Mekong River Commission

Weekly Wet Season Situation Report in the Lower Mekong River Basin

26 -31 October 2021

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

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Key Messages

Key messages for this weekly report are presented below.

Rainfall and its forecast

- Rainfall focused in the areas from Chiang Saen in Thailand to Pakse in Lao PDR, including the lower part in Cambodia and Viet Nam, varying from 1.60 millimetres (mm) to 67.00 mm.
- There will be average rainfalls for the next 5 days over the Mekong region from 1 to 8 November 2021 because there is still a low-pressure dominating the Mekong region.

Water level and its forecast

- . According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 26 October to 31 October 2021. Water levels at this station **significantly decreased about 0.84 m from 536.04 m on 19 Oct to 535.20 on 31 Oct 2021 (recorded on 7:00 am) and stayed about 0.83 m lower than its long-term-average (LTA) value**. The outflow dropped from 1362.91.00 m^3/s on 19 Oct to 789.82 m^3/s on 31 Oct 2021.
- . Amid the significantly decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.33 m from 25 to 31 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.15 m during October 26-31 due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR, on the other hand, were decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia, moreover, were drastically 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 and the levels in 2019 but was higher than 2020 during the same period from 26 to 31 October 2021, and still considered critical.
- Over the next few 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

- Soil moisture conditions were anomaly dry in some areas of the upper part of the LMB. However, the combined drought indicator shows that the LMB did not face any significant drought during the monitoring week from October 16 to 22. The entire LMB region received from average to above average rainfall.

- For the upcoming thee-month forecast, the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.

1 Introduction

This Weekly Wet Season Situation Report presents a preliminary analysis of the weekly hydrological and drought situation in the Lower Mekong River Basin (LMB) for the period from **26 to 31 October 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 (MCs) – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. All the water levels indicated in this report refer 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 Lake
- 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.

At the end of October 2021, rainfall has been much deducted in the LMB, with the gradually decreasing water levels in both mainstream and tributaries. The data from the TMD predict that low pressure of air-mass which will bring cool weather condition in the upper part of Thailand, Lao PDR and Vietnam. As a result, the temperature of the Upper Thailand will reduce to happen as commonly chilly weather, specifically at the upper portion of the northern and north-eastern parts together with feasibly very cold weather at mountainous areas and mount top (within the Mekong region).

Figure 1 presents the weather map on 01 November 2021, showing a low-pressure line dominating the LMB, after the Tropical Storm KOMPASU. The below-average rainfall is predicted over the middle and lower parts of LMB, including northern Thailand, Lao PDR and Viet Nam and the 3S area (Sesan, Sre Pok, and Sekong) of Cambodia and Viet Nam.

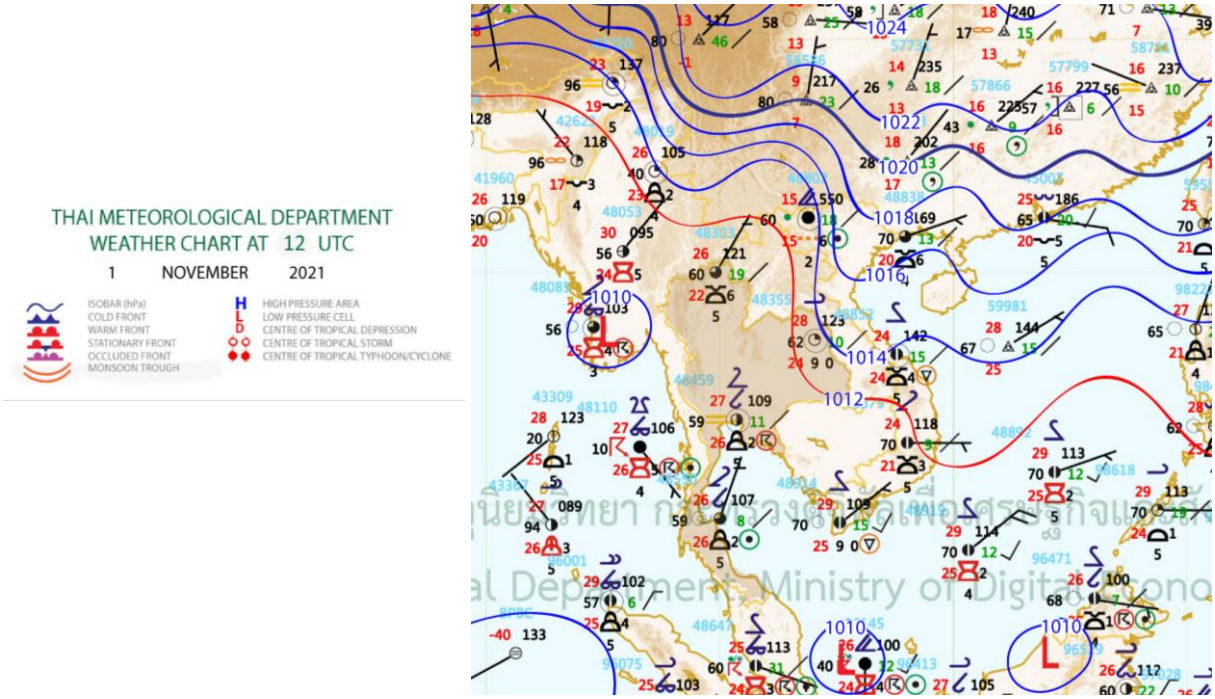

Figure 1. Summary of weather conditions over the LMB.

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of wetter condition is predicted over of the lower part of the Mekong region covering Lao PDR and Thailand from 1 to 14 November 2021, during the 1st and 2nd weeks of November. 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 1 to 14 November 2021 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

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Figure 2 shows the outlook of comparative wet conditions from 1 to 14 November 2021 covering the whole LMB region, based on results from the NCEP model (National Centres for Environmental Prediction).

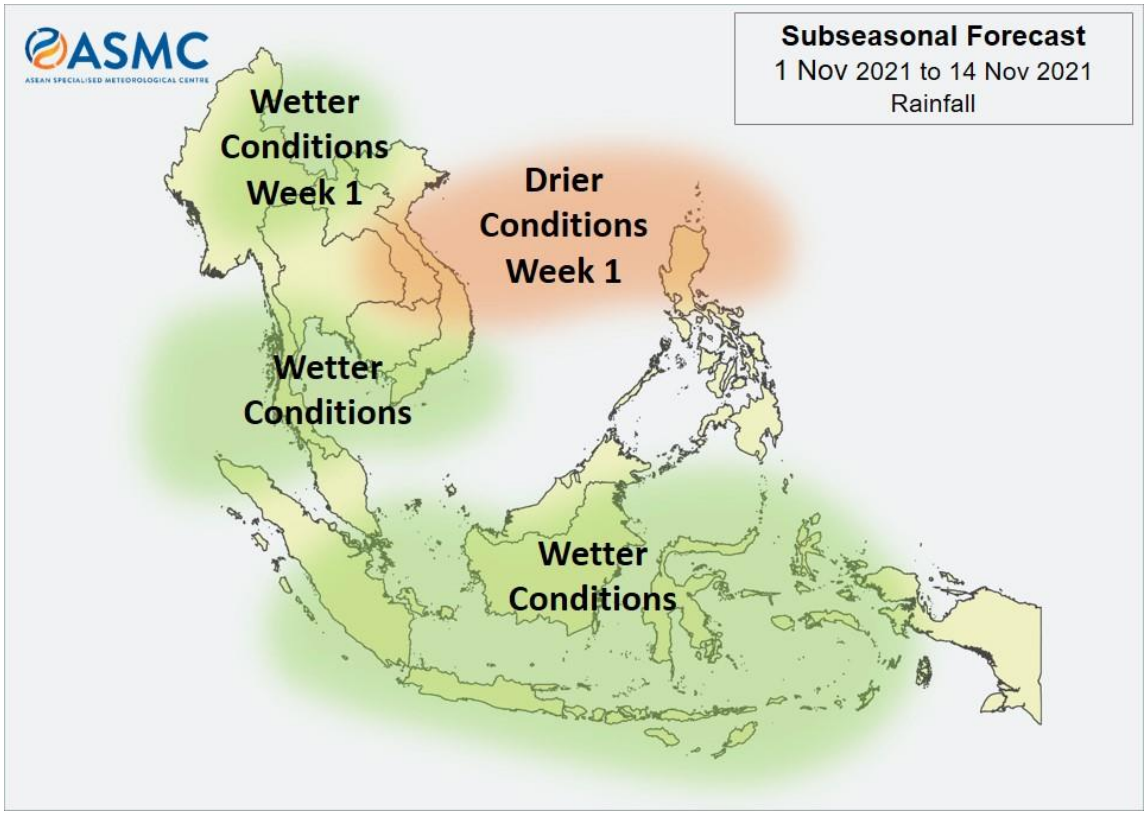


Figure 2. Outlook of wet and dry conditions over the Asian countries by ASMC.

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

There is no sign of Tropical Storm moving from the Sea to the LMB on 02 November 2021, a low- pressure line is still shown as shown in Figure 1. No storms movement detected on 02 November in the LMB, as displayed in Figure 3.

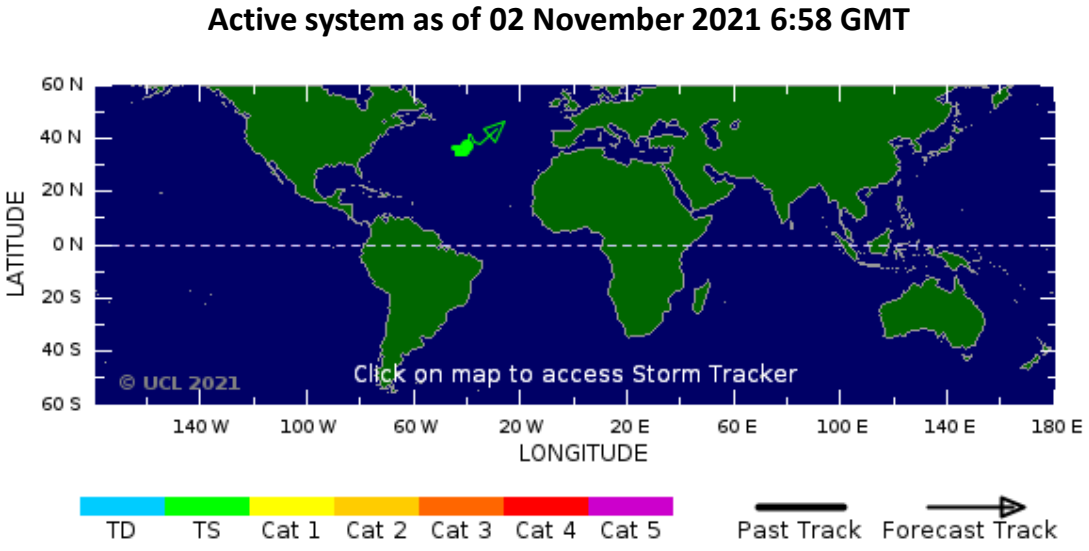


Figure 3. A tropical depression risk observed on 25 October 2021.

2.2 Rainfall patterns over the LMB

This week, rainfall focused in the areas from Chiang Saen in Thailand to Pakse in Lao PDR, including the lower part in Cambodia and Viet Nam, varying from 1.60 mm to 67.00 mm. The weekly total rainfall from 26 October to 01 November 2021 in this reporting week was considered low especially from Chiang Sean in Thailand to Pakse in Lao PDR. This week rainfall was lower than last week rainfall in entire LMB (see Figure 4).

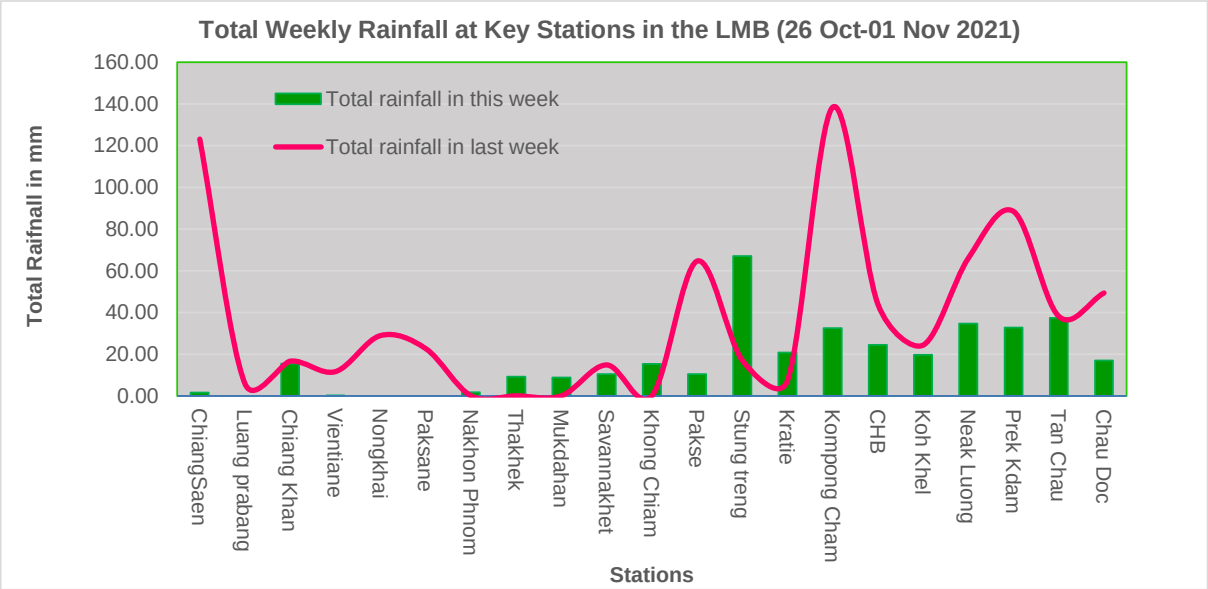


Figure 4. Weekly total rainfall at key stations in the LMB during 26 Oct-01 Nov 2021.

To verify area rainfall distribution, Figure 5 shows a map of the weekly accumulated rainfall based on observed data provided by the MRC MCs – Cambodia, Lao PDR, Thailand, and Viet Nam – from 26 October to 01 November 2021.

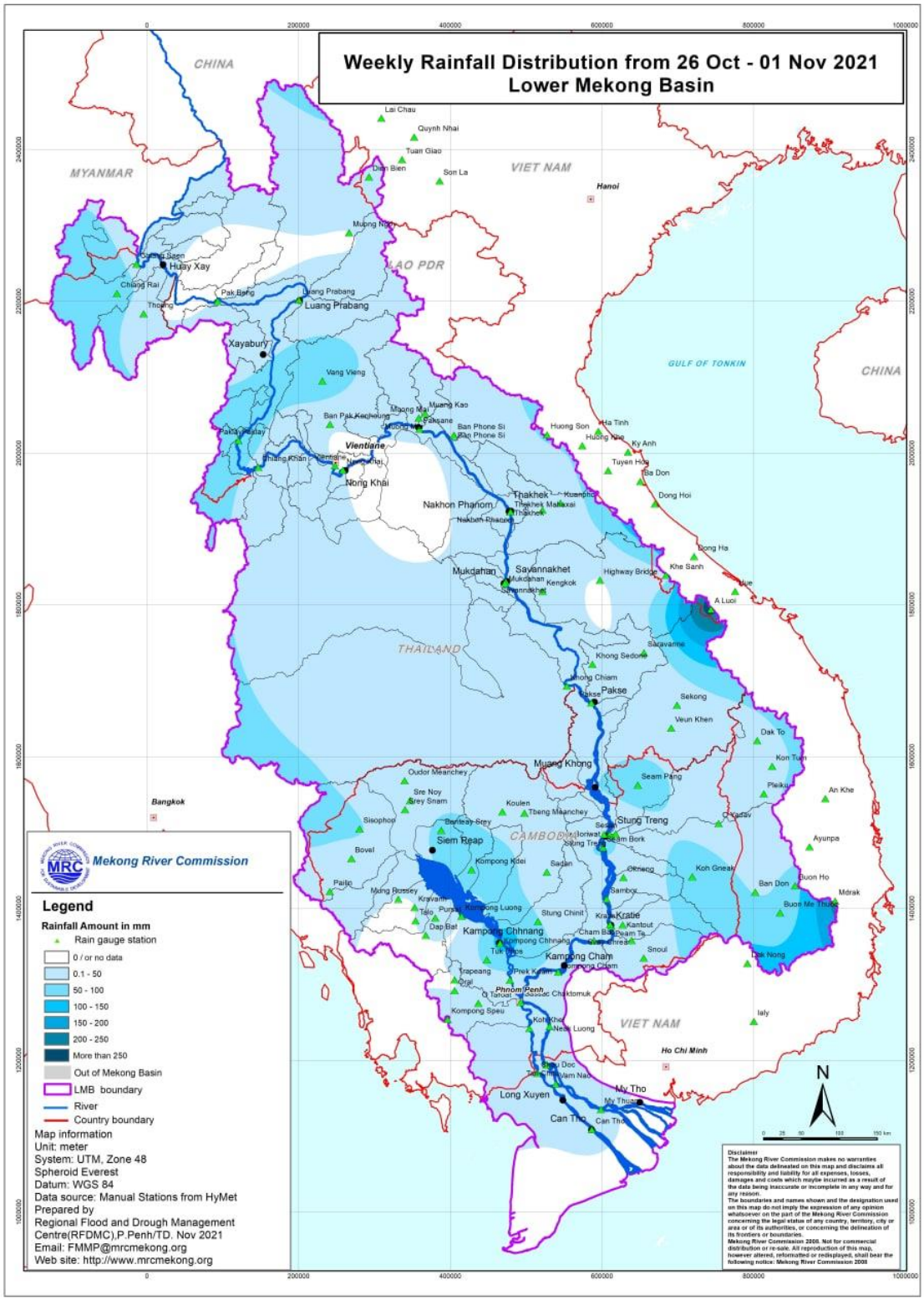


Figure 5. Weekly rainfall distribution over the LMB during 26 October- 01 November 2021.

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 in Thailand to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane in Lao PDR to present flows generated by climate conditions in the upper part of the LMB; at Pakse in Lao PDR 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.

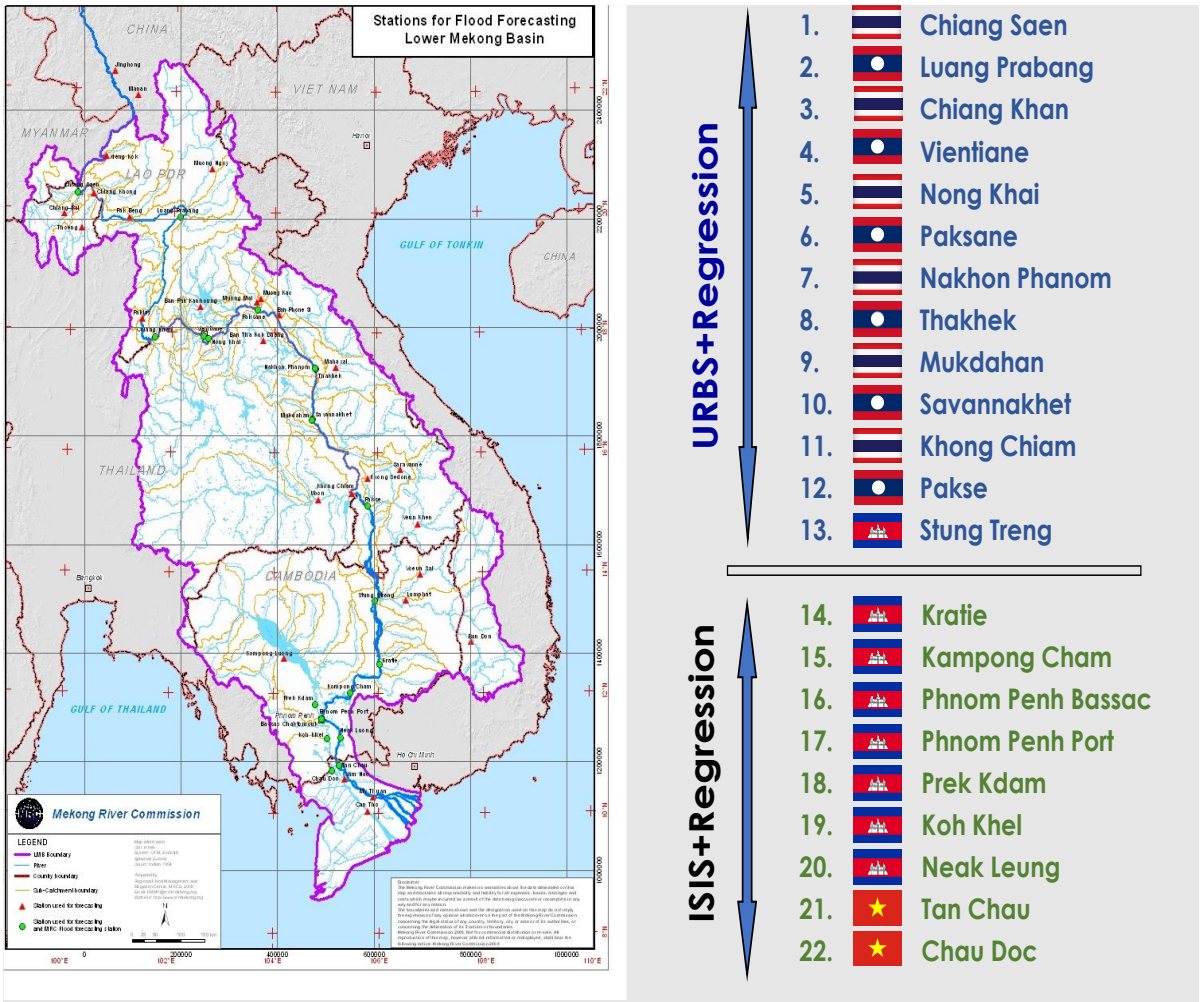


Figure 6. Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 26 October to 31 October 2021. Water levels at this station **significantly decreased about 0.84 m from 536.04 m on 19 Oct to 535.20 on 31 Oct 2021 (recorded on 7:00 am) and stayed about 0.83 m lower than its long-term-average (LTA) value**. The outflow dropped from 1362.91.00 m^3/s on 19 Oct to 789.82 m^3/s on 31 Oct 2021.

Figure 7 below presents water level that decreased at the Jinghong hydrological station[1], indicating the trend of fluctuating water level up to 31 October 2021.

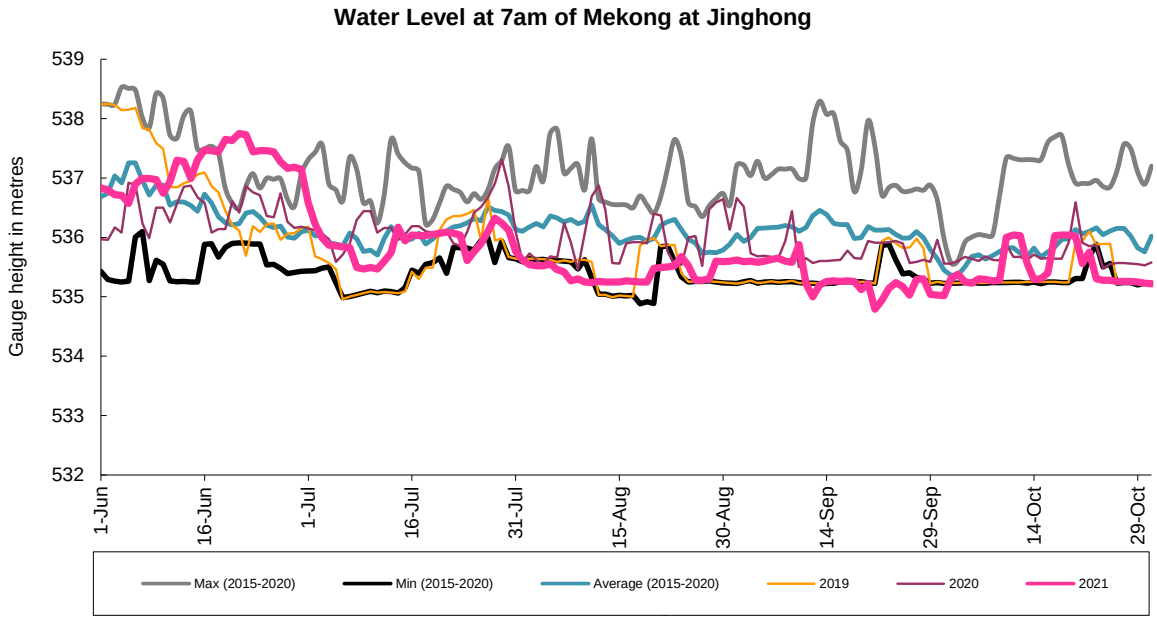


Figure 7. Water level at the Jinghong hydrological station during 1 July-31 October 2021.

Amid the significantly decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.33 m from 25 to 31 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.15 m during October 26-31 due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR, on the other hand, were decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia, moreover, were drastically 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. 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

The water level from 26 to 31 October 2021 at Thailand's Chiang Saen dropped from 2.48 m to 2.30 m, showing 0.18 m down and was about 1.68 m lower than its Long-Term-Average (LTA) value, which considered critical. The water level at Luang Prabang station in Lao PDR decreased from 9.34 m to 9.22 m during the reporting period. This level shows 0.68 m lower than its long-term-average (LTA) value. The trend – sometimes higher or lower to its historical maximum and LTA values – has been observed since early 2021. The phenomenon was potentially caused by upstream dam operations, downstream Xayaburi dam, and heavy rainfall in the surrounding areas. 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 of wet and dry season**.

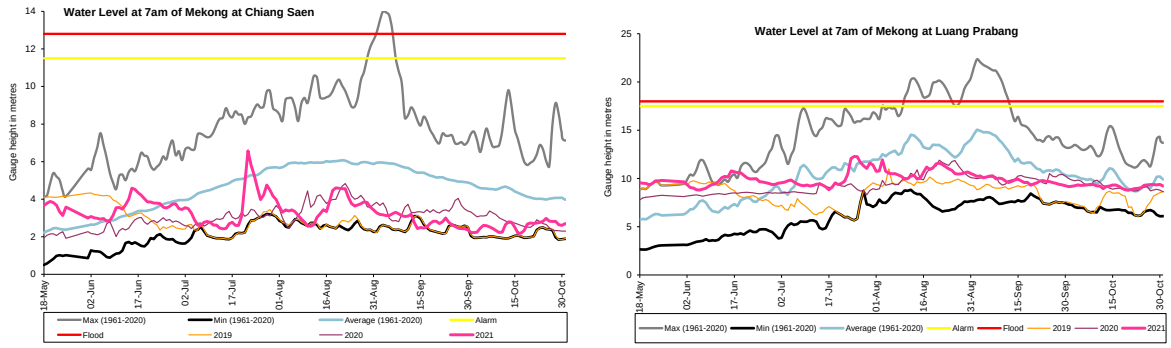


Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) slightly increased from 6.42 m to 6.50 m during the reporting week. It showed 1.41 m lower than its Long-Term- Average (LTA). The water level downstream at Vientiane in Lao PDR followed the upstream trend. It also increased from 3.81 m to 3.89 m and was about 0.97 m lower than its LTA during 26-31 October 2021. At Nong Khai station in Thailand, the water level was also up during the reporting period. It increased from 3.45 m to 3.48 m, and still showing 1.86 m lower than its LTA. At Paksane in Lao PDR, water levels increased about 0.08 m, rising from 4.16 m to 4.24 m. The WL at this station was still about 1.97 m lower than its LTA. The recently slightly increased water levels were obviously due to the low 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.

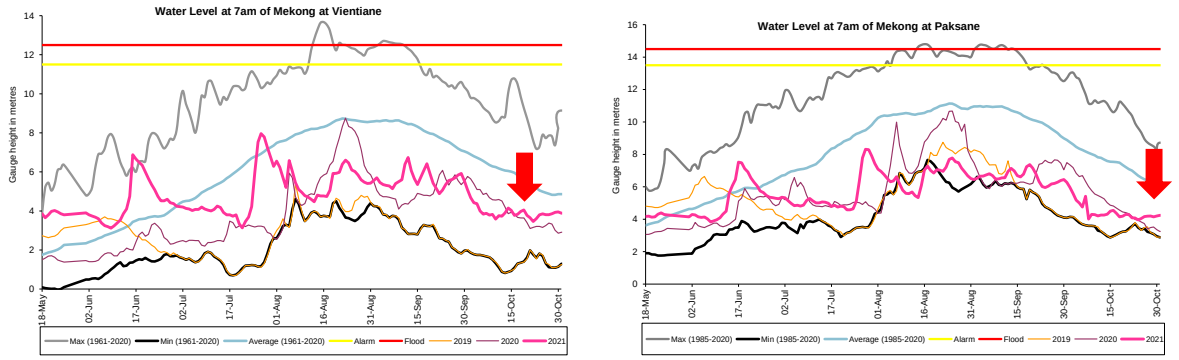


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were slightly decreasing in between 0.05 m and 0.25 m due to less rainfall and inflow from upstream. However, **Water levels at these stations were staying below their LTA level, which considered critical**. Figure 10 shows the water levels at Nakhon Phanom and Pakse stations.

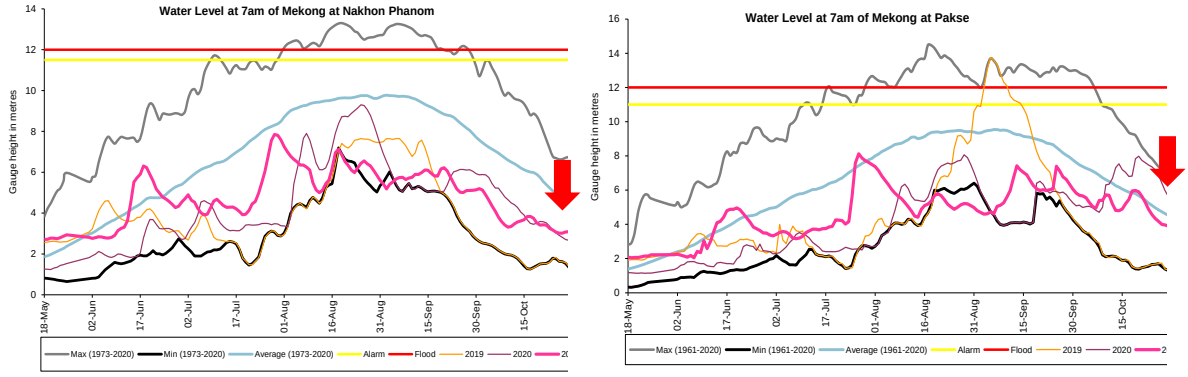


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

Stung Treng to Kampong Cham/Phnom Penh to Koh Khel/Neak Luong/Prek Kdam

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 remarkably down, during 26-31 October 2021. This week water level at Stung Treng and Kratie decreased about 0.16 m and 0.59 m, respectively, but still remained about 0.41 m and 1.27 m above their LTA (as showed in Figure 11). The water level at Kampong Cham decreased about 0.87 m and was still about 0.19 m lower than its LTA. Generally, the **Water levels at these stations were higher than their LTA, which considered normal**.

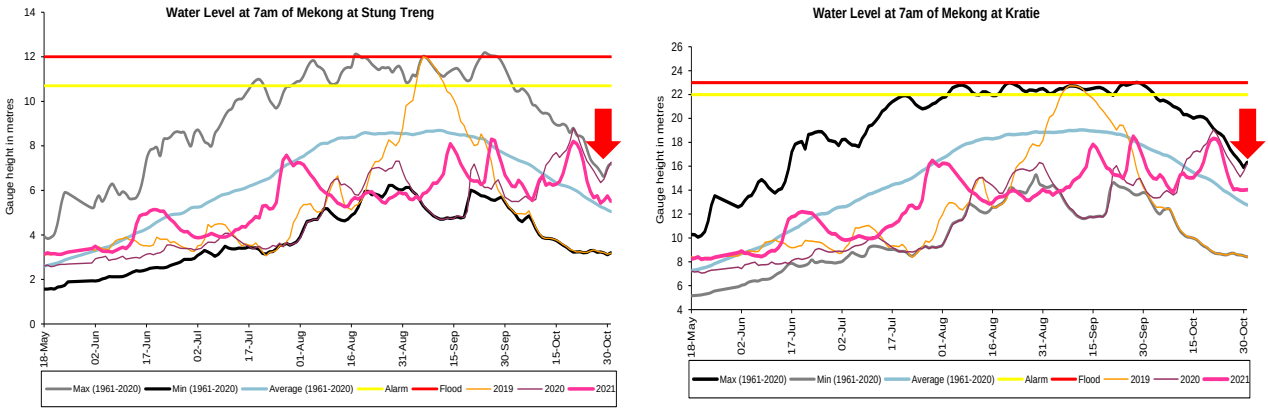


Figure 11. Water levels at Stung Treng and Kratie on the Mekong River.

However, at Chaktomuk on the Bassac River, due to less rainfall and contributed flows from upstream catchment, the water level was down by about 0.47 m and stayed 1.16 m lower than its LTA value; while at Koh Khel, water level increased about 0.31 m, staying 0.20 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake increased about 0.31 m and was about 1.09 m lower than its LTA value. The water level at the Tonle Sap Lake (observed at Kampong Luong) was similar to Prek Kdam station's water level. The recently increased water level was because of heavy rain and high inflow contributed from upstream of the Tonle Sap Lake area during the reporting period. The water level at the Tonle Sap Lake (observed at Kampong Luong) followed the same trend of Prek Kdam station's water level. **Water levels at these stations were staying lower than their LTA level, which still considered critical**.

Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 26 to 31 October 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 2.17 m and 2.43 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 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 outflow of the Tonle Sap Lake at Prek Kdam in comparison with the flows of 2018 and 2019, and their LTA levels (1997–2019). Up to October 31 of this reporting period, **it was observed that the main outflow to Tonle Sap Lake decreased due to high rainfall from upstream**. This decreased outflow of Tonle Sap Lake was most likely caused by small inflows due to less rainfall from the catchment area. Up to 31 October 2021, the outflow from the Tonle Sap Lake condition in 2021 was lower than 2019 but higher than 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 to continuing decrease from the current level.

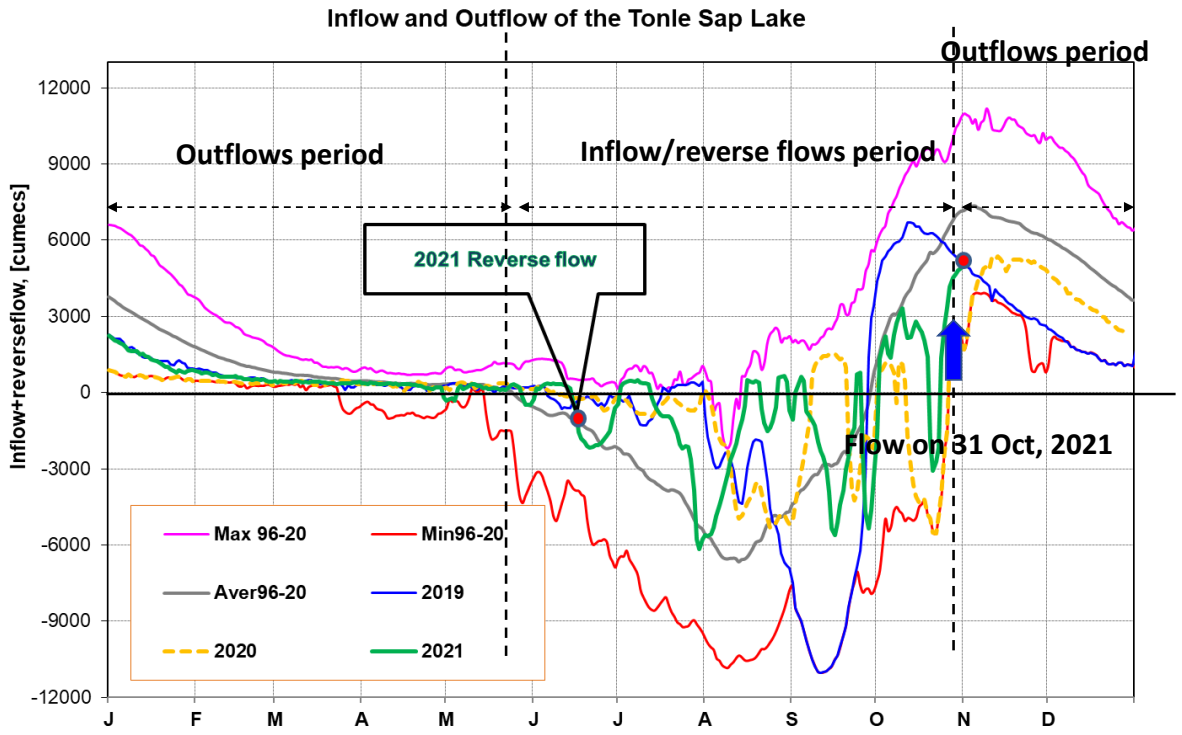


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake

The water volume of the Tonle Sap Lake up to this point has been considered low in comparison with its 2019 and LTA levels. Figure 13 shows seasonal changes in monthly flow volumes up to October 25 for the Lake compared with the volumes in 2018, 2019 and 2020, their LTA, and the fluctuation levels (1997–2019). It shows that up to October 31, **the water volume of the Tonle Sap Lake is lower than its LTA and also lower than the levels in 2019 but higher than 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 very critical***.

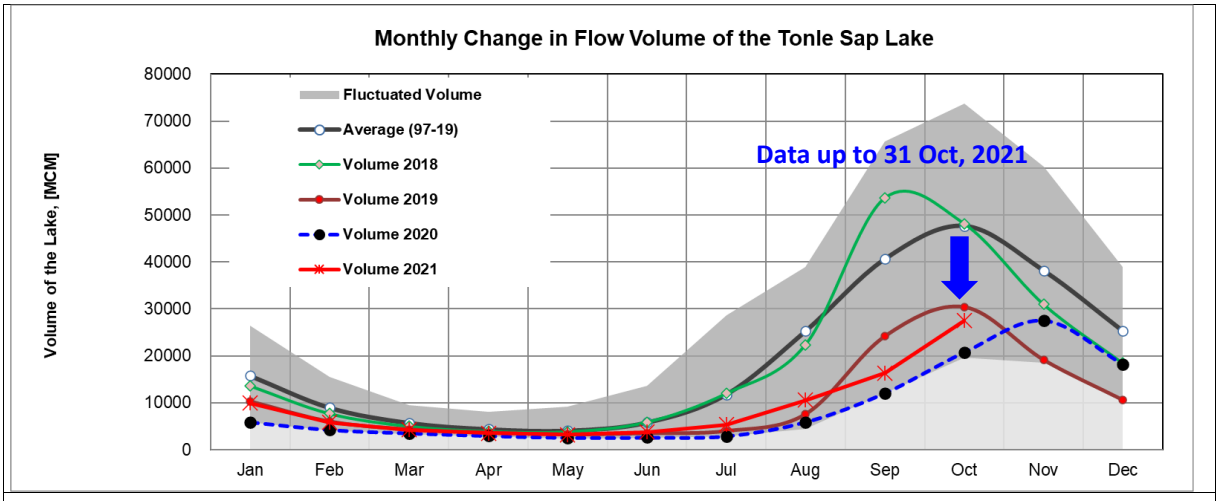


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

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	27477.56
Nov	38191.50	60367.33	18534.61	31036.07	19112.65	27546.80	
Dec	25332.58	38888.95	10563.49	18469.21	10577.29	18251.65	
	Critical situation, comapred with historical Min values						
	Normal condition, compared with LTA (Long term average)						
	Low volume situation, comapred with LTA values						
Unit: Million Cubic Meter (1 MCM= 0.001 Km^3)							

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.

4 Flash Flood in the Lower Mekong Basin

During October 19 -25 the LMB was affected by three weather factors including (i) the monsoon trough lay across the upper southern and eastern parts toward a low pressure cell over southern Viet Nam on some days of the week; (ii) the active southwest monsoon prevailed over the Andaman Sea, southern part and the Gulf of Thailand on the first day of the week; and (iii) the high pressure area from China moved and covered the from upper to lower part during last week. These conditions caused rainfall over LMB, especially in the middle and lower parts.

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 the LMB for Thailand, Lao PDR, Cambodia, and Viet Nam ranging from low risk level to high level. Specifically, the high risks were detected in some areas in the south-central coast and highlands of the central part of Viet Nam as shown in Figure 14 and Table 2.

Table 2. Detected flash flood in Thailand, Lao PDR, Cambodia, and Viet Nam on October 25.

Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Thailand

Date of FFG products 25/10/2021 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
Phetchaburi	Ban Laem		Low-Risk	Surat Thani	King Amphoe Wipawadi	Southern-East Coast	Low-Risk	Samut Sakhon	Muang Samut Sakhon	Northeastern	Low-Risk
Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk					Samut Prakarn	Phra Samut Chedi		Low-Risk
Ranong	Kra Buri	Southern-West Coast	Low-Risk					Nonthaburi	Bang Bua Thong	Central	Low-Risk
Surat Thani	King Amphoe Wipawadi	Southern-East Coast	Low-Risk					Phetchaburi	Ban Laem		Low-Risk
								Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk
								Ranong	Kra Buri	Southern-West Coast	Low-Risk
								Phangnga	Khura Buri	Southern-West Coast	Low-Risk
								Surat Thani	King Amphoe Wipawadi	Southern-East Coast	Low-Risk
								Krabi	Khao Phanom	Southern-West Coast	Low-Risk

Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Lao PDR

Date of FFG products 25/10/2021 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	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk
Sekong	Dakcheung	DAKDEN	Southeast	Low-Risk	Sekong	Dakcheung	DAKDEN	Southeast	Low-Risk	Sekong	Dakcheung	DAKYUEN	Southeast	Low-Risk
Sekong	Dakcheung	DAKVANG	Southeast	Low-Risk	Sekong	Dakcheung	DAKVANG	Southeast	Low-Risk	Sekong	Dakcheung	DAKDEN	Southeast	Low-Risk
Sekong	Dakcheung	DAKXAM	Southeast	Low-Risk	Sekong	Dakcheung	DAKXAM	Southeast	Low-Risk	Sekong	Dakcheung	DAKKE	Southeast	Low-Risk
										Sekong	Dakcheung	DAKVANG	Southeast	Low-Risk
										Sekong	Dakcheung	DAKXAM	Southeast	Low-Risk

Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Cambodia

Date of FFG products 25/10/2021 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	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk
NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 01-HOUR					NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOUR					Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk
										Kampong Cham	Stueng Trang	Sampieng Kraom	Central Lowland	Low-Risk
										Kampong Thom	Baray	Kokir Thum	Nothwest	Low-Risk
										Kampong Speu	Aoral	Peam Lvea		Low-Risk
										Kampong Speu	Aoral	Choam Leu		Low-Risk
										Koh Kong	Thma Bang	Toap Khley	Southwestern	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 25/10/2021 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
Quang Nam	Nam Giang	South Central Coast	Low-Risk	Kon Tum	Dak To	Central Highlands	Moderate-Risk	Gia Lai	Krong Pa	Central Highlands	Moderate-Risk
Quang Nam	Phuoc Son	South Central Coast	Low-Risk	Quang Nam	Nam Giang	South Central Coast	Low-Risk	Phu Yen	TX. Tuy Hoa	South Central Coa	Low-Risk
Quang Nam	Tra My	South Central Coast	Moderate-Risk	Quang Nam	Phuoc Son	South Central Coast	Low-Risk	Phu Yen	Son Hoa	South Central Coa	Low-Risk
Quang Nam	Que Son	South Central Coast	Moderate-Risk	Quang Nam	Tra My	South Central Coast	Moderate-Risk	Gia Lai	Kbang	Central Highlands	Low-Risk
Quang Ngai	Son Ha	South Central Coast	Low-Risk	Quang Nam	Que Son	South Central Coast	Moderate-Risk	Gia Lai	Ayun Pa	Central Highlands	Low-Risk
Quang Ngai	Son Tay	South Central Coast	High-Risk	Quang Ngai	Son Tay	South Central Coast	High-Risk	Gia Lai	Kong Chro	Central Highlands	Low-Risk
Quang Ngai	Tra Bong	South Central Coast	High-Risk	Quang Ngai	Tra Bong	South Central Coast	Moderate-Risk	Gia Lai	Kbang	Central Highlands	Low-Risk
Gia Lai	Ayun Pa	Central Highlands	Low-Risk	Quang Ngai	Minh Long	South Central Coast	Low-Risk	Phu Yen	Dong Xuan	South Central Coa	Moderate-Risk
Kon Tum	Kon Plong	Central Highlands	High-Risk	Binh Dinh	Hoai An	South Central Coast	Low-Risk	Phu Yen	Tuy Hoa	South Central Coa	High-Risk
Quang Ngai	Ba To	South Central Coast	High-Risk	Binh Dinh	Phu Cat	South Central Coast	Low-Risk	Khanh Hoa	Van Ninh	South Central Coa	High-Risk
Binh Dinh	Phu Cat	South Central Coast	Low-Risk	Binh Dinh	Phu My	South Central Coast	Low-Risk	Khanh Hoa	Ninh Hoa	South Central Coa	High-Risk
Binh Dinh	Tay Son	South Central Coast	Low-Risk	Gia Lai	Krong Pa	Central Highlands	Low-Risk	Khanh Hoa	Khanh Vinh	South Central Coa	Low-Risk
Phu Yen	Tuy An	South Central Coast	Low-Risk	Phu Yen	TX. Tuy Hoa	South Central Coast	Low-Risk	Khanh Hoa	Dien Khanh	South Central Coa	Low-Risk
Binh Dinh	Van Canh	South Central Coast	Low-Risk	Phu Yen	Son Hoa	South Central Coast	Low-Risk	Ninh Thuan	Ninh Hai	South Central Coa	Low-Risk
Kon Tum	Dak To	Central Highlands	Moderate-Risk	Gia Lai	Kbang	Central Highlands	Low-Risk	Ninh Thuan	Ninh Son	South Central Coa	Low-Risk
Phu Yen	Dong Xuan	South Central Coast	Moderate-Risk	Gia Lai	Ayun Pa	Central Highlands	Low-Risk	Binh Thuan	Tuy Phong	South Central Coa	Low-Risk
Phu Yen	Tuy Hoa	South Central Coast	High-Risk	Phu Yen	Dong Xuan	South Central Coast	Low-Risk	Long An	Can Giuoc	Southewest-Meko	Low-Risk
Khanh Hoa	Van Ninh	South Central Coast	Low-Risk	Phu Yen	Tuy Hoa	South Central Coast	High-Risk	Long An	Can Duoc	Southewest-Meko	Low-Risk
Khanh Hoa	Van Ninh	South Central Coast	High-Risk	Khanh Hoa	Van Ninh	South Central Coast	High-Risk	Binh Phuoc	Bu Dang	Southeast	Low-Risk
Khanh Hoa	Ninh Hoa	South Central Coast	High-Risk	Khanh Hoa	Ninh Hoa	South Central Coast	High-Risk	Lam Dong	Bao Lam	Central Highlands	Low-Risk
Khanh Hoa	Khanh Vinh	South Central Coast	Low-Risk	Khanh Hoa	Khanh Vinh	South Central Coast	Low-Risk	Binh Thuan	Ham Thuan Nam	South Central Coa	Low-Risk
Long An	Can Giuoc	Southewest-Mekong	Low-Risk	Long An	Thu Thua	Southewest-Mekong	Low-Risk	Dong Nai	Xuan Loc	Southeast	Low-Risk
Long An	Can Duoc	Southewest-Mekong	Low-Risk	Kon Tum	Ngoc Hoi	Central Highlands	High-Risk	Dong Nai	Nhon Trach	Southeast	Low-Risk
Dong Nai	Xuan Loc	Southeast	Low-Risk	Kon Tum	Dak Glei	Central Highlands	Moderate-Risk	Tay Ninh	Ben Cau	Southeast	Low-Risk
Tay Ninh	Ben Cau	Southeast	Low-Risk	Kon Tum	Dak Ha	Central Highlands	Moderate-Risk	Long An	Duc Hoa	Southewest-Meko	Low-Risk
Long An	Duc Hoa	Southewest-Mekong	Low-Risk	Dong Thap	Cao Lanh	Southewest-Mekong	Low-Risk	Long An	Tan Tru	Southewest-Meko	Low-Risk
Vinh Long	Long Ho	Southewest-Mekong	Low-Risk	Tien Giang	Cai Lay	Southewest-Mekong	Low-Risk	Vinh Long	Long Ho	Southewest-Meko	Low-Risk
Tien Giang	Chau Thanh	Southewest-Mekong	Low-Risk	Tien Giang	Cai Be	Southewest-Mekong	Low-Risk	Tien Giang	Chau Thanh	Southewest-Meko	Low-Risk
Tien Giang	Cai Lay	Southewest-Mekong	Low-Risk	Tien Giang	Chau Thanh	Southewest-Mekong	Low-Risk	Long An	Tan Thanh	Southewest-Meko	Low-Risk
Long An	Tan Thanh	Southewest-Mekong	Low-Risk	Kon Tum	Kon Plong	Central Highlands	Moderate-Risk	Long An	Tan Thanh	Southewest-Meko	Low-Risk

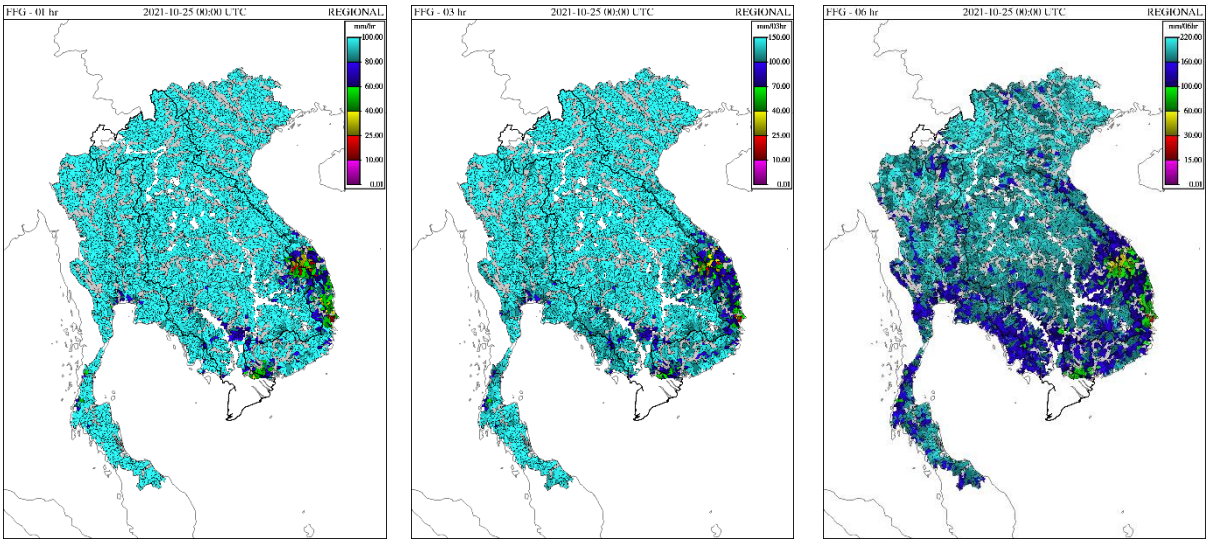


Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on Oct 25.

5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from 16 to 22 October 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 indicator of SPI from October 16 to 22, as displayed in Figure 15, shows that the LMB was normal in the north and relatively wet in the south; the region received from average to above average rainfall during the monitoring week.

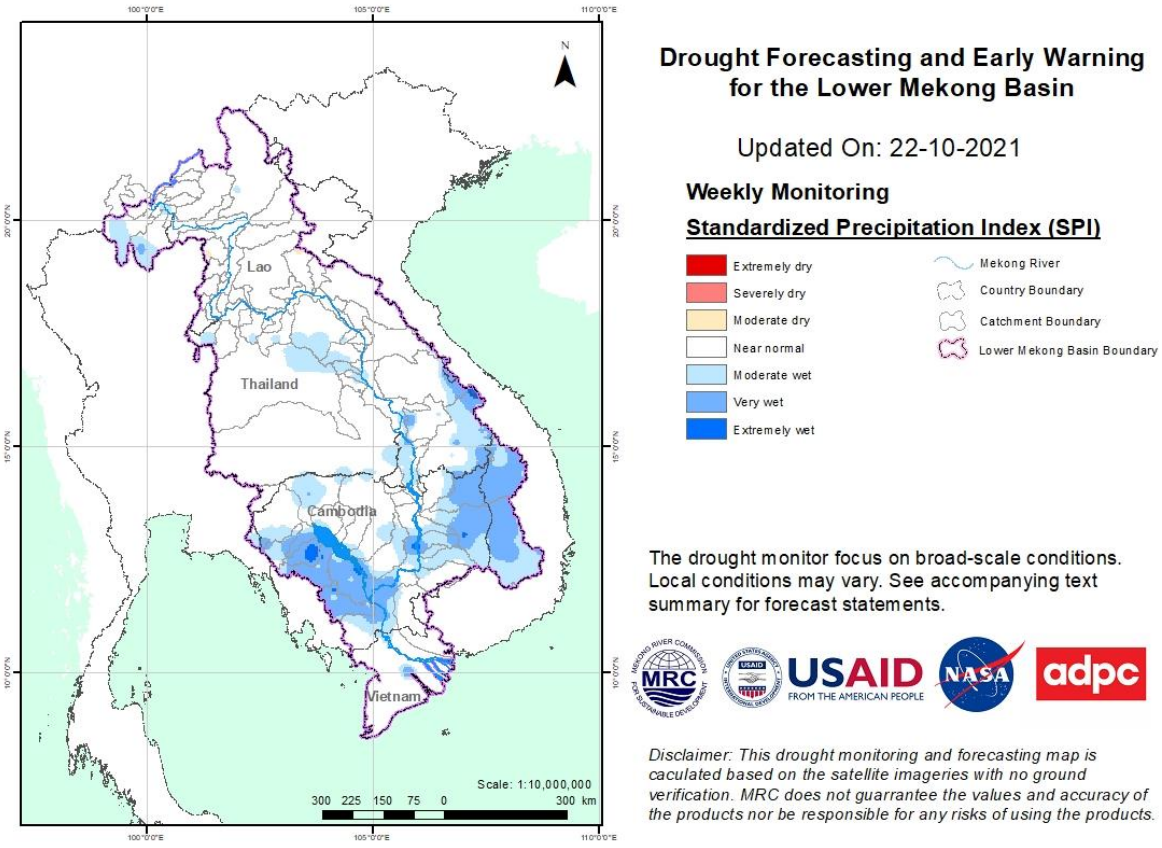


Figure 15. Weekly standardized precipitation index from 16 to 22 October 2021.

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

Like last week (Oct 9-15), the soil water fraction from October 16 to 22, as displayed in Figure 16, shows dry condition in the north and extremely wet condition in the south of the LMB. The most severe dry soil moisture covered almost the entire area of Phongsaly province, while moderately dry soil moisture took place in northern Vientiane, Xiengkhuang, and Luang Prabang of Lao PDR.

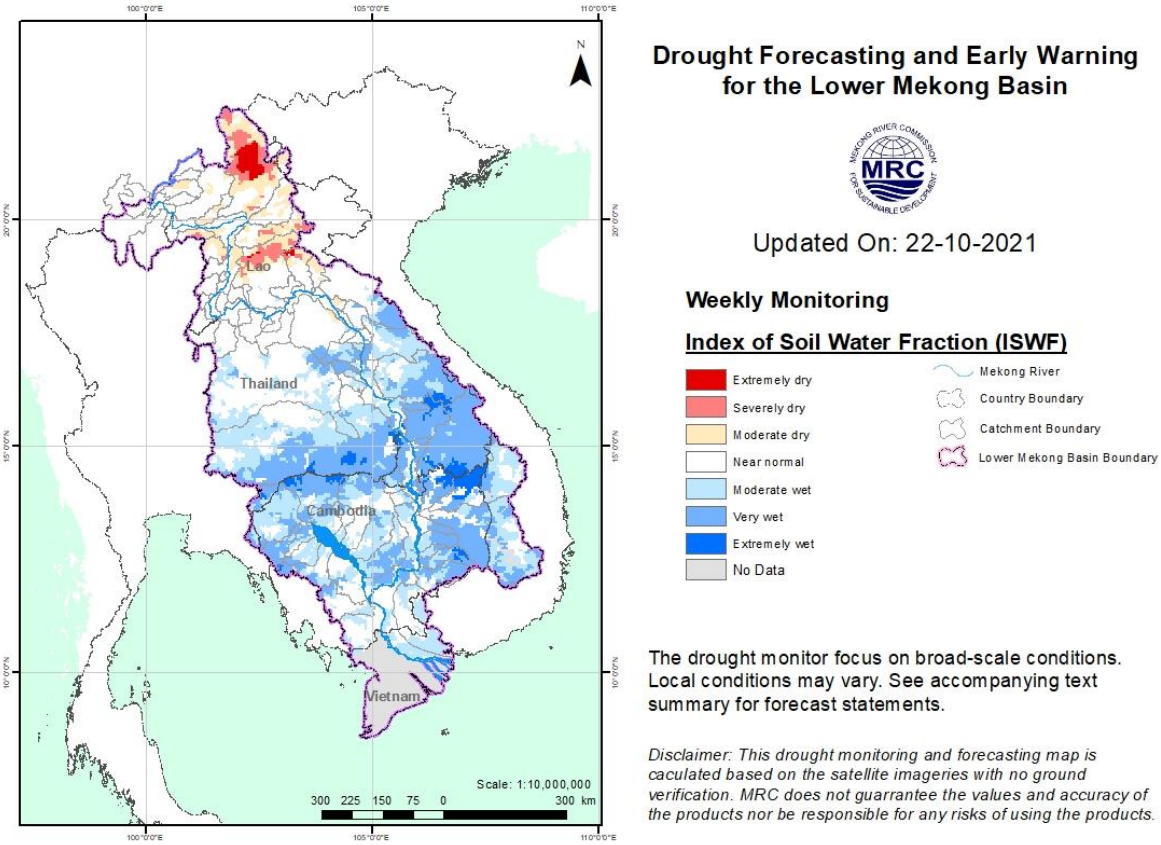


Figure 16. Weekly Soil Moisture Anomaly from 16 to 22 October 2021.

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

Amid some anomaly dry soil moistures in the northern part, the LMB was generally at normal during the monitoring week except some little area of Phongsaly province of Lao PDR in the northern part of the region which experienced some moderate and severe drought, as displayed in Figure 17. The combined drought indicator reveals normal conditions in most part of the region.

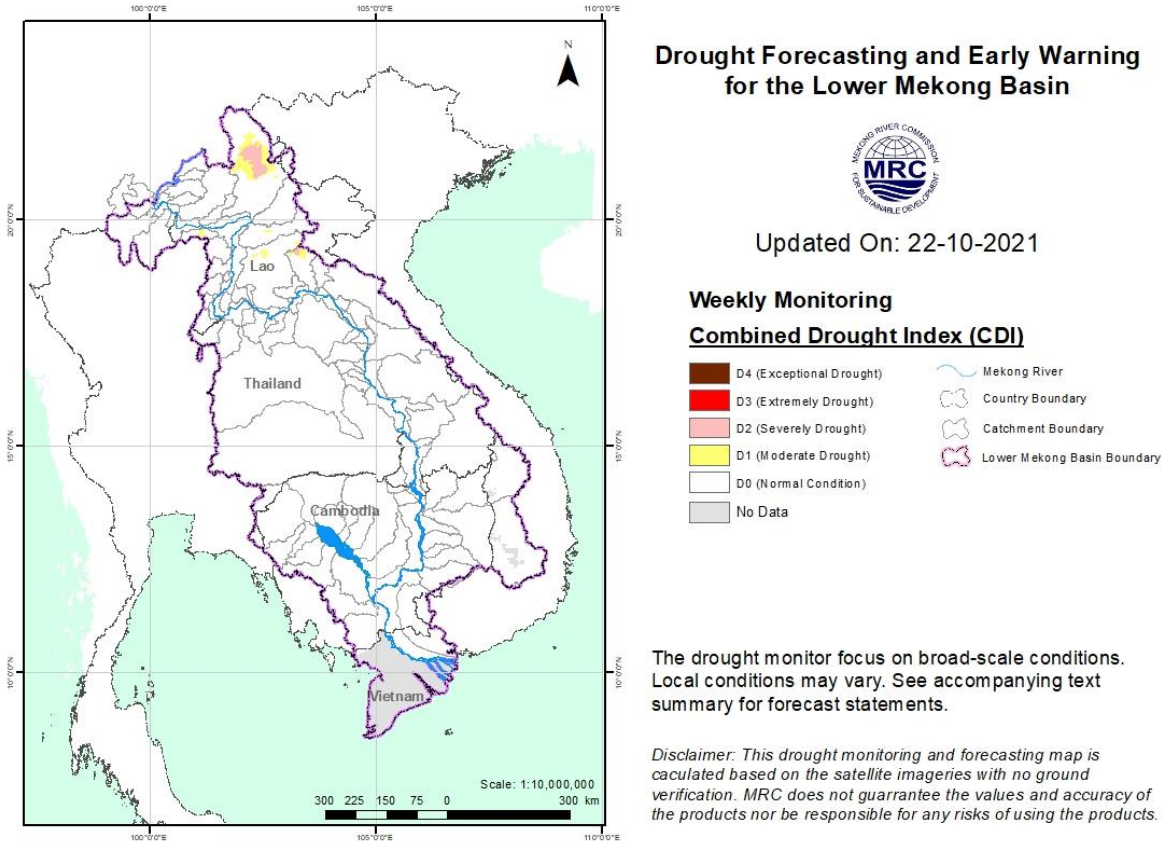


Figure 17. Weekly Combined Drought Index from 16 to 22 October 2021.

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.

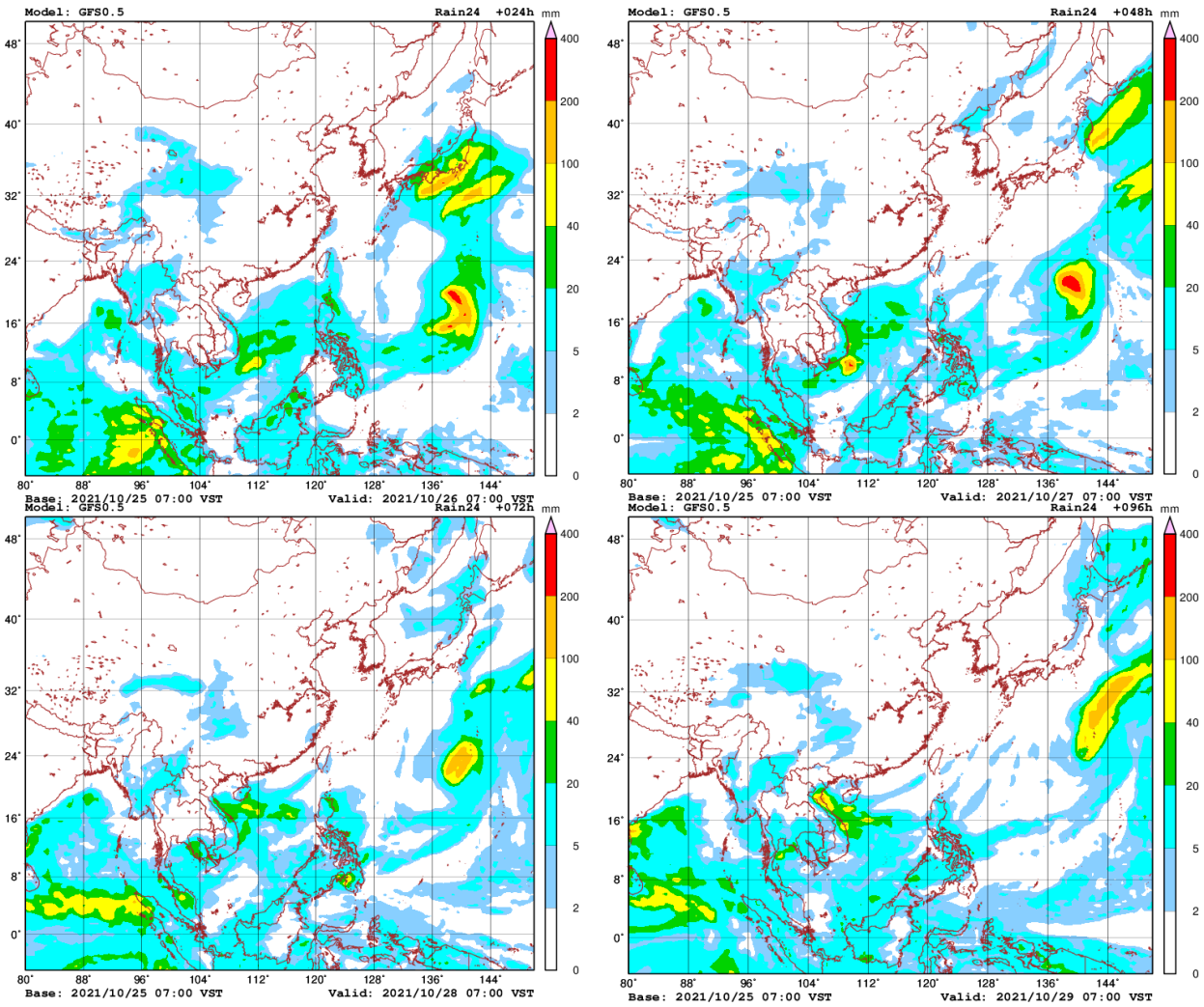
6 Weather and Water Level Forecast and Flash Flood Information

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, the southwest monsoon and high pressure will be prevailing over the LMB.

In general, from October 26 to November 28, small (<20 mm/24h) will likely occur over the LMB. However, from October 29 to November 1, moderate rainfall (20-50 mm/24h) will likely occur in some areas of the middle and lower parts of the LMB.

Figure 18 shows accumulated rainfall forecast (24 h) of the GFS model from October 26 – November 01.



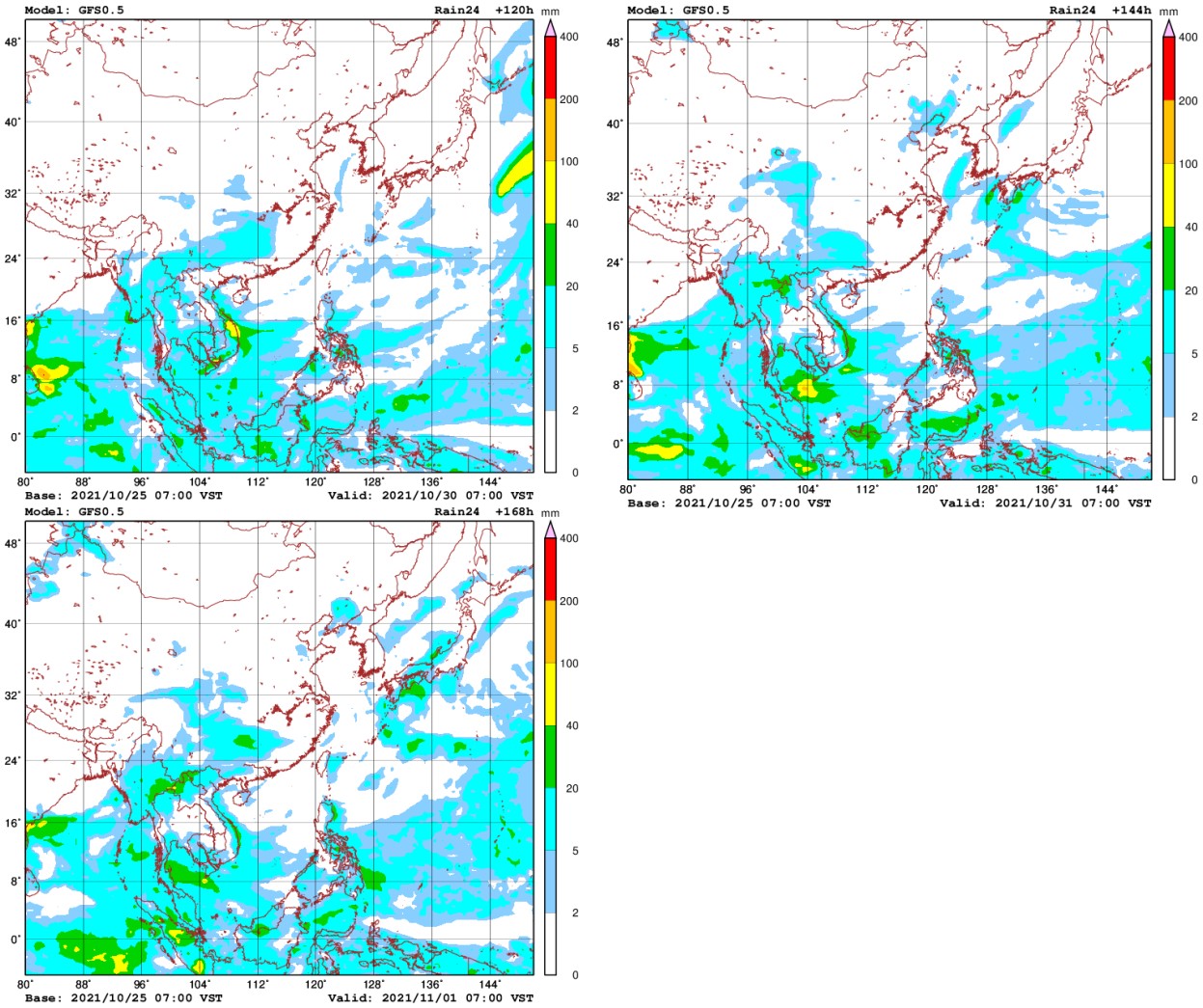


Figure 18. Accumulated rainfall forecast (24 h) based on a GFS model.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on October 31's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to slightly increase from 2.69 m to 3.96 m over the next five days. The trend will keep the water level at this station below its LTA.

For Luang Prabang in Lao PDR, the water level will also increase from 9.22 m to 9.53 m during the next five days. The current water level is lower than its LTA. Precipitation is forecasted for the area between Chiang Saen and Luang Prabang next week.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand is forecasted to go down approximately 0.08 m, while water level at Vientiane in Lao PDR will also decrease about 0.11 m. Furthermore, from Nong Khai in Thailand, the water level will decrease also about 0.13 m over the next five days; at Paksane in Lao PDR water level will increase about 0.20 m due to forecasted rainfall in the upper catchments. Rainfall is forecasted for the area of Paksane next week.

The water levels at these stations are remaining lower than their LTA.

Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR are forecasted to decrease between 0.02 m and 0.23 m over the next five days. But water levels from Khong Chiam in Thailand to Pakse in Lao PDR will increase between 0.05 m and 0.15 m. Water level at these stations will stay lower than their LTA level. Rainfall is forecasted for the area next week.

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

From Stung Treng to Kampong Cham along the Mekong River in Cambodia, the water levels will go down from 0.15 m to 0.90 m over the next five 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 0.20 m over the next five 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, the water levels will be fluctuating above their minimum level, following daily tidal effects from the sea. Rainfall is forecasted for the Delta area next week.

The performance of the weekly flood forecast, with an accuracy and data input evaluation from 26 to 31 October 2021, is presented in **Annex 1**.

Table 2 shows the daily flood forecasting Bulletin issued on October 31. Results of the weekly river monitoring bulletin are also available at http://ffw.mrcmekong.org/bulletin_wet.php.

6.3 Flash Flood Information

With small and moderate rainfall forecasted for next week, flash floods with high level are not expected to take place in the LMB. However local heavy rain in a short period of time is possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice a day at: http://ffw.mrcmekong.org/ffg.php.

Detailed information on Flash Flood Warning Information 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 18 shows the ensemble mean of daily average precipitation (mm/day) each month from October to December 2021 produced by the NMME.

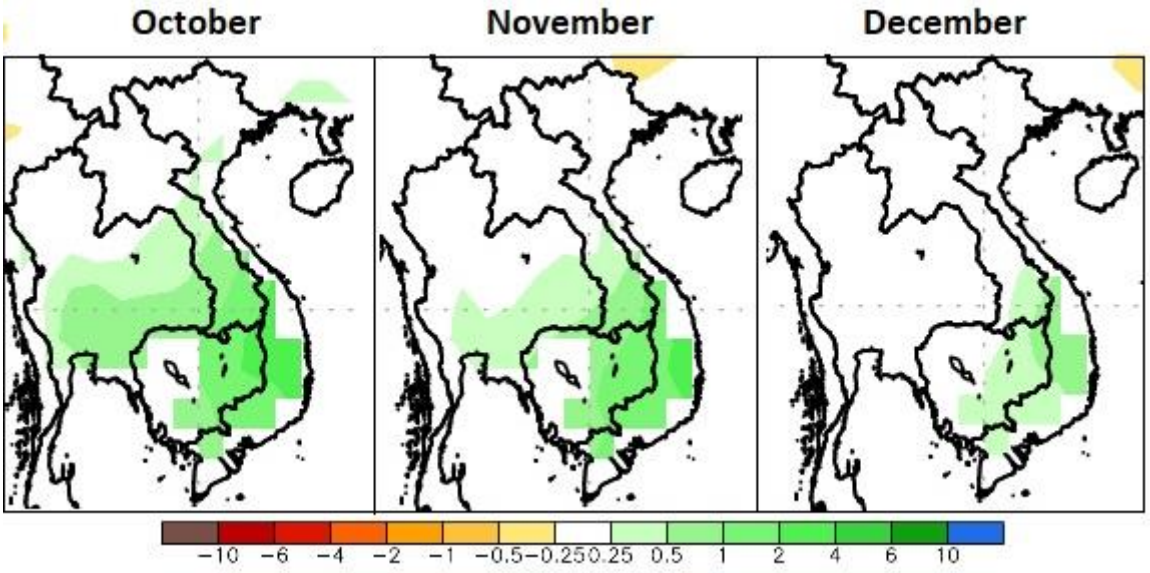


Figure 19. Daily average of monthly rainfall anomaly forecast from October to December 2021.

The ensemble prediction model based on the initial conditions in September reveals that the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.

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

River Flood Forecast: 01 November - 05 November 2021

Date: 31 October 2021

Location	Country	24-hr Observed Rainfall (mm)	Zero gauge above M.S.L (m)	Flood level (m)	Alarm level (m)	Observed W. level against zero gauge (m)		Forecasted Water Levels (m)					There is currently no flood warning in place at monitoring sites on the Mekong					
		30-Oct				30-Oct	31-Oct	01-Nov	02-Nov	03-Nov	04-Nov	05-Nov	31	01	02	03	04	05
Jinghong		1.0				535.23	535.22							×	×	×	×	×
Chiang Saen		1.6	357.110	12.80	11.50	2.60	2.69	2.75	2.80	2.85	2.90	2.96						
Luang Prabang		0.0	267.195	18.00	17.50	9.38	9.22	9.20	9.32	9.40	9.46	9.53	↓		↑			
Chiang Khan		0.0	194.118	16.00	14.50	6.55	6.50	6.33	6.27	6.40	6.48	6.55		↓		↑		
Vientiane		0.0	158.040	12.50	11.50	3.95	3.89	3.84	3.67	3.60	3.75	3.85			↓		↑	
Nongkhai		0.0	153.648	12.20	11.40	3.52	3.48	3.44	3.28	3.22	3.37	3.47			↓		↑	
Paksane		0.0	142.125	14.50	13.50	4.20	4.24	4.25	4.26	4.15	4.12	4.22				↓		
Nakhon Phanom		1.6	130.961	12.00	11.50	3.07	3.05	3.02	3.00	2.97	2.87	2.85						
Thakhek		9.0	129.629	14.00	13.00	4.31	4.28	4.24	4.21	4.17	4.06	4.03					↓	
Mukdahan		0.0	124.219	12.50	12.00	3.25	3.22	3.18	3.14	3.11	3.08	3.00						
Savannakhet		0.0	125.410	13.00	12.00	1.69	1.69	1.67	1.65	1.64	1.63	1.58						
Khong Chiam		0.0	89.030	14.50	13.50	5.29	5.33	5.36	5.38	5.41	5.45	5.50						
Pakse		7.8	86.490	12.00	11.00	3.90	3.94	3.96	3.97	3.99	4.02	4.05						
Stung Treng		nr	36.790	12.00	10.70	5.75	5.51	5.39	5.30	5.23	5.18	5.15	↓	↓	↓	↓	↓	
Kratie		nr	-0.101	23.00	22.00	14.00	14.03	13.70	13.47	13.32	13.18	13.10	↑	↓	↓	↓	↓	↓
Kompong Cham		11.0	-0.930	16.20	15.20	9.05	9.04	8.93	8.79	8.68	8.61	8.54		↓	↓	↓	↓	↓
Phnom Penh (Bassac)		11.5	-1.020	12.00	10.50	6.79	6.77	6.74	6.68	6.63	6.60	6.57		↓	↓	↓	↓	↓
Phnom Penh Port		-	0.070	11.00	9.50	5.81	5.79	5.76	5.70	5.64	5.60	5.57		↓	↓	↓	↓	↓
Koh Khel (Bassac)		3.7	-1.000	8.40	7.90	6.12	6.11	6.09	6.04	5.99	5.96	5.93			↓	↓	↓	↓
Neak Luong		nr	-0.330	8.00	7.50	5.01	4.98	4.96	4.91	4.85	4.80	4.77	↓		↓	↓	↓	↓
Prek Kdam		15.4	0.080	10.00	9.50	6.18	6.16	6.13	6.09	6.05	6.02	6.00		↓	↓	↓	↓	
Tan Chau		0.1	0.000	4.50	3.50	2.37	2.43	2.47	2.47	2.45	2.42	2.39	↑	↑			↓	↓
Chau Doc		1.1	0.000	4.00	3.00	2.21	2.30	2.34	2.36	2.36	2.35	2.33	↑	↑				

REMARKS:

-: not available.

nr: no rain.

LEGEND	
rising water level	↑
stable water level	
falling water level	↓
alarm stage	
alarm situation	
flood stage	
no data available	×

Note: Stable water level is defined as a daily change of less than 10cm from Chiang Saen to Savannakhet; less than 5cm at Pakse and Stung Treng; and no more than 3cm cm from Kratie downstream.
Flood stage is when the flood level exceeds. A flood level is determined by each Member Country.
Alarm stage is when the water level ranges between alarm and flood levels.
Alarm situation is when the water level is forecasted to reach the flood stage within the next three days.

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

Rain was observed from Chiang Saen in Thailand to Pakse in Lao PDR during October 26-31, including the lower part in Cambodia and Viet Nam, varying from 1.60 mm to 67.00 mm due to do any low-pressure ling dominating in the LMB. However, this week rainfall was considered low at the upper and middle parts of the LMB compared with last week rainfall.

Based on the forecasted satellite data, rainfall is forecasted for some areas of the LMB with the value range from 20 mm to 50 mm for the next seven days. The forecasting model using GFS data, moreover, shows that no significant rainfall (<100 mm) is likely to take place in the Mekong region from 1 to 9 November 2021.

7.2 Water level and its forecast

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 26 October to 31 October 2021. Water levels at this station significantly decreased about 0.84 m from 536.04 m on 19 Oct to 535.20 on 31 Oct 2021 (recorded on 7:00 am) and stayed about 0.83 m lower than its long-term-average (LTA) value. The outflow dropped from 1362.91.00 m^3/s on 19 Oct to 789.82 m^3/s on 31 Oct 2021.
Amid the significantly decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.33 m from 25 to 31 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.15 m during October 26-31 due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR, on the other hand, were decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia, moreover, were drastically decreasing, due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).

Over the next five days, the water levels from Khong Chiam to the lower part at key stations in Cambodia are expected to go down between 0.10 m and 0.90 m.

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 the less rainfall forecasted in the inflow catchments of the Tonle Sap Lake.

From Stung Treng to Kratie, the water levels will continue staying slightly higher than their LTA. 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 lower than 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 2020, 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 amount of rainfall for the coming week as mentioned earlier in section 6.1, the major flash floods are not expected in the LMB during next week. However local heavy rain in a short period of time is possible with unexpected short flash floods.

7.4 Drought condition and its forecast

Soil moisture conditions were anomaly dry in some areas of the upper part of the LMB. However, the combined drought indicator shows that the LMB did not face any significant drought during the monitoring week from October 16 to 22. The entire LMB region received from average to above average rainfall.

For the upcoming thee-month forecast, the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.

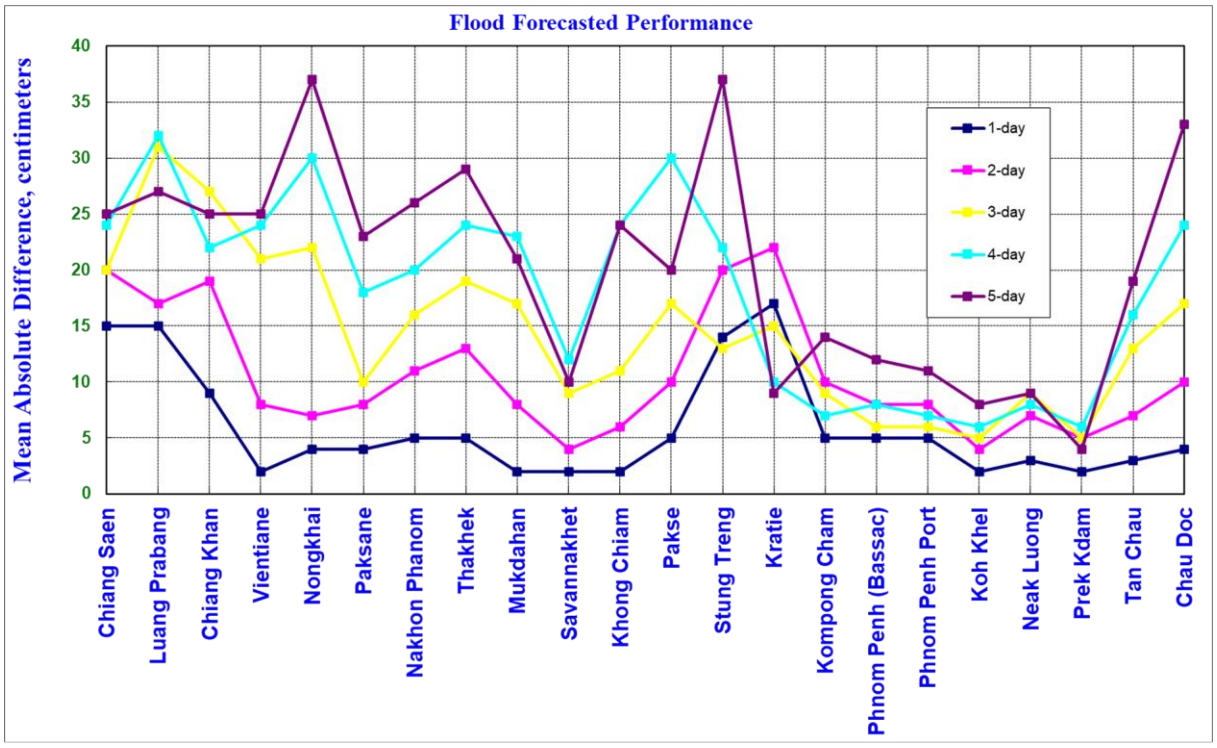
Annex 1: Performance of the weekly flood forecasting

Accuracy

"Accuracy" here refers to the state where data recorded in the MRC's Mekong River Flood Forecasting System are cleaned and verified.

The adjustment of flood forecasting outcomes from the flood forecasting system requires flood forecasters to have extensive knowledge in hydrology and statistical modelling for estimating the relationships between stations upstream and downstream in the Mekong River Basin. Flood forecasting performance presented in the graph below shows the average flood forecasting accuracy at each key station along the Mekong mainstream from 19 to 25 October 2021.

The forecasting values from 26 to 31 October show that the overall accuracy is fair for a one-day to three-day forecast in lead time at stations in the lower parts of the Mekong River from Chaing Sean to the lower part in Cambodia and Vietnam due to no effect of rainfall and dams operation in this area during the report period.



Note: The higher percentage of flood forecasting accuracy is due to several key factors as follows:

- Missing rainfall in Cambodia (DOM) data and data input are not sufficient to be used for inputting into the flood forecasting model system.
- Luang Prabang to Chiang Khan and Stung Treng to Kratie have been effluent by hydropower operations upstream, tributaries inflows.
- The influence of heavy rainfall caused by storms and hydropower operations from

upstream, tributaries inflows and the lower part of the Mekong floodplain, including the 3S (Stung Treng and Kratie).

- Khong Chaim, Pakse, Stung Treng and Kratie stations have been affected by heavy rainfall from Viet Nam and some hydropower operations on Sekong, Sesan and Sre Pok (water retention and release). Rainfall always accumulates at this spot, which could be causing rapidly high-water levels.
- Fluctuations of the water levels at Tan Chau and Chau Doc stations were due to daily tidal effects of the sea in the Mekong Delta.
- Satellite rainfall data were not representative of the actual rainfall at ground stations in some areas of the Mekong region.

Performance based on data from the Member Countries

Flood forecasting performance is based on the hydro-met data received from the Member Countries. The flood forecasting achievement indicated in (%) and (cm) from 1 day to 5 days at each key station, against with Old Benchmark are presented in Table B1 and Table B2.

The evaluation of performance indicators, missing data and completion time for flood forecasting are presented in Table B3 and Figures B4, B5 and B6, respectively from 26 to 31, October 2021.

Table B1: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 26-31 October, 2021 in cm

Lead-time Forecasted	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Thakhek	Mukdahan	Savannakhet	Khong Chiam	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Phnom Penh Port	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
1-day	15	15	9	2	4	4	5	5	2	2	2	5	14	17	5	5	5	2	3	2	3	4
2-day	20	17	19	8	7	8	11	13	8	4	6	10	20	22	10	8	8	4	7	5	7	10
3-day	20	31	27	21	22	10	16	19	17	9	11	17	13	15	9	6	6	5	9	5	13	17
4-day	24	32	22	24	30	18	20	24	23	12	24	30	22	10	7	8	7	6	8	6	16	24
5-day	25	27	25	25	37	23	26	29	21	10	24	20	37	9	14	12	11	8	9	4	19	33

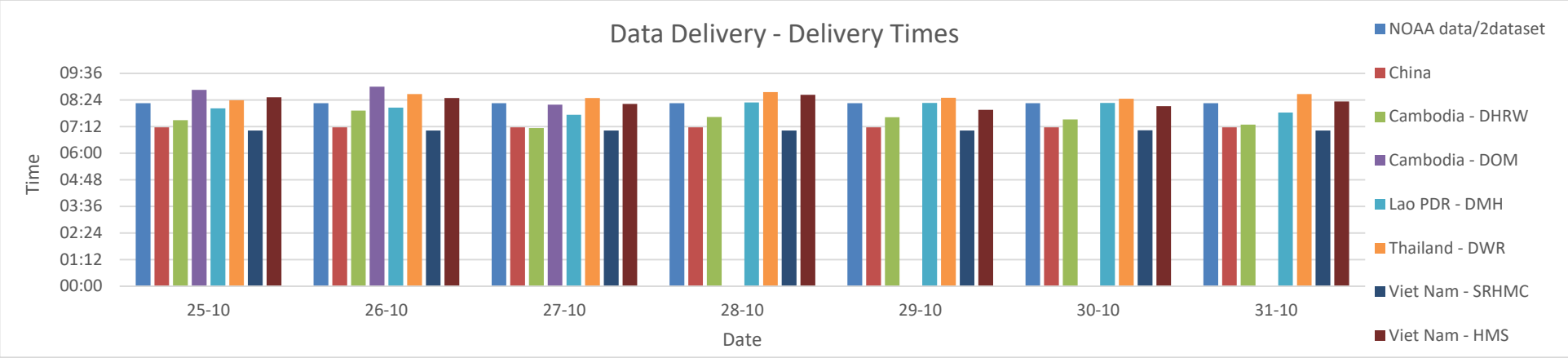
Table B2: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 26-31 October, 2021 in %

Lead-time Forecasted	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Thakhek	Mukdahan	Savannakhet	Khong Chiam	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Phnom Penh Port	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc	*Average*
1-day	57.1	42.9	42.9	85.7	57.1	71.4	57.1	57.1	71.4	57.1	57.1	57.1	57.1	42.9	42.9	71.4	71.4	85.7	71.4	57.1	71.4	57.1	***61.0***
2-day	50.0	50.0	50.0	50.0	66.7	50.0	50.0	33.3	50.0	66.7	83.3	66.7	66.7	50.0	66.7	50.0	50.0	66.7	66.7	50.0	66.7	50.0	***56.8***
3-day	60.0	60.0	60.0	60.0	60.0	80.0	80.0	80.0	60.0	60.0	60.0	60.0	80.0	80.0	60.0	60.0	80.0	40.0	40.0	80.0	40.0	60.0	***63.6***
4-day	75.0	50.0	75.0	75.0	50.0	50.0	75.0	75.0	50.0	50.0	50.0	75.0	25.0	50.0	75.0	75.0	75.0	75.0	50.0	50.0	50.0	50.0	***60.2***
5-day	66.7	33.3	66.7	66.7	33.3	33.3	33.3	33.3	66.7	66.7	66.7	66.7	33.3	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	33.3	***56.1***

Table B3: Overview of performance indicators for the past 7 days from 26-31 October 2021

	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
2021	FF completed and sent (time)	Stations without forecast	FF2 completed and sent (time)	Weather data available (time)	NOAA data	China	Cambodia - DHRW	Cambodia - DOM	Lao PDR - DMH	Thailand - DWR	Viet Nam - SRHMC	Viet Nam - HMS	NOAA data/2dataset	China/2	Cambodia - DHRW/15	Cambodia - DOM/34	Lao PDR - DMH/32	Thailand - DWR/13	Viet Nam - SRHMC/6	Viet Nam - HMS/39
week	*10:23*	*00:00*	-	-	*08:15*	*07:10*	*07:30*	*08:40*	*08:03*	*08:33*	*07:01*	*08:19*	*0*	*0*	*2*	*136*	*56*	*15*	*3*	*0*
month	*10:30*	*00:00*	-	-	*08:15*	*07:10*	*07:21*	*08:36*	*08:26*	*08:14*	*07:17*	*08:17*	*0*	*0*	*14*	*272*	*334*	*48*	*7*	*38*

Fig. B4: Data delivery times for the past 7 days from 26-31 October 2021



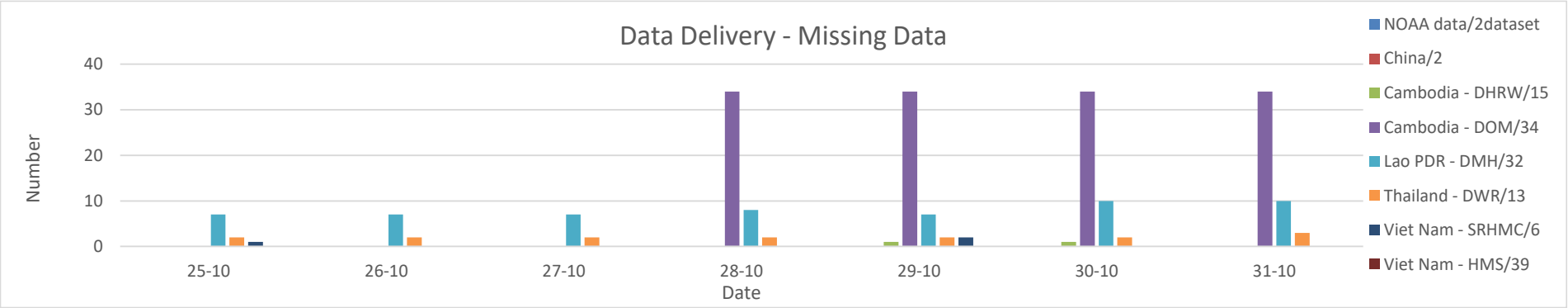
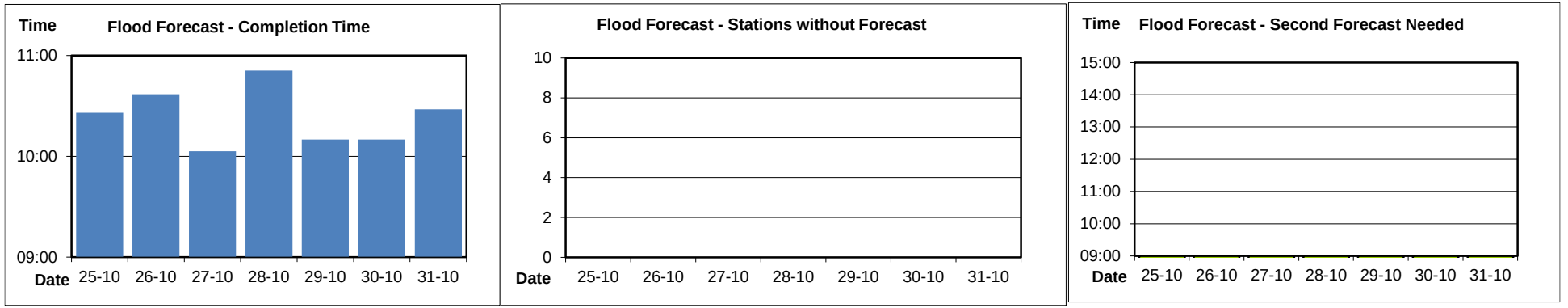


Fig. B5: Missing data for the past 7 days from 26-31 October 2021

Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 26-31 October 2021



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