November 20-26 was normal all over the LMB except some moderate drought in northeastern part due to severely dry soil moistures during the beginning of dry season. The region showed no significant threat except some moderate and severe dry soil moistures in the upper and middle parts of the LMB.
- For the upcoming three-month forecast, the LMB is likely to receive from average to above average rainfall from November 2021 to January 2022. There will be some more rain dropping over the southern part of the LMB during November and December 2021 making the condition cooler than normal year, while normal condition is likely taking place in the upper and middle parts of the region during the last two months of the year.

1 Introduction

This Weekly Dry Season Situation Report presents a preliminary analysis of the weekly hydrological situation in the Lower Mekong River Basin (LMB) for **23-29 November 2021**. The trend and outlook for water levels are also presented.

This analysis is based on the daily hydro-meteorological data provided by the Mekong River Commission (MRC) Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. Water level indicated in this report refers to an above zero gauge of each station.

The report covers the following topics that are updated weekly:

- General weather patterns, including rainfall patterns over the LMB
- Water levels in the LMB, including in the Tonle Sap
- Flash flood and drought situation in the LMB
- Weather, water level and flash flood forecast, and
- Possible implications.

Mekong River water levels are updated daily and can be accessed from:
http://ffw.mrcmekong.org/bulletin_wet.php.

Drought monitoring and forecasting information is available at:
<http://droughtforecast.mrcmekong.org>

Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

2 General Weather Patterns

The weather outlook bulletins for three months (November, December and January) and the weather maps issued by the Thai Meteorological Department (TMD) were used to verify weather conditions in the LMB.

Since the beginning of November 2021, rainfall has been significantly reduced in the LMB, with gradually decreasing water levels in both mainstream and tributaries. The data from the TMD predict that low pressure of air-mass will bring cool weather condition in the upper part of Thailand, Lao PDR and Viet Nam. As a result, the temperature in the upper part of Thailand will drop sharply as commonly chilly weather, specifically at the upper portion of the northern and north-eastern parts together with very cold weather in mountainous areas (within the Mekong region).

[Figure 1](#) presents the weather map of 29 November 2021, showing a line of low pressure of the Monsoon Trough crossing the upper Mekong region which can still bring some rainfall over the next few days.

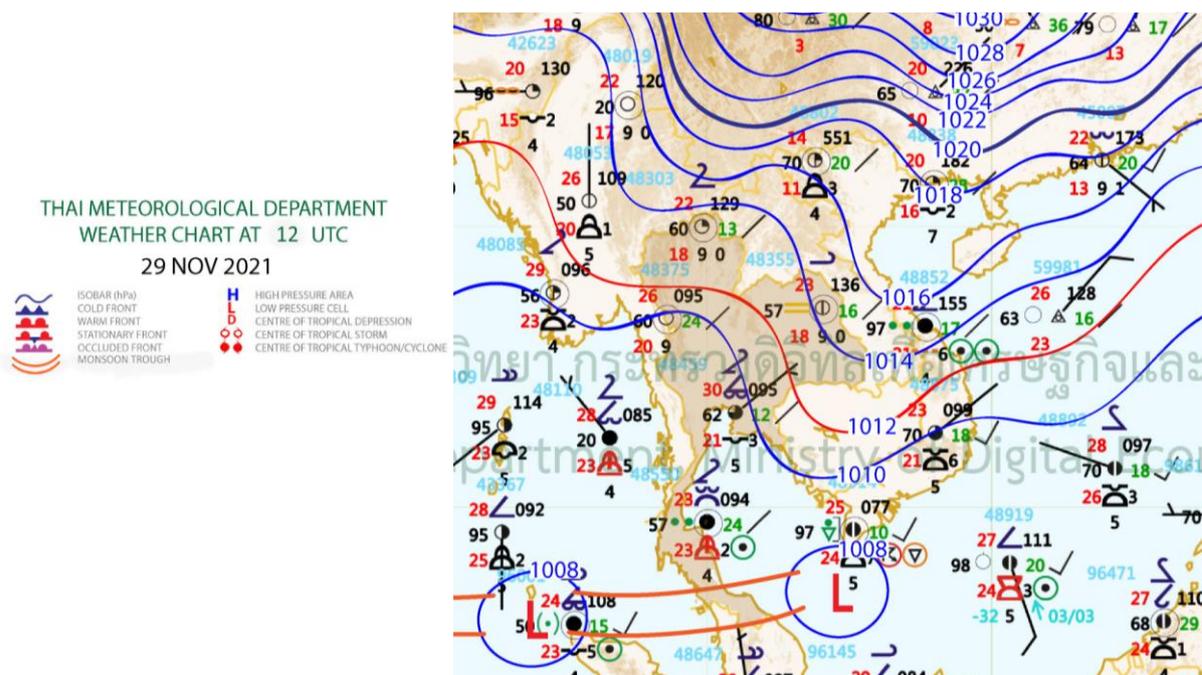


Figure 1: Summary of weather conditions over the LMB.

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of wetter and warm conditions is predicted over the lower part of the Mekong region covering Lao PDR and Thailand from 29 November to 12 December 2021, during the 4th and 3rd weeks of November and December. Moreover, LMB is likely dominated by wetter condition, which may receive cool temperature in general in the Lower part to the LMB. **Figure 2** shows the outlook of weather condition from 29 November to 12 December 2021 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

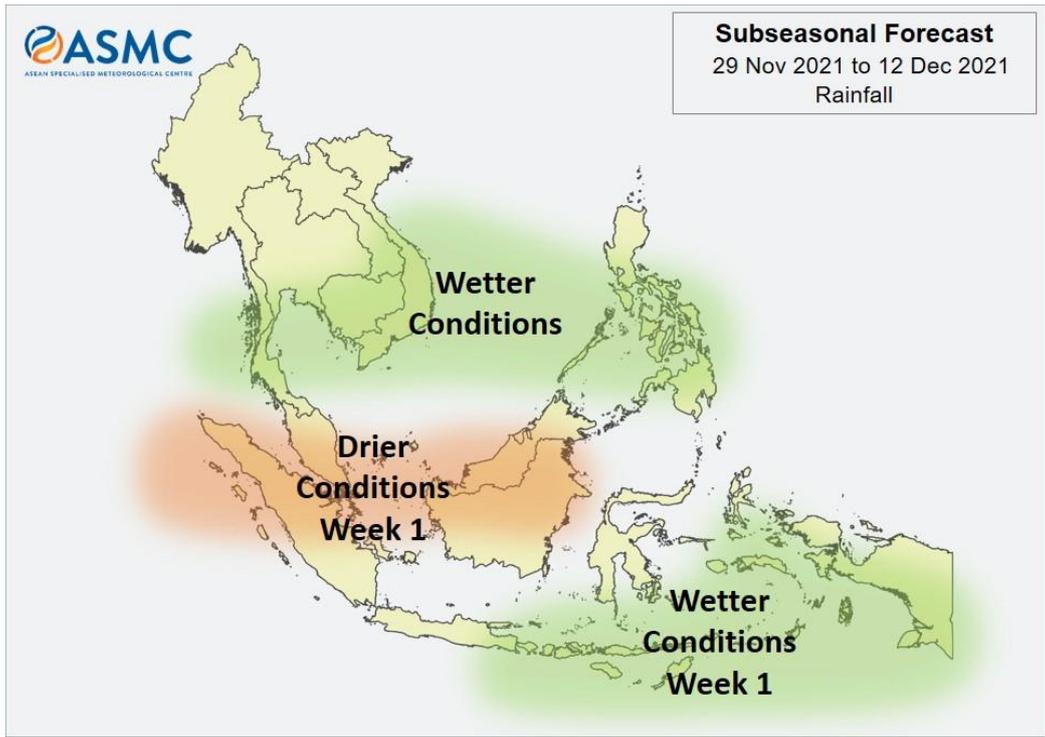


Figure 2: Outlook of wet and dry conditions over the Asian countries by ASMC.

Tropical depressions (TD), tropical storms (TS) and typhoons (TY)

There was a low pressure hitting the LMB during 23-29 November 2021. This had caused some rainfall in the middle and the lower parts of the LMB, as well as in the Mekong Delta in Viet Nam and the 3S area (Sesan, Sre Pok, and Sekong) of Cambodia and Viet Nam. No storms movement was detected on 29 November in the LMB, as displayed in [Figure 3](#).

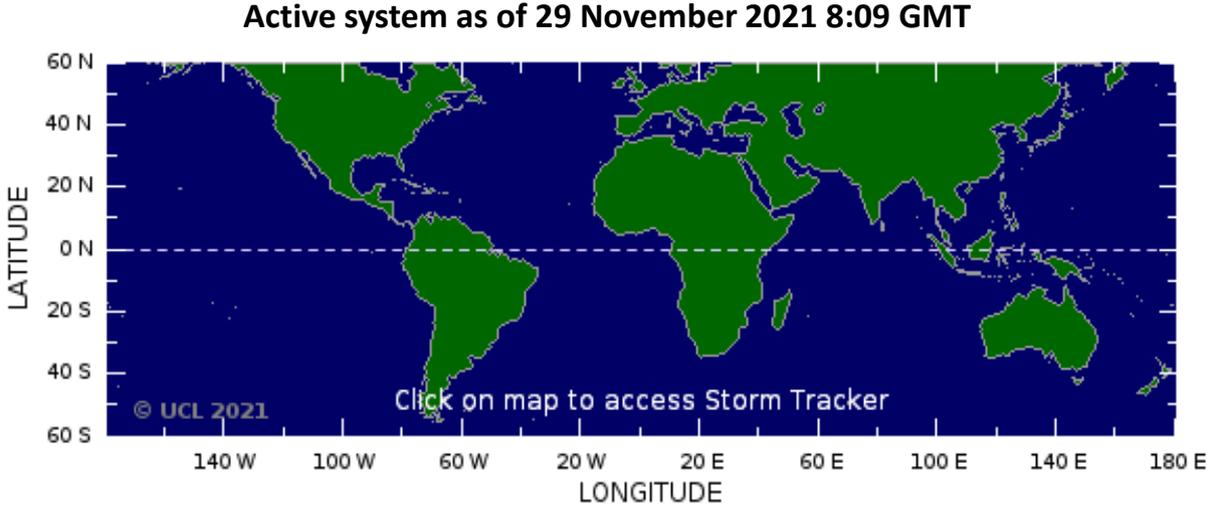


Figure 3: No tropical storm risk observed on 29 November.

Rainfall patterns over the LMB

This week, rain concentrated in the lower part from Stung Treng in Cambodia to Viet Nam's Tan Chau and Chau Doc. However, the amount of rainfall over the Mekong region was considered low, varying from 18.00 mm to 53.20 mm. No rain was observed at the upper and middle parts of the Mekong basin. Compared with last week's amount, the rainfall this week was considered lower. The total rainfall in this week compared with last week in the LMB is showed in [Figure 4](#).

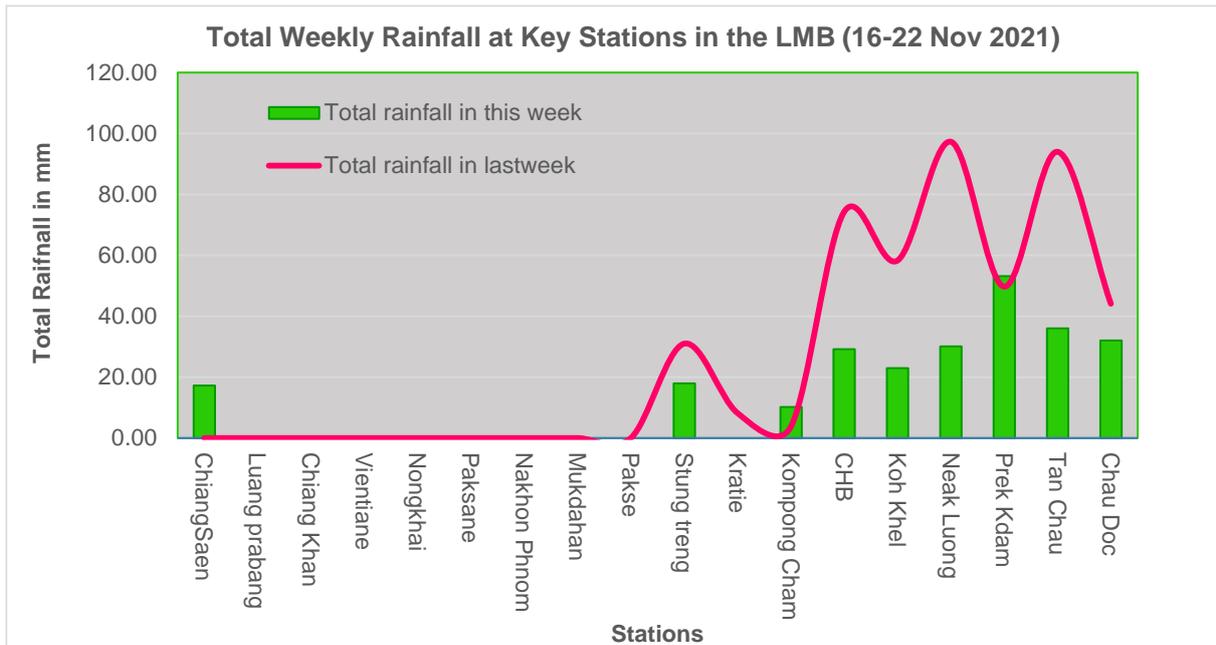


Figure 4: Weekly total rainfall at key stations in the LMB.

To verify area rainfall distribution, [Figure 5](#) shows a map of the weekly accumulated rainfall based on observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 23 to 29 November 2021.

The very small amount of rainfall this week is an indication of the end of the rainy season in the LMB.

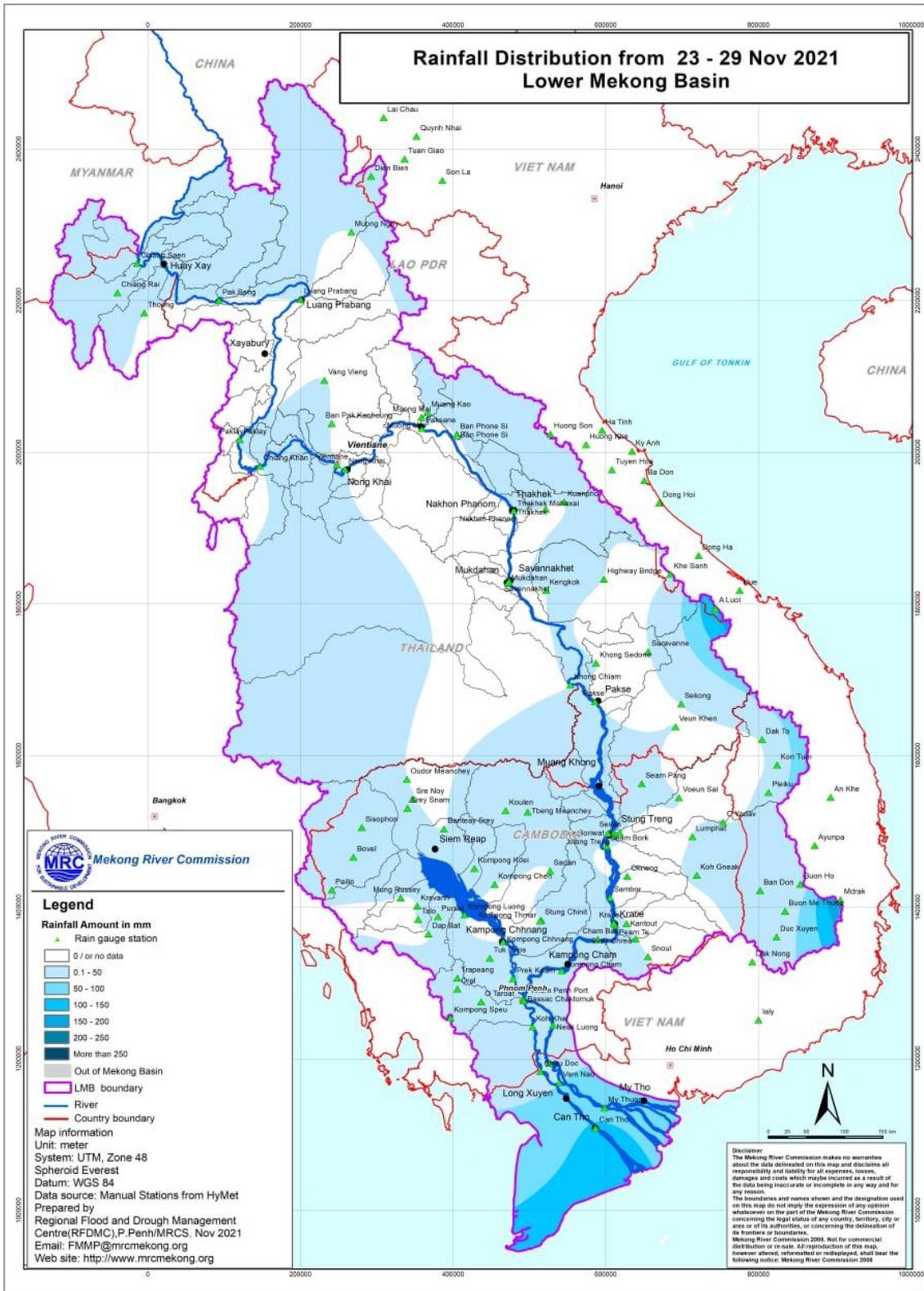


Figure 5: Weekly rainfall distribution over the LMB.

3 Water Levels in the Lower Mekong River

The hydrological regimes of the Mekong mainstream are illustrated by recorded water levels and flows at key mainstream stations: at Chiang Saen to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane to present flows generated by climate conditions in the upper part of the LMB; at Pakse to investigate flows influenced by inflows from the larger Mekong tributaries; at Kratie in Cambodia to capture overall flows of the Mekong Basin; and at Viet Nam’s Tan Chau and Chau Doc to monitor flows to the Delta.

The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in [Figure 6](#). The hydrograph for each key station is available from the MRC’s River Flood Forecasting: <http://ffw.mrcmekong.org/overview.php>. The weekly water levels and rainfall at each key station are summarised in **Annex A**.

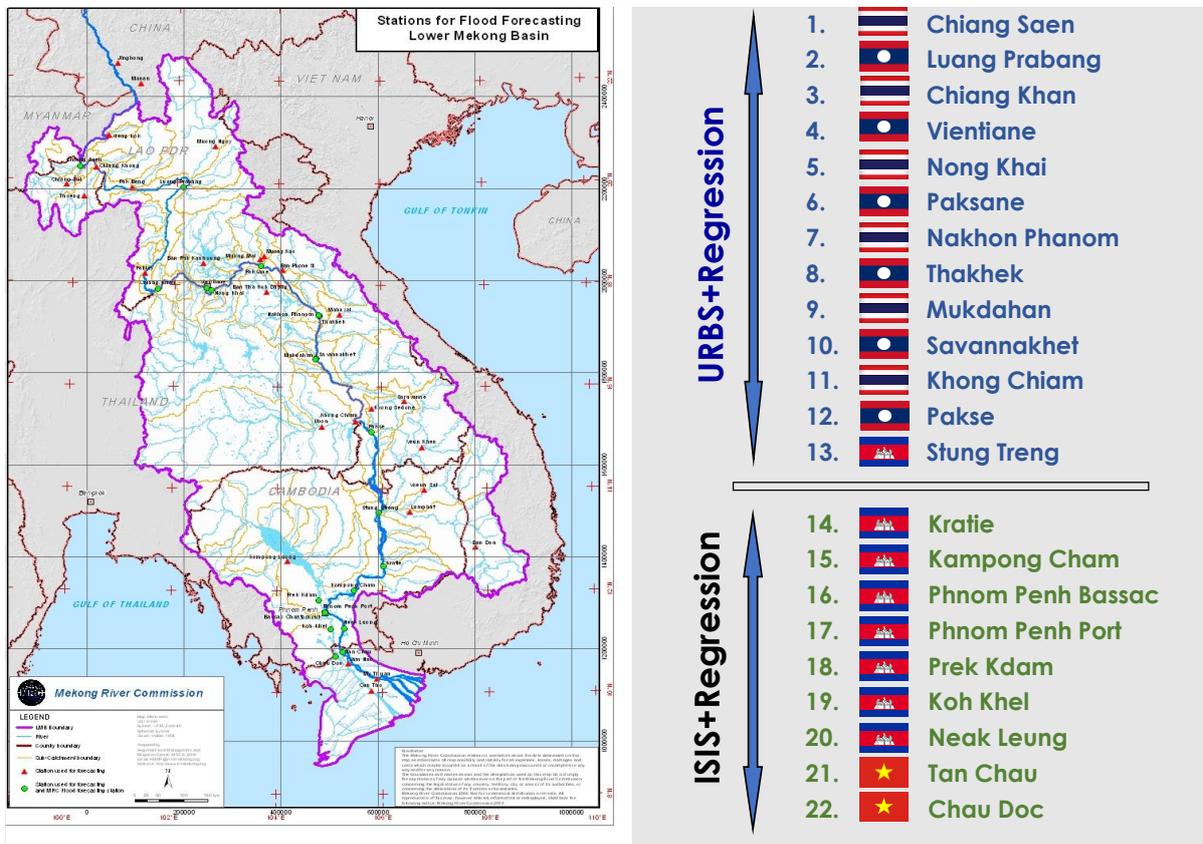


Figure 6: Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC’s observed water level at Jinghong showed a slight **increase of about 0.04 m from 535.21 m on 23 Nov to 535.25 on 29 Nov 2021 (recorded on 7:00 am)**, and stayed about 0.49 m lower than its two-average (2020-2021) value. The Eyes on Earth (Mekong Dam Monitor) Natural Flow Model indicates that 39% of water is missing at the gauge in Chiang Saen, Thailand and just under 48% of water is missing at Vientiane, Laos. Flow restrictions from dams over the course of the last month are the main driver of missing water throughout the mainstream. The amount of missing water is expected to decrease over the coming month as upstream restrictions end and dams prepare for dry season releases. The outflow was up from 796.00 m³/s on 23 Nov to 819.00 m³/s on 22 Nov 2021.

[Figure 7](#) below presents water level that decreased at the Jinghong hydrological station¹, indicating the trend of fluctuating water level up to 29 November 2021.

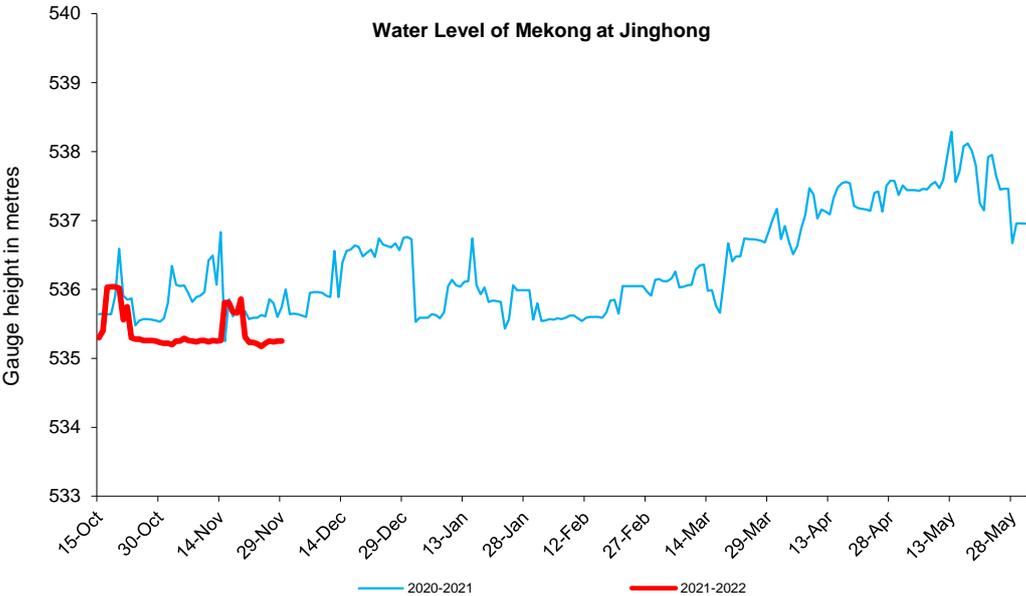


Figure 7. Water level at the Jinghong hydrological station during 15 Oct to 29 Nov 2021.

Along with the slightly increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also increased about 0.06 m from 23 to 29 Nov 2021. However, from Chiang Khan in Thailand to Paksane in Lao PDR, water levels decreased about 0.55 m from Nov 23 to 29 due to less rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were also decreasing about 0.25 m. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia, moreover, were decreasing, due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).

Based on hydrological phenomenon, the contribution of inflow water from the upstream of Lancang-Mekong in China to the Mekong mainstream is about 16% in total during the wet season from June to October and about 25% in total during the dry season from November to May. The whole inflow of water into the LMB is influenced by rainfall at the Mekong mainstream and its tributaries during the wet season.

¹ Near-real time data of hydro-meteorological monitoring at the Jinghong hydrological station is available at <https://portal.mrcmekong.org/monitoring/river-monitoring-telemetry>.

Chiang Saen and Luang Prabang

Water level during November 23-29 at Thailand's Chiang Saen slightly increased from 2.18 m to 2.24 m. When compared to last week, this week's water level is relatively lower.

Water level at the Luang Prabang station in Lao PDR slightly decreased from 9.38 m to 9.25 m, during the reporting period. Compared to last week, the figure shows a decline by about 0.13 m. The water level at this station was 0.26 m higher than its Maximum Value. The water levels at Chiang Saen and Luang Prabang are shown in [Figure 8](#) below.

Being situated between the upstream (Nam Beng, Nam Ou, Nam Suong, and Nam Khan) and downstream (Xayaburi) hydropower dams, the Luang Prabang station has a unique characteristic as it is influenced by the operations of all its surrounding dams. **Thus, the water level at this station can possibly change very rapidly during the early dry season.**

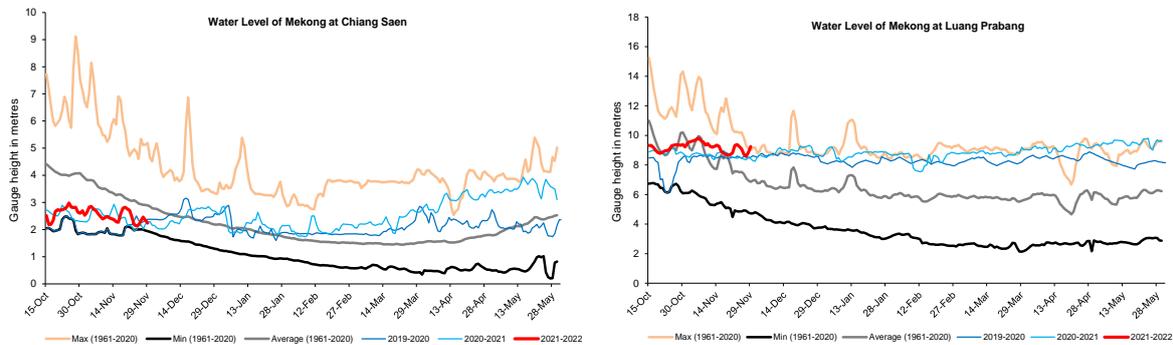


Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) significantly decreased from 5.51 m to 4.90 m during the reporting week. It showed 1.34 m lower than its Long-Term- Average (LTA). Furthermore, water level downstream at Vientiane in Lao PDR showed a reduction from 3.10 m to 2.68 m and was about 0.51 m lower than its LTA during 23-29 November 2021. At Nong Khai station in Thailand, the water level was also down during the reporting period. It decreased from 2.62 m to 2.20 m, and still showing 1.47 m lower than its LTA. At Paksane in Lao PDR, water levels decreased about 0.24 m, down from 3.18 m to 2.94 m. The WL at this station was still about 1.50 m lower than its LTA. The recently decreased water levels were obviously due to the less rainfall in the sub-catchment area, amid the inflows and water storing from upstream. The water levels at Vientiane and Paksane are shown in [Figure 9](#) below.

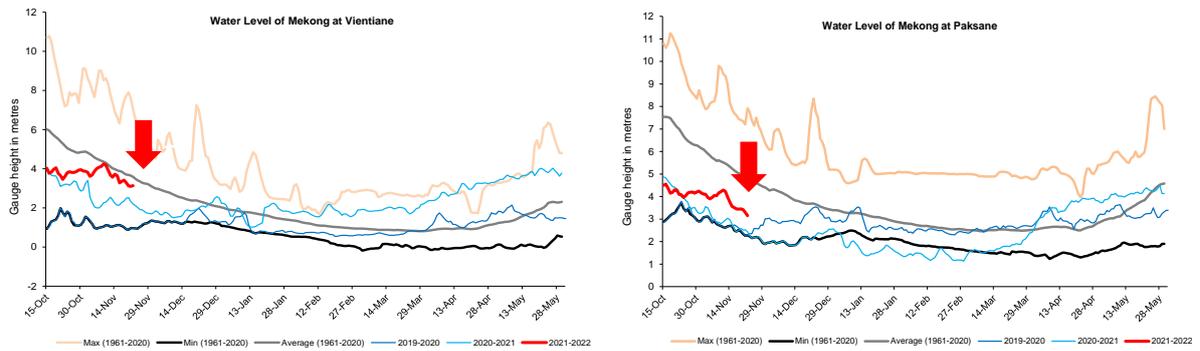


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

Nakhon Phanom to Pakse

Similarly, water levels from Nakhon Phanom to Mukdahan in Thailand slightly decreased by about 0.30 metres, during the reporting period. **Water levels at these stations were staying below their LTA level, except at Pakse where water level was slightly higher than its LTA.** [Figure 10](#) shows the water levels at Nakhon Phanom and Pakse stations.

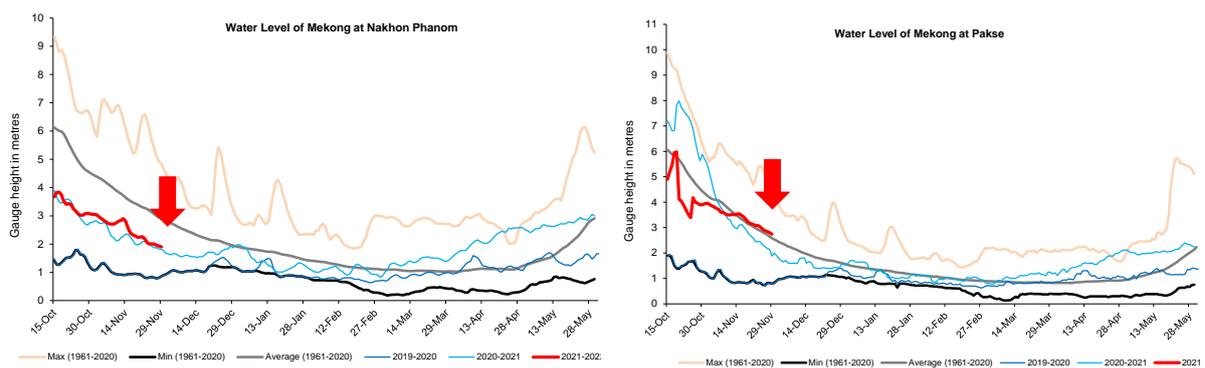


Figure 10: Water levels at Nakhon Phanom and Pakse of Thailand and Lao PDR.

Stung Treng to Kompong Cham/Phnom Penh to Koh Khel/Neak Luong

Following the same trend from the upstream part of the Mekong River and the 3S river (Sekong, Se San, and Sre Pok), the water levels from Stung Treng to Kratie in Cambodia were remarkably down, during 23-29 November 2021. This week water level at Stung Treng and Kratie decreased about 0.19 m and 0.65 m, respectively. Water levels at Stung Treng and Kratie still remained about 0.31 m and 0.27 m higher than their LTA value, while water level at Kompong Cham was about 0.81 m, below their LTA (as showed in [Figure 11](#)).

Generally, the **Water levels at these stations were lower than their LTA, which considered normal at Stung Treng and Kratie.**

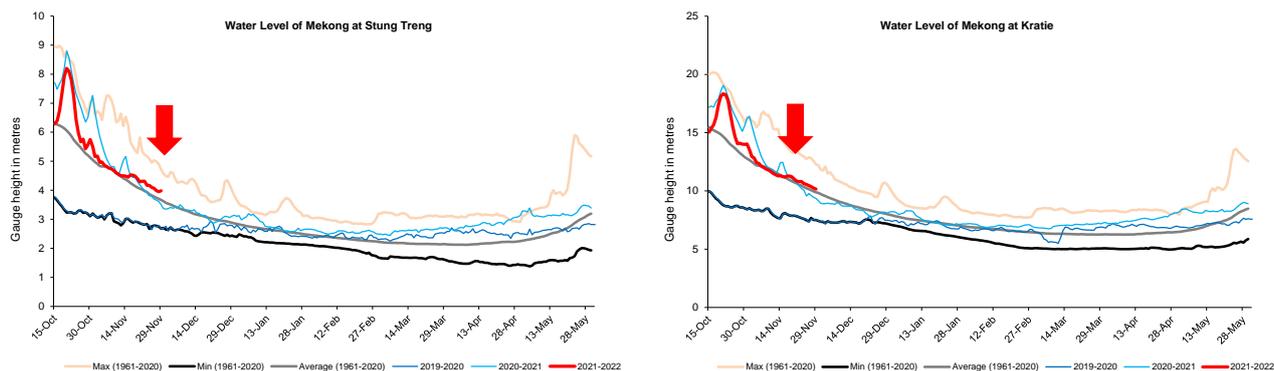


Figure 11: Water levels at Stung Treng and Kratie on the Mekong River.

At Chaktomuk on the Bassac River, due to less rainfall and contributed flows from upstream catchment, the water level was down by about 0.50 m and stayed 1.24 m lower than its LTA value; while at Koh Khel, water level decreased about 0.40 m, staying 0.55 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake decreased about 0.39 m and was about 0.78 m lower than its LTA value. The water level at the Tonle Sap Lake (observed at Kompong Luong) was similar to Prek Kdam station's water level. The recently decreased water level was because of less rain and low inflow contributed from upstream of the Tonle Sap Lake area during the reporting period. The water level at the Tonle Sap Lake (observed at Kompong Luong) followed the same trend of Prek Kdam station's water level. **Water levels at these stations were staying below their LTA level, which still considered critical.**

Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 23 to 29 November 2021 at Viet Nam's Tan Chau and Chau Doc were fluctuating due to daily tidal effects from the sea. The fluctuation levels were between 1.75 m and 1.79 m; they were in between the range of their LTA and historical minimum levels and **considered normal**.

The Tonle Sap Flow

At the end of the wet season, when water levels along the Mekong River subside, outflows of the Tonle Sap Lake (TSL) return into the Mekong River and then to the Delta. This phenomenon normally takes place from end of September to October. Based on flow observation at Prek Kdam, the outflow of the Tonle Sap Lake was taken place since 10 October 2021.

[Figure 12](#) shows the seasonal changes of the inflow/reverse flow and the outflow of the TSL at Prek Kdam in comparison with the flows of 2019 and 2020, and their LTA level (1997-2020). Up to November 29 of this reporting period, **it was observed that the main outflow to Tonle Sap Lake slightly decreased due to less rainfall and inflows from upstream**. This decreased outflow of Tonle Sap Lake was most likely caused by small inflows and rainfall from the catchment area. Up to this date, the outflow from the Tonle Sap Lake condition in 2021 is higher than 2019 and 2020 outflow conditions. For next week, small rainfall is forecasted for the Tonle Sap area; thus, the outflow into the Tonle Sap Lake is likely continuing to decrease from the current level.

Figure 13 shows seasonal changes in monthly flow volumes up to November 29 for the Lake compared with the volumes in 2019, 2020 and their LTA, and the fluctuation levels (1997–2020). It shows that up to November 29, the water volume of the Tonle Sap Lake is lower than its LTA but higher than 2019 and 2020 during the same period. The figure is displayed in Table 1, which indicates that the Tonle Sap Lake has been affected by water levels from the Mekong River, the tributaries, and rainfall in the surrounding sub-catchments and ***considered critical***.

This demonstrates the influence of the relationships between the reverse flows, water levels of the Mekong River, inflows from tributaries, and the flow direction in the complex hydraulic environment of the Tonle Sap Lake during the wet and dry seasons. The data show that about half of the annual inflow volume into the Tonle Sap Lake has originated from the Mekong mainstream. Thus, flow alterations in the mainstream could have direct impact on the Tonle Sap Lake water levels and on its hydrology.

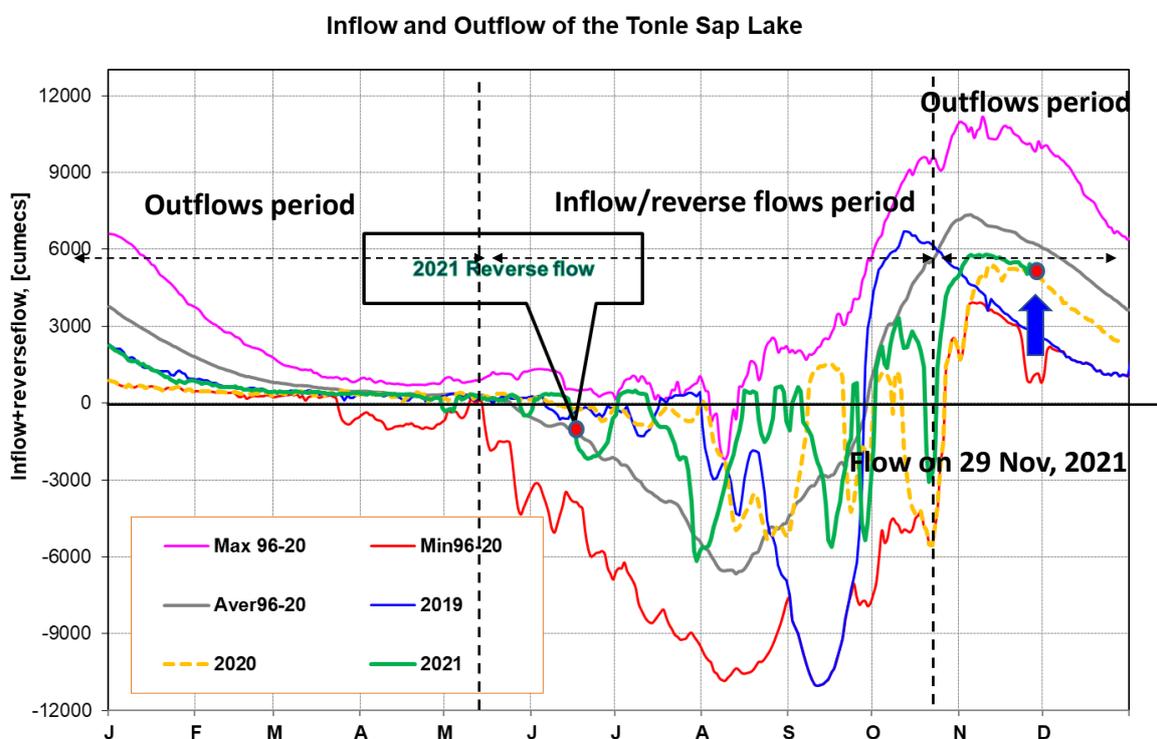


Figure 12: Seasonal change of inflows and outflows of Tonle Sap Lake.

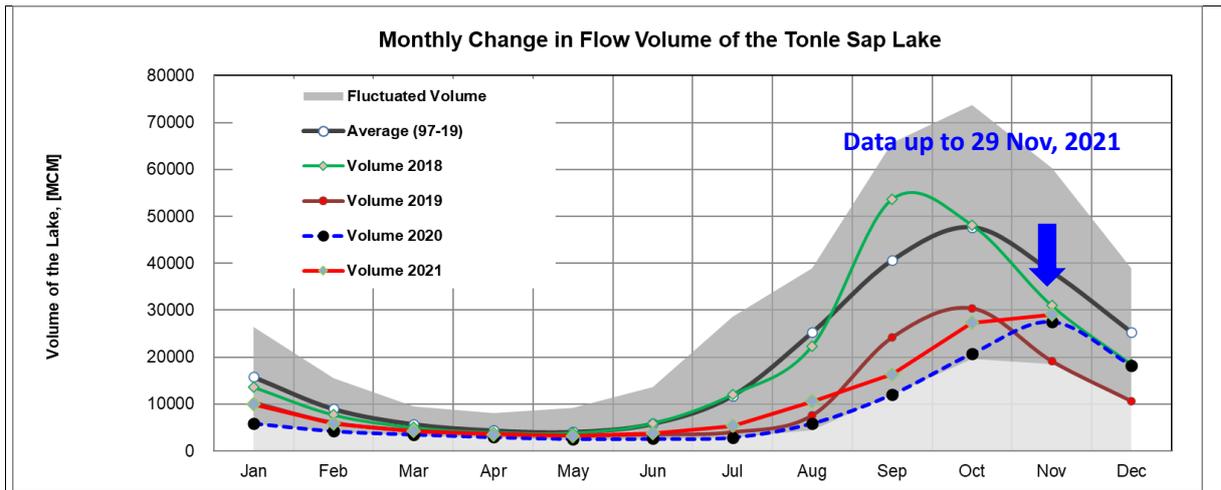


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

Table 1. The monthly change in the flow volume of Tonle Sap Lake.

Month	Average Volume (97-19) [MCM]	Max Volume [MCM]	Min Volume [MCM]	Volume 2018 [MCM]	Volume 2019 [MCM]	Volume 2020 [MCM]	Volume 2021 [MCM]
Jan	15756.54	26357.53	5906.80	13633.41	10285.31	5906.80	9923.80
Feb	8964.81	15596.22	4198.60	7729.72	6019.30	4264.19	5832.97
Mar	5711.41	9438.24	3347.07	5037.06	4354.62	3553.99	4264.88
Apr	4379.57	8009.14	2866.91	3956.47	3667.47	2992.61	3556.68
May	4063.12	9176.93	2417.81	3864.00	3266.43	2594.92	3240.78
Jun	5787.88	13635.01	2468.70	5919.18	3517.06	2641.88	3798.29
Jul	11749.36	28599.56	2925.86	12024.96	4001.99	2925.86	5346.73
Aug	25254.98	39015.12	4433.46	22399.65	7622.71	5941.07	10547.80
Sep	40602.85	65632.35	12105.31	53639.54	24194.19	12105.31	16382.34
Oct	47688.24	73757.23	19705.50	48193.08	30358.38	20799.13	27318.21
Nov	38191.50	60367.33	18534.61	31036.07	19112.65	27546.80	29112.72
Dec	25332.58	38888.95	10563.49	18469.21	10577.29	18251.65	
	Critical situation, compared with historical Min values						
	Normal condition, compared with LTA (Long term average)						
	Low volume situation, compared with LTA values						
Unit: Million Cubic Meter (1 MCM= 0.001 Km ³)							

4 Flash Flood in the Lower Mekong Basin

During November 23-29, the LMB was affected by three main weather factors. These include (i) The rather active high-pressure area from China extended its ridge to cover the northeastern part during the first half of the week. These conditions caused cool weather in some areas in the upper part during last week (ii) the rather active northeast monsoon prevailed over the Gulf of Thailand during the second half of the week and it lay toward the low-pressure cell on the last days of the week; and (iii) the low-pressure cell covered the middle and lower southern part causing heavy and very heavy rainfall in some areas of the middle and lower parts in some areas during the week.

According to the MRC-Flash Flood Guidance System (MRC-FFGS) and analysis, flash flood events were detected during the reporting period in several areas of Thailand and Viet Nam ranging from low risk level to high level. Specially, the high-risk level was detected in some areas as shown in [Figure 14](#) and [Table 2](#). In Lao PDR and Cambodia, the MRC-FFGS did not detect any flash flood events.

Table 2. Detected flash flood in Thailand, Cambodia and Viet Nam on November 18.

 Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Thailand												
Date of FFG products 29/11/2021 00:00				UTC time								
01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location				
Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	
Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk	Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk	Phangnga	Khura Buri	Southern-West Coast	Low-Risk	
Chumphon	Sawi	Southern-East Coast	Low-Risk	Chumphon	Phalo	Southern-East Coast	Low-Risk	Surat Thani	Thachang	Southern-East Coast	Low-Risk	
Ranong	La-un	Southern-West Coast	Low-Risk	Surat Thani	Chalya	Southern-East Coast	Low-Risk	Phatthalung	Tamot	Southern-East Coast	Moderate-Risk	
Chumphon	Phalo	Southern-East Coast	Low-Risk	Surat Thani	Thachang	Southern-East Coast	Low-Risk	Surat Thani	Khilirat Nikhom	Southern-East Coast	Low-Risk	
Surat Thani	Chalya	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Lan Saka	Southern-East Coast	Moderate-Risk	Surat Thani	Wiang Sa	Southern-East Coast	Low-Risk	
Surat Thani	Thachang	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Thung Song	Southern-East Coast	Moderate-Risk	Surat Thani	King Amphoe Chai Buri	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Sichon	Southern-East Coast	Low-Risk	Surat Thani	Bannasan	Southern-East Coast	Low-Risk	Krabi	Khao Phanom	Southern-West Coast	Moderate-Risk	
Surat Thani	Thachang	Southern-East Coast	Low-Risk	Surat Thani	Muang Suratthani	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Thung Song	Southern-East Coast	Moderate-Risk	
Surat Thani	Wiang Sa	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Tha Sala	Southern-East Coast	Low-Risk	Krabi	Lam Tap	Southern-West Coast	Low-Risk	
Nakhon Si Thammarat	King Amphoe Tham Phanra	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Muang Nakhon Si Thammarat	Southern-East Coast	Moderate-Risk	Trang	Wang Wiset	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Phi Pun	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Lan Saka	Southern-East Coast	Moderate-Risk	Nakhon Si Thammarat	King Amphoe Tham Phanra	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Nabon	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	King Amphoe Phaphom	Southern-East Coast	Moderate-Risk	Nakhon Si Thammarat	Phi Pun	Southern-East Coast	Moderate-Risk	
Nakhon Si Thammarat	Nabon	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Thung Song	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Phi Pun	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Thung Song	Southern-East Coast	Moderate-Risk	Phatthalung	Muang Phatthalung	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Muang Nakhon Si Thammarat	Southern-East Coast	Moderate-Risk	
Nakhon Si Thammarat	Bang Chan	Southern-East Coast	Low-Risk	Phatthalung	Bang Kaeo	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Lan Saka	Southern-East Coast	Moderate-Risk	
Nakhon Si Thammarat	Chawang	Southern-East Coast	Low-Risk	Phatthalung	Tamot	Southern-East Coast	Moderate-Risk	Nakhon Si Thammarat	Nabon	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Sichon	Southern-East Coast	Low-Risk	Phatthalung	Pak Phayun	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Lan Saka	Southern-East Coast	Moderate-Risk	
Surat Thani	Bannasan	Southern-East Coast	Moderate-Risk	Nakhon Si Thammarat	Chian Yai	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Nabon	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	King Amphoe Phaphom	Southern-East Coast	Low-Risk	Krabi	King Amphoe Nua Khong	Southern-West Coast	Low-Risk	Nakhon Si Thammarat	King Amphoe Phaphom	Southern-East Coast	Moderate-Risk	
Nakhon Si Thammarat	Tha Sala	Southern-East Coast	Moderate-Risk	Trang	Sikao	Southern-West Coast	Low-Risk	Nakhon Si Thammarat	Thung Song	Southern-East Coast	Low-Risk	
Surat Thani	Bannadoem	Southern-East Coast	Low-Risk	Phatthalung	Pabon	Southern-East Coast	Low-Risk	Phatthalung	Khuan Khanun	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Sichon	Southern-East Coast	Low-Risk	Songkhla	Sathing Phra	Southern-East Coast	Low-Risk	Nakhon Si Thammarat	Sichon	Southern-East Coast	Low-Risk	
Nakhon Si Thammarat	Tha Sala	Southern-East Coast	Low-Risk	Trang	Palan	Southern-West Coast	Low-Risk	Surat Thani	Bannasan	Southern-East Coast	Low-Risk	

 Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Viet Nam												
Date of FFG products 29/11/2021 00:00 UTC time												
01-Hour Flash Flood Risk and Location				3-Hour Flash Flood Risk and Location in Vietnam				6-Hour Flash Flood Risk and Location in Vietnam				
Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks	
Phu Yen	Tuy Hoa	South Central Coast	High-Risk	Phu Yen	Tuy Hoa	South Central Coast	High-Risk	Khanh Hoa	Ninh Hoa	South Central Coast	Low-Risk	
Khanh Hoa	Van Ninh	South Central Coast	High-Risk	Khanh Hoa	Van Ninh	South Central Coast	High-Risk	Phu Yen	Tuy Hoa	South Central Coast	High-Risk	
Khanh Hoa	Ninh Hoa	South Central Coast	High-Risk	Khanh Hoa	Ninh Hoa	South Central Coast	Moderate-Risk	Phu Yen	Tuy Hoa	South Central Coast	Low-Risk	
Khanh Hoa	Dien Khanh	South Central Coast	Moderate-Risk	Khanh Hoa	Khanh Vinh	South Central Coast	Moderate-Risk	Phu Yen	Tuy Hoa	South Central Coast	Moderate-Risk	
Khanh Hoa	Khanh Son	South Central Coast	High-Risk	Khanh Hoa	Cam Ranh	South Central Coast	Low-Risk	Khanh Hoa	Khanh Vinh	South Central Coast	Moderate-Risk	
Lam Dong	Lac Duong	Central Highlands	Moderate-Risk	Khanh Hoa	Dien Khanh	South Central Coast	Low-Risk	Khanh Hoa	Dien Khanh	South Central Coast	Moderate-Risk	
Dak Lak	Krong Bong	Central Highlands	Low-Risk	Khanh Hoa	Khanh Son	South Central Coast	Moderate-Risk	Khanh Hoa	Khanh Son	South Central Coast	Moderate-Risk	
Khanh Hoa	Khanh Vinh	South Central Coast	High-Risk	Khanh Hoa	TP. Nha Trang	South Central Coast	Low-Risk	Khanh Hoa	TP. Nha Trang	South Central Coast	Low-Risk	
Khanh Hoa	TP. Nha Trang	South Central Coast	Low-Risk	Lam Dong	Lac Duong	Central Highlands	Moderate-Risk	Khanh Hoa	Cam Ranh	South Central Coast	Moderate-Risk	
Khanh Hoa	Cam Ranh	South Central Coast	Moderate-Risk	Ninh Thuan	Ninh Son	South Central Coast	Moderate-Risk	Ninh Thuan	Ninh Son	South Central Coast	Moderate-Risk	
Ninh Thuan	Ninh Son	South Central Coast	Moderate-Risk	Ninh Thuan	Ninh Hai	South Central Coast	Moderate-Risk	Ninh Thuan	Ninh Hai	South Central Coast	Moderate-Risk	
Ninh Thuan	Ninh Hai	South Central Coast	Moderate-Risk	Lam Dong	Don Duong	Central Highlands	Low-Risk	Lam Dong	Don Duong	Central Highlands	Low-Risk	
Lam Dong	Don Duong	Central Highlands	Low-Risk	Dak Lak	Krong Bong	Central Highlands	Low-Risk	Binh Thuan	Tuy Phong	South Central Coast	Low-Risk	
								Dak Lak	Krong Bong	Central Highlands	Low-Risk	
								Dak Lak	Lak	Central Highlands	Low-Risk	
								Lam Dong	Lac Duong	Central Highlands	Moderate-Risk	
								Khanh Hoa	Cam Ranh	South Central Coast	Low-Risk	
								Khanh Hoa	TP. Nha Trang	South Central Coast	Low-Risk	
								Khanh Hoa	Van Ninh	South Central Coast	Moderate-Risk	
								Khanh Hoa	Ninh Hoa	South Central Coast	Moderate-Risk	

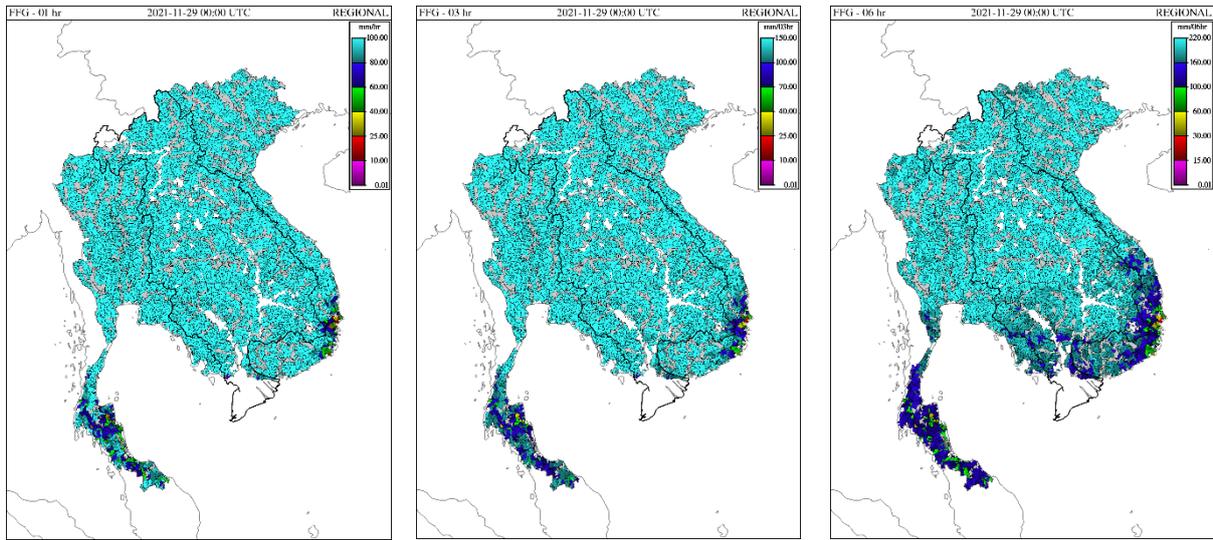


Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on Nov 29

5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from 20 to 26 November 2021

Drought monitoring data for 2021 are available from Saturday to Friday every week; thus, the reporting period is normally delayed by three days compared to Flood and Flash Flood reports. We adopt the Index of Soil Water Fraction (ISWF) data obtained from FFGS to represent soil moisture of agricultural indicator for both dry and wet seasons.

- **Weekly Standardised Precipitation Index (SPI1)**

Meteorological drought condition of the LMB from November 20 to 26, as shown in [Figure 11](#), was normal in most parts. Weekly SPI map shows that the LMB received average rainfall in most parts of the region except the Mekong Delta of Viet Nam that received above average rainfall during the monitoring week.

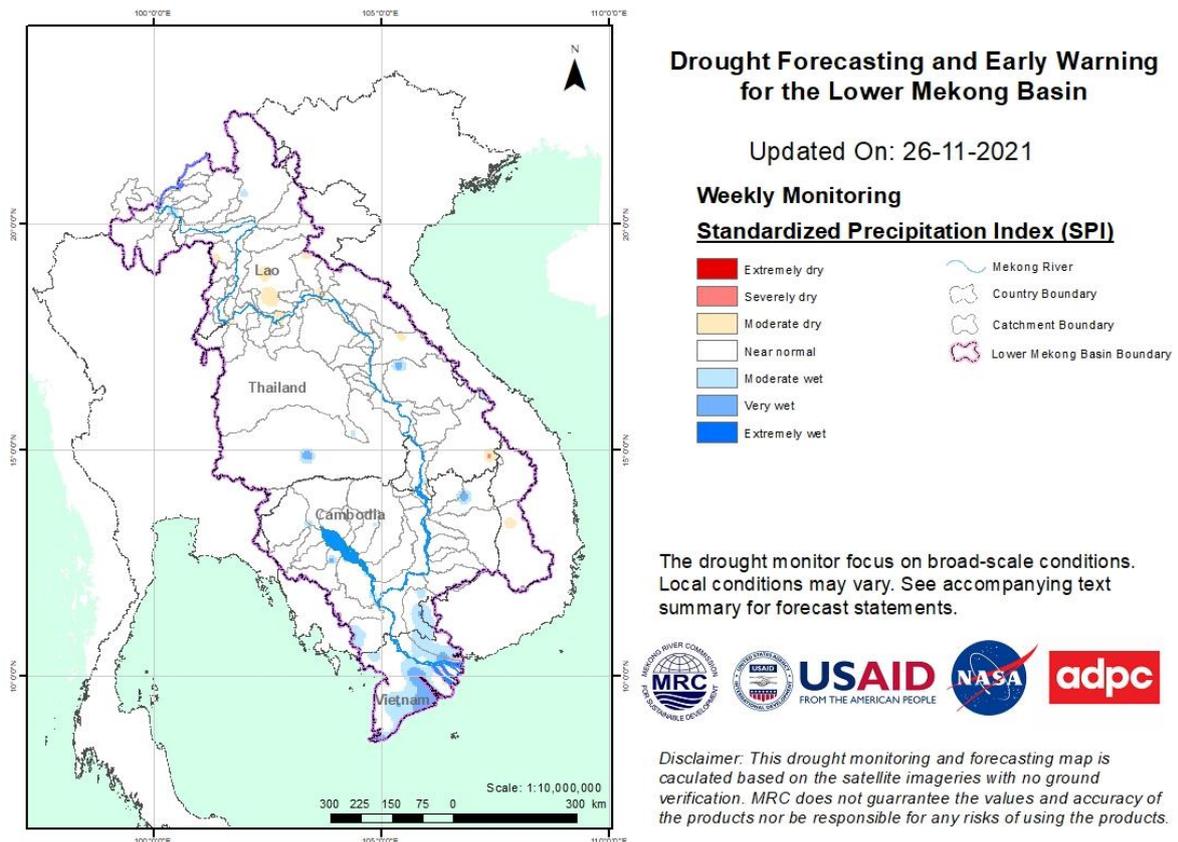


Figure 15: Weekly standardised precipitation index from Nov 20 to 26.

- **Weekly Index of Soil Water Fraction (ISWF)**

With much less rainfall in the northern and middle parts of the region, soil moisture conditions from Nov 20 to 26, as displayed in [Figure 12](#), were severely and extremely dry in most areas of the LMB especially the north and middle parts.

Note: The index of soil water fraction presents the current soil water fraction conditions compared with normal month; therefore, it normally shows extremely dry during dry season which is completely different from SPI which is standardized to its specific month of the years. However, this does not mean that the areas are threatened by agricultural drought as generally during transition period of wet and dry seasons and dry season only the irrigated areas are used for agricultural plantation.

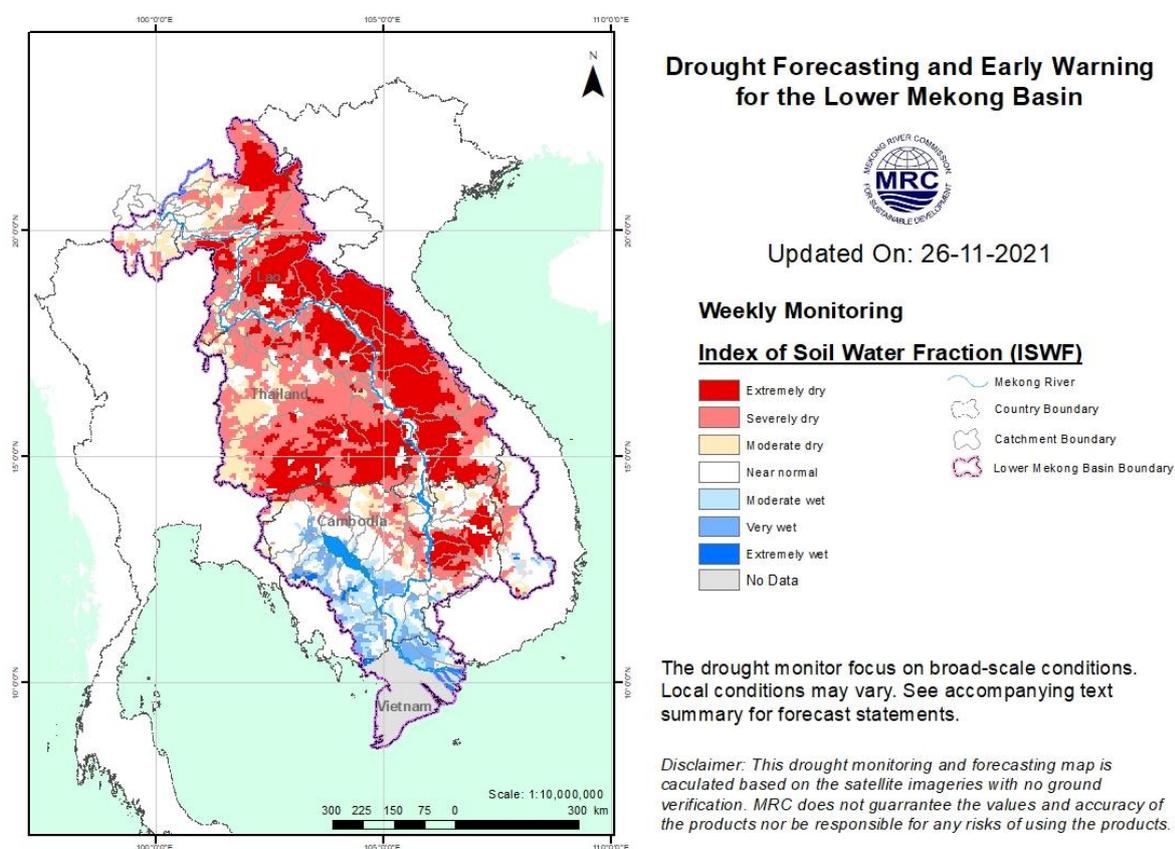
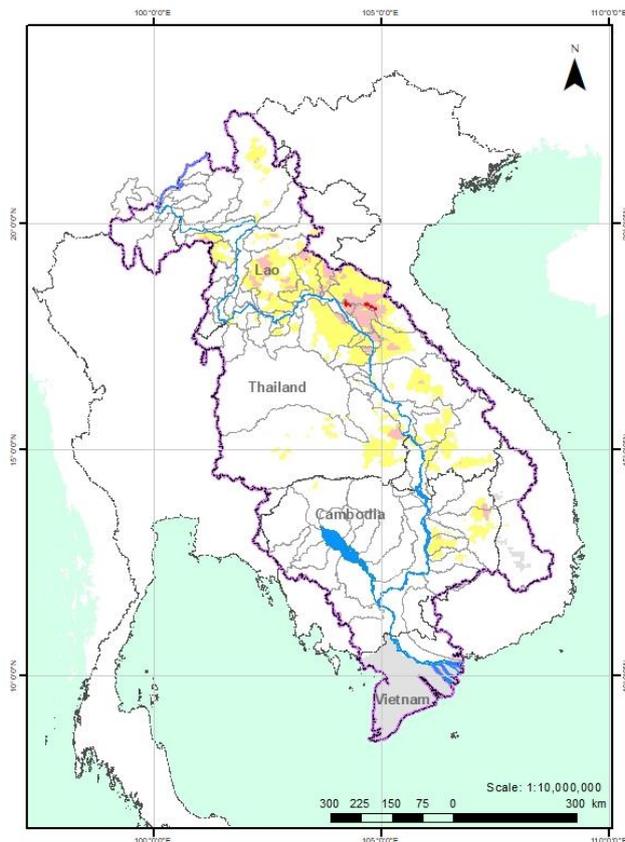


Figure 16: Weekly Soil Moisture Anomaly from Nov 20 to 26.

- **Weekly Combined Drought Index (CDI)**

The combined drought indicator, as displayed in [Figure 13](#), reveals that during Nov 20-26 the LMB was facing some moderate and severe droughts mainly in the northeast of the LMB covering Phongsaly, Xayaburi, Vientiane, Xaysomboun, Xiengkhuang, Borikhamxay, Khammuane, Nong Khai, Nakhon Phanom, Sakon Nakhon, Savannakhet, Champasack, Ubon Ratchathani, Ratana Kiri, and Kratie due to severely dry soil moisture as described above. The other areas, however, were normal during the reporting week. No serious drought risk was detected during the reporting week.



Drought Forecasting and Early Warning for the Lower Mekong Basin



Updated On: 26-11-2021

Weekly Monitoring

Combined Drought Index (CDI)

	D4 (Exceptional Drought)		Mekong River
	D3 (Extremely Drought)		Country Boundary
	D2 (Severely Drought)		Catchment Boundary
	D1 (Moderate Drought)		Lower Mekong Basin Boundary
	D0 (Normal Condition)		
	No Data		

The drought monitor focus on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Disclaimer: This drought monitoring and forecasting map is calculated based on the satellite imageries with no ground verification. MRC does not guarantee the values and accuracy of the products nor be responsible for any risks of using the products.

Figure 17: Weekly Combined Drought Index during Nov 20-26.

More information on Drought Forecasting and Early Warning (DFEW) as well as the explanation is available here: <http://droughtforecast.mrcmekong.org/templates/view/our-product>. DFEW provides not only weekly monitoring and forecasting information but also a three-month forecast of drought indicators with seasonal outlook which are updated every month based on international weather forecast models. Details on drought forecast are described in section 6.4 of this report.

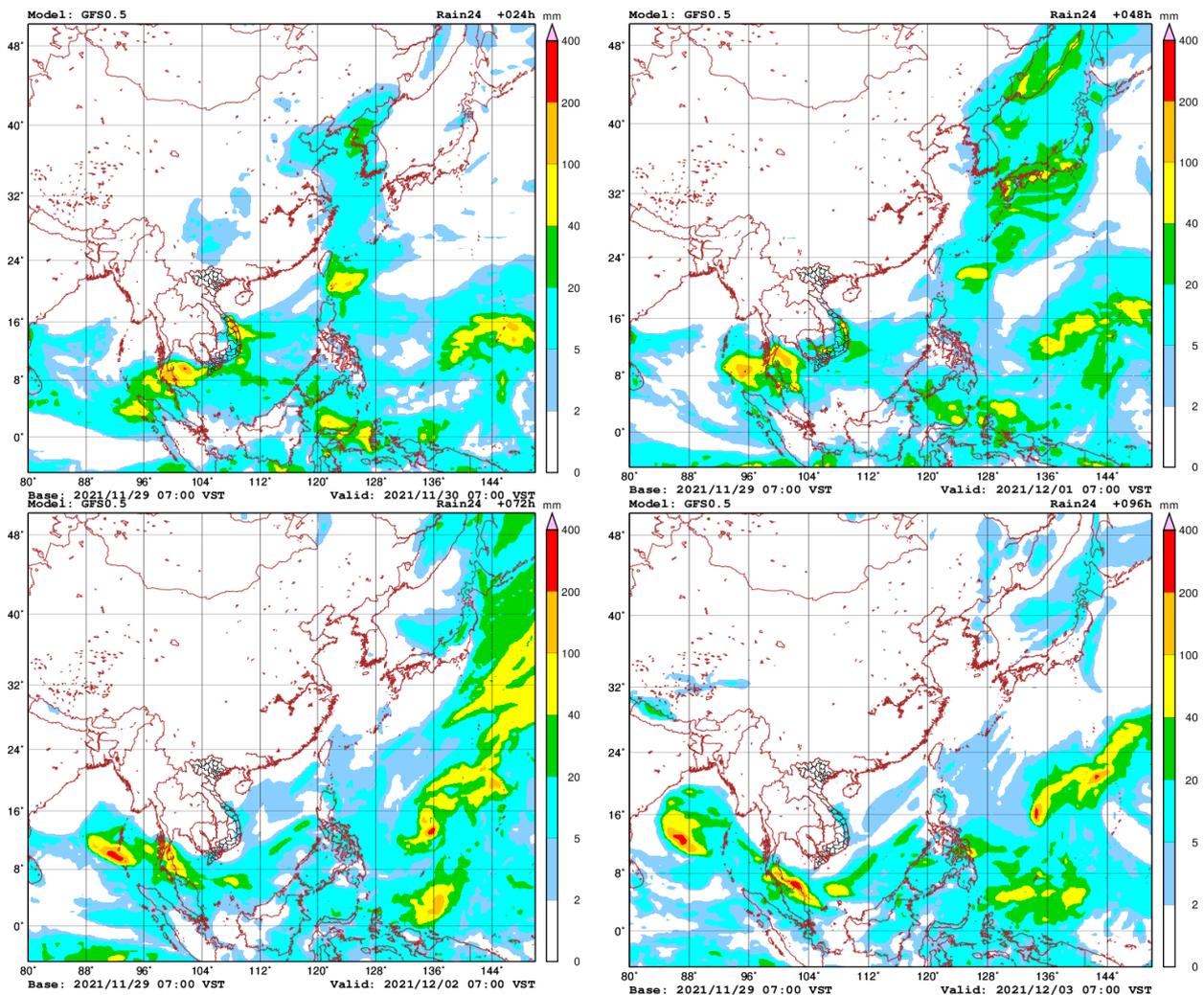
6 Weather and Water Level Forecast and Flash Flood Information

6.1 Weather and rainfall forecast

Based on the analysis of the synoptic meteorological information and result from the Global Forecast System (GFS) Model, in the coming week, two main factors might affect the LMB. They include (i) High pressure from China in the upper part and (ii) the on-going prevailing Southwest Monsoon from the Gulf of Thailand to the lower part of the LMB.

During November 30 – December 6, small rainfall (5-20 mm/24h) may occur in some areas of the LMB.

[Figure 14](#) shows accumulated rainfall forecast (24hrs) of the GFS model from November 30 to December 6.



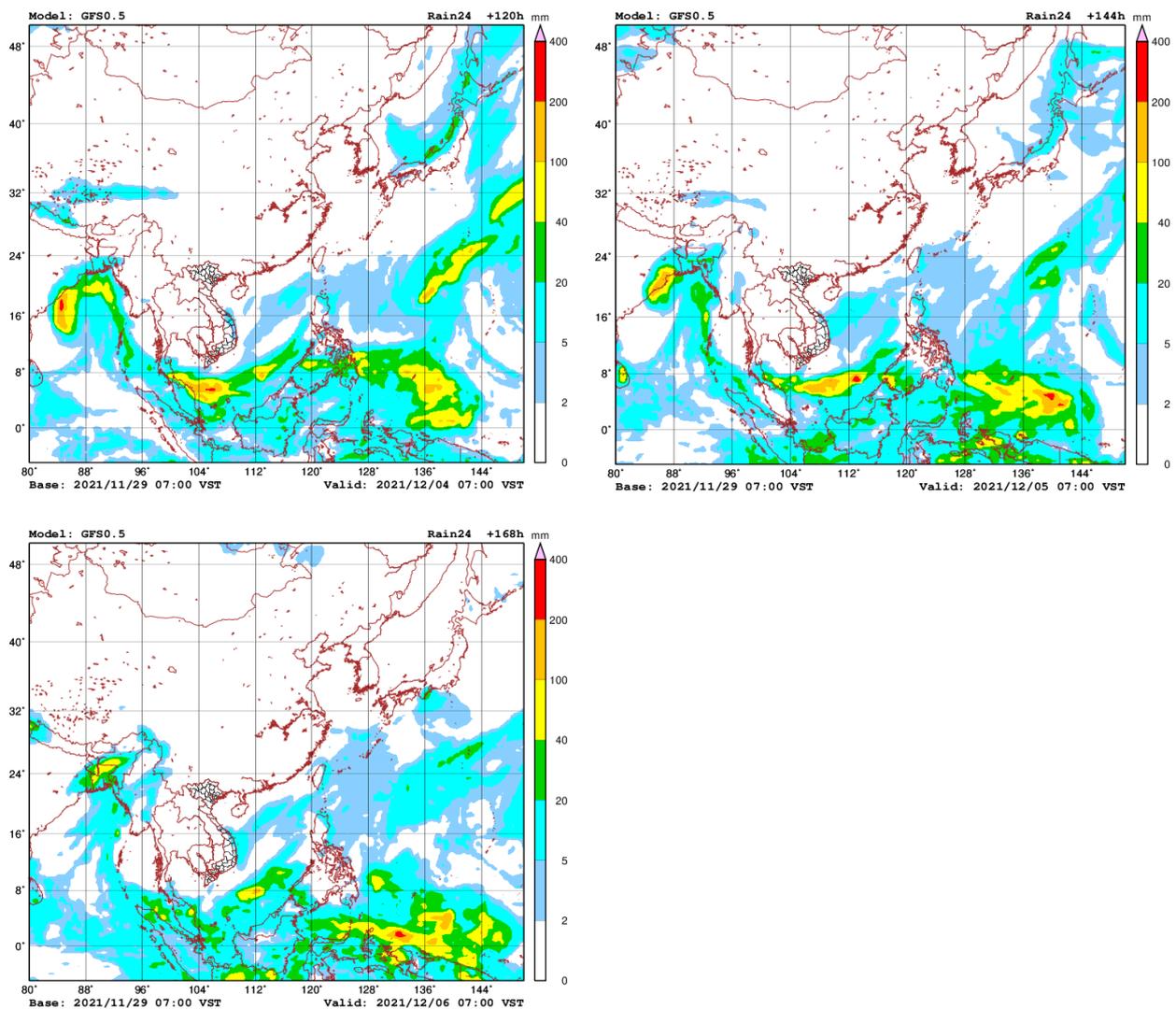


Figure 18: Accumulated rainfall forecast (24 hrs) of model GFS.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on November 29's weekly river monitoring bulletin, the weekly forecast water level at Chiang Saen in Thailand is expected to slightly decrease from 2.24 m to 2.22 m in the next seven days. Even so, the trend of water levels at these stations will continue staying below their LTA.

For Luang Prabang in Lao PDR, the water level is likely to decrease, staying between 9.25 m and 9.10 m during the same period. The current water levels are higher than its maximum value.

Chiang Khan, Vientiane-Nong Khai and Paksane

Water level at Chiang Khan station in Thailand is forecasted to be up about 0.16 m for the next seven days. But, from Vientiane in Lao PDR and Nong Khai in Thailand will see a very slight decrease of about 0.2 m in the next seven days. At Paksane in Lao PDR, water level will decrease about 0.24 m due to less inflow from the upper catchments. Below average rainfall is forecasted in the area. The water levels here will remain lower than their LTA.

Nakhon Phanom to Pakse

Water levels from Nakhon Phanom in Thailand and Savannakhet in Lao PDR will decrease by about 0.25 m in the next seven days. From Khong Chiam in Thailand to Pakse in Lao PDR the water will drop by about 0.20 m. Water level at these stations will stay lower than their LTA level. Next week average quantity of precipitation is forecasted in the area.

Stung Treng to Kompong Cham/Phnom Penh to Koh Khel/Neak Luong

From Stung Treng to Kompong Cham along the Mekong River in Cambodia, the water levels will go down in between 0.10 m and 0.30 m over the next seven days. Precipitation is forecasted for the area between Stung Treng and Kampong Cham during next week.

The water levels of the Tonle Sap Lake at Prek Kdam and Phnom Penh Port as well as at Phnom Penh's Chaktomuk on the Bassac River will decrease about 0.40 m over the next seven days.

Water levels at most of the stations will continue to stay lower than their LTA value, particularly in the lower part of the region from the Bassac at Phnom Penh to Koh Khel as well as from Tonle Sap at Prek Kdam to Phnom Penh Port, including the Tonle Sap Lake. Precipitation is forecasted for the low-lying area of Cambodia next week.

Tidal stations at Tan Chau and Chau Doc

For Viet Nam's Tan Chau on the Mekong River and Chau Doc on the Bassac River, water levels will be moving down below their LTA, following daily tidal effects from the sea.

[Table 3](#) shows the weekly River Monitoring Bulletin issued on November 29. Results of the started weekly river monitoring bulletin are also available at http://ffw.mrcmekong.org/bulletin_wet.php.

6.3 Flash Flood Information

Flash flood events are not likely to happen in the LMB. However, local heavy rain in a short period of time might still be possible with unexpected short flash floods. During the dry season if extreme weather occurs, the information on flash flood guidance for the next one, three, and six hours is updated at <http://ffw.mrcmekong.org/ffg.php>.

Further detailed information on Flash Flood Information Warning, as well as on its explanation, is available for download [here](#).

6.4 Drought forecast

There are several climate-prediction models with different scenarios on the upcoming months until November 2021. The MRC’s DFEWS adopts an ensemble model called the North America Multi-Model Ensemble (NMME), which averages all scenarios.

The global scale of rainfall prediction is used to see how the rain distribution looks like for the coming months. [Figure 15](#) shows the ensemble mean of daily average precipitation (mm/day) each month from November 2021 to January 2022 produced by the NMME.

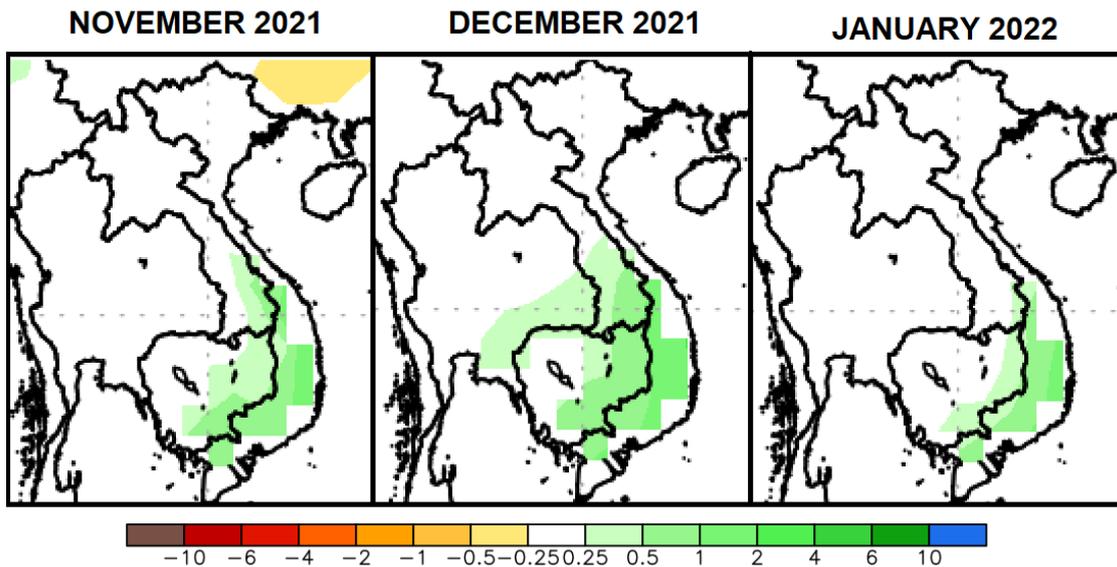


Figure 195. Daily average of monthly rainfall anomaly forecast from November 2021 to January 2022.

The ensemble prediction model based on the initial conditions in October reveals that the LMB is likely to receive from average to above average rainfall from November 2021 to January 2022. There will be some more rain dropping over the southern part of the LMB during November and December 2021 making the condition cooler than normal year, while normal condition is likely taking place in the upper and middle parts of the region during the last two months of the year.

The 2021 dry season is relatively wetter than that of 2020 and the monsoon rain in the 2021 wet season has arrived earlier than it did in 2019 and 2020 especially over the upper and central parts of the LMB.

Table 2. Weekly River Monitoring Bulletin.



Mekong Bulletin

Mekong River Commission Secretariat (MRCS)

Regional Flood and Drought Management Centre (RFDMC)

P.O. Box 623 #576, National Road #2, Chak Angre Krom, Meanchey, Phnom Penh, Cambodia

Tel: (855-23) 425353, Fax: (855-23) 425363, Email: floodforecast@mrcmekong.org

Forecast period from: 30 November to 06 December 2021

Date: 29 November 2021

LOCATION	Country	Observed Rainfall (mm)	Zero gauge above M.S.L (m)	Min water level against zero gauge (m)	Observed W. level against zero gauge (m)		Forecasted Water Levels (m)						
					28-Nov	29-Nov	30-Nov	01-Dec	02-Dec	03-Dec	04-Dec	05-Dec	06-Dec
Jinhong		0.0	-	-	535.25	535.25							
Chiang Saen		0.0	357.110	0.00	2.34	2.24	2.20	2.17	2.13	2.10	2.13	2.17	2.22
Luang Prabang		0.0	267.195	2.53	8.84	9.25	9.20	9.10	9.06	9.02	9.00	9.05	9.10
Chiang Khan		0.0	194.118	1.91	5.22	4.90	5.12	5.07	5.00	4.97	4.94	4.92	4.96
Vientiane		0.0	158.040	-0.28	2.84	2.68	2.45	2.63	2.60	2.55	2.53	2.50	2.49
Nongkhai		0.0	153.648	0.33	2.35	2.20	2.00	2.17	2.15	2.11	2.09	2.07	2.08
Paksane		0.0	142.125	0.10	3.07	2.94	2.82	2.66	2.77	2.76	2.74	2.72	2.70
Nakhon Phanom		0.0	130.961	0.18	1.93	1.90	1.80	1.72	1.60	1.68	1.68	1.67	1.66
Thakhek		0.0	129.629	1.38	3.17	3.13	3.02	2.94	2.82	2.92	2.93	2.94	2.95
Mukdahan		0.0	124.219	0.72	2.28	2.21	2.16	2.07	2.16	2.05	2.00	2.01	2.01
Savannakhet		0.0	125.410	-0.65	0.71	0.69	0.67	0.64	0.67	0.64	0.62	0.63	0.63
Khong Chiam		0.0	89.030	1.02	4.03	3.97	3.87	3.80	3.70	3.81	3.70	3.65	3.70
Pakse		0.0	86.490	0.03	2.80	2.74	2.67	2.60	2.54	2.59	2.52	2.50	2.55
Stung Treng		1.0	36.790	0.32	3.95	3.98	3.99	3.93	3.89	3.85	3.88	3.83	3.82
Kratie		nr	-1.080	3.06	10.25	10.15	10.15	10.17	10.09	10.02	9.96	10.00	10.02
Kompong Cham		2.1	-0.930	0.65	5.90	5.80	5.72	5.71	5.70	5.61	5.53	5.46	5.50
Phnom Penh (Bassac)		0.0	-1.020	1.58	4.75	4.63	4.55	4.50	4.47	4.41	4.35	4.32	4.30
Phnom Penh Port		-	0.000	0.14	3.77	3.70	3.64	3.60	3.58	3.53	3.47	3.43	3.40
Koh Khel		0.0	-1.000	1.52	4.50	4.43	4.37	4.32	4.30	4.25	4.20	4.15	4.12
Neak Luong		0.0	-0.330	0.81	3.60	3.60	3.57	3.54	3.51	3.48	3.44	3.39	3.35
Prek Kdam		nr	0.080	0.58	4.66	4.56	4.49	4.43	4.40	4.34	4.27	4.21	4.16
Tan Chau		0.0	0.000	-0.37	1.71	1.75	1.78	1.80	1.82	1.85	1.84	1.80	1.78
Chau Doc		nr	0.000	-0.60	1.71	1.75	1.78	1.80	1.83	1.87	1.86	1.82	1.80

REMARKS:

- : not available.
- *: reference stations without forecast.
- nr: no rain.

River Flood Forecaster

KHEM Sothea

NOTE: Discharge at Luang Prabang may be influenced by hydropower operations (at both upstream and downstream).
For more info, please refer to this link:
<http://www.mrcmekong.org/>; http://ffw.mrcmekong.org/bulletin_wet.php; <http://ffw.mrcmekong.org/reportflood.php>

7 Summary and Possible Implications

7.1 Rainfall and its forecast

Rainfall during this reporting week was considered low in the LMB (18.00 mm to 53.20 mm) due to low-pressure line dominating in the LMB. No rainfall in the upper and middle parts of the Mekong region were recorded during this week report. Compared with last week's amount, the rainfall this week was considered lower in the Mekong region.

Based on the forecasted rainfall from satellite using GFS data, rainfall is likely to take place in the areas from the lower part of Cambodia, the 3S area and Mekong Delta in Viet Nam during Nov 30- Dec 12, varying from 0.25 mm to 80 mm. This indicates the descending pace of rainfall and starting of the dry season from November over the LMB.

7.2 Water level and its forecast

The MRC's observed water level at Jinghong showed a slight increase of about 0.04 m from 535.21 m on 23 Nov to 535.25 on 29 Nov 2021 (recorded on 7:00 am), and stayed about 0.49 m lower than its two-average (2020-2021) value. The outflow was up from 796.00 m³/s on 23 Nov to 819.00 m³/s on 22 Nov 2021.

Water levels in the lower part of the monitoring locations in the LMB during this reporting week were decreasing from Chiang Khan in Thailand to Pakse in Lao PDR. Also, at Stung Treng, Kratie and Kampong Cham in Cambodia, after the end of the heavy rainfall in October water levels dropped significantly, but still higher than their LTA except at the Kampong Cham station. Water levels at Neak Luong, Bassac at Phnom Penh, and Prek Kdam in Cambodia were still lower than their LTA level. The low level was due to low inflows from upstream and less rainfall in the region from November 23 to 29. Generally, this week's water levels were relatively lower than those of last week from the upper to the lower part of the LMB.

The flow volume of the Tonle Sap Lake is lower than its LTA. From next week, the flow is expected to continue decreasing due to less rainfall forecasted in the inflow catchments of the Tonle Sap Lake.

From Stung Treng to Kampong Cham, the water levels will continue to go down. The water levels – at Neak Luong on the Mekong River, from Prek Kdam to Phnom Penh Port on the Tonle Sap, and from Chaktomuk to Koh Khel on the Bassac – are forecasted to continue staying below their LTA.

The situation in Tan Chau on the Mekong River and Chau Doc on the Bassac River is expected to remain unchanged.

Since the fourth week of October 2021, water levels across most monitoring stations in the LMB have significantly dropped to the level lower than their LTA (from upper to lower stretches within the LMB). For a more complete preliminary analysis of the hydrological

conditions in the LMB over July–December 2020 and November 2020 to May 2021 see this [Situation Report](#).

The contribution to the Mekong River’s flow from the UMB in China (Yunnan component) is about 16% by the time the river discharges through the Mekong Delta into the Sea. By far the major contribution comes from the two major ‘left-bank’ (Eastern) tributaries between Vientiane – Nakhon Phanom and Pakse – Stung Treng, which together contribute more than 40% of the flows.

7.3 Flash flood and its trends

With the predicted of rainfall for the coming week as mentioned earlier in [section 6.1](#), major flash floods are not likely to happen in the LMB.

7.4 Drought condition and its forecast

Drought condition of the LMB from November 20-26 was normal all over the LMB except some moderate drought in northeastern part due to severely dry soil moistures during the beginning of dry season. The region showed no significant threat except some moderate and severe dry soil moistures in the upper and middle parts of the LMB.

For the upcoming three-month forecast, the LMB is likely to receive from average to above average rainfall from November 2021 to January 2022. There will be some more rain dropping over the southern part of the LMB during November and December 2021 making the condition cooler than normal year, while normal condition is likely taking place in the upper and middle parts of the region during the last two months of the year.

Annex A: Tables for weekly updated water levels and rainfall at the Key Stations

Table A1: Weekly observed water levels

2021	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Khei	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
23-11-2021	535.21	2.18	9.38	5.51	3.10	2.62	3.18	2.05	2.41	3.08	4.17	10.80	6.36	5.13	4.84	3.79	4.95	1.79	1.77
24-11-2021	535.17	2.13	9.24	5.67	2.92	2.46	3.23	2.01	2.32	3.03	4.17	10.62	6.28	5.09	4.81	3.80	4.92	1.81	1.79
25-11-2021	535.22	2.17	9.08	5.75	3.02	2.43	3.15	2.01	2.31	2.94	4.10	10.56	6.18	5.01	4.75	3.76	4.68	1.75	1.75
26-11-2021	535.25	2.32	8.72	5.62	3.09	2.52	3.11	2.00	2.31	2.88	4.07	10.46	6.09	4.93	4.66	3.68	4.90	1.73	1.73
27-11-2021	535.24	2.46	8.59	5.42	3.00	2.53	3.12	1.96	2.29	2.84	3.99	10.37	6.00	4.85	4.56	3.63	4.72	1.71	1.71
28-11-2021	535.25	2.34	8.84	5.22	2.84	2.35	3.07	1.93	2.28	2.80	3.95	10.25	5.90	4.75	4.50	3.60	4.66	1.71	1.71
29-11-2021	535.25	2.24	9.25	4.90	2.68	2.20	2.94	1.90	2.21	2.74	3.98	10.15	5.80	4.63	4.43	3.60	4.56	1.75	1.75

Table A2: Weekly observed rainfall

2021	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Khei	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
23-11-2021	0	0	0	0	0	0	0	0	0	0	17	0	8.1	29.2	23	30.1	53.2	36	24.1
24-11-2021	0.5	8.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
25-11-2021	3	8.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
26-11-2021	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-11-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-11-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-11-2021	0	0	0	0	0	0	0	0	0	0	1	0	2.1	0	0	0	0	0	0



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