Mekong River Commission

Weekly Wet Season Situation Report in the Lower Mekong River Basin

05-11 July 2022

Prepared by
The Regional Flood and Drought Management Centre
12 July 2022

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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 Tan Chau and Chau Doc in Viet Nam, including the middle and lower parts in Lao PDR and Cambodia, varying from 1.60 millimetres (mm) to 188.40 mm.

- There will be above-average rainfalls for the next 5 days over the Mekong region from 12 to 17 July 2022 because there will be a low pressure dominating the Mekong region.

Water level and its forecast

- According to MRC's observed water level at Jinghong, it showed a significant surge from 535.41 m to 537.46 m from 05 to 11 July 2022. The current level is staying about 1.79 m higher than its LTA (2015-2021) value. The outflow at Jinghong station increased from 929.00 m3/s to 2490.00 m3/s from 05 to 11 July 2022.

- Along with the increasing outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand increased about 1.67 m from 05 to 11 July 2022, staying about 0.10 m higher than its LTA level**,** which is considered a normal situation.

- Moreover, water level at Chiang Khan in Thailand from 05 to 11 July 2022 increased about 1.20 m and stayed about 0.12 m higher than its LTA value, while water level at Vientiane increased about 1.08 m and stayed about 0.14 m higher than its LTA level, which **considered normal**. Water levels at Nong Khai increased 0.72 m and at Paksane increased about 1.38 m, staying about 0.86 m and 0.33 m lower than their LTA value, respectively, **considered critical**.

- Water levels from Nakhon Phanom in Thailand and Pakse in Lao PDR increased between 0.70 m and 1.35 m. The current WLs at these stations are staying about 0.50 m and 1.00 m lower than their LTA level, considering **critical**. From the stretches of the river at Stung Treng WL increased 0.48 m and stayed about 0.68 m lower than its LTA, while at Kratie water level increased 1.19 m, staying 1.35 m lower than its LTA level, which considered **critical**.

- Water levels from Kompong Cham down to Chaktomuk, Koh Khel and Phnom Penh Port to Prek Kdam in Cambodia increased between 0.30 m and 1.20 m, staying between 0.30 m and 1.50 m lower than their LTA level, considering **critical.**

- The current water levels for most of the stations are having water level higher than their LTA value. WLs at the 2 tidal stations at Tan Chau and Chau Doc were above their LTA value due to tidal effect during this monitoring period.

- Over the next five days, the water levels across most monitoring stations are expected to go up but still staying lower than their long-term average value in most stations.

Drought condition and its forecast

- During July 3-9, most areas of the LMB were at normal conditions. The region was facing only some meteorological drought covering some part of **Stung Treng and Phreah Vihea** of Cambodia in the lower part. No significant drought threat was found during the reporting week.

- In **July**, droughts are likely to take place in the **northern part, 3S area, and Mekong Delta of Viet Nam** with **moderate, severe, and extreme conditions**; in **August** droughts are intensifying over the **3S area of Cambodia, Lao PDR, and Viet Nam** with **severe and extreme conditions;** while in **September** droughts are moving westwards from the locations in August with smaller extent and severity.

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 **05-11 July 2022**. 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 (July, August and September) and the weather maps issued by the Thai Meteorological Department (TMD) were used to verify weather conditions in the LMB.

Since the beginning of July 2022, below-average rainfall has dropped over the LMB with decreasing water levels in both mainstream and tributaries. The data from the TMD predict that abundant rainfall will happen again in the 2nd week of July because of the coming back low-pressure trough moving downward in the LMB. From July to September, the low-pressure trough is going to prevail over the Mekong region bringing rainfalls for the start of rainy season period in 2022.

Figure 1 presents the weather map of 11 July 2022, showing low-pressure dominating the upper part of the Mekong region, which might bring some rains for the next few days. The average rainfall is also 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.

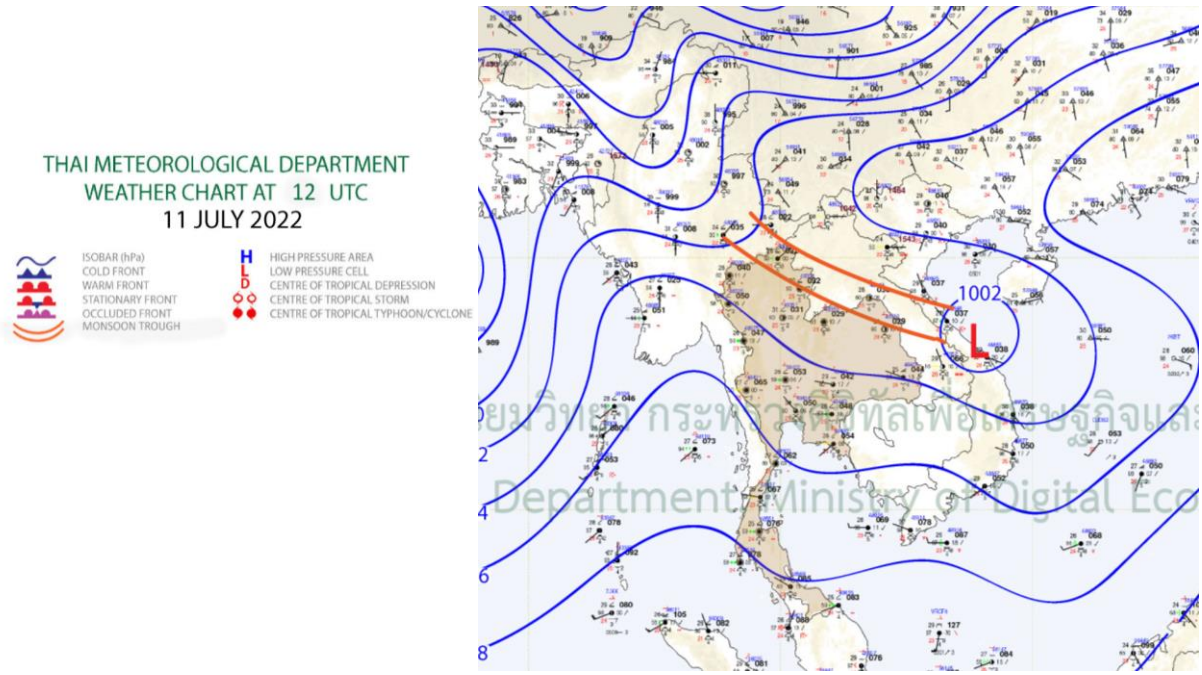


Figure 1. Summary of weather conditions over the LMB.

According to the ASEAN Specialised Meteorological Centre (ASMC), the highest probability of warm and wet conditions is predicted over the lower part of the Mekong region from 11 to 24 July 2022. Moreover, the Mekong region is likely dominated by warm and wet conditions, which may bring rainfall and warm temperatures in general to the upper and lower parts of the LMB. **Figure 2** shows the outlook of weather condition from 11 to 24 July 2022 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

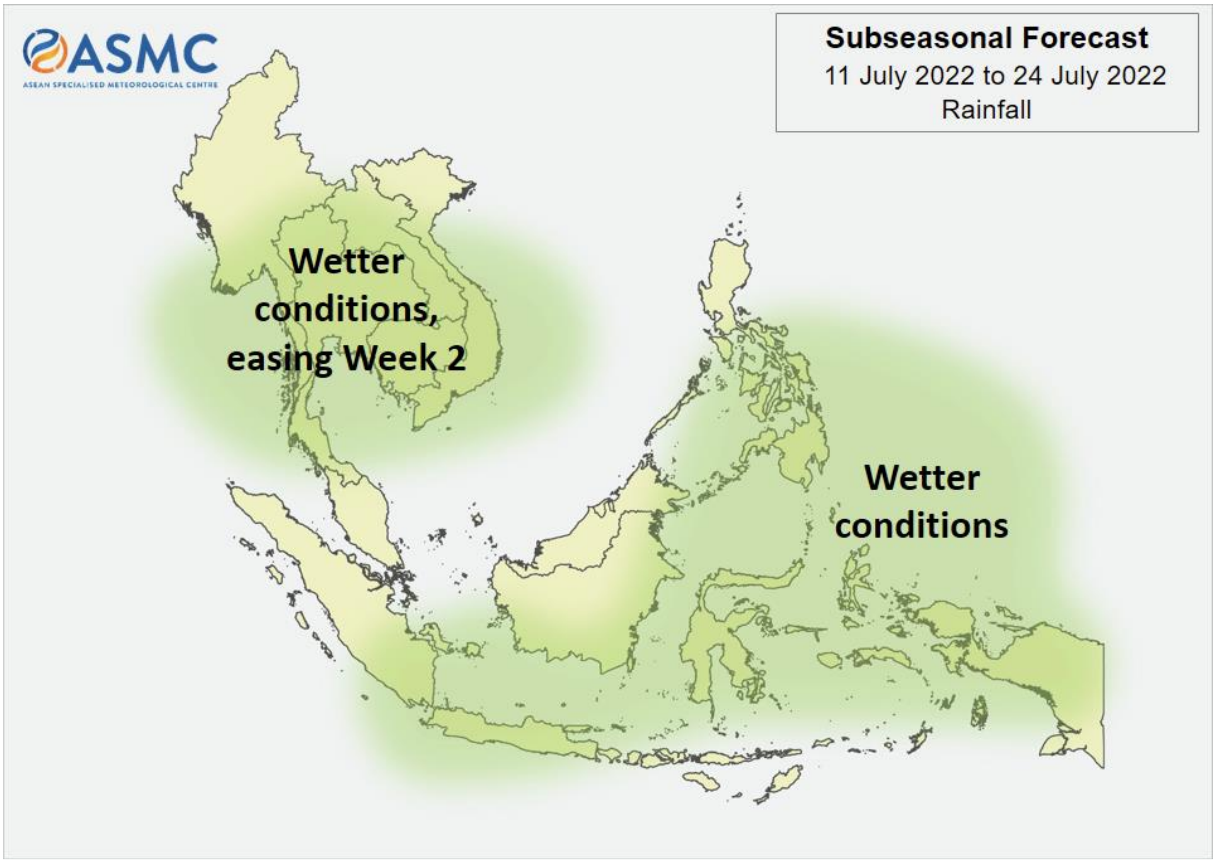


Figure 2. Outlook of wet and dry conditions over the Asian countries by ASMC.

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 between 05 and 11 July 2022, a low-pressure line is still presenting as shown in Figure 1. No storms movement detected on July 11 in the LMB, as displayed in Figure 3.

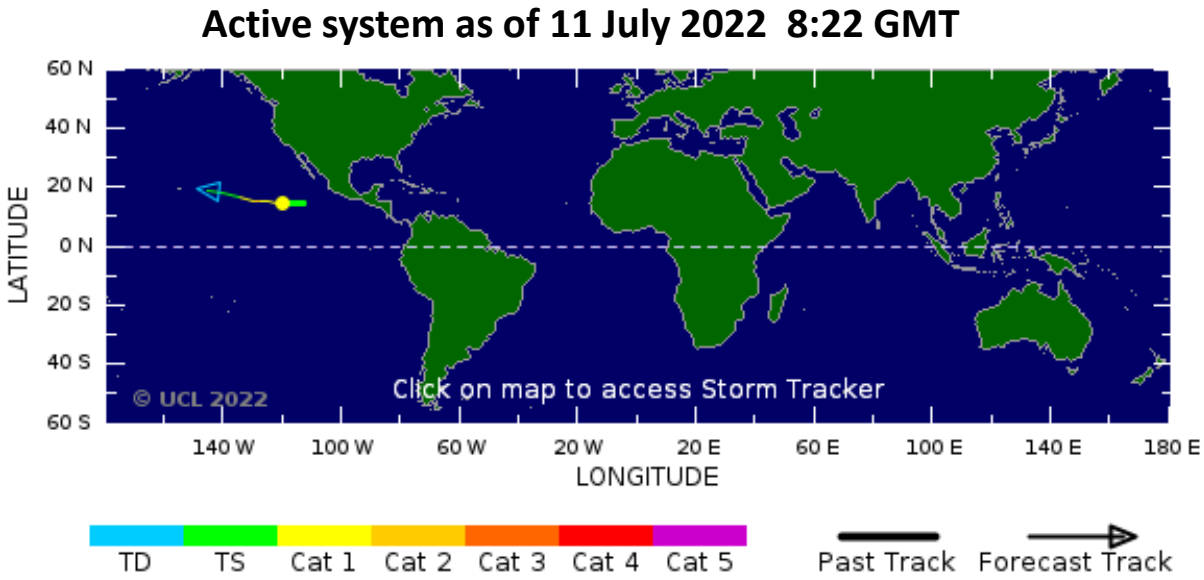


Figure 3. A tropical depression risk observed on 11 July 2022.

2.2 Rainfall patterns over the LMB

This week from 05 to 11 July 2022, rainfall was observed from the upper to lower part starting from Chiang Saen in Thailand to Tan Chau and Chau Doc in Viet Nam of the Lower Mekong Basin, varied from 2.70 mm to 188.40 mm. The highest rainfall of this week report concentrated in Kratie area of Cambodia, which reached up to 188.40 mm. The total rainfall of this week report in the Mekong region, compared with last week and its long-term-average (LTA) is showed in Figure 4. The total rainfall this week was bigger from Paksane to Prek Kdam, compared with last week rainfall and its LTA.

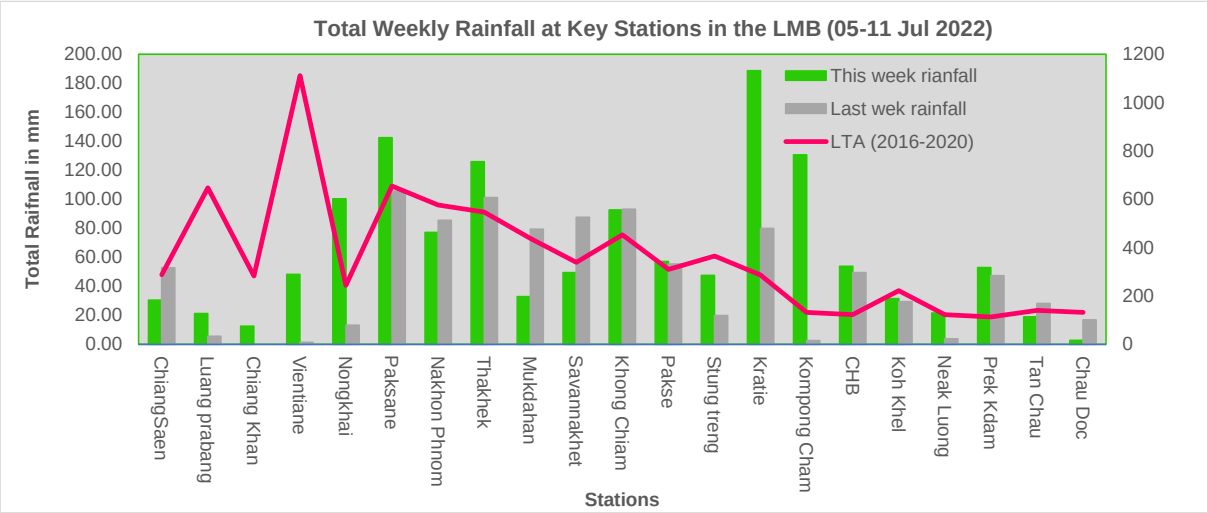


Figure 4. Weekly total rainfall at key stations in the LMB during 05- 11 July 2022.

To verify area rainfall distribution, Figure 5 shows a map of the weekly accumulated rainfall based on observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 05 to 11 July 2022.

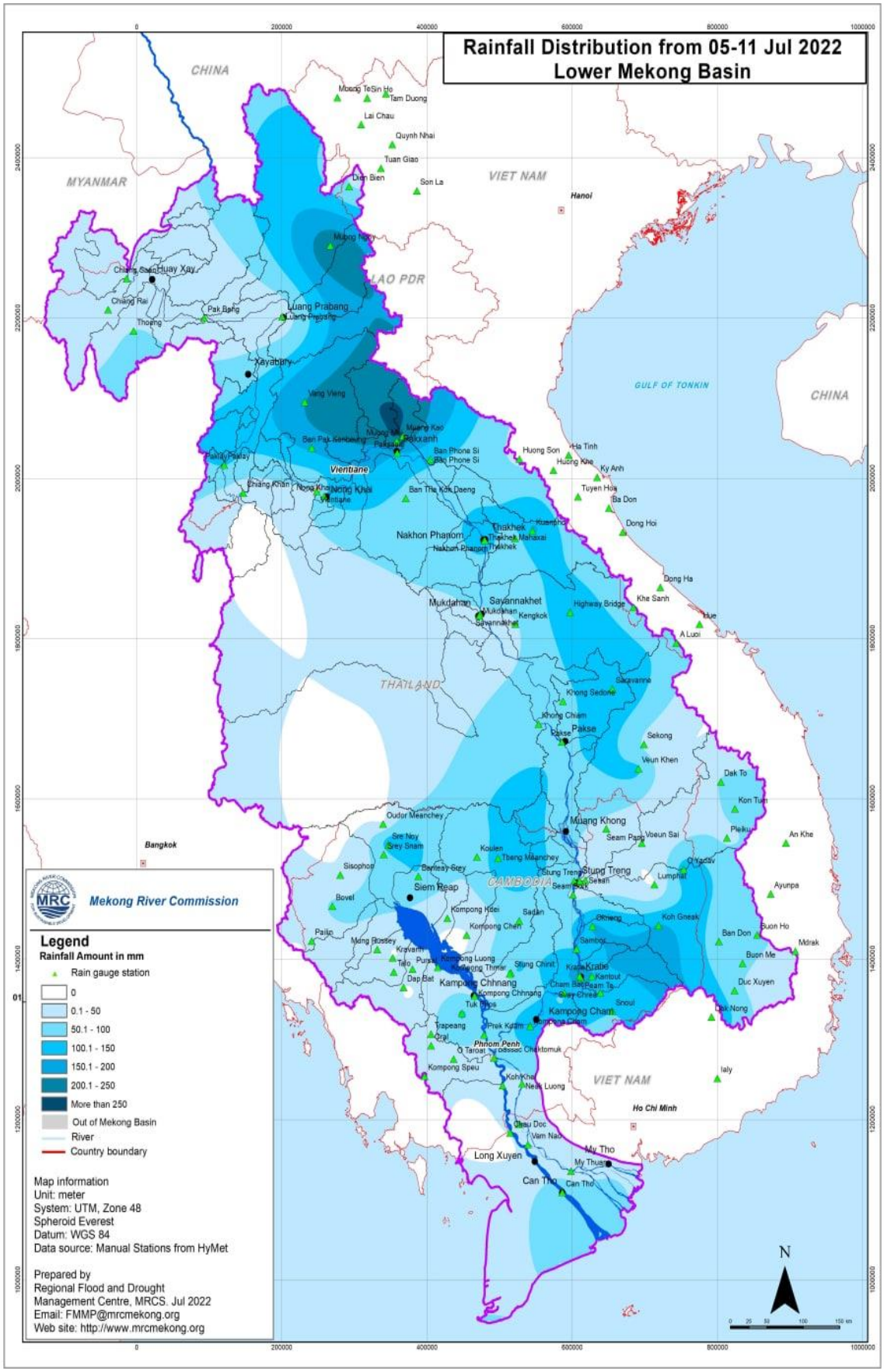


Figure 5. Weekly rainfall distribution over the LMB during 05-11 July 2022.

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.

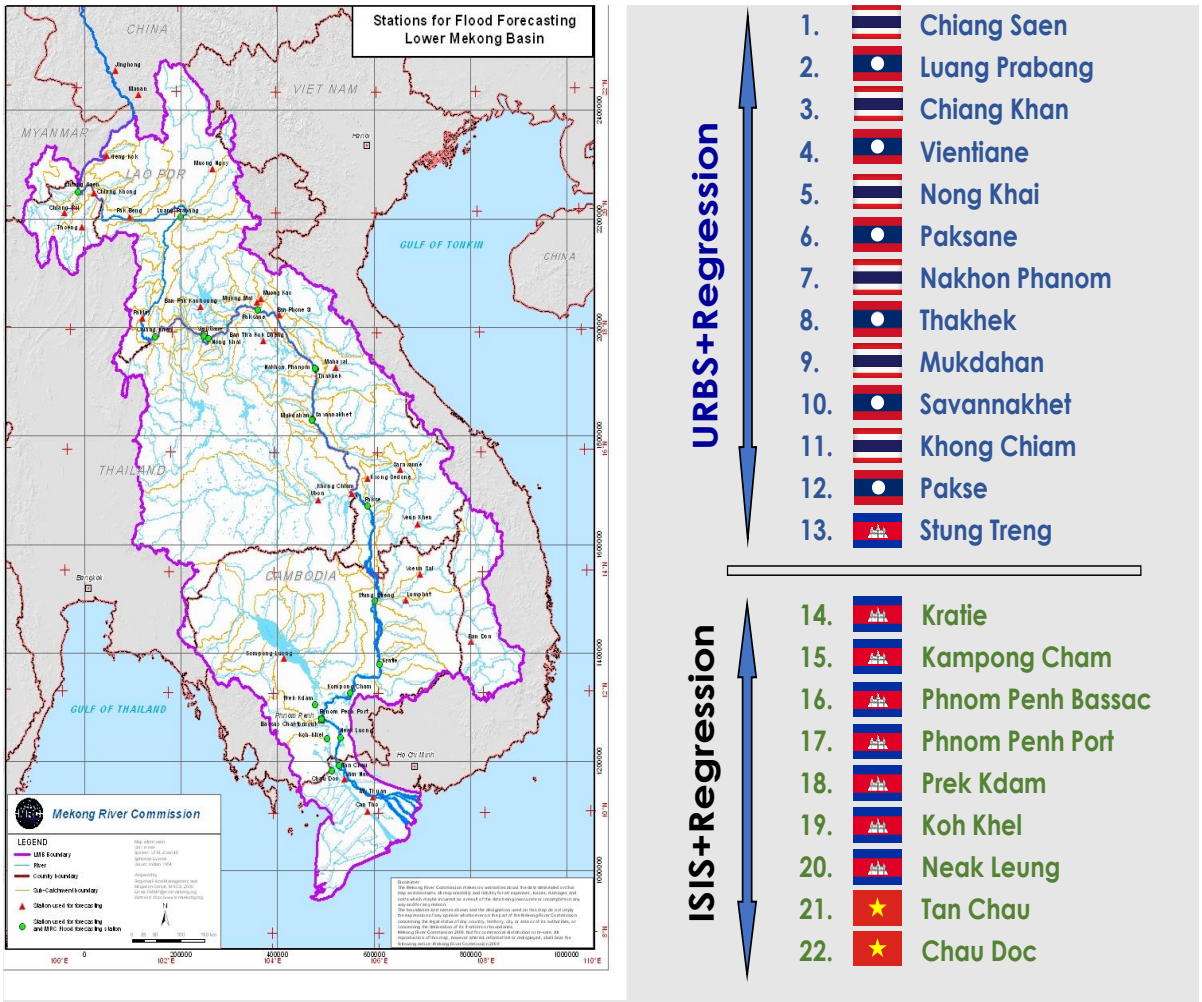


Figure 6. Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC's observed water level at Jinghong, it showed a significant surge of WL from **535.41 m to 537.46 m from 05 to 11 July 2022 (recorded on 7:00 am)**. The current level is staying about 1.79 m higher than its Long-Term-Average (LTA: 2015-2021) value. The outflow at Jinghong station increased from 929.00 m^3/s to 2,490.00 m^3/s from 05 to 11 July 2022. Figure 7 below presents water level that increased at the Jinghong hydrological station[1], indicating the trend of fluctuating water level up to 11 July 2022

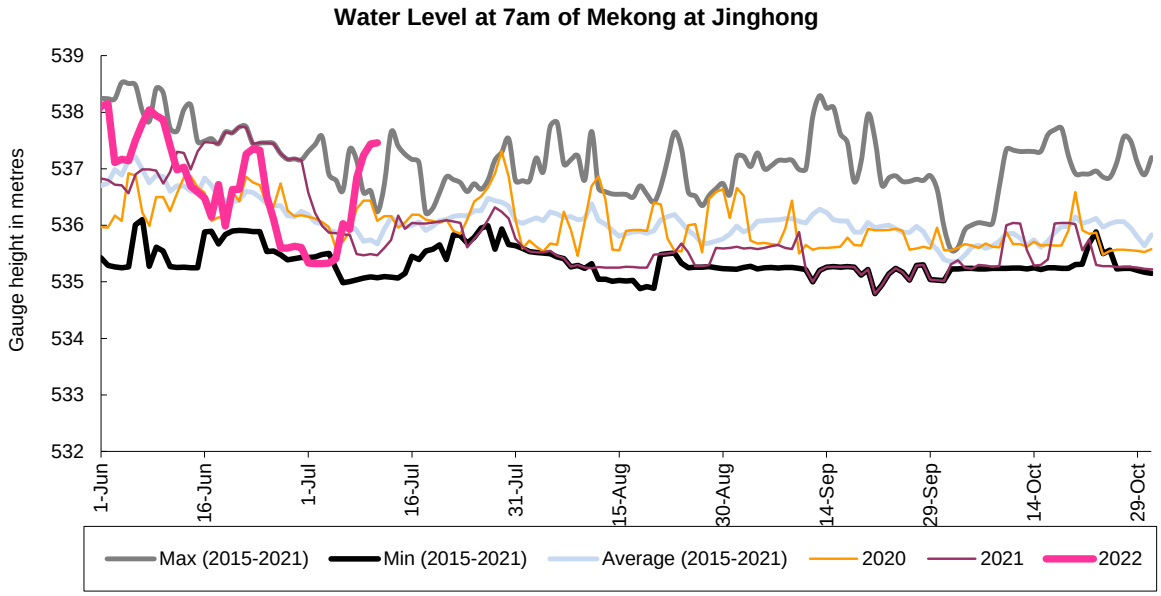


Figure 7. Water level at the Jinghong hydrological station up to 11 July 2022.

Along with the increasing outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand increased about 1.67 m from 05 to 11 July 2022, staying about 0.10 m higher than its LTA level**, which is considered normal**.

Moreover, water level at Chiang Khan in Thailand from 05 to 11 July 2022 increased about 1.20 m and stayed about 0.12 m higher than its LTA value, while water level at Vientiane increased about 1.08 m but still stayed about 0.14 m higher than its LTA level, which **considered normal**. Water levels at Nong Khai increased 0.72 m and at Paksane increased about 1.31 m, but still stayed about 0.86 m and 0.33 m lower than their LTA value, respectively which is still **considered critical**.

Water levels from Nakhon Phanom in Thailand and Pakse in Lao PDR increased between 0.74 m and 1.35 m. The current WLs at these stations are staying about 0.50 m and 1.50 m lower than their LTA level, considering **critical**. From the stretches of the river at Stung Treng increased 0.48 m and stayed about 0.68 m lower than its LTA, while at Kratie water level increased 1.19 m, staying 1.35 m lower than its LTA level, which considered **critical**.

Water levels from Kompong Cham down to Chaktomuk, Koh Khel and Phnom Penh Port to Prek Kdam in Cambodia increased between 0.05 m and 0.25 m, staying between 0.50 m and 2.00 m lower than their LTA level, considering **critical**.

[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.

Except water levels at Luang Prabang, Chiang Khan and Vientiane, the rest of water levels at key stations were lower than their LTA value. The tidal stations at Tan Chau and Chau Doc have WL lower than their LTA value due to tidal effect during this monitoring period.

Based on hydrological phenomenon, the contribution of inflow water from the upstream of Lancang-Mekong in China to the Mekong mainstream is from 16% to 18% 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.

Chiang Saen and Luang Prabang

The water level from 05 to 11 July 2022 at Thailand's Chiang Saen increased from 2.95 m to 4.62 m, showing 0.10 m higher than its Long-Term-Average (LTA) value, which considered normal. The water level at Luang Prabang station in Lao PDR increased about 0.74 m from 10.08 m to 10.82 m during the reporting period. This level shows 1.95 m higher than its LTA (about 4.81 m lower than its maximum value). The trend – sometimes higher or lower to its historical maximum and LTA values – has been observed since early 2022. 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**.

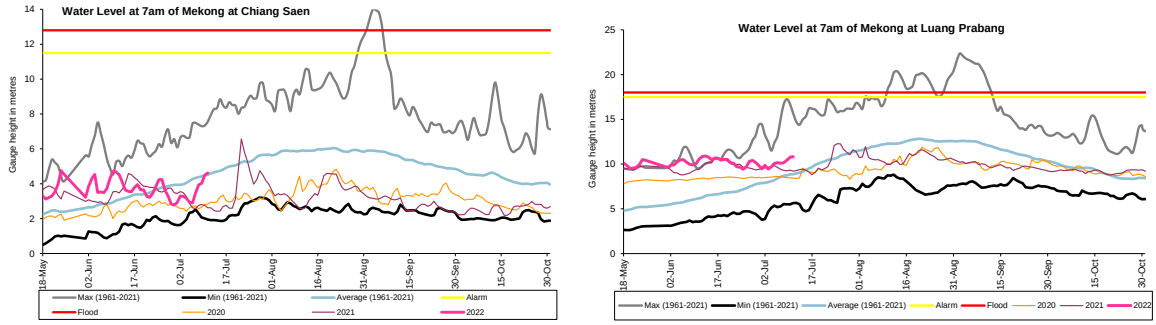


Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) increased from 7.21 m to 8.41 m during the reporting week. It showed 0.12 m higher than its LTA value. The water level downstream at Vientiane in Lao PDR followed the upstream trend. It also increased from 4.23 m to 5.31 m and was about 0.14 m higher than its LTA during 05 –11 July 2022. At Nong Khai station in Thailand, the water level was also up during the reporting period. It increased about 0.72 m from 4.25 m to 4.97 m and showing 0.86 m lower than its LTA. At Paksane in Lao PDR, water levels increased about 1.33 m from 5.60 m to 6.93 m. The water level at this station was about 0.33 m lower than its LTA value. The recently increased water levels were obviously due to the high rainfall in the sub-catchment area, amid the inflows and water released from upstream. The water levels at Vientiane and Paksane are shown in Figure 9 below.

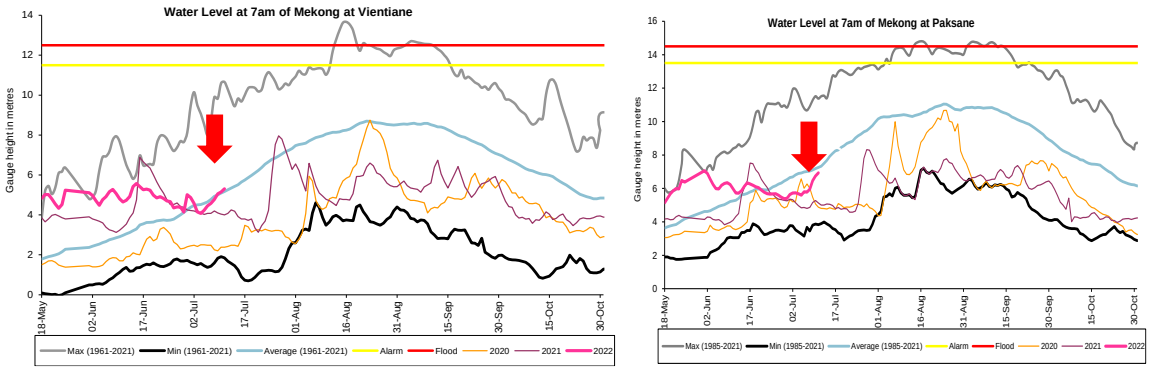


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were increasing between 0.74 m and 1.38 m due to high contribution of rainfalls and inflow from upstream. **Water levels at these stations are still staying about 0.50 m to 1.60 m lower than their LTA level, which considered critical**. Figure 10 shows the water levels at Nakhon Phanom and Pakse stations.

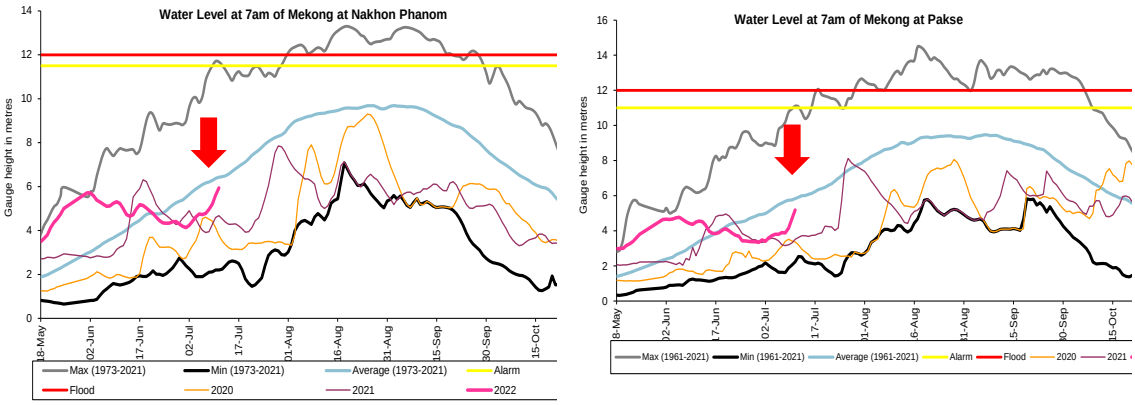


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

Stung Treng to Kompong 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 were increasing during 05-11 July 2022. The water levels at Stung Treng increased about 0.48 m, while at Kratie increased about 1.19 m, staying about 0.68 m and 1.35 m below their LTA respectively (as showed in Figure 11). The water level at Kompong Cham station increased about 1.15 m and was about 2.08 m lower than its LTA. Generally, the **Water levels at these stations were lower than their LTA, which considered critical**.

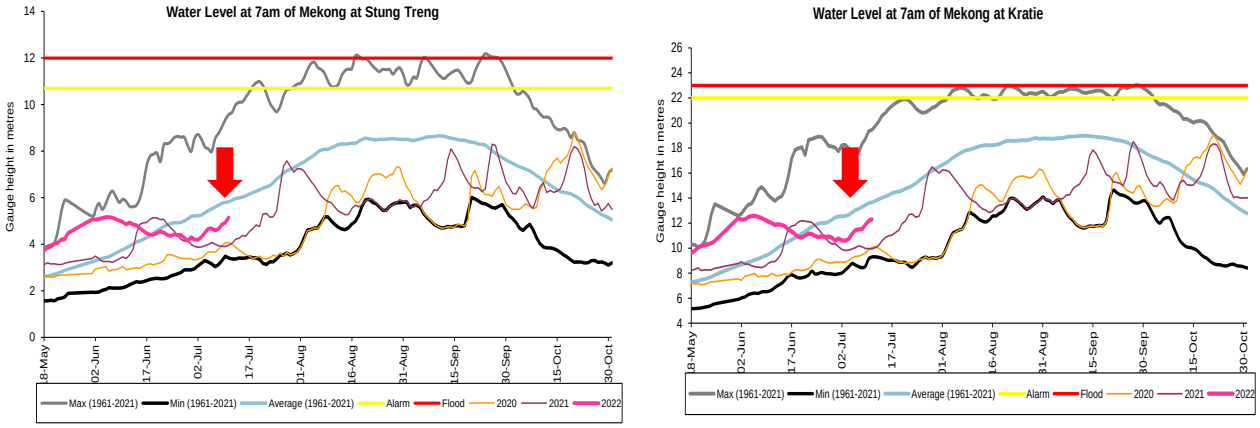


Figure 11. Water levels at Stung Treng and Kratie on the Mekong River.

At Chaktomuk on the Bassac River, due to high rainfall and contributed flows from upstream catchment, the water level was up by about 0.41 m and stayed 1.62 m lower than its LTA value; while at Koh Khel, water level increased about 0.35 m, staying 0.80 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake increased about 0.39 m and was about 1.37 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 high rainfall and 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. From next week, w**ater levels at most of these stations were staying close to their LTA levels, which will consider normal situation**.

Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 05 to 11 July 2022 at Viet Nam's Tan Chau and Chau Doc were fluctuating due to daily tidal effects from the sea. The fluctuation levels were between 0.08 m and 1.25 m; they were in between the range of their LTA and historical minimum levels and **considered critical**. The current water levels at Tan Chau and Chau Doc are higher than their LTA levels up to 11 July 2022.

The Tonle Sap Flow

At the end of the dry season, when water levels along the Mekong River rise and the inflows of the Mekong River return into the Tonle Sap Lake. This phenomenon normally takes place from end of May to July. Based on flow observation at Prek Kdam, the inflow of the Tonle Sap Lake took place since 29 May 2022.

Figure 12 shows the seasonal changes of the inflow/reverse flow and the inflow of the TSL at Prek Kdam in comparison with the flows of 2019 and 2020, and their LTA level (1997-2020). Up to July 11 of this reporting period, **it was observed that the main inflow into Tonle Sap Lake slightly increased due to rainfall and inflows from upstream**. This increased inflow into the Tonle Sap Lake was most likely caused by inflows and rainfall from the catchment area. Up to present, the inflow into the Tonle Sap Lake condition in 2022 is higher than 2019, 2020, 2021 but lower than its LTA (1997-2021) inflow conditions. For next week, some rainfall is

forecasted for the Tonle Sap area; thus, the outflow from the Tonle Sap Lake is likely continuing to drop from the current level.

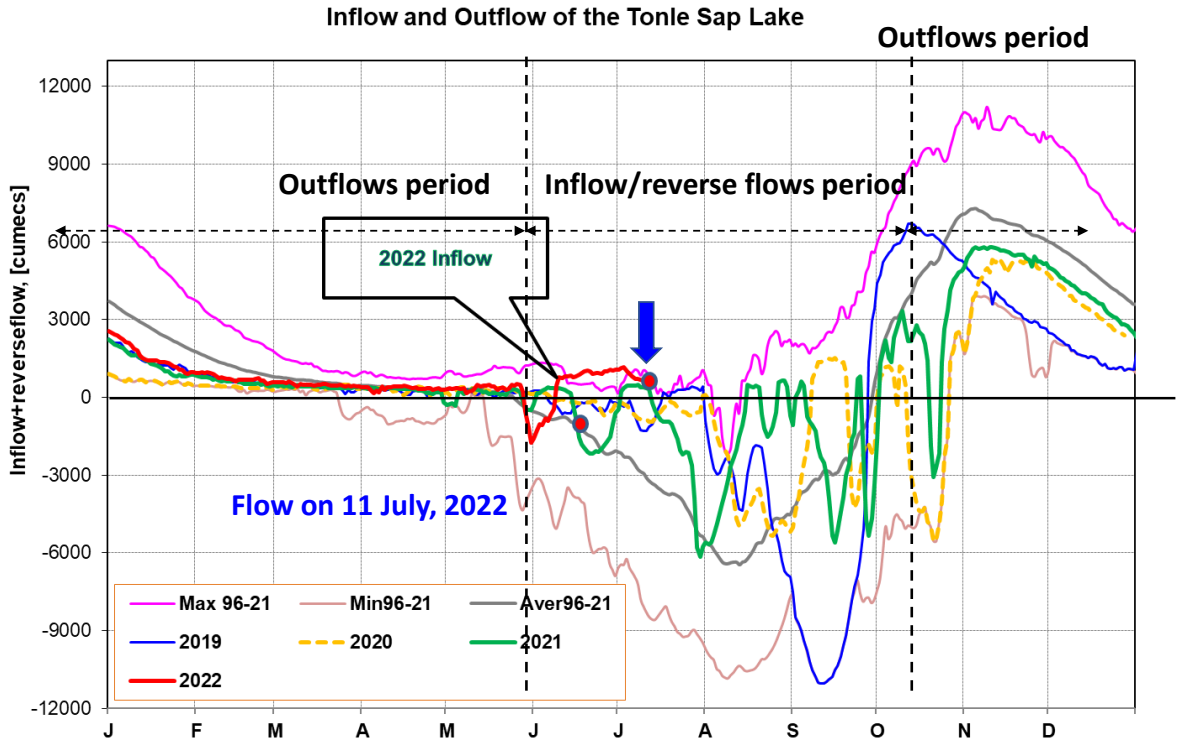


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake

Figure 13 shows seasonal changes in monthly flow volumes up to 11 July 2022 for the Lake compared with the volumes in 2019, 2020, 2021 and their LTA, and the fluctuation levels (1997–2021). It shows that up to July 11 **the water volume of the Tonle Sap Lake was even higher than 2019, 2020, 2021 but lower than its LTA (about 68%), 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 tributaries and rainfall in the surrounding sub-catchments and ***considered normal***.

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

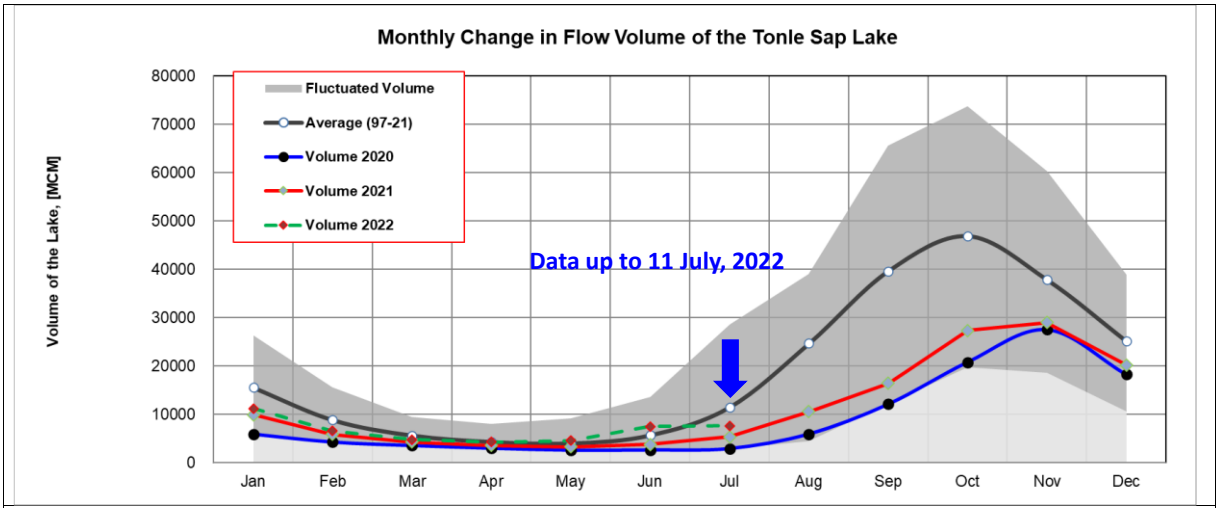


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

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

Month	Average Volume (97-21) [MCM]	Max Volume [MCM]	Min Volume [MCM]	Volume 2018 [MCM]	Volume 2019 [MCM]	Volume 2020 [MCM]	Volume 2021 [MCM]	Volume 2022 [MCM]	Percentage of Volume in 2021 [%]
Jan	15523.23	26357.53	5906.80	13633.41	10285.31	5906.80	9923.80	11214.32	72.24
Feb	8837.89	15596.22	4198.60	7729.72	6019.30	4264.19	5832.97	6558.79	74.21
Mar	5654.18	9438.24	3347.07	5037.06	4354.62	3553.99	4264.88	4736.52	83.77
Apr	4346.65	8009.14	2866.91	3956.47	3667.47	2992.61	3556.68	4288.31	98.66
May	4030.23	9176.93	2417.81	3864.00	3266.43	2594.92	3240.78	4556.83	113.07
Jun	5708.30	13635.01	2468.70	5919.18	3517.06	2641.88	3798.29	7489.04	131.20
Jul	11493.25	28599.56	2925.86	12024.96	4001.99	2925.86	5346.73	7650.39	66.56
Aug	24666.69	39015.12	4433.46	22399.65	7622.71	5941.07	10547.80		
Sep	39634.03	65632.35	12105.31	53639.54	24194.19	12105.31	16382.34		
Oct	46873.44	73757.23	19705.50	48193.08	30358.38	20799.13	27318.21		
Nov	37823.16	60367.33	18534.61	31036.07	19112.65	27546.80	28982.93		
Dec	25126.11	38888.95	10563.49	18469.21	10577.29	18251.65	20170.76		
	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)									

4 Flash Flood in the Lower Mekong Basin

From 5 to 11 July, the LMB was affected by three weather factors including (i) a low pressure-cell covered upper Viet Nam during almost the entire week (ii) the monsoon trough laid across Myanmar and upper portion of northern Thailand then transformed to low-pressure cell on July 6, and (iii) The southwest monsoon that prevailed over the Andaman Sea, Thailand and the Gulf of Thailand then strengthened during the second half of the week. These conditions caused moderate and heavy rainfall in some areas from the upper to the middle parts of the LMB.

According to the MRC-Flash Flood Guidance System (MRC-FFGS) and analysis, flash flood events were detected during the reporting period in several areas in Thailand, Lao PDR, Cambodia and Viet Nam ranging from low to high risk levels as shown in Figure 14 and Table 2.

Table 2. Detected flash flood in Viet Nam on July 12.

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

Date of FFG products 12/7/2022 0:00 UTC time

01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location			
Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk
Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk	Chumphon	Muang Chumphon	Southern-East Coast	Low-Risk	Chumphon	Muang Chumphon	Southern-East Coa	Low-Risk
Ranong	La-un	Southern-West Coast	Low-Risk	Ranong	La-un	Southern-West Coast	Low-Risk	Ranong	La-un	Southern-West Co	Low-Risk
Chumphon	Phato	Southern-East Coast	Moderate-Risk	Chumphon	Phato	Southern-East Coast	Low-Risk	Chumphon	Phato	Southern-East Coa	Moderate-Risk
Surat Thani	Thachang	Southern-East Coast	Low-Risk	Surat Thani	Thachang	Southern-East Coast	Low-Risk	Surat Thani	Thachang	Southern-East Coa	Low-Risk
Phangnga	Khura Buri	Southern-West Coast	High-Risk	Phangnga	Khura Buri	Southern-West Coast	Moderate-Risk	Phangnga	Khura Buri	Southern-West Co	Moderate-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 12/7/2022 0:00 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
Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk	Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk	Bolikhamxay	Khamkheut	NAPHOUA	Central Laos	Low-Risk
										Bolikhamxay	Pakxanh	XAYSAVA	Central Laos	Low-Risk
										Xaysomboun	Hom	KORMI	province is mountainous Northeast	Low-Risk
										Xaysomboun	Hom	MUANGS(	province is mountainous Northeast	Low-Risk
										Khammuane	Hinboon	VANG TA	Center of Laos	Low-Risk
										Khammuane	Hinboon	MOUANG	Center of Laos	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 12/7/2022 0:00 UTC time

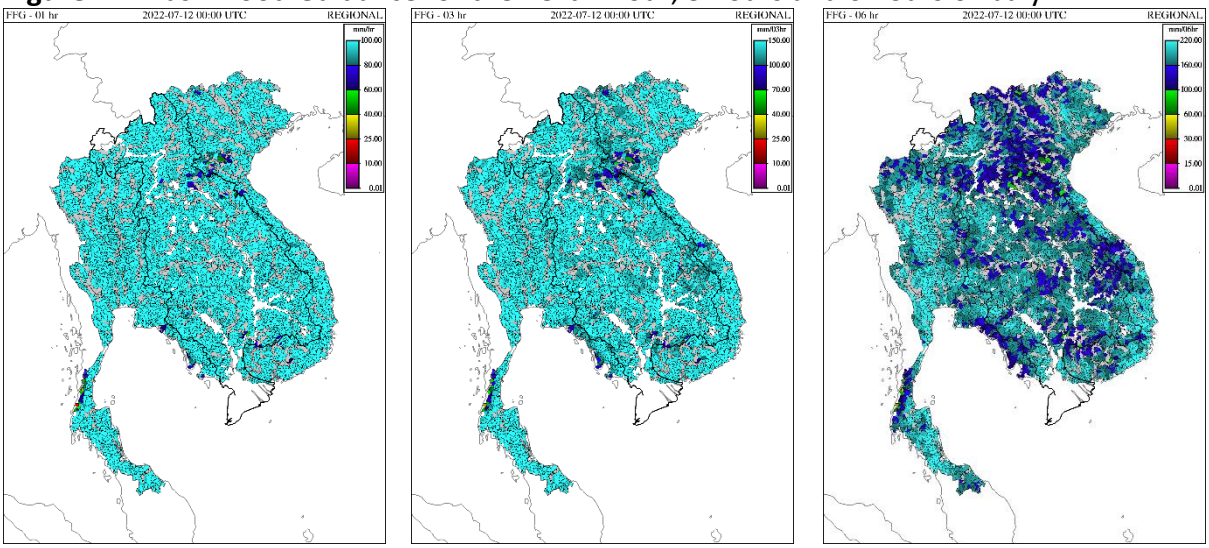
01-Hour Flash Flood Risk and Location					03-Hour Flash Flood Risk and Location					06-Hour Flash Flood Risk and Location				
Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk
Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk	NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOU					Kampong Cham	Stueng Trang	Veal Preah	Central Lowland	Low-Risk
										Kampong Cham	Stueng Trang	Sampieng Kraom	Central Lowland	Low-Risk
										Tboung Khmum	Memot	Chamkar Thmei	Central Lowland	Low-Risk
										Koh Kong	Botum Sakor	Andoung Tuek	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 12/7/2022 0:00 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
Ha Tinh	Huong Son	North Central	Low-Risk	Ha Tinh	Huong Son	North Central	Low-Risk	Ha Tinh	Huong Son	North Central	Low-Risk
Nghe An	Tuong Duong	North Central	Low-Risk	Nghe An	Tuong Duong	North Central	Low-Risk	Binh Thuan	Duc Linh	South Central Coa	Low-Risk
Hoa Binh	Ky Son	Northwest	Low-Risk	Hoa Binh	Ky Son	Northwest	Low-Risk	Hoa Binh	Ky Son	Northwest	Low-Risk
Nghe An	Que Phong	North Central	Low-Risk	Nghe An	Que Phong	North Central	Low-Risk	Lao Cai	Bat Xat	Northwest	Low-Risk
								Nghe An	Quy Chau	North Central	Low-Risk
								Nghe An	Tuong Duong	North Central	Low-Risk
								Nghe An	Que Phong	North Central	Low-Risk
								Ha Tinh	Huong Khe	North Central	Low-Risk

Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on July 12.



5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from 03 to 09 July 2022

Drought monitoring data in 2022 are available from Sunday to Saturday 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)**

The meteorological drought indicator of SPI from July 3 to 9, as displayed in Figure 15, shows normal conditions in most parts of the LMB except some **moderate and severe droughts** covering **Stung Treng and Preah Vihea** of Cambodia. No significant meteorological drought threat was found during the reporting week.

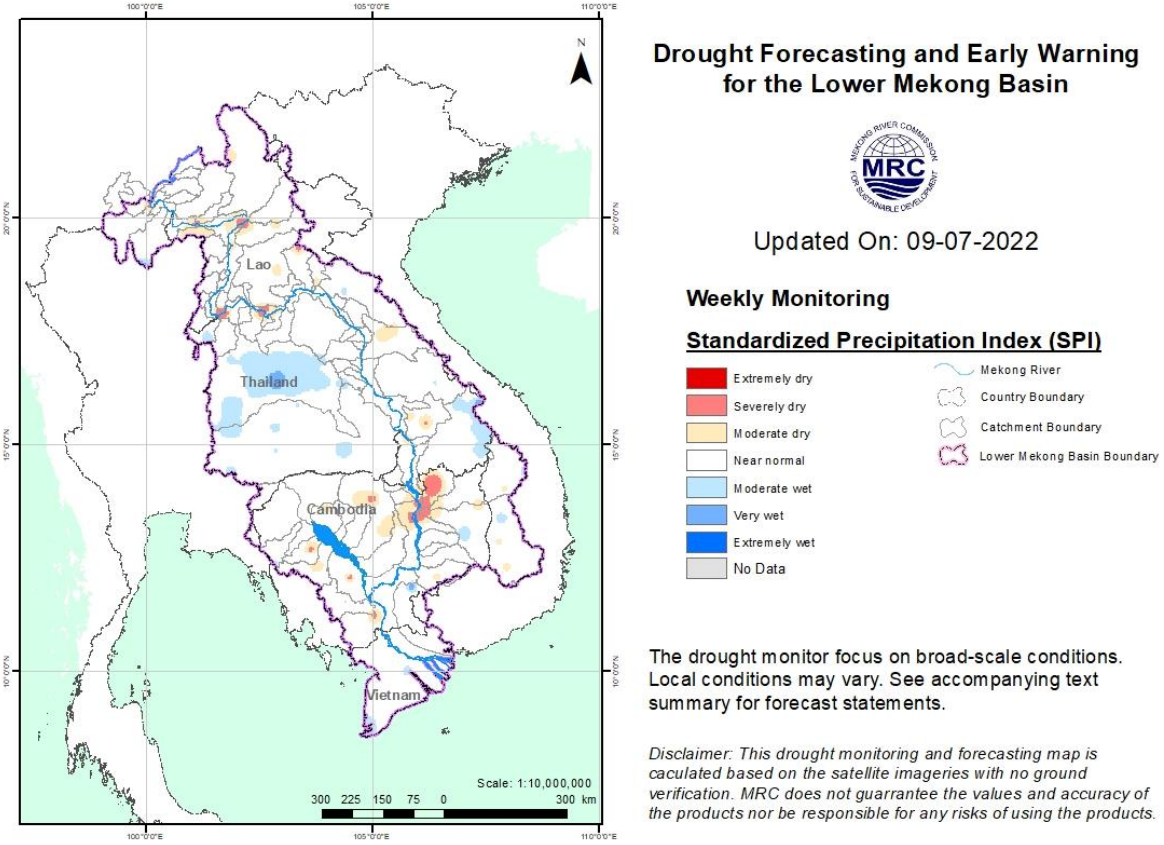


Figure 15. Weekly standardized precipitation index from 03 to 09 July 2022.

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

Like SPI, the soil water fraction from July 3 to 9, as displayed in Figure 16, shows normal conditions in most parts of the LMB; there was no agricultural drought threat found during the monitoring week.

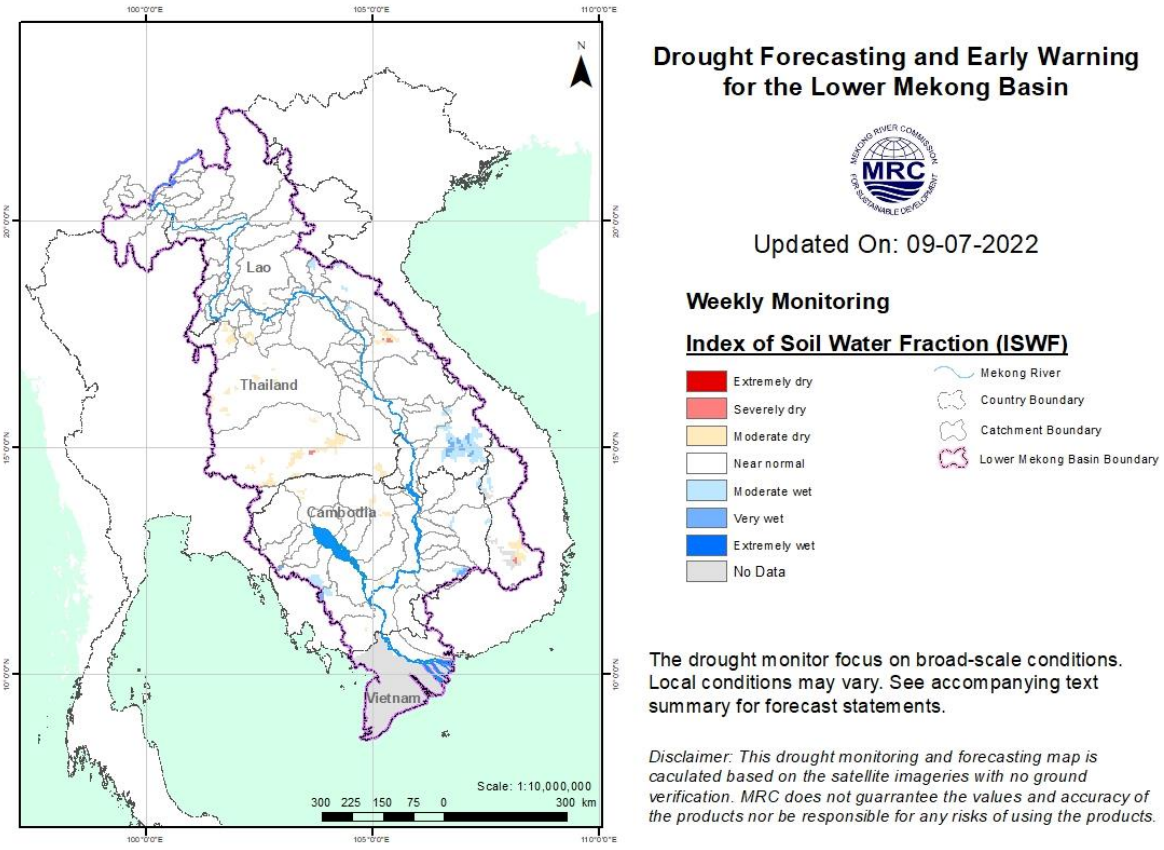


Figure 16. Index of Soil Water Fraction from 3 to 9 July 2022.

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

The combined drought indicator from the meteorological and agricultural indices, as displayed in Figure 17, shows that most areas of the LMB were at normal condition. No significant drought threat was found during the monitoring week.

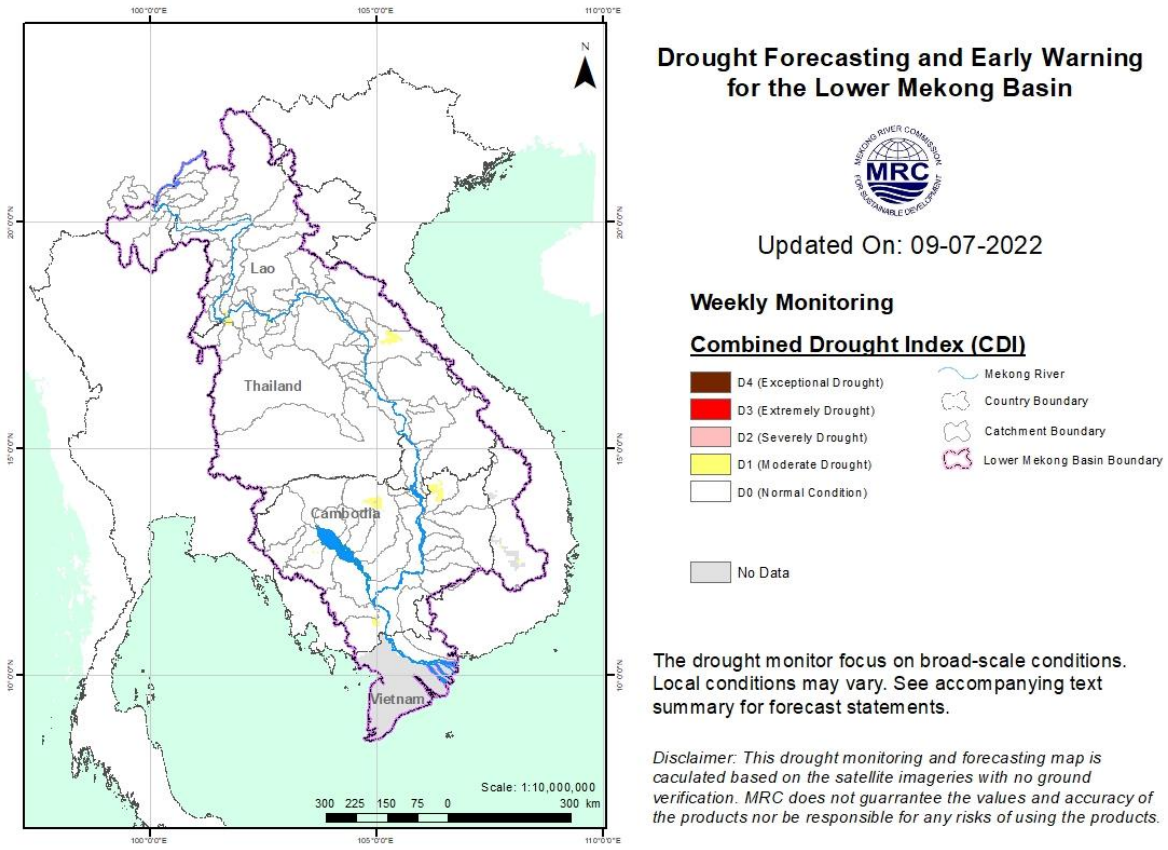


Figure 17. Weekly Combined Drought Index from 3 to 9 July 2022.

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.

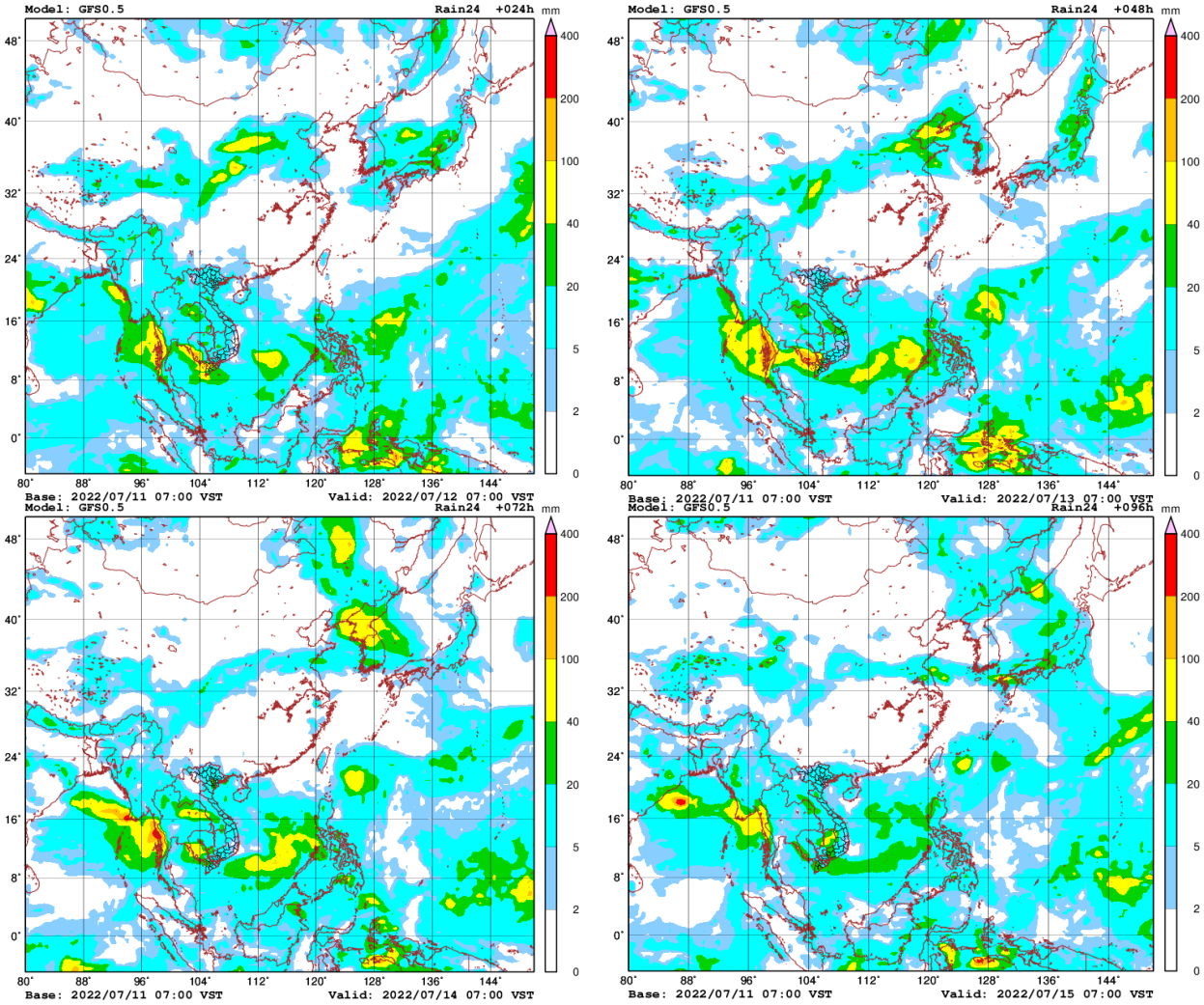
6 Weather and Water Level Forecast and Flash Flood Information

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 low-pressure cell will continue prevailing over the LMB.

In general, from 12 to 18 July, small (5 -20 mm/24h) and moderate (20-50 m/24h) amount of rainfall will likely occur over the LMB. However, on 12 July heavy rain (50-100 mm/24h) will likely occur in some areas in southwestern Cambodia.

Figure 18 shows accumulated rainfall forecast (24 h) of the GFS model from 5 to 11 July.



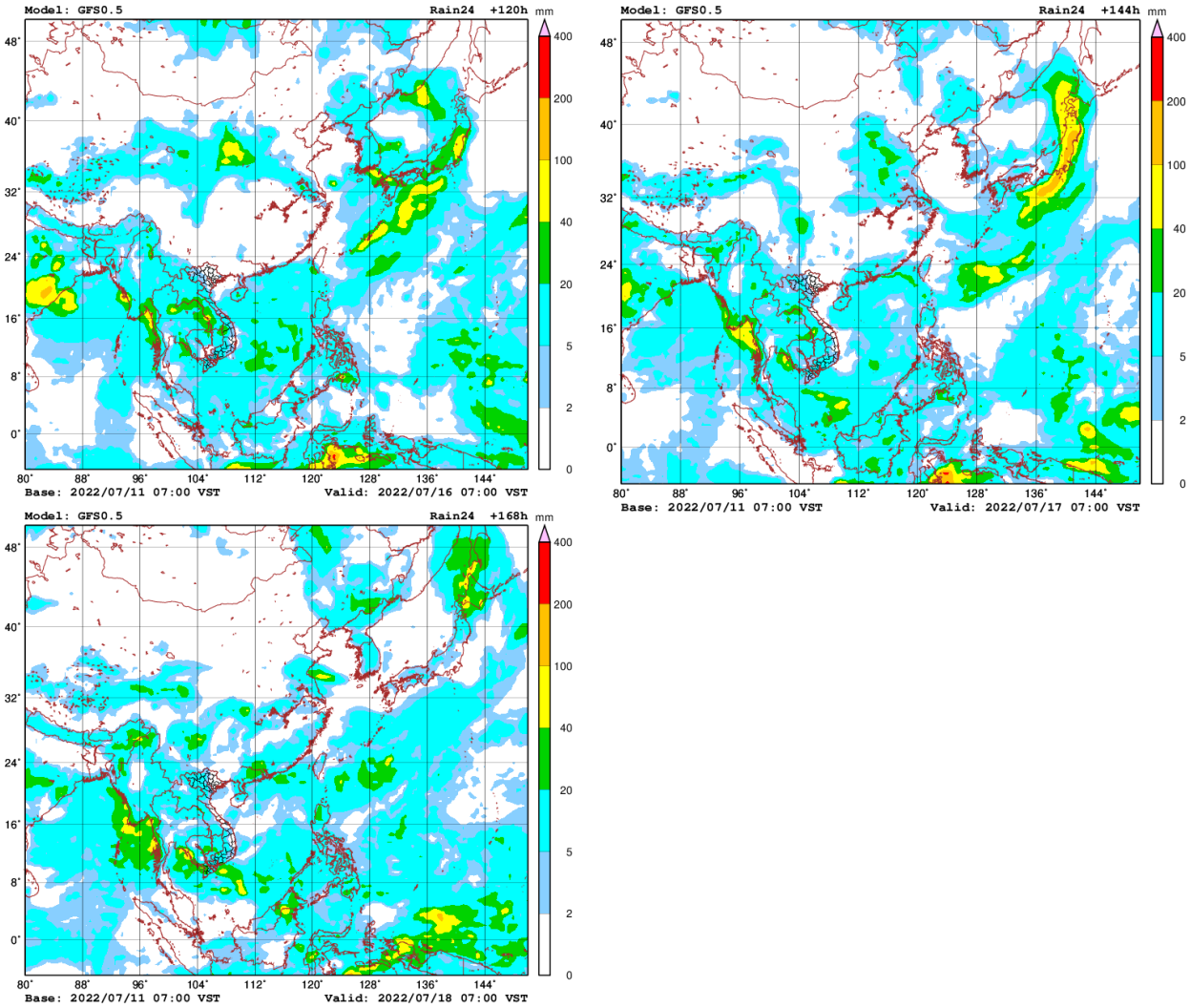


Figure 18. Accumulated rainfall forecast (24 h) based on a GFS model.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on July 11's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 4.62 m to 4.50 m over the next five days. The trend will keep the water level at this station above its LTA.

For Luang Prabang in Lao PDR, the water level will increase from 10.82 m to 11.16 m during the next five days. The current water level is higher 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 0.57 m, while water level at Vientiane in Lao PDR will also increase about 1.00 m. Furthermore, from Nong Khai in Thailand, the water level will increase also about 1.11 m over the next five days; at Paksane in Lao PDR water level will increase about 1.36 m due to highly 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 go up between 1.20 m and 2.00 m over the next five days. Water level at these stations will stay higher than their LTA level. Rainfall is forecasted for the area next week.

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

From Stung Treng to Kompong Cham along the Mekong River in Cambodia, the water levels will go up between 1.42 m to 1.62 m over the next five days. Precipitation is forecasted for the area between Stung Treng and Kompong 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 about 0.67 m over the next five days.

Water levels at most of the stations will go up and some stations will be staying higher than their LTA value, particularly in the middle part of the region from the Chiang Khan to Paksane and from Nakhon Phanom to Pakse as well as the lower part at Stung Treng and Kratie. 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 LTA 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 05 to 11 July 2022, is presented in **Annex 1**.

Table 2 shows the daily flood forecasting Bulletin issued on 11 July 2022. 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 its explanation is available for download here.

6.4 Drought forecast

There are several climate-prediction models with different scenarios in the upcoming months until November 2022. The MRC's DFEWS adopts an ensemble model called the North America Multi-Model Ensemble (NMME), which averages all scenarios, and downscales the forecasts to the regional level. The Viable Infiltration Capability (VIC) is then used to generate soil moisture and runoff for the whole basin.

Figure 19 below shows the Combine Drought Indicator (CDI) forecast for July, August, and September 2022. CDI is a combination of meteorological and agricultural indicators.

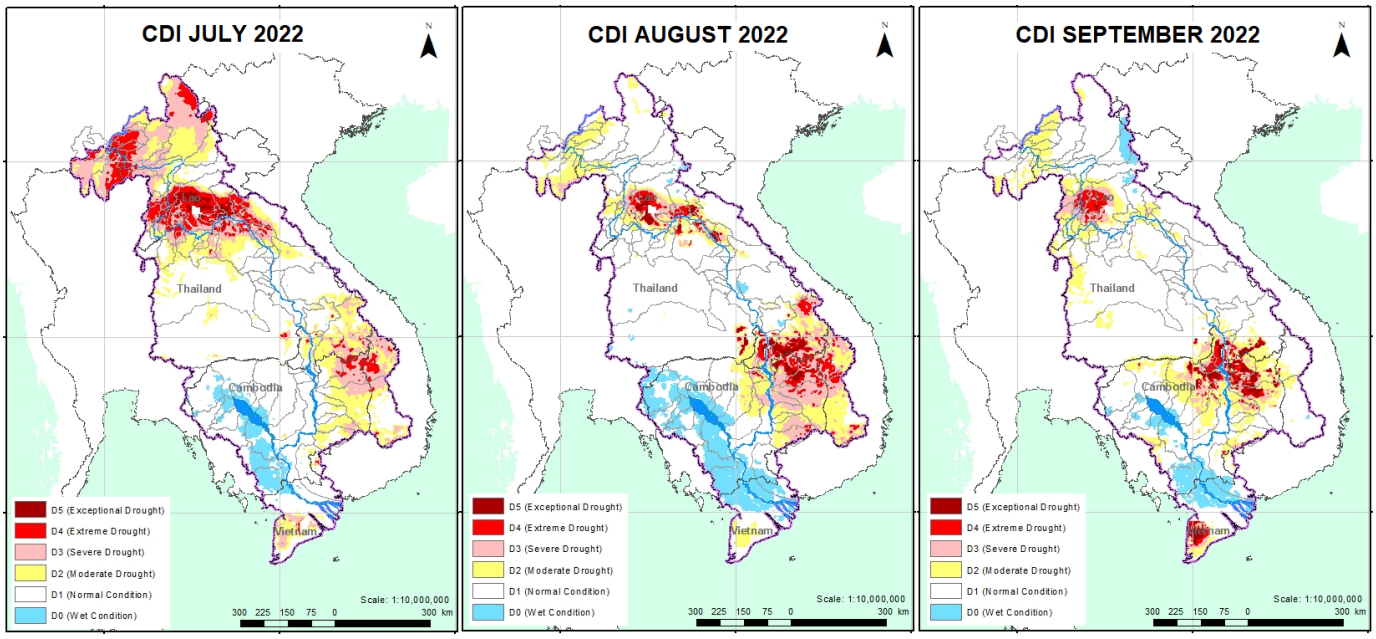


Figure 19. Monthly forecast of CDI for July, August, and September in 2022.

- **JULY:**

Droughts are likely to take place in the northern part, 3S area, and Mekong Delta of Viet Nam with moderate, severe, and extreme conditions. They cover mainly **Chiang Mai, Chiang Rai, Bokeo, Luangnamtha, Phongsaly, Oudomxay, Luangprabang, Xayaburi, Vientiane, Xaysomboun, Loei, Bong Bua Lamphu, Udon Thani, Sakon Nakhon, Nong Khai, Borikhamxay, and Khammuane in the north and Saravane, Sekong, Champasack, Attapeu, Kon Tum, Gia Lai, Ratana Kiri, Stung Treng, Mondul Kiri, Mondul Kiri, Kratie, Dak Lak, Lam Dong, Kien Giang, Can Tho, Soc Trang, Bac Lieu, and Ca Mau in the souther part**. Below-average rainfall is the main cause of drought phenomena.

- **AUGUST:**

Droughts are intensifying over the 3S area of Cambodia, Lao PDR, and Viet Nam with **severe and extreme conditions**; **Sekong, Attapeu, Campasack, Ubon Ratchathani, Preah Vihea, Stung Treng, Ratana Kiri, Kon Tum, Gia Lai, Dak Lak, Mondul Kiri, and Kratie are covered**. While the conditions in the northern part are predicted to get better from July situation; however, there will be some small moderate and severe droughts over the bordering area between Lao and Thailand covering mainly **Vientiane, Xaysomboun, Nong Khai,**

Borikhamxay, and Khammuane; however, only small part of Borikhamxay, and Khammuane are taken.

- **SEPTEMBER:**

Drought conditions forecasted for August are moving westwards during September with smaller extent and severity to cover **Vientiane, Xayaburi, and Borikhamxay. At the 3S area it moves to Champasack, Attapeu, Ratana Kiri, Stung Treng, Preah Vihear, Kampong Thom, and Mondul Kiri**. Additionally, **Ca Mau, Bac Lieu and Kien Giang in the Delta are also forecasted with severe and extreme droughts**. Both precipitation and soil moisture are the main cause of such droughts.

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: 12 July - 16 July 2022

Date: 11 July 2022

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					
		10-Jul				10-Jul	11-Jul	12-Jul	13-Jul	14-Jul	15-Jul	16-Jul	11	12	13	14	15	16
Jinghong		0.0				537.44	537.46							×	×	×	×	×
Chiang Saen		3.0	357.110	12.80	11.50	4.50	4.62	4.73	4.75	4.67	4.58	4.50	↑	↑				
Luang Prabang		1.4	267.195	18.00	17.50	10.78	10.82	11.06	11.15	11.22	11.24	11.16		↑				
Chiang Khan		1.5	194.118	16.00	14.50	8.02	8.41	8.50	8.75	8.83	8.90	8.93	↑		↑			
Vientiane		2.8	158.040	12.50	11.50	5.15	5.31	5.73	5.84	6.11	6.22	6.31	↑	↑	↑	↑	↑	
Nongkhai		18.8	153.648	12.20	11.40	4.80	4.97	5.42	5.55	5.84	5.97	6.08	↑	↑	↑	↑	↑	↑
Paksane		13.4	142.125	14.50	13.50	6.74	6.93	7.35	7.76	7.89	8.17	8.29	↑	↑	↑	↑	↑	↑
Nakhon Phanom		14.3	130.961	12.00	11.50	5.61	5.94	6.18	6.63	7.06	7.21	7.50	↑	↑	↑	↑	↑	↑
Thakhek		19.8	129.629	14.00	13.00	6.69	7.02	7.28	7.76	8.21	8.38	8.69	↑	↑	↑	↑	↑	↑
Mukdahan		2.4	124.219	12.50	12.00	5.20	5.54	5.86	6.12	6.58	7.00	7.15	↑	↑	↑	↑	↑	↑
Savannakhet		4.3	125.410	13.00	12.00	3.76	4.08	4.39	4.62	5.06	5.45	5.60	↑	↑	↑	↑	↑	↑
Khong Chiam		1.5	89.030	14.50	13.50	5.90	6.29	6.70	7.10	7.40	7.92	8.41	↑	↑	↑	↑	↑	↑
Pakse		11.2	86.490	12.00	11.00	4.66	5.18	5.62	6.00	6.27	6.76	7.20	↑	↑	↑	↑	↑	↑
Stung Treng		17.0	36.790	12.00	10.70	4.93	5.15	5.45	5.70	5.97	6.20	6.57	↑	↑	↑	↑	↑	↑
Kratie		37.2	-0.101	23.00	22.00	12.19	12.31	12.67	13.04	13.35	13.66	13.93	↑	↑	↑	↑	↑	↑
Kompong Cham		11.2	-0.930	16.20	15.20	6.34	6.55	6.71	7.08	7.47	7.80	8.15	↑	↑	↑	↑	↑	↑
Phnom Penh (Bassac)		1.3	-1.020	12.00	10.50	3.57	3.69	3.77	3.95	4.13	4.30	4.47	↑	↑	↑	↑	↑	↑
Phnom Penh Port		-	0.070	11.00	9.50	2.48	2.56	2.62	2.77	2.93	3.09	3.25	↑	↑	↑	↑	↑	↑
Koh Khel (Bassac)		nr	-1.000	8.40	7.90	3.48	3.55	3.64	3.76	3.89	4.04	4.17	↑	↑	↑	↑	↑	↑
Neak Luong		1.7	-0.330	8.00	7.50	2.56	2.62	2.75	2.83	3.00	3.20	3.37	↑	↑	↑	↑	↑	↑
Prek Kdam		27.3	0.080	10.00	9.50	2.72	2.81	2.91	3.03	3.17	3.31	3.46	↑	↑	↑	↑	↑	↑
Tan Chau		0.2	0.000	4.50	3.50	0.83	1.18	1.30	1.40	1.48	1.55	1.60	↑	↑	↑	↑	↑	↑
Chau Doc		0.2	0.000	4.00	3.00	0.79	1.25	1.44	1.57	1.70	1.80	1.86	↑	↑	↑	↑	↑	↑

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 Tan Chau and Chau Doc in Viet Nam during July 05-11, including the lower part in Lao PDR and Cambodia, varying from 2.60 mm to 188.40 mm due to low-pressure dominating the LMB. However, this week rainfall was considered high in 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 50 mm to 250 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 12 to 17 July 2022.

7.2 Water level and its forecast

According to MRC's observed water level at Jinghong, it showed a significant surge of WL from 535.41 m to 537.46 m from 05 to 11 July 2022. The current level is staying about 1.79 m higher than its LTA (2015-2021) value. The outflow at Jinghong station increased from 929.00 m^3/s to 2,490.00 m^3/s from 05 to 11 July 2022.

Along with the significantly increased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand increased about 1.67 m from 05 to 11 July 2022. From Chiang Khan in Thailand to Vientiane in Lao PDR, water levels increased about 1.10 m during July 05-11 due to influence of high rainfall and dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR, moreover, were also increasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia were also increasing about 1.20 m, due to high contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).

Over the next five days, the water levels from Chaing Sean down to Stung Treng and to the lower part at key stations in Cambodia are expected to go up between 0.20 m and 1.20 m.

The flow volume of the Tonle Sap Lake is lower than its LTA up to July 11. From next week, the flow is expected to continue increasing due to rainfall forecasted in the inflow catchments of the Tonle Sap Lake.

From Stung Treng to Kratie, the water levels will continue staying higher than their LTA value. The water levels – at Neak Luong on the Mekong River, from Prek Kdam to Phnom Penh Port on the Tonle Sap, and from Chaktomuk to Koh Khel on the Bassac – are forecasted to continue staying 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 second week of June 2022, water levels across most monitoring stations in the LMB have significantly dropped to the level lower than their LTA (from middle to lower stretches within the LMB). The preliminary analysis of the hydrological conditions in the LMB over July–December 2020 and November 2020 to May 2021 was done as Situation Report, which can be used as reference for the trend of water level and flows of the Mekong River Basin.

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

During July 3-9, most areas of the LMB were at normal conditions. The region was facing only some meteorological drought covering some part of **Stung Treng and Phreah Vihea** of Cambodia in the lower part. No significant drought threat was found during the reporting week.

In **July**, droughts are likely to take place in the **northern part, 3S area, and Mekong Delta of Viet Nam** with **moderate, severe, and extreme conditions**; in **August** droughts are intensifying over the **3S area of Cambodia, Lao PDR, and Viet Nam** with **severe and extreme conditions;** while in **September** droughts are moving westwards from the locations in August with smaller extent and severity.

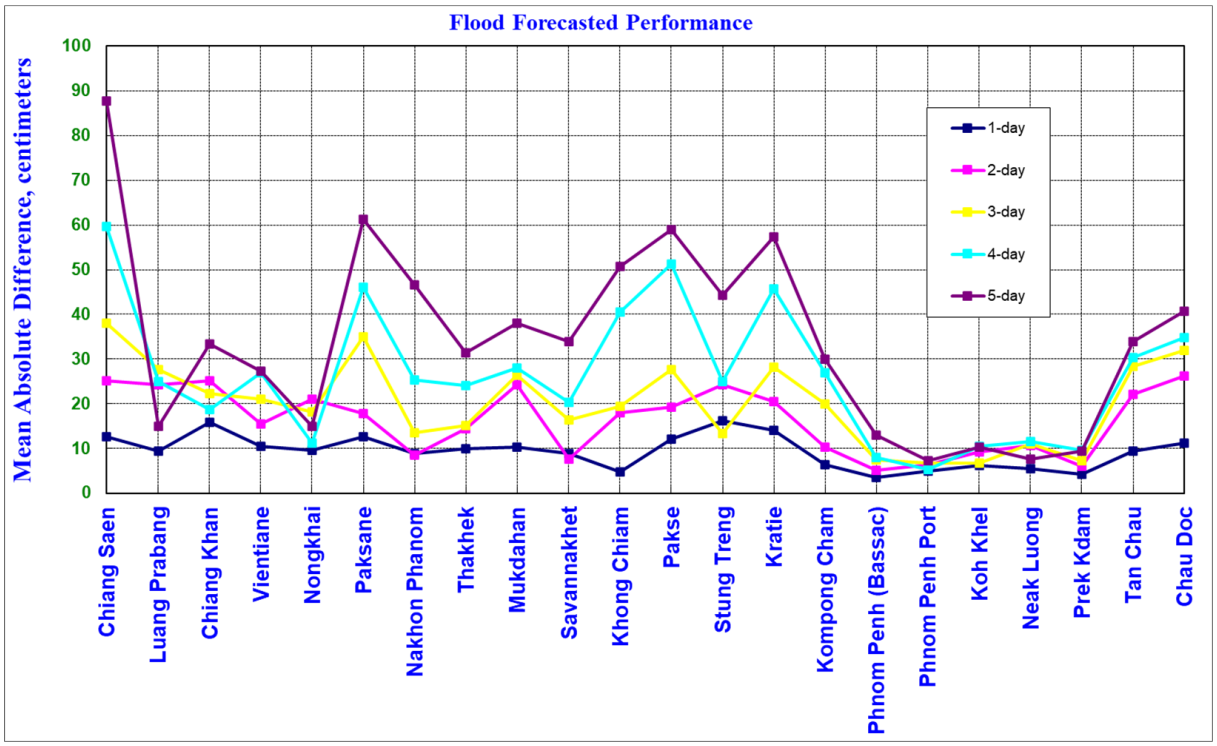
Annex 1: Performance of the weekly flood forecasting

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 05 to 11 July 2022.

The forecasting values from 05 to 11 July 2022 show that the overall accuracy is fair for a one-day to five-day forecast in lead time at stations in the lower parts of the Mekong River from Chiang Saen to Paksane in in Lao PDR due to some 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 05 to 11 July 2022.

Table B1: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 05 to 11 July 2022 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	13	9	16	10	10	13	9	10	10	9	5	12	16	14	6	4	5	6	5	4	9	11
2-day	25	24	25	16	21	18	9	15	24	8	18	19	24	21	10	5	6	9	11	6	22	26
3-day	38	28	22	21	18	35	14	15	26	16	19	28	13	28	20	7	7	7	11	7	28	32
4-day	60	25	19	27	11	46	25	24	28	20	41	51	25	46	27	8	5	11	12	10	30	35
5-day	88	15	33	27	15	61	47	31	38	34	51	59	44	57	30	13	7	10	8	9	34	41

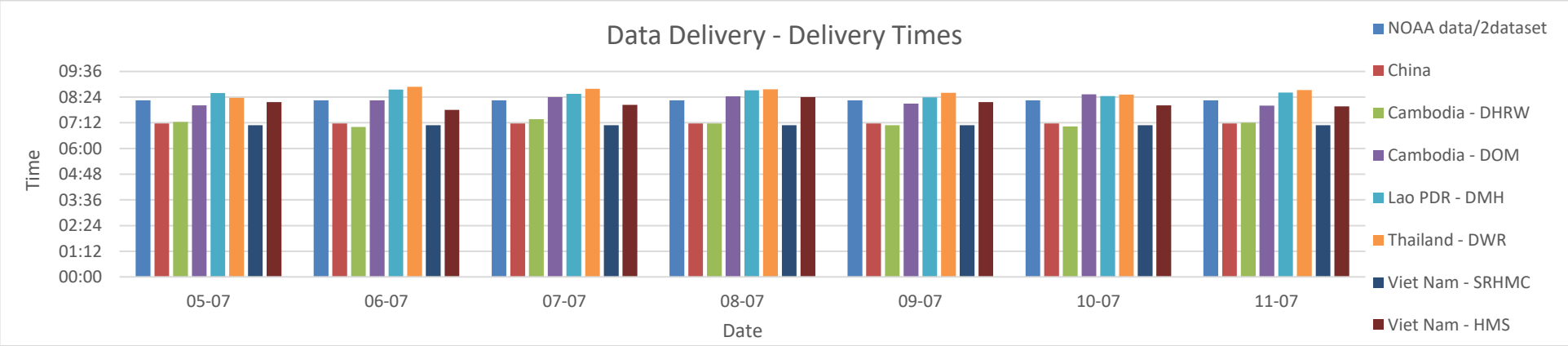
Table B2: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 05 to 11 July 2022 in %

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	71.4	57.1	42.9	57.1	57.1	71.4	42.9	42.9	28.6	42.9	57.1	57.1	71.4	71.4	57.1	57.1	57.1	71.4	42.9	71.4	71.4	71.4	***57.8***
2-day	66.7	66.7	50.0	50.0	50.0	66.7	50.0	66.7	33.3	50.0	50.0	66.7	50.0	50.0	50.0	50.0	50.0	83.3	50.0	33.3	33.3	50.0	***53.0***
3-day	40.0	40.0	60.0	40.0	40.0	60.0	60.0	40.0	40.0	60.0	60.0	60.0	60.0	40.0	40.0	60.0	60.0	40.0	20.0	40.0	40.0	40.0	***47.3***
4-day	50.0	50.0	50.0	50.0	50.0	25.0	50.0	75.0	50.0	75.0	50.0	50.0	50.0	50.0	50.0	75.0	50.0	75.0	50.0	50.0	50.0	50.0	***53.4***
5-day	33.3	66.7	66.7	33.3	66.7	33.3	33.3	33.3	33.3	66.7	66.7	33.3	66.7	66.7	66.7	66.7	33.3	33.3	66.7	66.7	66.7	66.7	***53.0***

Table B3: Overview of performance indicators for the past 7 days from 05 to 11 July 2022

	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
2022	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	*10:27*	*#DIV/0!*	-	-	*08:15*	*07:10*	*07:09*	*08:14*	*08:34*	*08:39*	*07:05*	*08:04*	*0*	*0*	*0*	*0*	*19*	*1*	*0*	*0*
month	*10:27*	*#DIV/0!*	-	-	*08:15*	*07:10*	*07:16*	*08:01*	*08:33*	*08:25*	*07:16*	*08:03*	*0*	*0*	*0*	*34*	*26*	*0*	*0*	*2*

Fig. B4: Data delivery times for the past 7 days from 05 to 11 July 2022



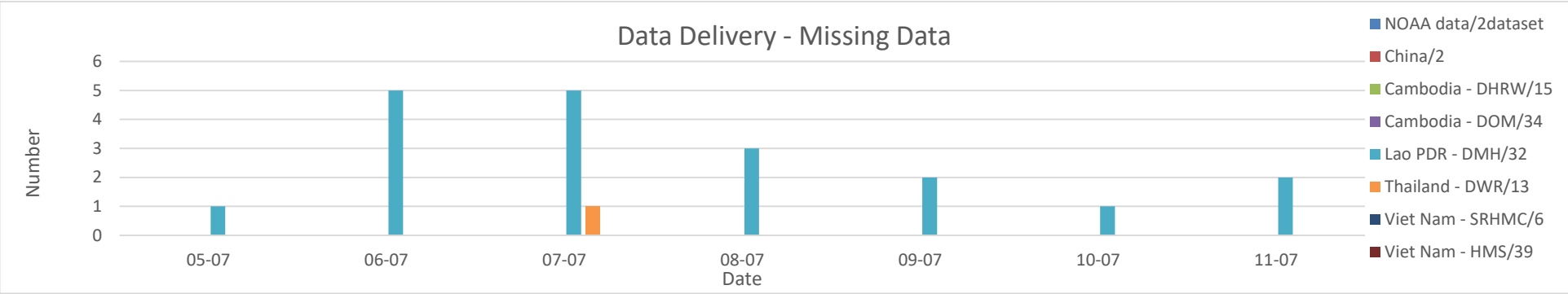
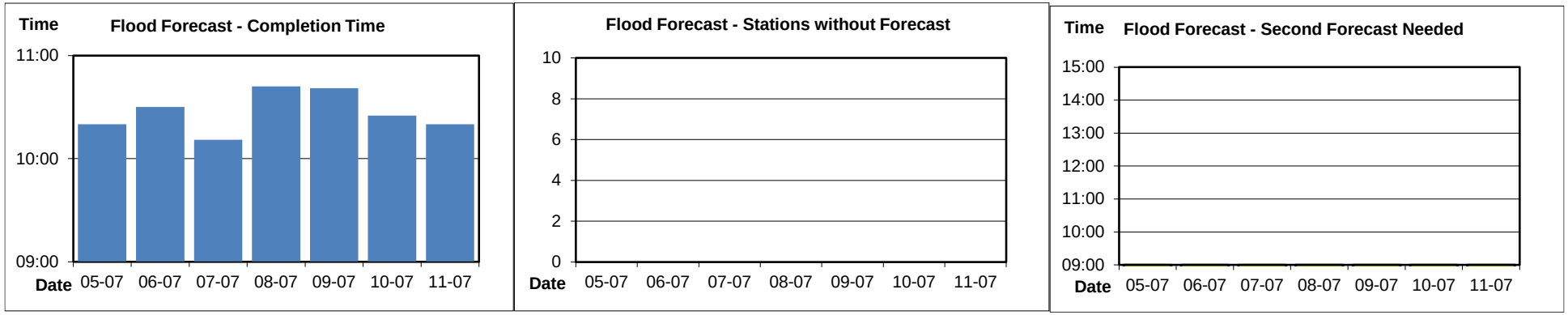


Fig. B5: Missing data for the past 7 days from 05 to 11 July 2022

Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 05 to 11 July 2022



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