Mekong River Commission

Weekly Wet Season Situation Report in the Lower Mekong River Basin

12 – 18 October 2021

Prepared by
The Regional Flood and Drought Management Centre
19 October 2021

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Mekong River Commission
Documentation and Learning Centre
184 Fa Ngoum Road, Unit 18, Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR
Telephone: +856-21 263 263 | E-mail: mrcs@mrcmekong.org | www.mrcmekong.org

Contents

Figures

Table

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 5.60 millimetres (mm) to 210.60 mm.
- There will be average rainfalls for the next 5 days over the Mekong region from 19 to 23 October 2021 due to 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 12 to 18 October 2021. Water levels at this station significantly increased from 535.27 m on 8 Oct to 536.02 on 18 Oct 2021 (recorded on 7:00 am) and stayed about 0.08 m higher than its long-term-average (LTA) value. The outflow was up from 832.00 m3/s on 8 Oct to 1348.51 m^3/s on 18 Oct 2021. From October 8 to 18, water level at this station increased about 0.75 m and was about 0.08 m higher than its LTA value.
- Along with the significant increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand slightly increased from 10 to 18 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.33 m during October 10-18 due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were also rising. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia, furthermore, were significantly increasing, due to high rainfall (Tropical Strom "KOMPASU") and following the same trend of the upstream flow (at Pakse and 3S area in Viet Nam).
- The water volume of the Tonle Sap Lake was lower than its LTA and the levels in 2019 but was higher than 2020 during the same period from 12 to 18 October 2021, and still considered critical.
- Over the next few days, the water levels across most monitoring stations are expected to increase but 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 9 to 15. 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 **12 – 18 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 (October, November and December) and the weather maps issued by the Thai Meteorological Department (TMD) were used to verify weather conditions in the LMB.

The TMD states that the transition period moving from the rainy to the winter season will start from October and the below average rainfall which reduces temperature and cool weather will start from the end of this month onward. However, low pressure and Tropical Storms will lay across the southern part of the LMB mainly in Viet Nam, which will bring more rainfall in October and early November.

Figure 1 presents the weather map on 18 October 2021, showing low-pressure lines are dominating the middle part of LMB, after the Tropical Storm KOMPASU. Rainfall focused in 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.

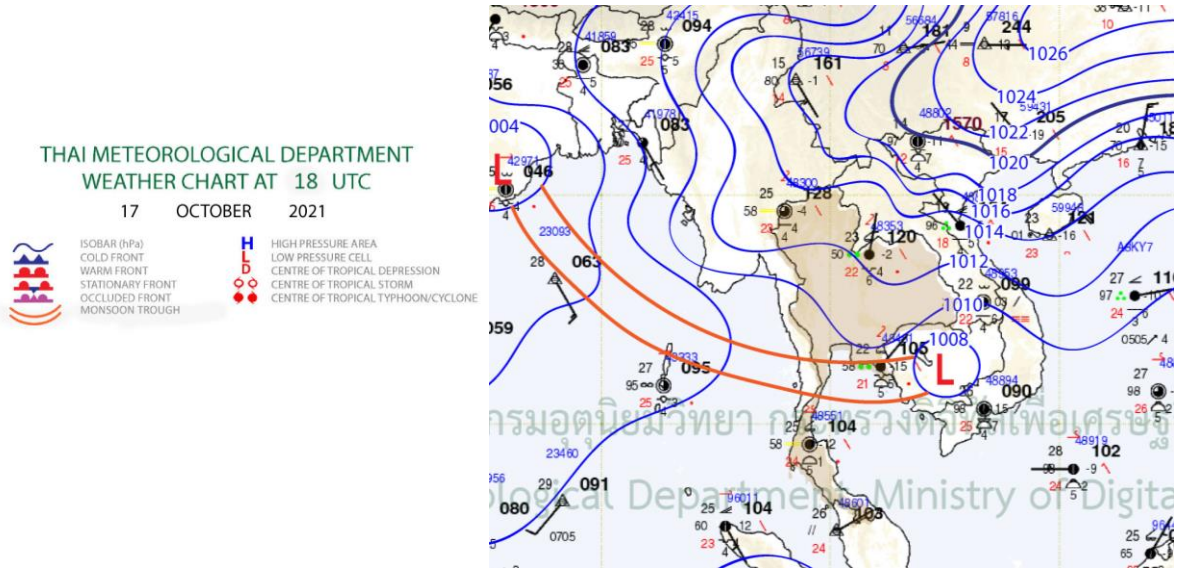


Figure 1. Summary of weather conditions over the LMB.

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 18 to 31 October 2021, during the 3rd and 4th weeks of October. Moreover, LMB is likely dominated by wetter condition, which may receive more rainfall in general (above-average rainfall) in the Lower part to the LMB.

Figure 2 shows the outlook of comparative wet conditions from 18 to 31 October 2021 covering the whole LMB region, based on results from the NCEP model (National Centres for Environmental Prediction).

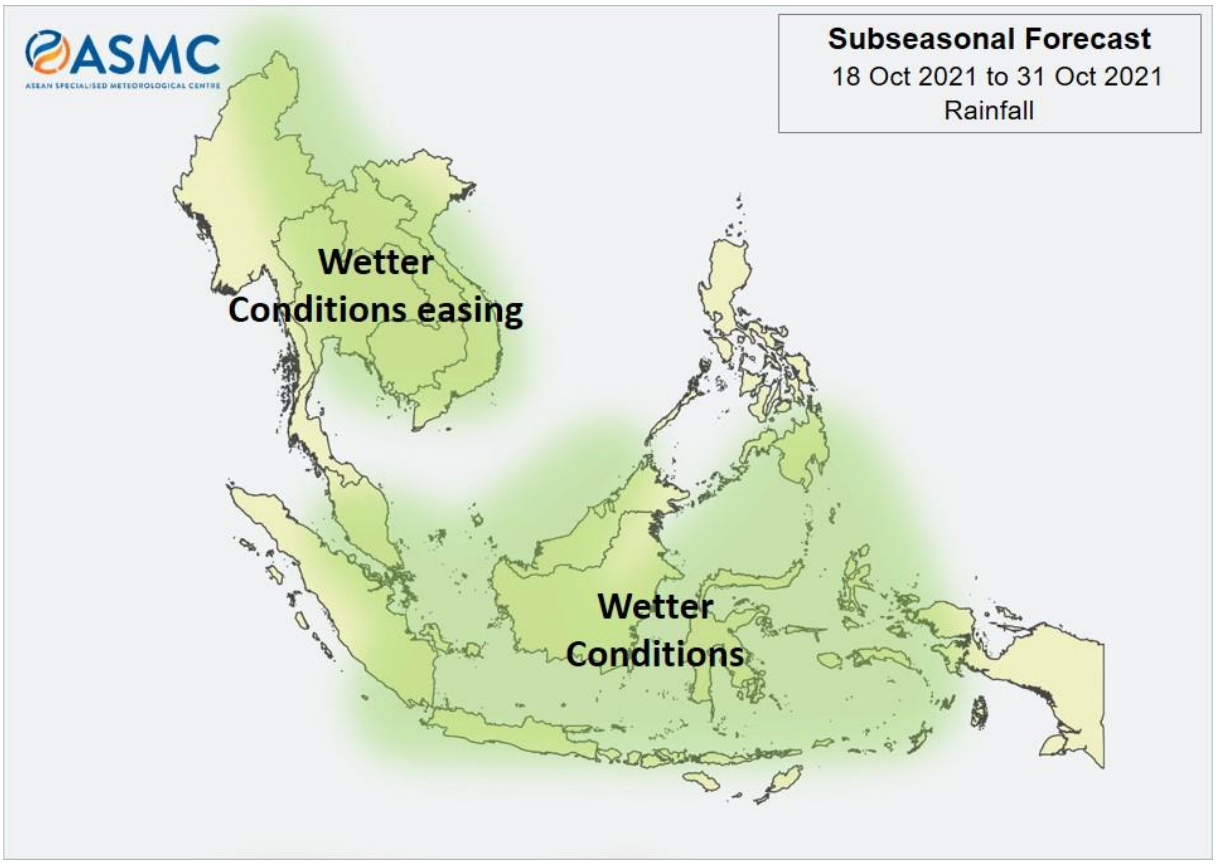


Figure 2. Outlook of wet and dry conditions over the Asian countries by ASMC.

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 18 October 2021, as shown in Figure 1. Based on the low-pressure lines nominated over the LMB the rainfall still predicted over the week report, as displayed in Figure 3.

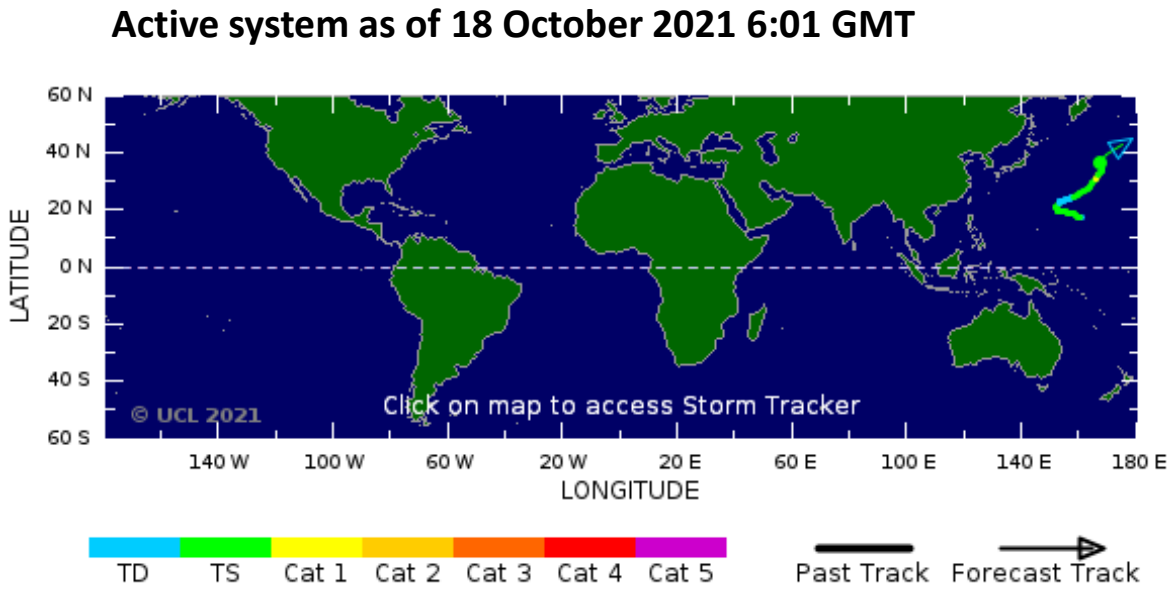


Figure 3. A tropical depression risk observed on 11 October 2021.

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 5.60 mm to 210.60 mm. The weekly total rainfall from 12 to 18 October 2021 in this reporting week was considered high especially from Mukdahan in Thailand to Chau Doc in Viet Nam. This week rainfall was lower than last week rainfall in the Upper and Middle parts of the LMB (see Figure 4).

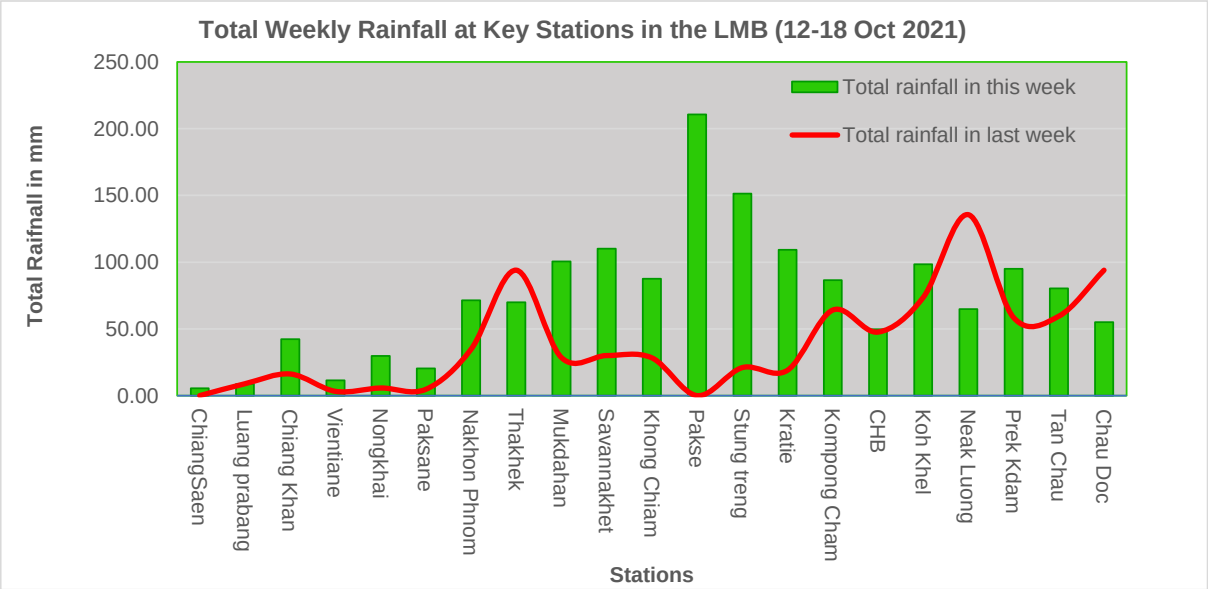


Figure 4. Weekly total rainfall at key stations in the LMB during 12-18 Oct 2021.

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 12 to 18 October 2021.

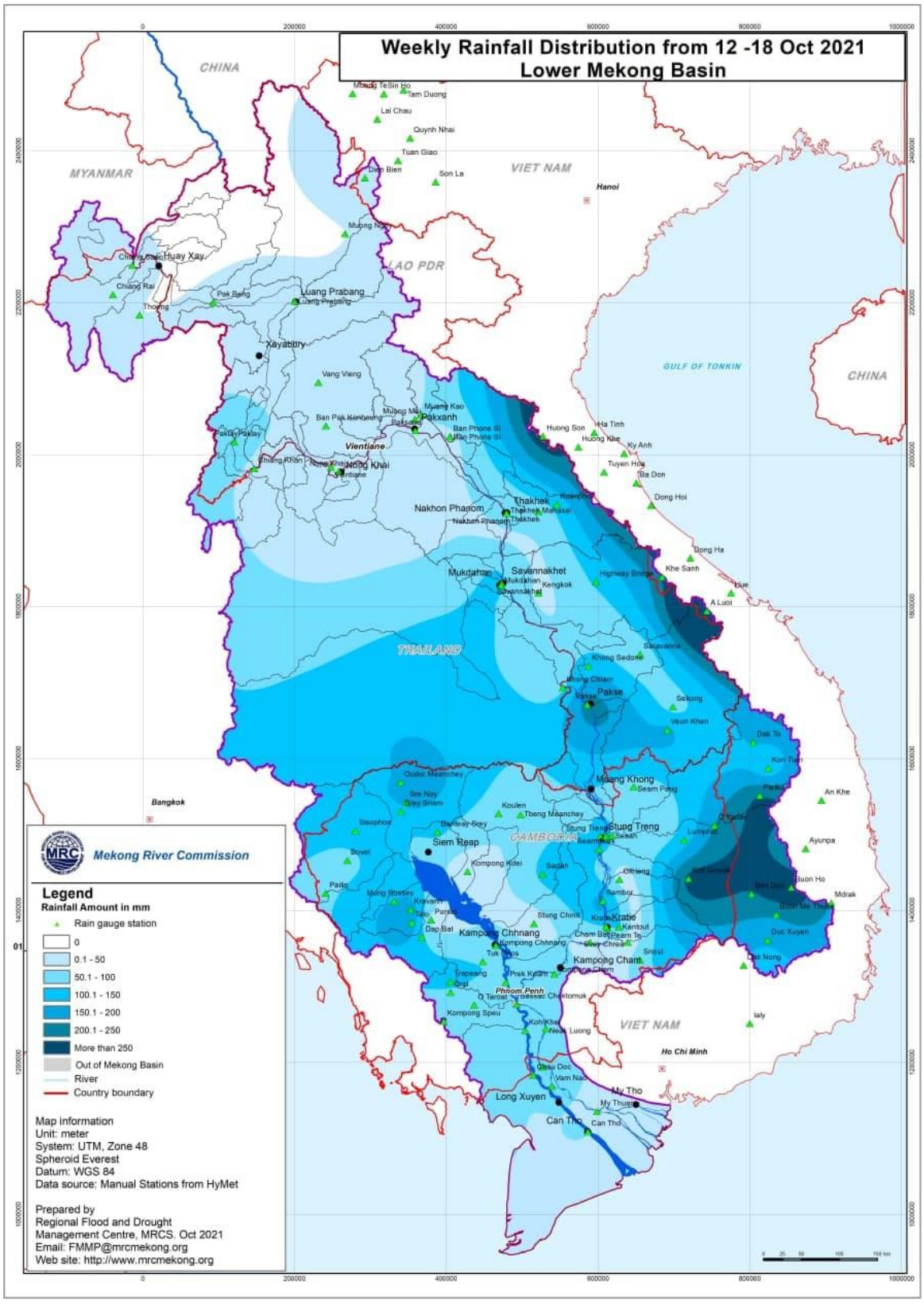


Figure 5. Weekly rainfall distribution over the LMB during 12 – 18 October 2021.

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.

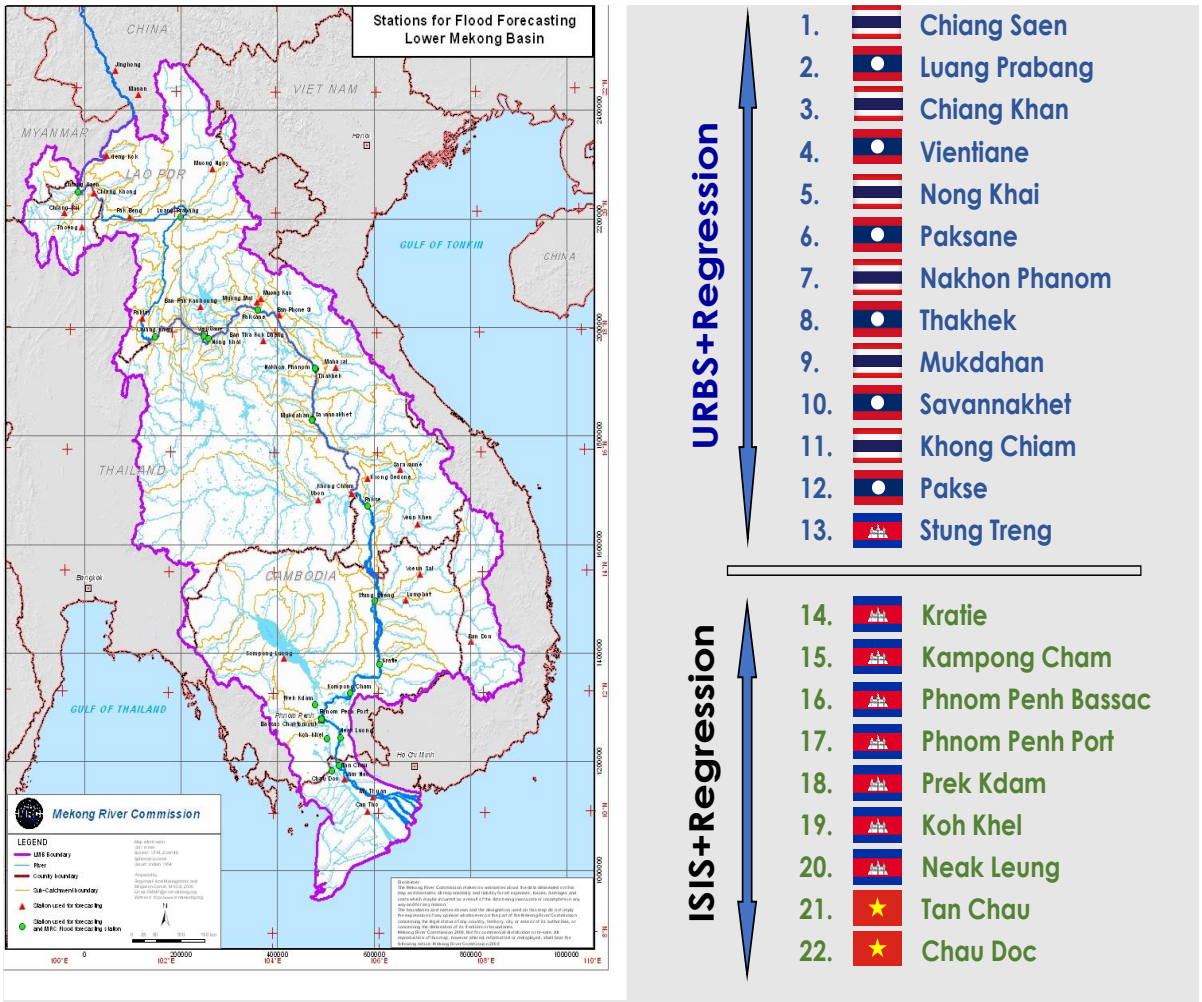


Figure 6. Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 12 to 18 October 2021. Water levels at this station **significantly rose from 535.27 m on 8 Oct to 536.02 on 18 Oct 2021 (recorded on 7:00 am) and stayed about 0.08 m higher than its long-term-average (LTA) value**. The outflow was up from 832.00 m^3/s on 8 Oct to 1348.51 m^3/s on 18 Oct 2021. From October 8 to 18, water level at this station increased about 0.75 m and was about 0.08 m higher than its LTA value.

Figure 7 below presents water level that decreased at the Jinghong hydrological station[1], indicating the trend of fluctuating water level up to 18 October 2021 and showing about 0.08 m higher than its LTA level.

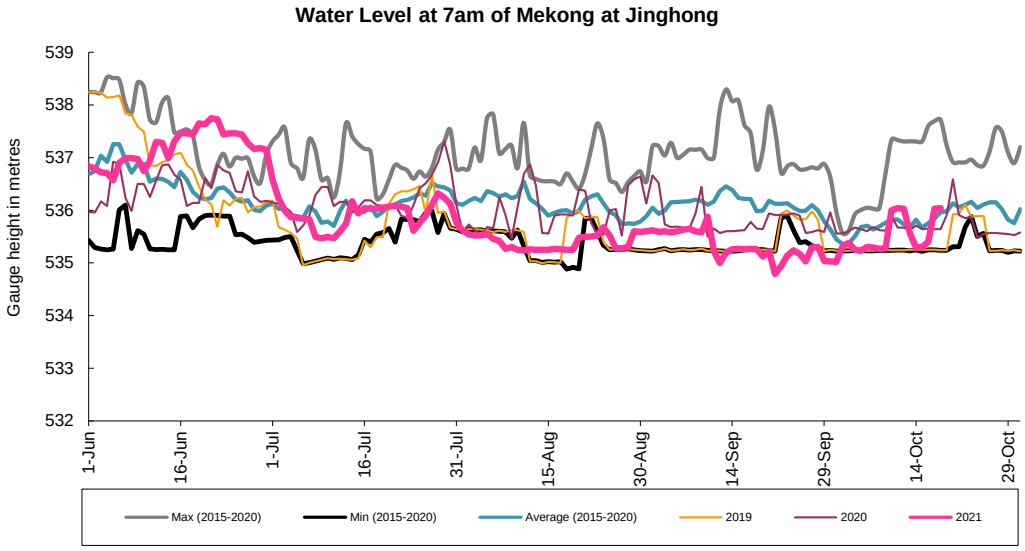


Figure 7. Water level at the Jinghong hydrological station during 1 July-18 October 2021.

Along with the significant increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand slightly rose from 10 to 18 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.33 m during October 10-18 due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were also increasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia, moreover, were soaring, due to high rainfall (Tropical Strom "KOMPASU") and following the same trend of the upstream flow (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 12 to 18 October 2021 at Thailand's Chiang Saen decreased from 2.63 m to 2.33 m, showing 0.30 m down and was about 1.87 m lower than its Long-Term-Average (LTA) value, which considered critical. The water level at Luang Prabang station in Lao PDR slightly increased from 8.95 m to 8.97 m during the reporting period. This level shows 0.60 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**.

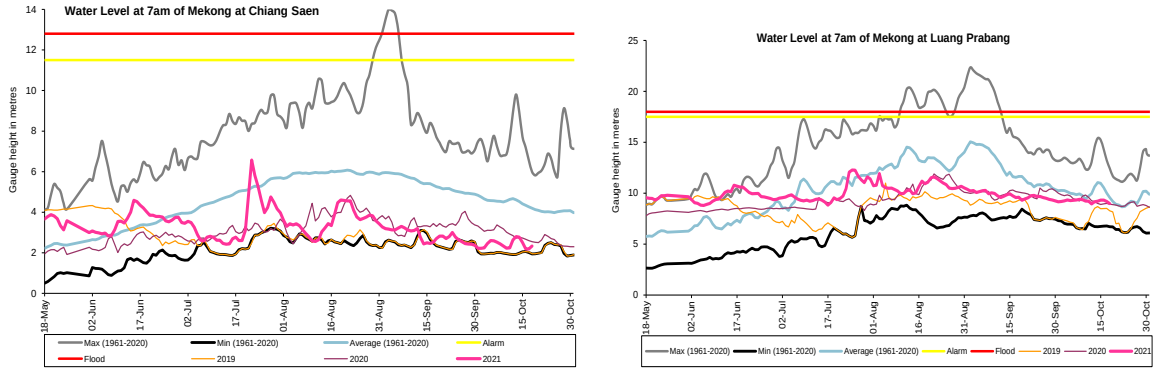


Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) rose from 6.38 m to 6.80 m during the reporting week. It showed 1.93 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 3.73 m to 3.97 m and was about 1.74 m lower than its LTA during 12-18 October 2021. At Nong Khai station in Thailand, the water level was also up during the reporting period. It increased from 3.48 m to 3.62 m, and still showing 2.62 m lower than its LTA. However, at Paksane in Lao PDR, water levels decreased about 0.11 m, dropping from 4.16 m to 4.15 m. The WL at this station was still about 3.34 m lower than its LTA. The recently decreased 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.

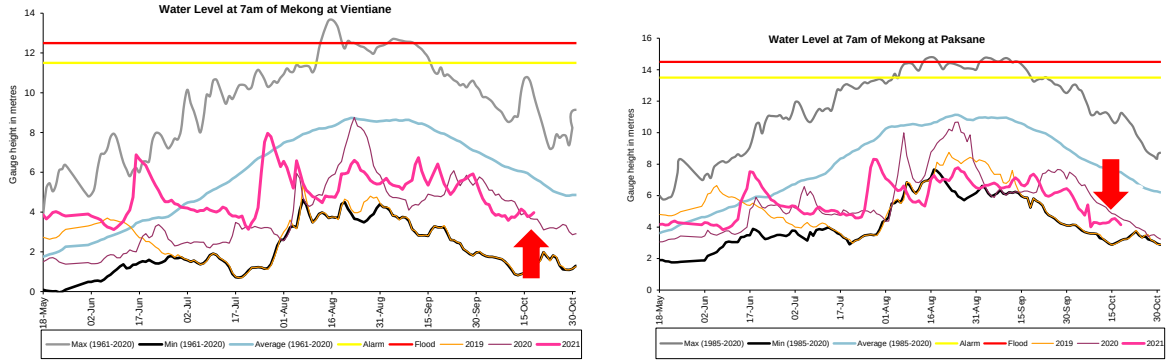


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR were increasing in between 0.20 m and 0.50 m due to high rainfall and inflow from upstream. Further downstream from Khong Chiam in Thailand to Pakse in Lao PDR, water level also increased, rising about 0.75 m due to heavy rainfall in the catchment area (influencing by Tropical Storm KOMPASU). **Water levels at these stations (Nakhon Phanom to Sovannakhet) were staying below their LTA level, except from Khong Chiam in Thailand to Pakse in Lao PDR where water levels were higher than their LTA level**. Figure 10 shows the water levels at Nakhon Phanom and Pakse stations.

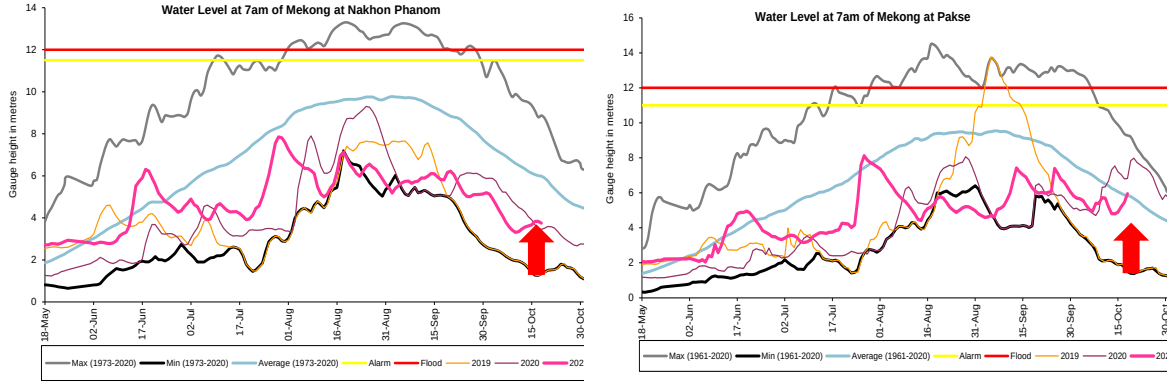


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

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 went up during 12-18 October 2021. This week water level at Stung Treng and Kratie significantly increased about 1.09 m and 0.91 m, respectively, moving up to about 1.14 m and 1.23 m above their LTA (as showed in Figure 11). The water level at Kompong Cham rose about 0.48 m and was still about 0.57 m lower than its LTA. Generally, the **Water levels at these stations were moving up to the level higher than their TLA, which considered normal**.

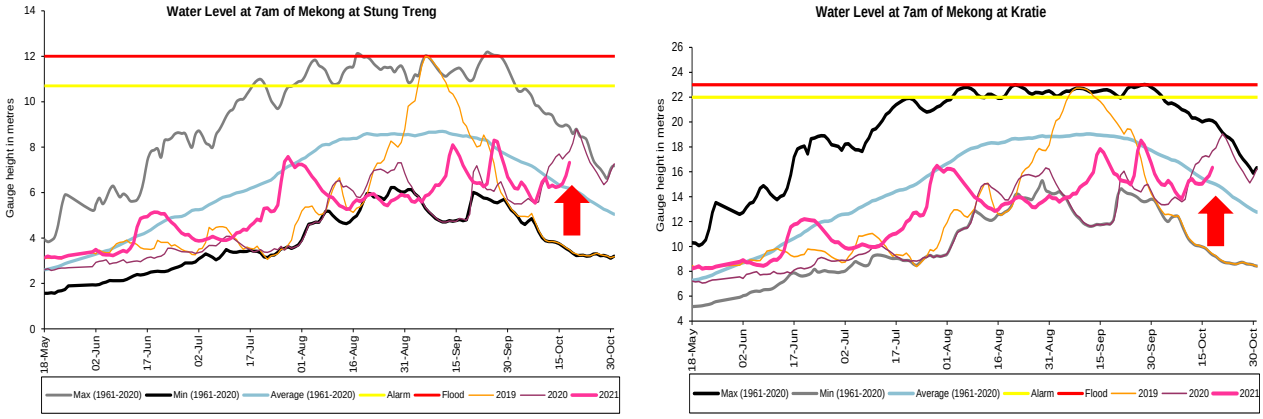


Figure 11. Water levels at Stung Treng and Kratie on the Mekong River.

At Chaktomuk on the Bassac River, due to heavy rainfall in the inflow catchment, the water level was up by about 0.28 m and stayed 1.83 m lower than its LTA value; while at Koh Khel, water level increased about 0.24 m, staying 0.60 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake increased about 0.32 m and was about 1.91 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 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 Kompong 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 12 to 18 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 1.87 m and 2.59 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 18 of this reporting period, **it was observed that the main outflow to Tonle Sap Lake increased due to high rainfall from upstream**. This increased outflow of Tonle Sap Lake was most likely caused by high inflows due to heavy rainfall from the catchment area. Up to 18 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, rainfall is forecasted for the Tonle Sap area; thus, the outflow into the Tonle Sap Lake is likely to slightly increase from the current level.

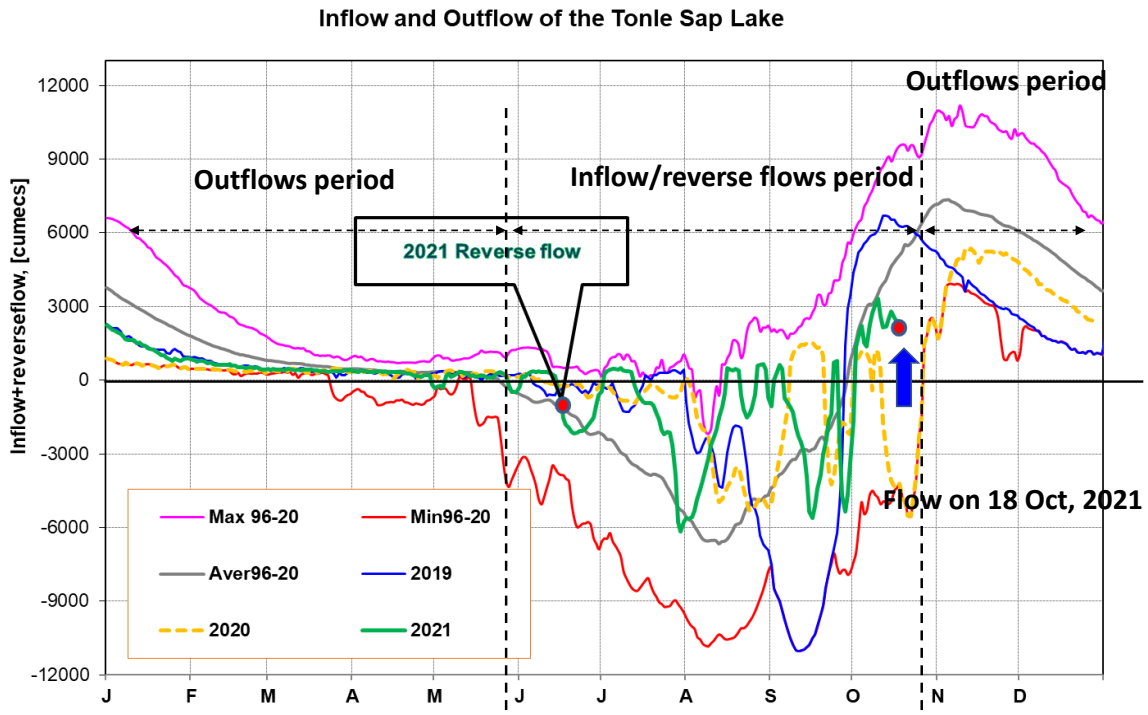


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake

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 18 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 18, **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***.

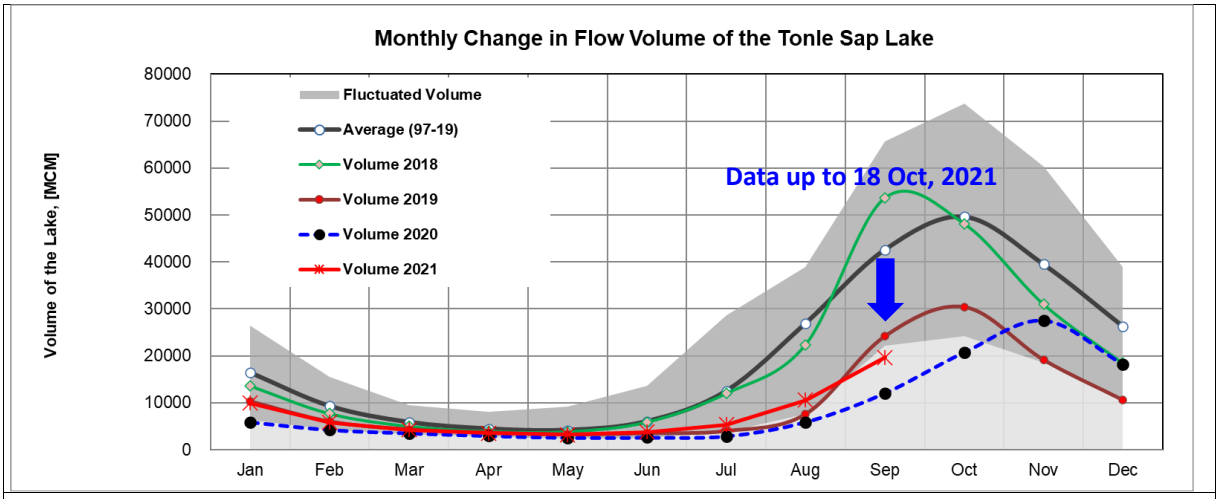


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

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	16452.95	26357.53	6272.01	13633.41	10285.31	5906.80	9923.80
Feb	9312.36	15596.22	4281.41	7729.72	6019.30	4264.19	5832.97
Mar	5868.92	9438.24	3350.92	5037.06	4354.62	3553.99	4264.88
Apr	4474.98	8009.14	2875.42	3956.47	3667.47	2992.61	3556.68
May	4166.07	9176.93	2417.81	3864.00	3266.43	2594.92	3240.78
Jun	6034.10	13635.01	2470.54	5919.18	3517.06	2641.88	3798.29
Jul	12502.58	28599.56	3832.51	12024.96	4001.99	2925.86	5346.73
Aug	26934.35	39015.12	7554.93	22399.65	7622.71	5941.07	10547.80
Sep	42644.05	65632.35	22180.73	53639.54	24194.19	12105.31	19686.19
Oct	49698.19	73757.23	24276.79	48193.08	30358.38	20799.13	
Nov	39542.58	60367.33	18576.01	31036.07	19112.65	27546.80	
Dec	26325.13	38888.95	10869.43	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 12-18, the LMB was affected by three weather factors (i) The monsoon trough lay across the lower northern and upper central parts toward an active low-pressure cell which degenerated from a tropical storm “Lionrock” over the north-eastern part on the first day of the week. After that, the monsoon trough moved southward to lie across the central and lower parts toward a tropical storm “Kompasu”. The mentioned storm moved westward through Hainan Island, China in the evening of Oct 13, before making landfall over the north of Vinh province in Viet Nam in the evening of Oct 14, and later downgraded into a tropical depression and an active low-pressure cell respectively on the same day. Then, the monsoon trough lay across the central, eastern and lower north-eastern parts on Oct 15-16 and moved southward to lie across the eastern and upper southern parts toward a low-pressure cell over the north central Viet Nam on the last day of the week; (ii) the southwest monsoon which prevailed over the Gulf of Thailand was active during the second half of the week; and (iii) the high pressure area from China extended its ridge to cover the northern and upper north-eastern parts on the last day of the 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.
as shown in Figure 14 and Table 2.

Table 2. Detected flash flood in Thailand, Lao PDR, Cambodia, and Viet Nam on October 17.

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

Date of FFG products 17/10/2021 06:00 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
Surin	Bua Ched	Northeastern	Low-Risk	Prachinburi	Prachantakham	Eastern	Low-Risk	Ubon Ratchathani	Buntharik	Northeastern	Low-Risk
Sa Kaeo	Taphraya	Eastern	Low-Risk	Trad	Khao Saming	Eastern	Low-Risk	Surin	Bua Ched	Northeastern	Low-Risk
Trad	Bo Rai	Eastern	Low-Risk	Trad	Muang Trat	Eastern	Low-Risk	Sa Kaeo	Taphraya	Eastern	Low-Risk
Ubon Ratchathani	Buntharik	Northeastern	Low-Risk	Nakhon Nayok	Pak Phli	Eastern	Low-Risk	Chanthaburi	Pong Nam Ron	Eastern	Low-Risk
Nakhon Ratchasima	Pakthongchai	Northeastern	Low-Risk	Prachinburi	Muang Prachinburi	Eastern	Low-Risk	Trad	Bo Rai	Eastern	Low-Risk
Prachinburi	Prachantakham	Eastern	Low-Risk	Nonthaburi	Bang Bua Thong	Central	Low-Risk	Trad	Muang Trat	Eastern	Low-Risk
Chanthaburi	Laem Sing	Eastern	Low-Risk	Lopburi	Kok Sumrong	Central	Low-Risk	Ubon Ratchathani	Buntharik	Northeastern	Low-Risk
Trad	Khao Saming	Eastern	Low-Risk	Lopburi	Sa Bot	Central	Low-Risk	Nakhon Ratchasima	Pakthongchai	Northeastern	Low-Risk
Trad	Bo Rai	Eastern	Low-Risk	Lopburi	Kok Sumrong	Central	Low-Risk	Nakhon Ratchasima	Wang Nam Khieo	Northeastern	Low-Risk
Trad	Muang Trat	Eastern	Low-Risk	Lopburi	Phatthana Nikhom	Central	Low-Risk	Prachinburi	Prachantakham	Eastern	Low-Risk
Chachoengsao	Bang Nam Pieo	Eastern	Low-Risk	Lopburi	Chai Badan	Central	Low-Risk	Sa Kaeo	Muang Sra Kaeo	Eastern	Low-Risk
Nakhon Nayok	Pak Phli	Eastern	Low-Risk	Lopburi	Chai Badan	Central	Low-Risk	Sa Kaeo	Muang Sra Kaeo	Eastern	Low-Risk
Prachinburi	Muang Prachinburi	Eastern	Moderate-Risk	Phra Nakhon Si Ayudhya	Bang Pa-in		Low-Risk	Chanthaburi	Laem Sing	Eastern	Low-Risk
Nonthaburi	Sai Noi	Central	Low-Risk	Phra Nakhon Si Ayudhya	Bang Pa-in		Low-Risk	Trad	Khao Saming	Eastern	Low-Risk
Nonthaburi	Bang Bua Thong	Central	Low-Risk	Phra Nakhon Si Ayudhya	Wang Noi		Low-Risk	Trad	Bo Rai	Eastern	Low-Risk
Nakhon Sawan	Ta Khli	Central	Low-Risk	Phra Nakhon Si Ayudhya	Wang Noi		Low-Risk	Trad	Muang Trat	Eastern	Low-Risk
Lopburi	Kok Sumrong	Central	Low-Risk	Kanchanaburi	Si Sawat	Central	Low-Risk	Bangkok	Bangkok	Central	Low-Risk
Lopburi	Sa Bot	Central	Low-Risk	Kanchanaburi	Sai Yok	Central	Low-Risk	Samut Prakarn	Muang Samut Prakarn		Low-Risk
Lopburi	Kok Sumrong	Central	Low-Risk	Kanchanaburi	Thong Pha Phum	Central	Low-Risk	Samut Prakarn	Muang Samut Prakarn		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 17/10/2021 06:00 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
Champasak	Paksong	THONGYAO	Southwestern	Moderate-Risk	Saravane	Samuoi	ATUK	South	Low-Risk	Saravane	Samuoi	ATUK	South	Low-Risk
Saravane	Ta oi	THONG KA TAI	South	Low-Risk	Savannakhet	Nong	GNANG	Southern	Low-Risk	Savannakhet	Nong	GNANG	Southern	Low-Risk
Sekong	Kaleum	PRO	Southeast	High-Risk	Savannakhet	Nong	LAGNENG KHOK	Southern	Low-Risk	Savannakhet	Nong	LAPID	Southern	Low-Risk
Sekong	Kaleum	AR-HOR NEUA	Southeast	Low-Risk	Savannakhet	Nong	PASANEIR TAI	Southern	Low-Risk	Savannakhet	Nong	LAGNENG KHOK	Southern	Moderate-Risk
Sekong	Kaleum	KA-OUANG	Southeast	High-Risk	Saravane	Ta oi	TUMLEKHAO	South	Low-Risk	Savannakhet	Nong	PASANEIR TAI	Southern	Low-Risk
Sekong	Kaleum	PANORM	Southeast	Low-Risk	Saravane	Ta oi	PHOBEUI	South	Low-Risk	Saravane	Ta oi	TUMLEKHAO	South	Low-Risk
Sekong	Kaleum	AR-PEUANG	Southeast	High-Risk	Saravane	Ta oi	PHOR SANH	South	High-Risk	Saravane	Ta oi	PHOBEUI	South	Low-Risk
Sekong	Kaleum	PALAENG	Southeast	High-Risk	Saravane	Ta oi	TUMLE KAO	South	Low-Risk	Saravane	Ta oi	PHOR SANH	South	High-Risk
Sekong	Kaleum	VAK TAI	Southeast	Moderate-Risk	Saravane	Ta oi	KANG	South	Low-Risk	Saravane	Ta oi	TUMLE KAO	South	Low-Risk
Sekong	Kaleum	TIN	Southeast	High-Risk	Saravane	Ta oi	PATEUM	South	Low-Risk	Saravane	Ta oi	KANG	South	Low-Risk
Sekong	Kaleum	TANGKAAD	Southeast	Low-Risk	Saravane	Ta oi	PI TIANE	South	Low-Risk	Saravane	Ta oi	PATEUM	South	Low-Risk
Sekong	Kaleum	STTHORN	Southeast	High-Risk	Saravane	Ta oi	TAPEUPHOU	South	Low-Risk	Saravane	Ta oi	POI	South	Low-Risk
Sekong	Lamarm	SANAK	Southeast	Low-Risk	Saravane	Saravane	NONSAVANH	South	Low-Risk	Saravane	Ta oi	PI TIANE	South	Low-Risk
Sekong	Lamarm	KANONG MAI	Southeast	High-Risk	Saravane	Toomlarn	DORNMOUANG	South	Low-Risk	Saravane	Ta oi	TAPEUPHOU	South	Low-Risk
Sekong	Lamarm	TAVI	Southeast	Moderate-Risk	Attapeu	Xaysetha	XENOI	Sotheast	Low-Risk	Saravane	Ta oi	SOITAMM	South	Low-Risk
Sekong	Lamarm	NAMHIENG	Southeast	Low-Risk	Champasak	Paksong	THONGYAO	Southwestern	Low-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk
Sekong	Lamarm	KADONE	Southeast	Low-Risk	Saravane	Ta oi	THONG KA TAI	South	Low-Risk	Bolikhamxay	Khamkheut	NAPHOUANG	Central Laos	Low-Risk
Sekong	Dakcheung	DAKPORK	Southeast	Moderate-Risk	Sekong	Kaleum	PRO	Southeast	High-Risk	Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk
Sekong	Dakcheung	DAKYUENG	Southeast	Moderate-Risk	Sekong	Kaleum	AR-HOR NEUA	Southeast	Low-Risk	Saravane	Saravane	NONSAVANH	South	Low-Risk
Sekong	Dakcheung	DAKDEN	Southeast	High-Risk	Sekong	Kaleum	KA-OUANG	Southeast	Moderate-Risk	Saravane	Toomlarn	DORNMOUANG	South	Low-Risk
Sekong	Dakcheung	DAKKE	Southeast	Low-Risk	Sekong	Kaleum	PANORM	Southeast	Low-Risk	Saravane	Toomlarn	DONE KHA YUNG TAI	South	Low-Risk
Sekong	Dakcheung	DAKTHOU	Southeast	Low-Risk	Sekong	Kaleum	AR-PEUANG	Southeast	Moderate-Risk	Saravane	Saravane	KENGMUANGLAO	South	Low-Risk
Sekong	Dakcheung	DAKMONGNOI	Southeast	Low-Risk	Sekong	Kaleum	PALAENG	Southeast	Moderate-Risk	Saravane	Saravane	MAKNAONHAI	South	Low-Risk
Sekong	Dakcheung	DAKVANG	Southeast	High-Risk	Sekong	Kaleum	VAK TAI	Southeast	Moderate-Risk	Attapeu	Xaysetha	XENOI	Sotheast	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 08/10/2021 06:00 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
Saravane	Samuoi	ATUK	South	Low-Risk	Saravane	Samuoi	ATUK	South	Low-Risk	Saravane	Samuoi	ATUK	South	Low-Risk
Savannakhet	Nong	GNANG	Southern	Low-Risk	Savannakhet	Nong	LAGNENG KHOK	Southern	Low-Risk	Savannakhet	Nong	GNANG	Southern	Low-Risk
Savannakhet	Nong	LAPID	Southern	Low-Risk	Savannakhet	Nong	PASANEIR TAI	Southern	Low-Risk	Savannakhet	Nong	LAPID	Southern	Low-Risk
Savannakhet	Nong	LAGNENG KHOK	Southern	Low-Risk	Saravane	Ta oi	TUMLEKHAO	South	Low-Risk	Savannakhet	Nong	LAGNENG KHOK	Southern	Low-Risk
Savannakhet	Nong	PASANEIR TAI	Southern	Low-Risk	Saravane	Ta oi	PHOBEUI	South	Low-Risk	Savannakhet	Nong	PASANEIR TAI	Southern	Low-Risk
Saravane	Ta oi	TUMLEKHAO	South	Low-Risk	Saravane	Ta oi	PHOR SANH	South	High-Risk	Saravane	Ta oi	TUMLEKHAO	South	Low-Risk
Saravane	Ta oi	PHOBEUI	South	Low-Risk	Saravane	Ta oi	TUMLE KAO	South	Low-Risk	Saravane	Ta oi	PHOBEUI	South	Low-Risk
Saravane	Ta oi	PHOR SANH	South	High-Risk	Saravane	Ta oi	KANG	South	Low-Risk	Saravane	Ta oi	PHOR SANH	South	High-Risk
Saravane	Ta oi	TUMLE KAO	South	Low-Risk	Saravane	Ta oi	PATEUM	South	Low-Risk	Saravane	Ta oi	TUMLE KAO	South	Low-Risk
Sekong	Kaleum	PRO	Southeast	High-Risk	Saravane	Ta oi	PI TIANE	South	Low-Risk	Saravane	Ta oi	KANG	South	Low-Risk
Sekong	Kaleum	AR-HOR NEUA	Southeast	Low-Risk	Saravane	Ta oi	TAPEUPHOU	South	Low-Risk	Saravane	Ta oi	PATEUM	South	Low-Risk
Sekong	Kaleum	KA-OUANG	Southeast	High-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk	Saravane	Ta oi	POI	South	Low-Risk
Sekong	Kaleum	PANORM	Southeast	Low-Risk	Saravane	Saravane	NONSAVANH	South	Low-Risk	Saravane	Ta oi	PI TIANE	South	Low-Risk
Sekong	Kaleum	AR-PEUANG	Southeast	High-Risk	Saravane	Saravane	MAKNAONHAI	South	Low-Risk	Saravane	Ta oi	TAPEUPHOU	South	Low-Risk
Sekong	Kaleum	PALAENG	Southeast	High-Risk	Champasak	Bachiangc	KONGPHALITHIN	Southwestern	Low-Risk	Saravane	Ta oi	SOITAMM	South	Low-Risk
Sekong	Kaleum	VAK TAI	Southeast	High-Risk	Champasak	Pathoomph	NAMPHAAK	Southwestern	Low-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk
Sekong	Kaleum	TIN	Southeast	High-Risk	Attapeu	Xaysetha	XENOI	Sotheast	Low-Risk	Saravane	Saravane	NONSAVANH	South	Low-Risk
Sekong	Kaleum	TANGKAAD	Southeast	Low-Risk	Champasak	Paksong	NAMHAAN	Southwestern	Low-Risk	Saravane	Toomlarn	DORNMOUANG	South	Low-Risk
Sekong	Kaleum	STTHORN	Southeast	High-Risk	Champasak	Paksong	THONGYAO	Southwestern	Moderate-Risk	Saravane	Toomlarn	NA HONG KANG	South	Low-Risk
Sekong	Lamarm	SANAK	Southeast	Low-Risk	Sekong	Kaleum	PRO	Southeast	Moderate-Risk	Saravane	Toomlarn	DONE KHA YUNG TAI	South	Low-Risk
Sekong	Lamarm	KANONG MAI	Southeast	High-Risk	Sekong	Kaleum	AR-HOR NEUA	Southeast	Low-Risk	Saravane	Saravane	KENGMUANGLAO	South	Low-Risk
Champasak	Pathoomph	NAMPHAAK	Southwestern	Moderate-Risk	Sekong	Kaleum	KA-OUANG	Southeast	High-Risk	Saravane	Saravane	MAKNAONHAI	South	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 17/10/2021 06:00 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
Kratie	Sambour	Koun Va	Northeast	Low-Risk	Pursat	Veal Veaeng	Chamka Chrey Khang Tbong	Western	Low-Risk	Stung Treng	Siem Pang	Kham Phouk	Northeast	Low-Risk
Kratie	Sambour	Ampok	Northeast	Low-Risk	Pursat	Veal Veaeng	Cheuteal Chrum	Western	Low-Risk	Stung Treng	Siem Pang	Chantuh	Northeast	Low-Risk
Pursat	Veal Veaeng	Krang Rongieng	Western	Low-Risk	Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk	Ratana Kiri	Koun Mom	Ko Hokseb	Northeast	Low-Risk
Pursat	Veal Veaeng	Chamka Chrey Khang Tbong	Western	Moderate-Risk						Otdar Meanchey	Banteay Ampil	Pou Chas	North	Low-Risk
Pursat	Veal Veaeng	Cheuteal Chrum	Western	Low-Risk						Kratie	Sambour	Koun Va	Northeast	Low-Risk
Kampong Chhnang	Kampong Leaeng	Kandal	Central	Low-Risk						Kratie	Sambour	Ampok	Northeast	Low-Risk
Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk						Pursat	Veal Veaeng	Krang Rongieng	Western	Low-Risk
Kampong Cham	Stueng Trang	Sampieng Kraom	Central Lowland	Low-Risk						Pursat	Veal Veaeng	Chamka Chrey Khang Tbong	Western	Moderate-Risk
Kampong Thom	Kampong Svay	Kaoh Krob Bay	Nothwest	Low-Risk						Pursat	Veal Veaeng	Cheuteal Chrum	Western	Low-Risk
Tboung Khmum	Memot	Chamkar Thmei	Central Lowland	Low-Risk						Kampong Chhnang	Kampong Leaeng	Kandal	Central	Low-Risk
Pursat	Veal Veaeng	Kien Chongruk	Western	Low-Risk						Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk
										Kampong Cham	Stueng Trang	Sampieng Kraom	Central Lowland	Low-Risk
										Kampong Thom	Kampong Svay	Kaoh Krob Bay	Nothwest	Low-Risk
										Tboung Khmum	Memot	Kantuot	Central Lowland	Low-Risk
										Tboung Khmum	Memot	Chamkar Thmei	Central Lowland	Low-Risk
										Tboung Khmum	Tboung Khmum	Phum Prammuoy Dabpir	Central Lowland	Low-Risk
										Pursat	Veal Veaeng	Kien Chongruk	Western	Low-Risk
										Koh Kong	Thma Bang	Teap Khley	Southwestern	Low-Risk
										Sihanouk Ville	Prey Nob	Chumpu Khmau	Southwest	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 17/10/2021 06:00 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 Tri	Huong Hoa	North Central	Low-Risk	Gia Lai	Ia Grai	Central Highlands	Low-Risk	Kon Tum	Sa Thay	Central Highlands	Low-Risk
Quang Tri	Da Krong	North Central	Low-Risk	Thua Thien Hue	A Luoi	North Central	Moderate-Risk	Gia Lai	Ia Grai	Central Highlands	Low-Risk
Quang Binh	Minh Hoa	North Central	Low-Risk	Gia Lai	Duc Co	Central Highlands	Low-Risk	Kon Tum	Sa Thay	Central Highlands	Low-Risk
Thua Thien Hue	A Luoi	North Central	High-Risk	Gia Lai	Chu Se	Central Highlands	Low-Risk	Kon Tum	Sa Thay	Central Highlands	Low-Risk
Quang Nam	Nam Giang	South Central Coast	High-Risk	Dak Lak	Buon Don	Central Highlands	Low-Risk	Gia Lai	Duc Co	Central Highlands	Low-Risk
Thua Thien Hue	Phong Dien	North Central	High-Risk	Dak Lak	TX. Buon Ma Thuot	Central Highlands	Low-Risk	Gia Lai	Chu Prong	Central Highlands	Low-Risk
Thua Thien Hue	Quang Dien	North Central	Low-Risk	Quang Tri	Huong Hoa	North Central	Low-Risk	Gia Lai	Chu Se	Central Highlands	Low-Risk
Thua Thien Hue	Phong Dien	North Central	Low-Risk	Quang Binh	Minh Hoa	North Central	Low-Risk	Dak Lak	Ea Sup	Central Highlands	Low-Risk
Quang Nam	Dai Loc	South Central Coast	High-Risk	Quang Nam	Nam Giang	South Central Coast	Moderate-Risk	Dak Lak	Dak Mil	Central Highlands	Low-Risk
Quang Nam	Hien	South Central Coast	High-Risk	Quang Nam	Nui Thanh	South Central Coast	Low-Risk	Dak Lak	Buon Don	Central Highlands	Low-Risk
Da Nang	Lien Chieu	South Central Coast	Low-Risk	Quang Ngai	Son Ha	South Central Coast	Low-Risk	Dak Lak	Cu Jut	Central Highlands	Low-Risk
Da Nang	Hoa Vang	South Central Coast	High-Risk	Quang Ngai	Son Tay	South Central Coast	Low-Risk	Dak Lak	TX. Buon Ma Thuo	Central Highlands	Low-Risk
Kon Tum	Dak Glei	Central Highlands	High-Risk	Quang Nam	Tra My	South Central Coast	High-Risk	Dak Lak	Dak Mil	Central Highlands	Low-Risk
Quang Nam	Tra My	South Central Coast	Low-Risk	Quang Nam	Que Son	South Central Coast	High-Risk	Quang Tri	Huong Hoa	North Central	Low-Risk
Quang Tri	Da Krong	North Central	Moderate-Risk	Kon Tum	Ngoc Hoi	Central Highlands	Low-Risk	Quang Nam	Tra My	South Central Coa	Moderate-Risk
Thua Thien Hue	Phong Dien	North Central	Low-Risk	Quang Nam	Hien	South Central Coast	High-Risk	Quang Nam	Que Son	South Central Coa	High-Risk
Kon Tum	Dak To	Central Highlands	Moderate-Risk	Thua Thien Hue	Nam Dong	North Central	Moderate-Risk	Kon Tum	Ngoc Hoi	Central Highlands	Low-Risk
Quang Nam	Phuoc Son	South Central Coast	High-Risk	Da Nang	Hoa Vang	South Central Coast	Moderate-Risk	Quang Binh	Bo Trach	North Central	Low-Risk
Quang Ngai	Tra Bong	South Central Coast	Moderate-Risk	Da Nang	Lien Chieu	South Central Coast	Low-Risk	Quang Binh	Quang Ninh	North Central	Low-Risk
Quang Nam	Tra My	South Central Coast	High-Risk	Quang Tri	Da Krong	North Central	Moderate-Risk	Quang Nam	Nam Giang	South Central Coa	Moderate-Risk
Quang Nam	Que Son	South Central Coast	High-Risk	Quang Nam	Dai Loc	South Central Coast	High-Risk	Kon Tum	Dak Glei	Central Highlands	Moderate-Risk
Quang Nam	Nui Thanh	South Central Coast	Low-Risk	Kon Tum	Dak To	Central Highlands	Low-Risk	Thua Thien Hue	Phong Dien	North Central	Moderate-Risk
Quang Ngai	Son Ha	South Central Coast	Low-Risk	Thua Thien Hue	Phong Dien	North Central	Moderate-Risk	Thua Thien Hue	Quang Dien	North Central	Low-Risk
Dak Lak	Dak Nong	Central Highlands	Moderate-Risk	Kon Tum	Dak Glei	Central Highlands	Moderate-Risk	Da Nang	Lien Chieu	South Central Coa	Low-Risk
Dak Lak	Lak	Central Highlands	High-Risk	Quang Nam	Phuoc Son	South Central Coast	Moderate-Risk	Da Nang	Hoa Vang	South Central Coa	Moderate-Risk
Lam Dong	Lam Ha	Central Highlands	High-Risk	Quang Ngai	Tra Bong	South Central Coast	Low-Risk	Quang Nam	Hien	South Central Coa	Moderate-Risk
Ha Tinh	Cam Xuyen	North Central	Low-Risk	Kon Tum	Kon Plong	Central Highlands	Low-Risk	Quang Tri	Da Krong	North Central	Moderate-Risk
Ha Tinh	Ky Anh	North Central	Low-Risk	Quang Ngai	Ba To	South Central Coast	Low-Risk	Thua Thien Hue	A Luoi	North Central	Moderate-Risk
Quang Binh	Quang Trach	North Central	Low-Risk	Quang Ngai	Minh Long	South Central Coast	Low-Risk	Thua Thien Hue	Nam Dong	North Central	Moderate-Risk
Ha Tinh	Huong Khe	North Central	Low-Risk	Binh Dinh	Hoai An	South Central Coast	Low-Risk	Quang Nam	Dai Loc	South Central Coa	Moderate-Risk

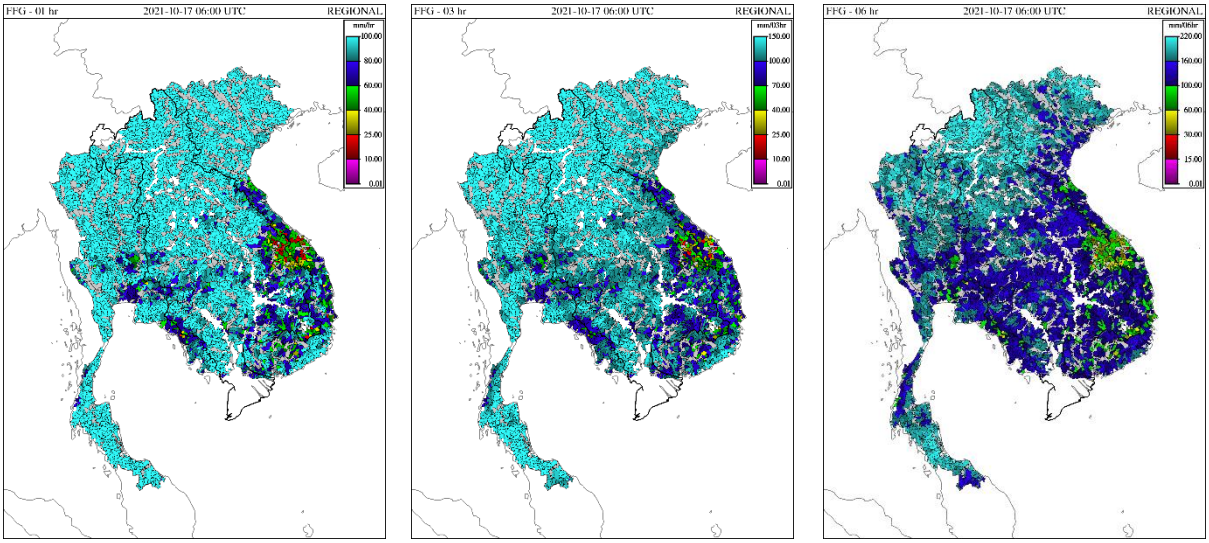


Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on Oct 17.

5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from 09 to 15 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 9 to 15, as displayed in Figure 15, shows that the LMB was normal in the north and wet in the south; the region received from average to above average rainfall during the monitoring week.

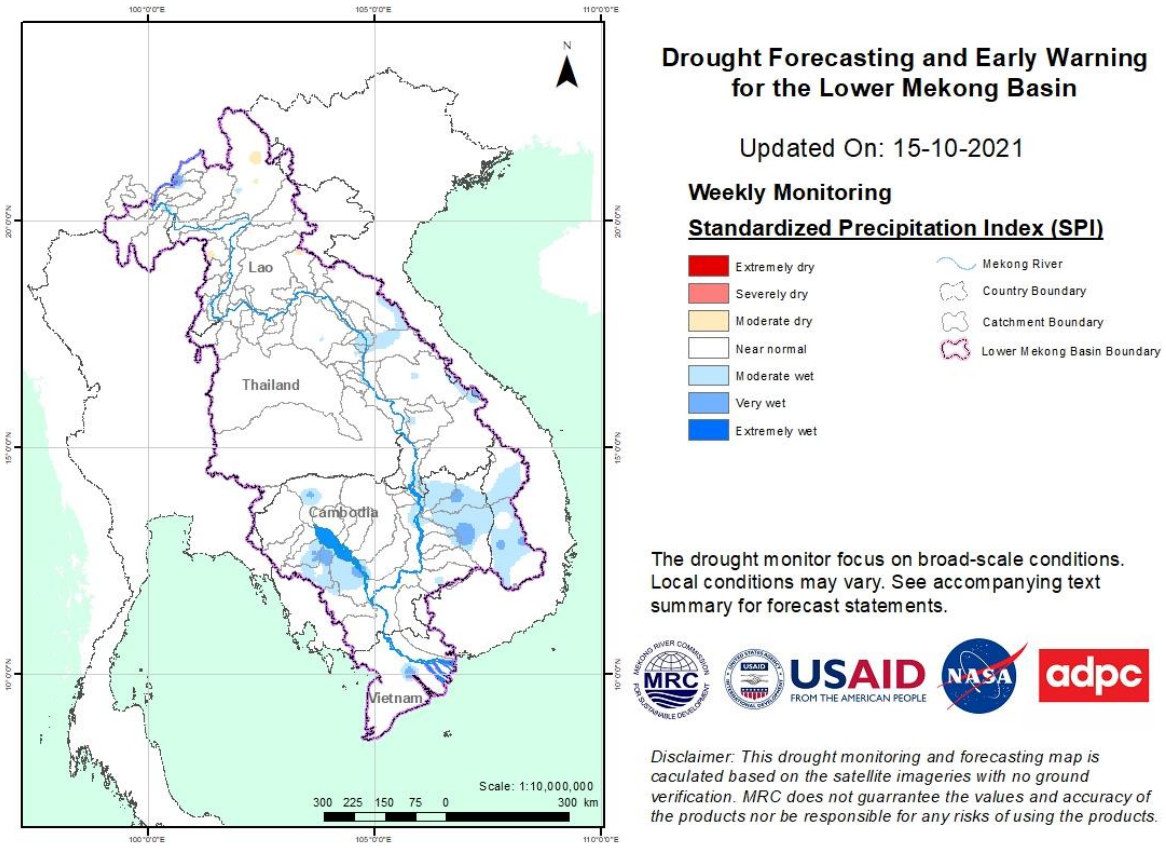


Figure 15. Weekly standardized precipitation index from 09 to 15 October 2021.

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

Like last week (Oct 2-8), the soil water fraction from October 9 to 15, as displayed in Figure 16, shows dry condition in the north, normal in the middle and extremely wet condition in the south and east of the LMB. The anomaly dry soil moistures covered some area of Phongsaly, Oudomxay, Luang Prabang, Xiengkhuang, and Vientiane of Lao PDR. The conditions were at moderate and severely dry.

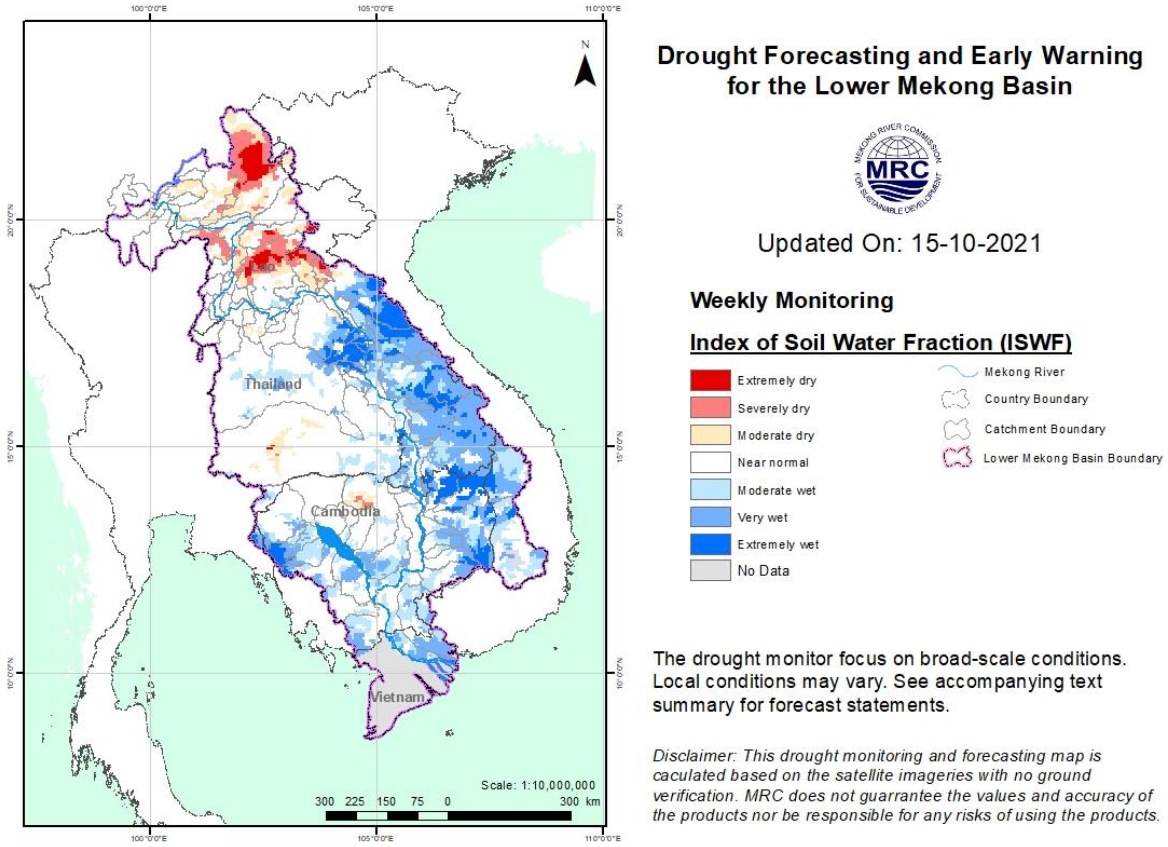


Figure 16. Weekly Soil Moisture Anomaly from 09 to 15 October 2021.

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

Amid some anomaly dry soil moistures in the northern part, the LMB were generally at normal during the monitoring week except some little area of Phongsaly province of Lao PDR int 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.

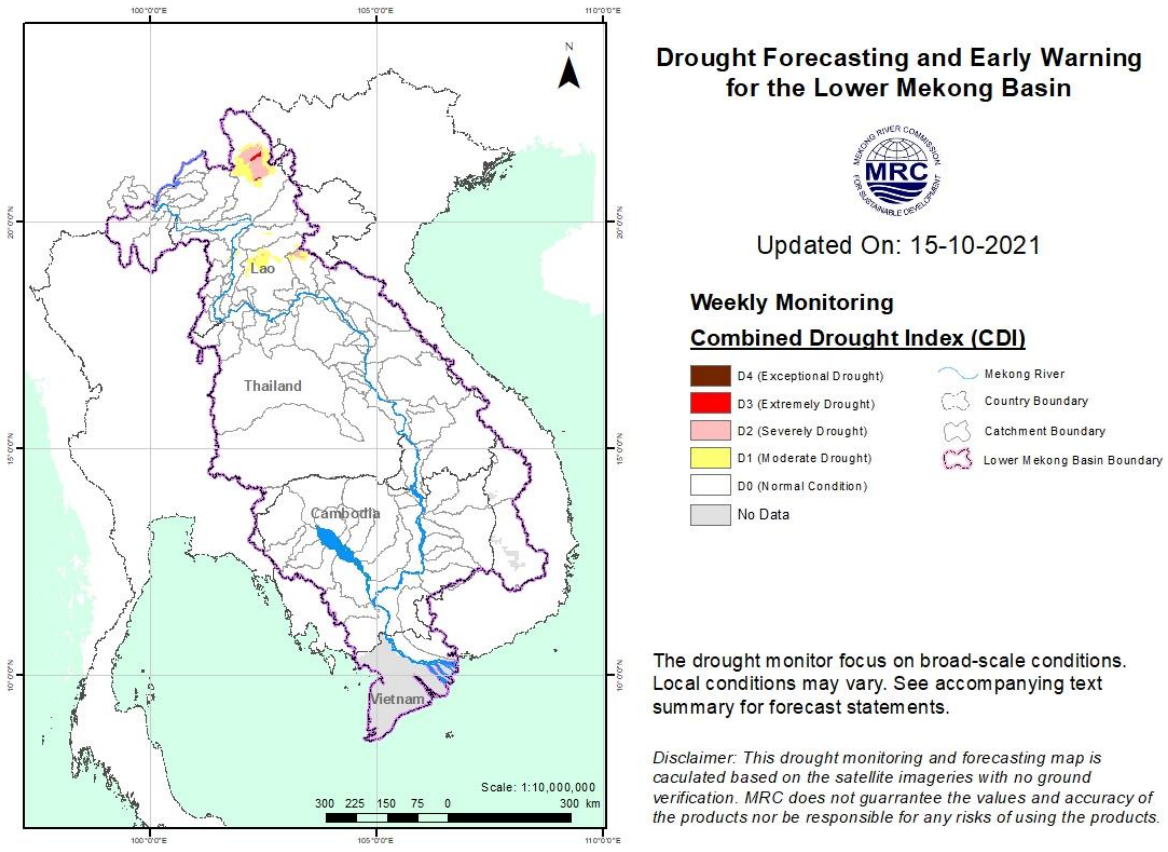


Figure 17. Weekly Combined Drought Index from 09 to 15 October 2021.

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.

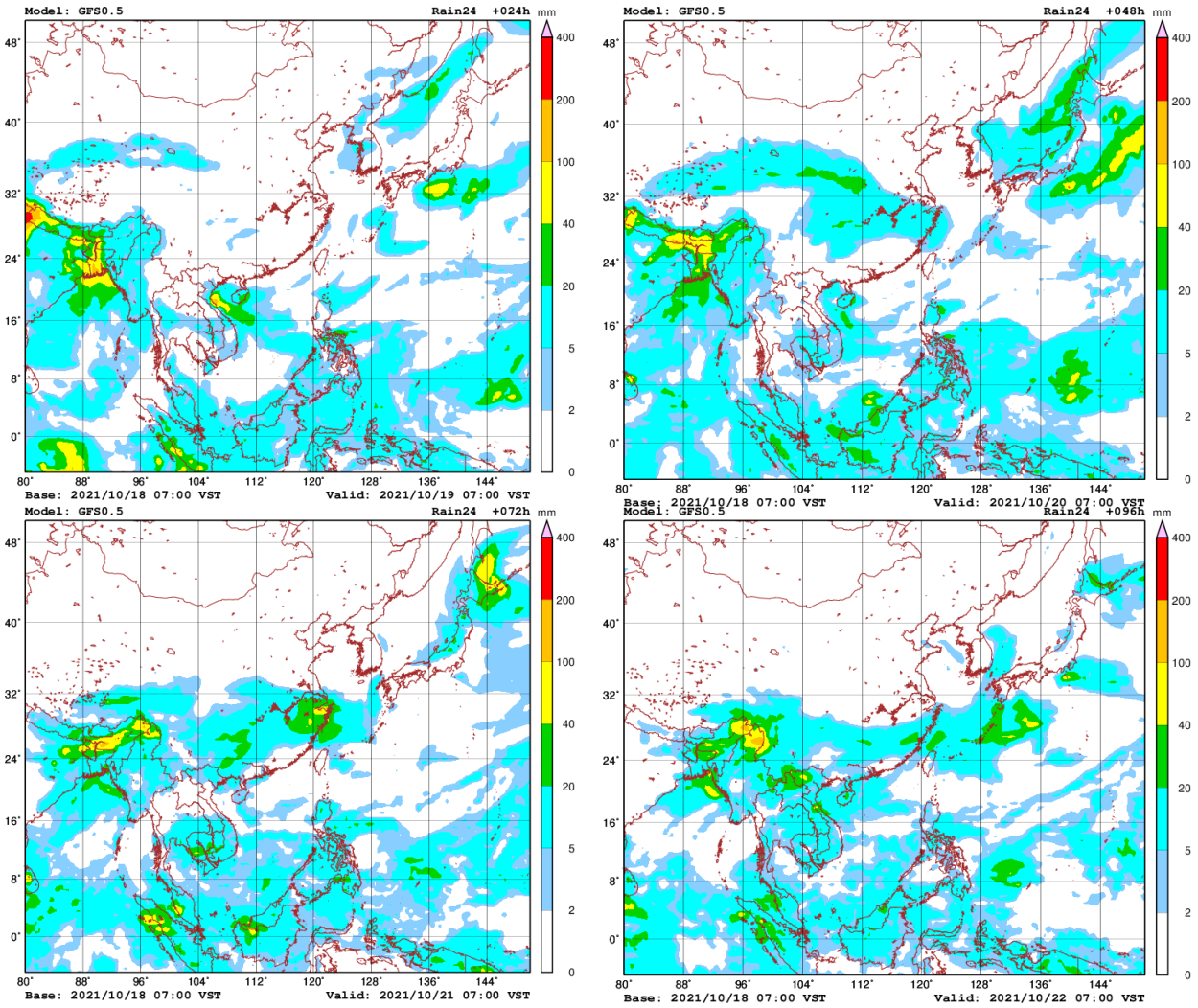
6 Weather and Water Level Forecast and Flash Flood Information

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 19 to 23, small (<20 mm/24h) will likely occur over the LMB. However, from October 24 to 25, 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 19-25.



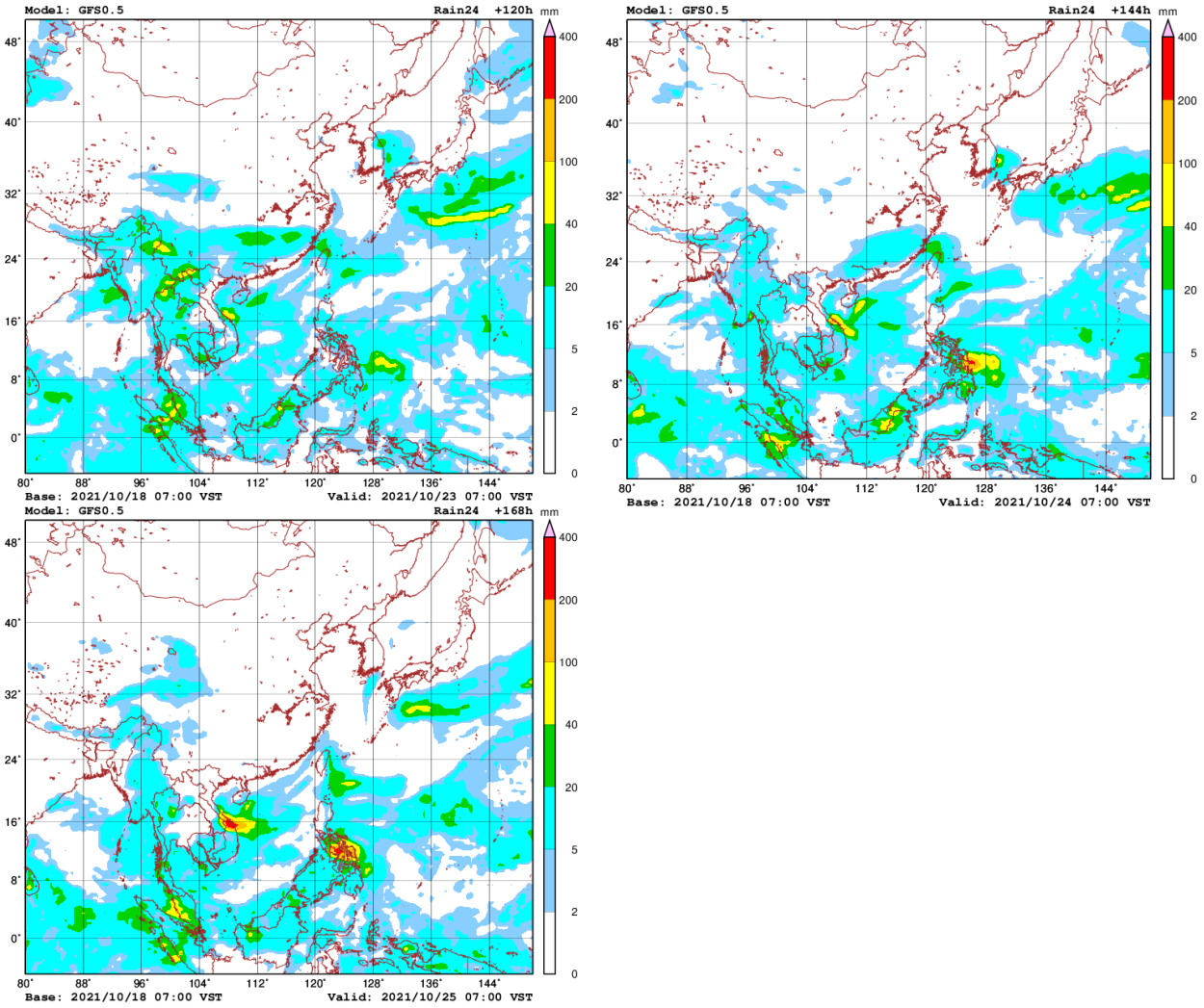


Figure 18. Accumulated rainfall forecast (24 h) based on a GFS model.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on October 18's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 2.33 m to 3.00 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 8.87 m to 9.50 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 up approximately 0.61 m, while water level at Vientiane in Lao PDR will also increase up to 0.66 m. Furthermore, from Nong Khai in Thailand, the water level will increase also about 0.70 m over the next five days; at Paksane in Lao PDR water level will increase about 0.30 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 Pakse in Lao PDR are forecasted to slightly decrease between 0.05 m and 0.30 m over the next five days. 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 up from 0.30 m to 2.20 m over the next five days (still being nfluenced by TD KOMPASU). 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 increase by about 0.55 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 12 to 18 October 2021, is presented in **Annex 1**.

Table 2 shows the daily flood forecasting Bulletin issued on October 18. 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.

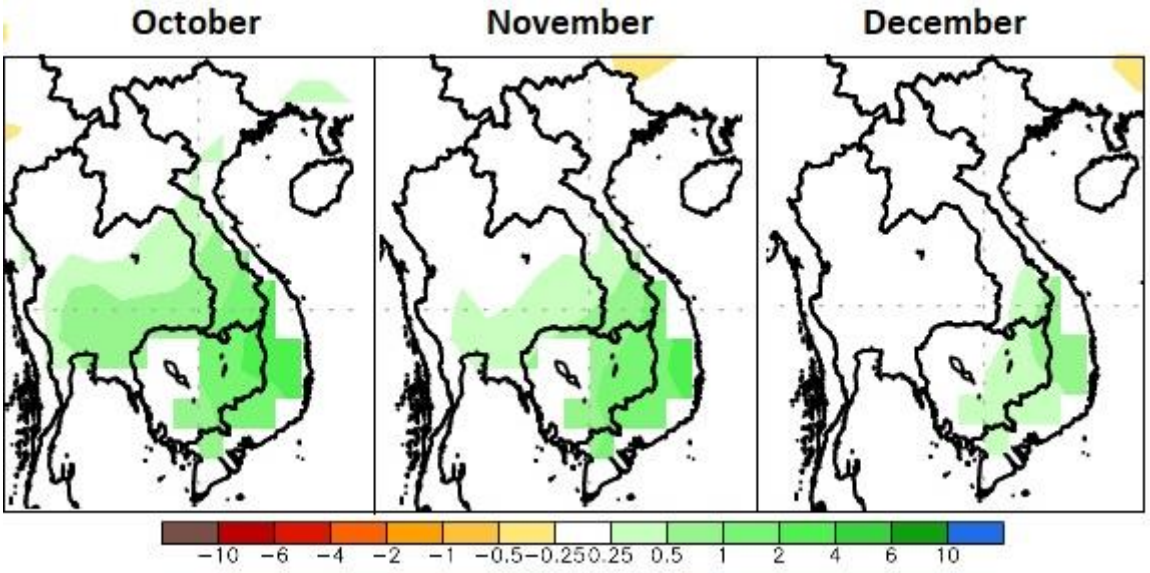


Figure 19. Daily average of monthly rainfall anomaly forecast from October to December 2021.

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: 19 October - 23 October 2021

Date: 18 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					
		17-Oct				17-Oct	18-Oct	19-Oct	20-Oct	21-Oct	22-Oct	23-Oct	18	19	20	21	22	23
Jinghong		0.0				536.03	536.04							×	×	×	×	×
Chiang Saen		0.0	357.110	12.80	11.50	2.19	2.33	2.72	2.75	2.77	2.82	3.00	↑	↑				↑
Luang Prabang		0.0	267.195	18.00	17.50	9.18	8.97	8.89	9.05	9.45	9.50	9.53	↓		↑	↑		
Chiang Khan		1.0	194.118	16.00	14.50	6.62	6.80	6.87	6.90	7.02	7.36	7.41	↑			↑	↑	
Vientiane		0.2	158.040	12.50	11.50	3.83	3.97	4.12	4.17	4.20	4.30	4.63	↑	↑				↑
Nongkhai		1.5	153.648	12.20	11.40	3.48	3.62	3.79	3.85	3.90	4.00	4.33	↑	↑				↑
Paksane		0.4	142.125	14.50	13.50	4.36	4.15	4.23	4.33	4.36	4.39	4.45	↓					
Nakhon Phanom		3.8	130.961	12.00	11.50	3.84	3.75	3.65	3.70	3.76	3.78	3.80						
Thakhek		2.5	129.629	14.00	13.00	5.09	4.99	4.88	4.94	5.02	5.05	5.08		↓				
Mukdahan		2.7	124.219	12.50	12.00	4.71	4.58	4.38	4.20	4.15	4.10	4.08	↓	↓	↓			
Savannakhet		2.2	125.410	13.00	12.00	3.11	3.01	2.85	2.72	2.70	2.68	2.66		↓	↓			
Khong Chiam		12.1	89.030	14.50	13.50	7.00	7.30	7.55	7.28	7.00	6.90	6.80	↑	↑	↓	↓		↓
Pakse		29.6	86.490	12.00	11.00	5.46	5.95	6.41	6.16	5.88	5.75	5.65	↑	↑	↓	↓	↓	↓
Stung Treng		10.5	36.790	12.00	10.70	6.75	7.32	8.10	8.59	8.68	8.44	8.33	↑	↑	↑	↑	↓	↓
Kratie		20.0	-0.101	23.00	22.00	15.69	16.33	17.21	18.05	18.60	18.72	18.50	↑	↑	↑	↑	↑	↓
Kompong Cham		7.5	-0.930	16.20	15.20	9.94	10.36	11.10	12.00	12.83	13.36	13.48	↑	↑	↑	↑	↑	↑
Phnom Penh (Bassac)		1.0	-1.020	12.00	10.50	6.81	6.99	7.30	7.66	8.00	8.20	8.25	↑	↑	↑	↑	↑	↑
Phnom Penh Port		-	0.070	11.00	9.50	5.83	6.02	6.33	6.69	7.03	7.23	7.28	↑	↑	↑	↑	↑	↑
Koh Khel (Bassac)		32.6	-1.000	8.40	7.90	6.09	6.21	6.46	6.75	7.00	7.16	7.20	↑	↑	↑	↑	↑	↑
Neak Luong		4.0	-0.330	8.00	7.50	4.92	5.04	5.30	5.60	6.00	6.30	6.49	↑	↑	↑	↑	↑	↑
Prek Kdam		7.2	0.080	10.00	9.50	5.99	6.11	6.36	6.63	6.90	7.05	7.10	↑	↑	↑	↑	↑	↑
Tan Chau		14.5	0.000	4.50	3.50	2.47	2.59	2.65	2.70	2.73	2.75	2.76	↑	↑	↑	↑		
Chau Doc		4.0	0.000	4.00	3.00	2.35	2.46	2.51	2.56	2.60	2.63	2.65	↑	↑	↑	↑	↑	

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 12-18, including the lower part in Cambodia and Viet Nam, varying from 5.60 mm to 210.60 mm due to influence of the Tropical Storm KOMPASU, and considered high at the middle and lower 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 100 mm for the next seven days. The forecasting model using GFS data, moreover, shows that significant rainfall (<100 mm) is likely to take place in the Mekong region from 19 to 23 October 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 12 to 18 October 2021. Water levels at this station significantly increased from 535.27 m on 8 Oct to 536.02 on 18 Oct 2021 (recorded on 7:00 am) and stayed about 0.08 m higher than its long-term-average (LTA) value. The outflow was up from 832.00 m^3/s on 8 Oct to 1348.51 m^3/s on 18 Oct 2021. From October 8 to 18, water level at this station rose about 0.75 m and was about 0.08 m higher than its LTA value.

Along with the significant increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand slightly increased from 10 to 18 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 0.33 m during 10-18 October due to some rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were also increasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia were significantly increasing, due to high rainfall (Tropical Strom "KOMPASU") and following the same trend of the upstream flow (at Pakse and 3S area in Viet Nam).

Over the next five days, the water levels from Stung Treng, Kratie, Kompong Cham to the lower part at key stations in Cambodia are expected to go up between 0.50 m and 2.00 m.

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

From Stung Treng to Kampong Cham, the water levels will continue staying 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 remain 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 9 to 15. 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.

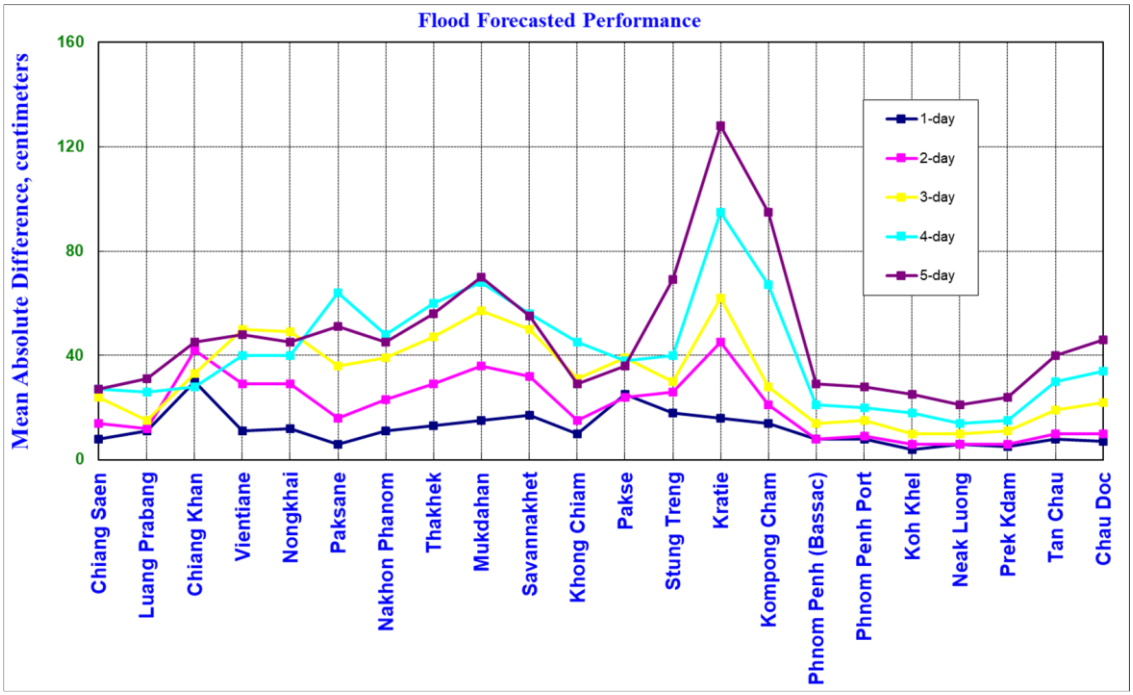
Annex 1: Performance of the weekly flood forecasting

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 12 to 18 October 2021.

The forecasting values from 12 to 18 October show that the overall accuracy is fair for a one-day to three-day forecast in lead time at stations in the middle to the lower parts of the Mekong River from Luang Prabang to Chiang Khan due to the effect of heavy 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 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 12 to 18, October 2021.

Table B1: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 12 to 18 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	8	11	30	11	12	6	11	13	15	17	10	25	18	16	14	8	8	4	6	5	8	7
2-day	14	12	42	29	29	16	23	29	36	32	15	24	26	45	21	8	9	6	6	6	10	10
3-day	24	15	33	50	49	36	39	47	57	50	31	39	30	62	28	14	15	10	10	11	19	22
4-day	27	26	28	40	40	64	48	60	68	56	45	38	40	95	67	21	20	18	14	15	30	34
5-day	27	31	45	48	45	51	45	56	70	55	29	36	69	128	95	29	28	25	21	24	40	46

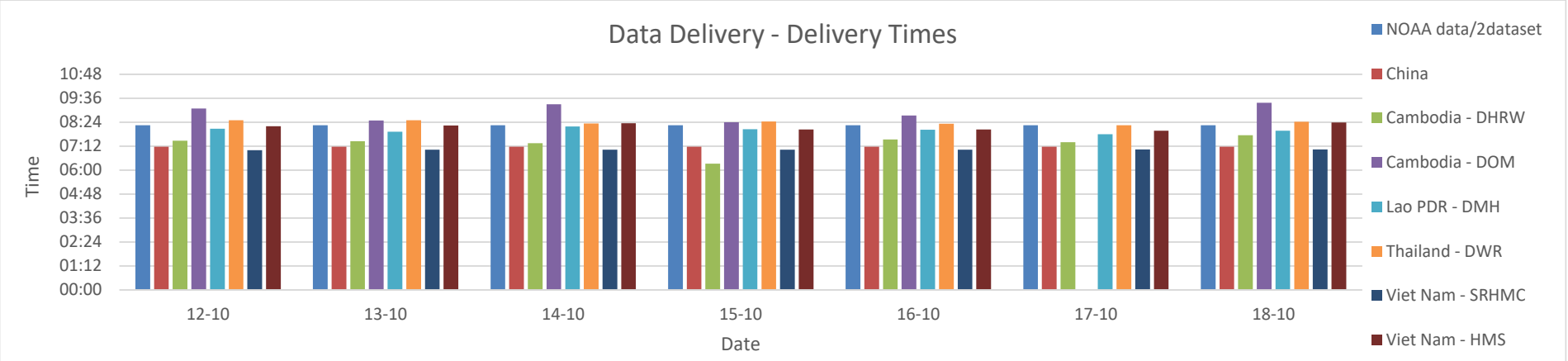
Table B2: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 12 to 18 October, 2021 in %

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	71.4	57.1	71.4	42.9	71.4	57.1	71.4	57.1	57.1	42.9	42.9	42.9	42.9	42.9	71.4	71.4	71.4	71.4	71.4	57.1	57.1	***59.1***
2-day	50.0	66.7	50.0	66.7	50.0	50.0	66.7	50.0	33.3	50.0	50.0	50.0	66.7	66.7	66.7	50.0	50.0	66.7	83.3	50.0	66.7	66.7	***57.6***
3-day	60.0	80.0	80.0	60.0	60.0	60.0	60.0	60.0	40.0	40.0	40.0	40.0	60.0	20.0	40.0	60.0	60.0	40.0	60.0	40.0	80.0	80.0	***55.5***
4-day	25.0	50.0	75.0	75.0	75.0	50.0	50.0	50.0	50.0	50.0	50.0	75.0	25.0	75.0	50.0	50.0	25.0	50.0	50.0	50.0	75.0	75.0	***54.5***
5-day	33.3	66.7	66.7	66.7	66.7	66.7	33.3	33.3	33.3	66.7	33.3	66.7	66.7	66.7	66.7	66.7	66.7	66.7	33.3	66.7	66.7	66.7	***57.6***

Table B3: Overview of performance indicators for the past 7 days from 12 to 18 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*	*07:19*	*08:53*	*08:00*	*08:23*	*07:01*	*08:10*	*0*	*0*	*1*	*34*	*57*	*14*	*3*	*0*
month	*10:30*	*00:00*	-	-	*08:15*	*07:10*	*07:21*	*08:36*	*08:26*	*08:14*	*07:17*	*08:10*	*0*	*0*	*14*	*272*	*334*	*48*	*7*	*38*

Fig. B4: Data delivery times for the past 7 days from 12 to 18 October 2021



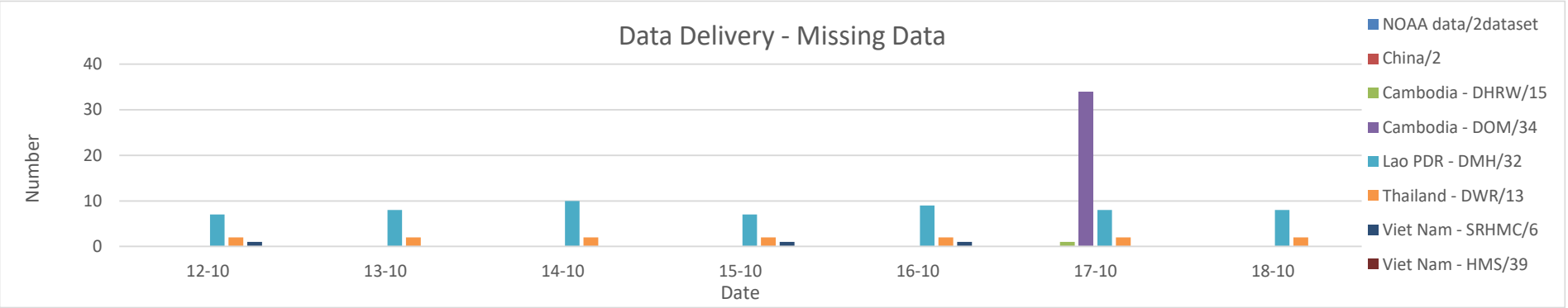
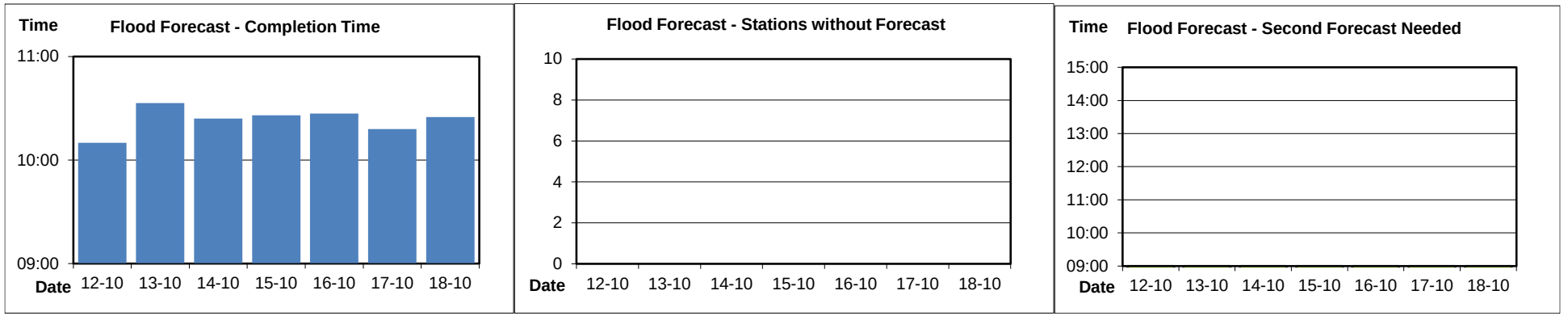


Fig. B5: Missing data for the past 7 days from 12 to 18 October 2021

Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 12 to 18 October 2021



Mekong River Commission Secretariat

P. O. Box 6101, 184 Fa Ngoum Road, Unit 18 Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR
Tel: +856 21 263 263. Fax: +856 21 263 264 ww.mrcmekong.org