



Mekong River Commission

Weekly Wet Season Situation Report in the Lower Mekong River Basin 13-19 July 2021

Prepared by
The Regional Flood and Drought Management Centre
20 July 2021

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Key Messages

Key messages for this weekly report are presented below.

Rainfall and its forecast

- Rainfall took place from Chiang Saen in Thailand to Pakse in Lao PDR, including the lower part in Cambodia and Viet Nam, varying from 11.70 millimetres (mm) to 247.70 mm.
- There will be a significant rainfall is projected for the next 5 days in the Mekong region from 20 to 26 July 2021 because of low-pressure nominated in the Mekong region.

Water level and its forecast

- The outflows at Jinghong hydrological station increased over the monitoring period from 13 to 19 July 2021. It rose about 0.45 m from 535.60 metres (m) on July 12 to 536.05 m on July 19. The outflows increased from 1,050 cubic metres per second (m³/s) on July 12 to 1,368 m³/s on July 19.
Due to below average rainfall from June 30 to July 19 and decreased flow from Jinghong upstream at the same period, water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR were decreasing, and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia were also repeatedly decreasing and staying lower than their LTA.
- The water volume of the Tonle Sap Lake during this reporting period was slightly higher than that in 2020 of the same periods but was still lower than its long-term average.
- Over the next few days, the water levels across most monitoring stations are expected to rise but are forecasted to stay lower than their long-term value.

Drought condition and its forecast

- The LMB did not face any significant threat during July 3-9. The region was mostly at normal conditions except some moderate drought taking place in the central part of the LMB covering some areas of Sakon Nakhon, Roi Et, Yasothon, Surin, Si Saket, Ubon Ratchathani, and Sekong.
- The ensemble prediction model forecasts that in July the LMB is likely to receive from below-average to average rainfall for the entire region; Cambodia, the Central Highlands of Viet Nam, and southern Lao PDR will be the driest areas. In August and September, eastern Cambodia and the Central Highland of Viet Nam are forecasted to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Fortunately, the models show that the LMB might receive much above average of rain during October.

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 **13-19 July 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 level indicated in this report refers to an above zero gauge of each station.

The report covers the following topics that are updated weekly:

- General weather patterns, including rainfall patterns over the LMB
- Water levels in the LMB, including in the Tonle Sap 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.

The TMD stated that above average rainfall will start from the second week of July and is influenced by the Southwest Monsoon of the rainy season onset. During this time, there will be more thunder rainstorms, wet-season thunderstorms, and low-pressure air mass prevailing over the Mekong region. The TMD also predicted that an influential Southwest Monsoon is likely to occur and may cause more rainfall in the Mekong region between July and August.

[Figure 1](#) presents the weather map of 19 July 2021, showing that a low pressure is dominating the upper part of Lao PDR and Viet Nam that might affect the 3S area (Sesan, Sre Pok, and Sekong) in Cambodia and Viet Nam of the LMB.

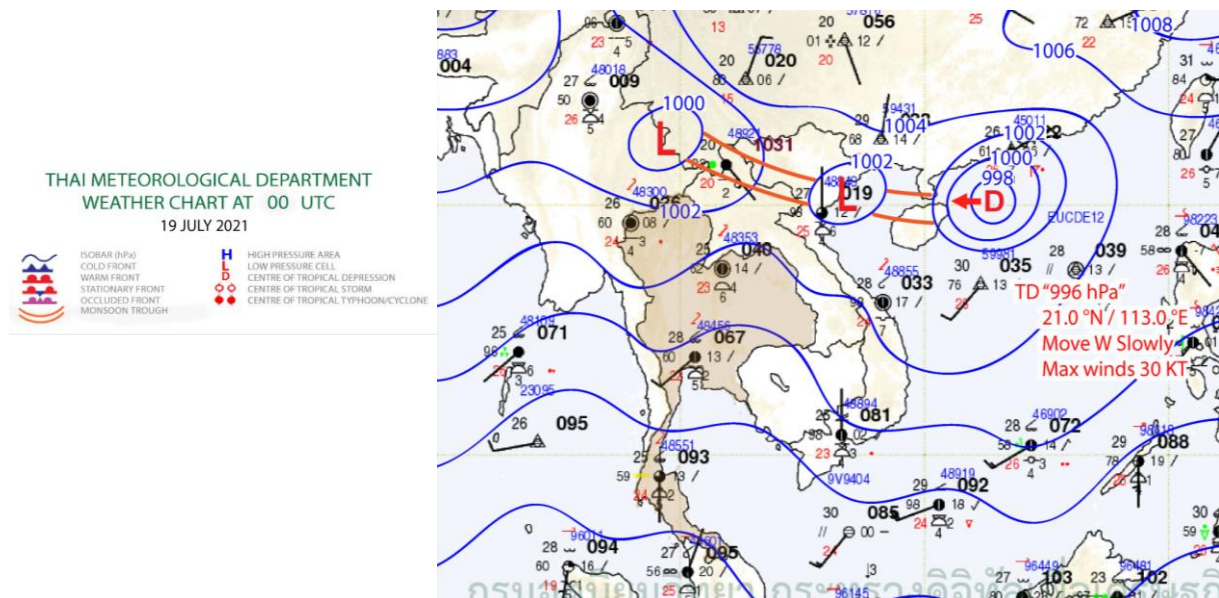


Figure 1. Summary of weather conditions over the LMB.

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of wetter condition is predicted over the lower part in Mekong region covering Cambodia and Viet Nam from 12-25 July 2021, during the 2nd and 3rd weeks of July. Nonetheless, the Northern part of Thailand and Lao PDR is likely dominated by wet condition, which may receive average rainfall in general.

[Figure 2](#) shows the outlook of comparative warm conditions from 12-25 July 2021 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

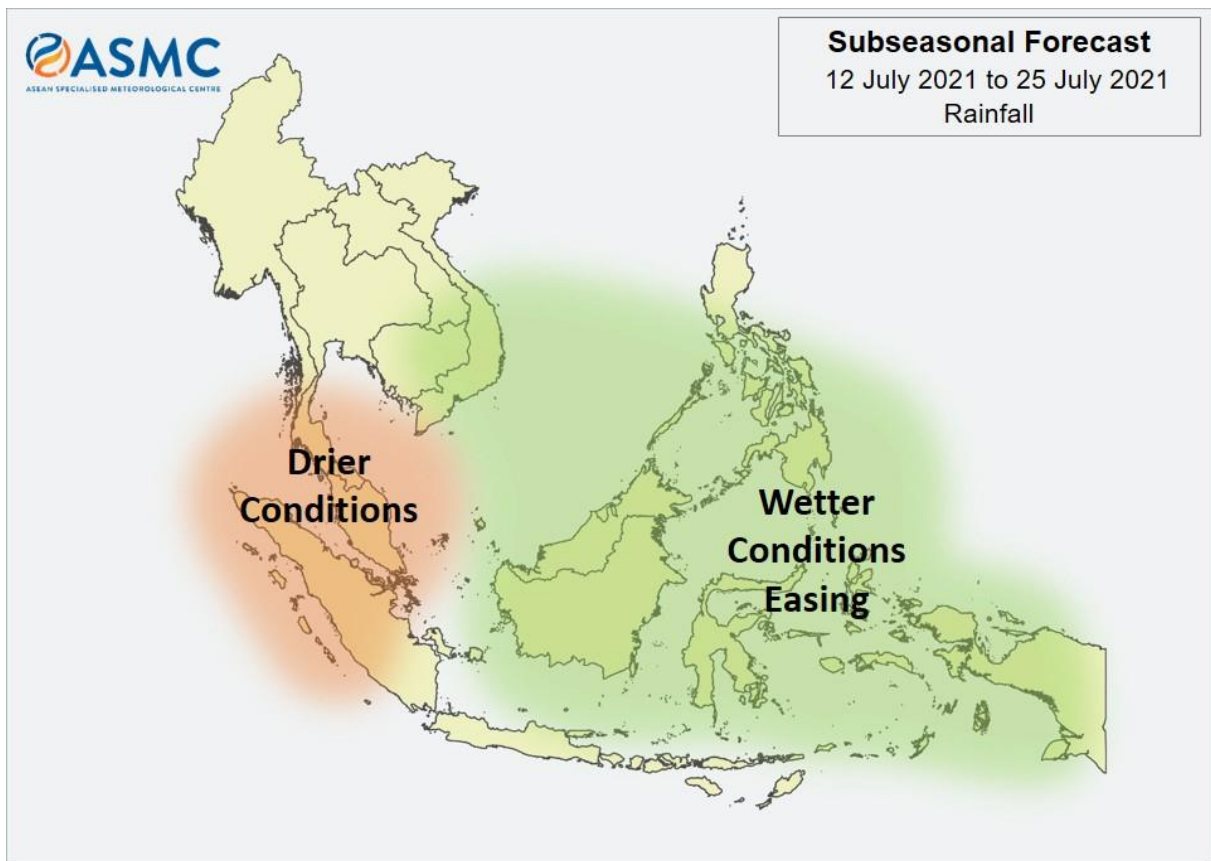


Figure 2. Outlook of wet and dry conditions over the Asian countries by ASMC.

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

There were low-pressure lines taking place in the lower part of the LMB during 19 July 2021, as shown in [Figure 1](#), which would bring rain to some areas of the LMB. But based on a Tropical Storm Risk (TSR), as displayed in [Figure 3](#), there was no sign of tropical depression (TD), tropical storm (TS), or typhoon (TY) in the Mekong region up to 19 July 2021.

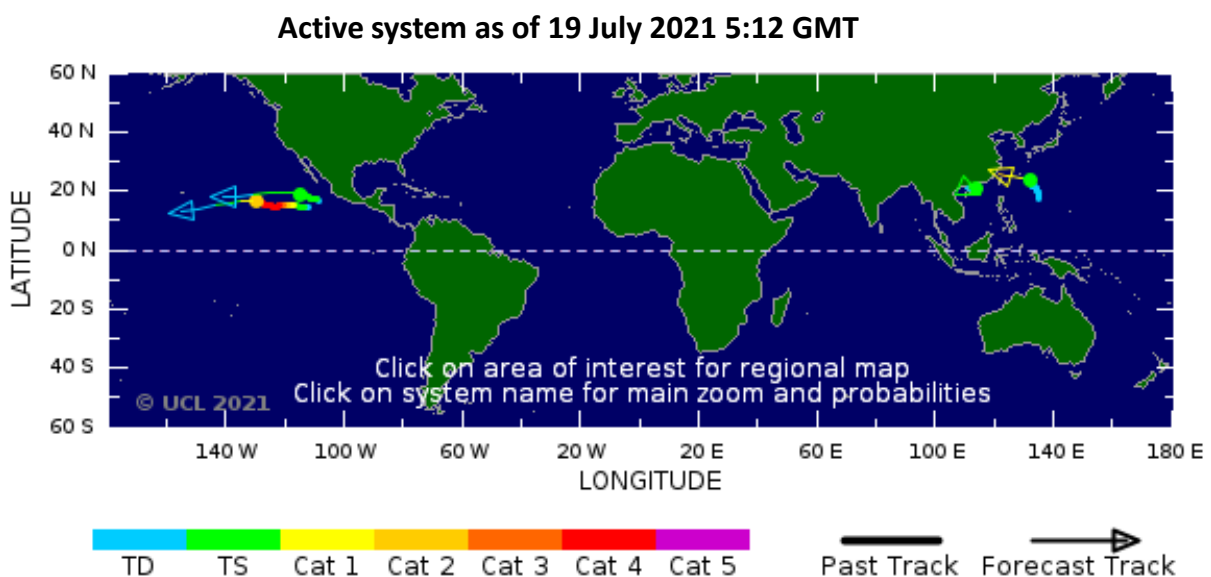


Figure 3. A tropical depression risk observed on 19 July 2021.

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 11.70 millimetres (mm) to 247.50 mm. The weekly total rainfall from 13 to 19 July in this reporting week was considered higher, compared with last week rainfall in the Lower part of the LMB (see [Figure 4](#)).

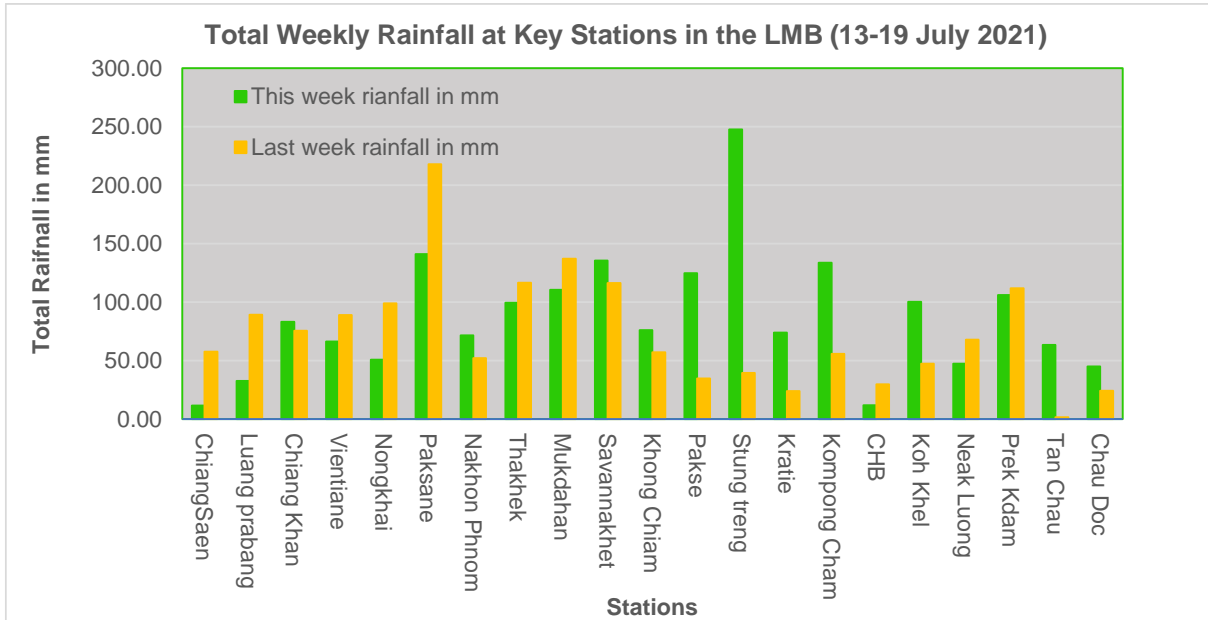


Figure 4. Weekly total rainfall at key stations in the LMB during 13-19 July 2021.

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 13 to 19 July 2021.

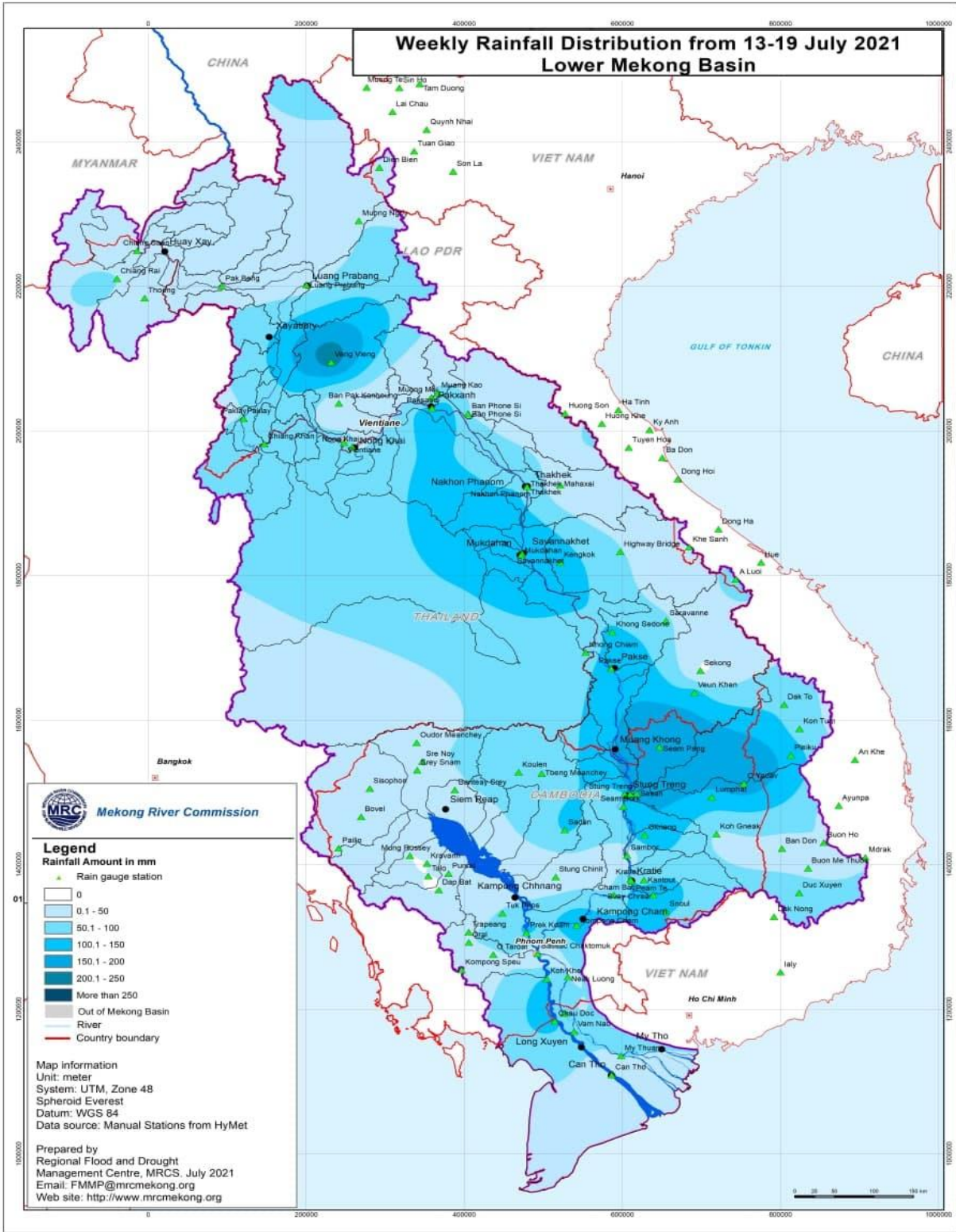


Figure 5. Weekly rainfall distribution over the LMB during 13-19 July 2021.

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](#).

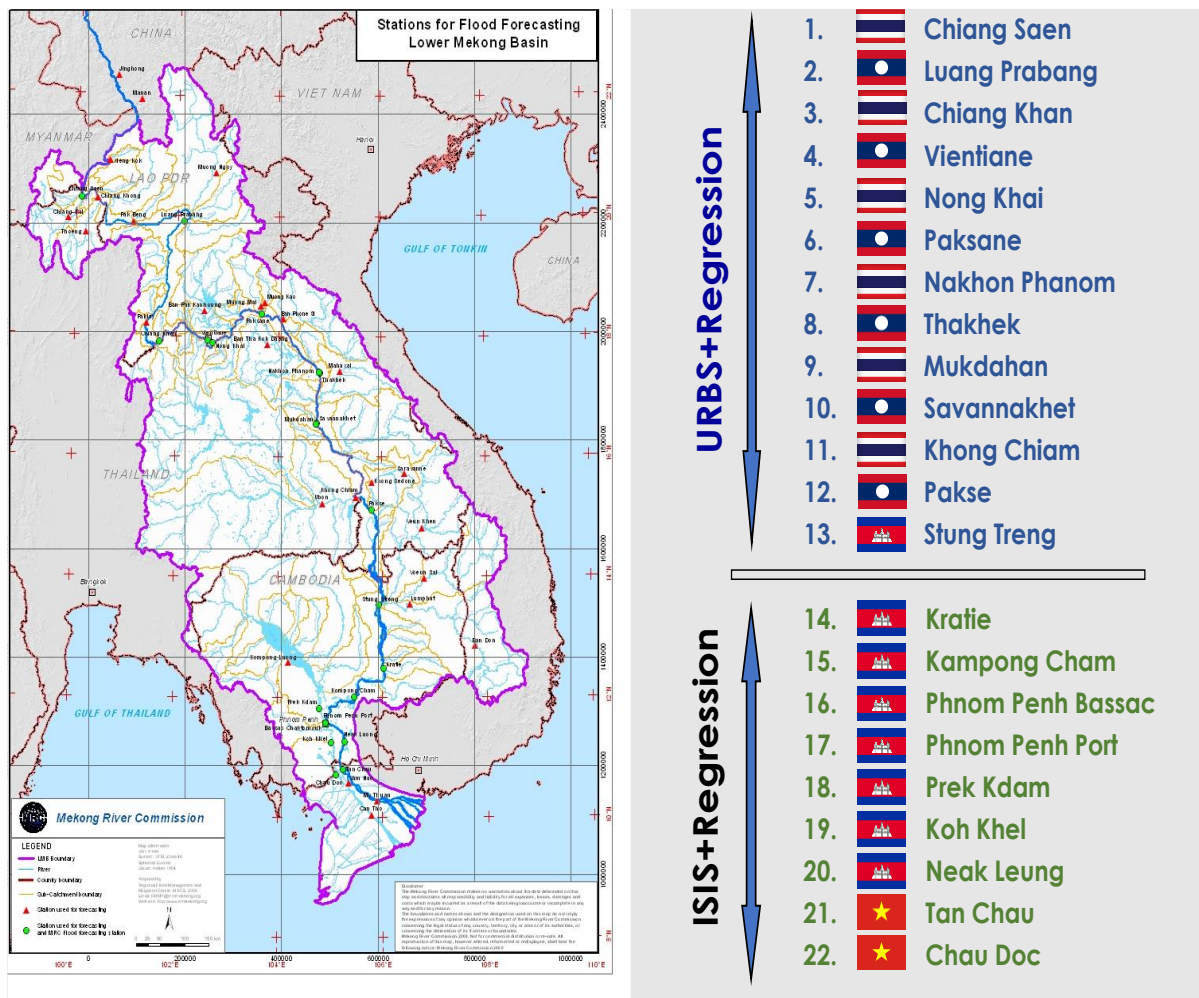


Figure 6. Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC’s observed water level data, the outflows at Jinghong hydrological station showed increase over the monitoring period from 12 to 19 July 2021. It rose about 0.45 m from 535.60 metres (m) on July 12 to 536.05 m on July 19. The outflows increased from 1,050 cubic metres per second (m³/s) on July 12 to 1,368 m³/s on July 19.

[Figure 7](#) below presents water level fluctuations at the Jinghong hydrological station¹ during 15 June – 19 July 2021.

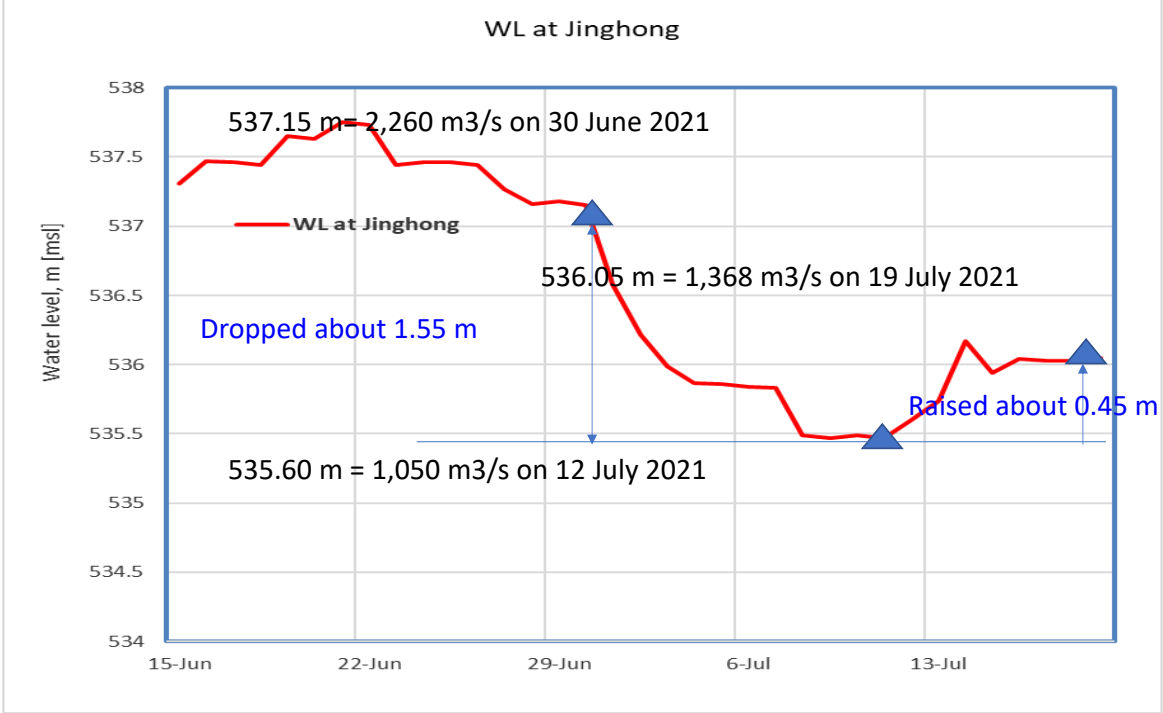


Figure 7. Water level at the Jinghong hydrological station during 15 June – 19 June 2021.

Due to below average rainfall from June 30 to July 19 and decreased flow from Jinghong upstream at the same period, water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR were decreasing, and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia were also repeatedly decreasing and staying lower than their LTA.

Based on a 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.

Chiang Saen and Luang Prabang

The water level from 13 to 19 July 2021 at Thailand’s Chiang Saen increased from 2.46 to 2.60 m, showing about 2. 46 m lower than its LTA.

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>.

Similarly, the water level at Luang Prabang station in Lao PDR also slightly increased, rising from 9.39 m to 9.54 m during the reporting period. This level shows 1.60 m lower than its LTA value. The trend – sometimes higher or closer to its historical maximum value – has been observed since late 2020. 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.**

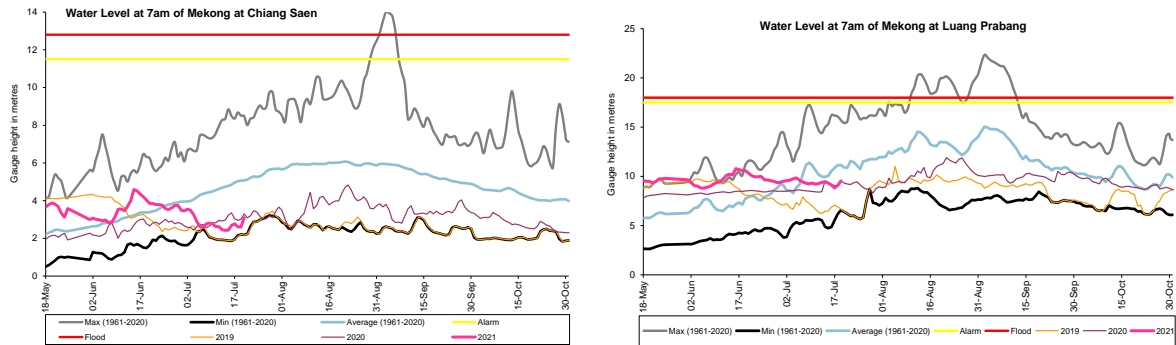


Figure 8. Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) decreased during the reporting week, July 13 to 19, from 6.69 m to 5.80 m and showing 3.45 m lower than its Long-Term- Average (LTA).

The water level downstream at Vientiane in Lao PDR followed the upstream trend. Water level also decreased from 4.15 m to 3.80 m and was about 2.22 m lower than its LTA from July 13 to 19. At Nong Khai station in Thailand, the water level decreased. It dropped about 0.62 m, decreasing from 3.92 m down to 3.30 m and showing 3.48 m lower than its LTA. The water level at Paksane in Lao PDR also decreased by about 0.26 m, dropping from 5.01 m down to 4.75 m. Although, there was some rainfall in the surrounding areas, the trend of water levels at the mentioned stations was still down. The decreased level was obviously due to less rainfall and together with the effect by the Nam Ngum dam operation located upstream.

The water levels at Vientiane and Paksane are shown in [Figure 9](#) below.

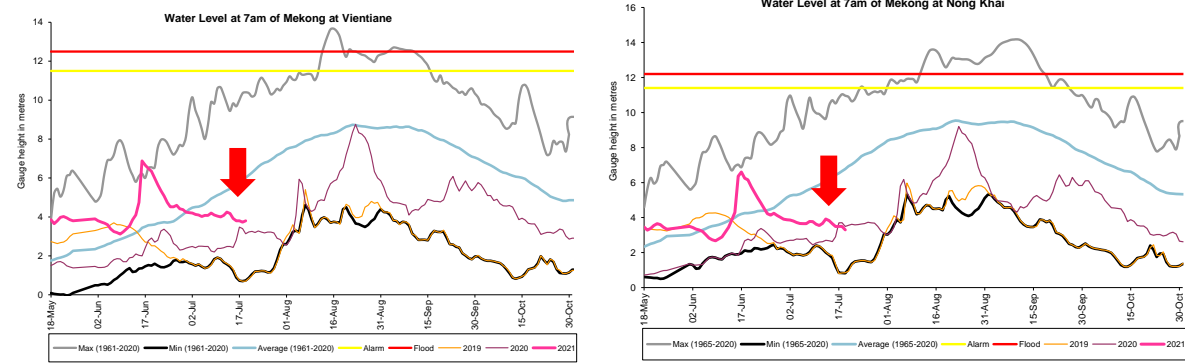


Figure 9. Water levels at Veintiane and Paksane in Lao PDR.

Nakhon Phanom to Pakse

The water levels at Nakhon Phanom in Thailand to Sovannkhet in Lao PDR decreased by about 0.35 m, while at Pakse in Lao PDR slightly increased about 0.16 m (see [Figure 10](#)). These stations are still showing about 3.10 m below their LTA.

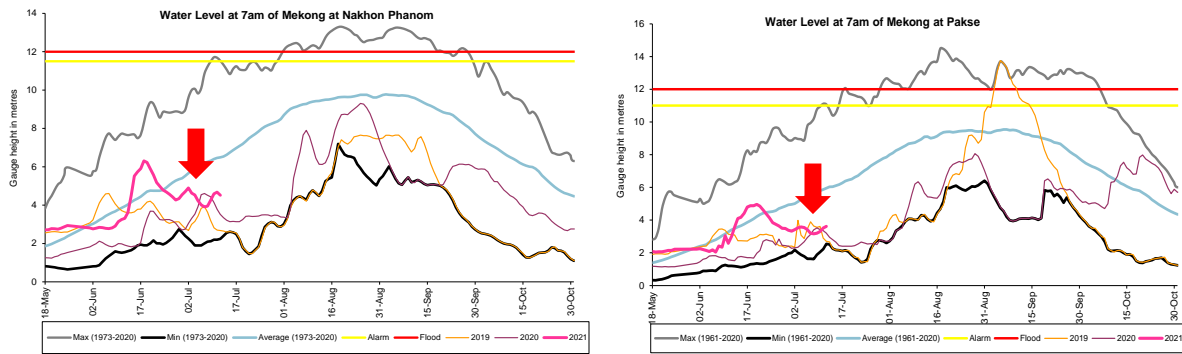


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

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

The contribution of flows and rainfall from the upstream part of the Mekong River and the 3S river (Sekong, Se San, and Sre Pok) caused the water levels from Stung Treng to Kratie in Cambodia to increase during 13-19 July 2021. This week water level at Stung Treng was about 1.47 m and at Kratie was about 3.13 m lower than their LTA (see [Figure 11](#)). The water level at Kompong Cham rose about 1.06 m but still stayed 3.54 m lower than its LTA.

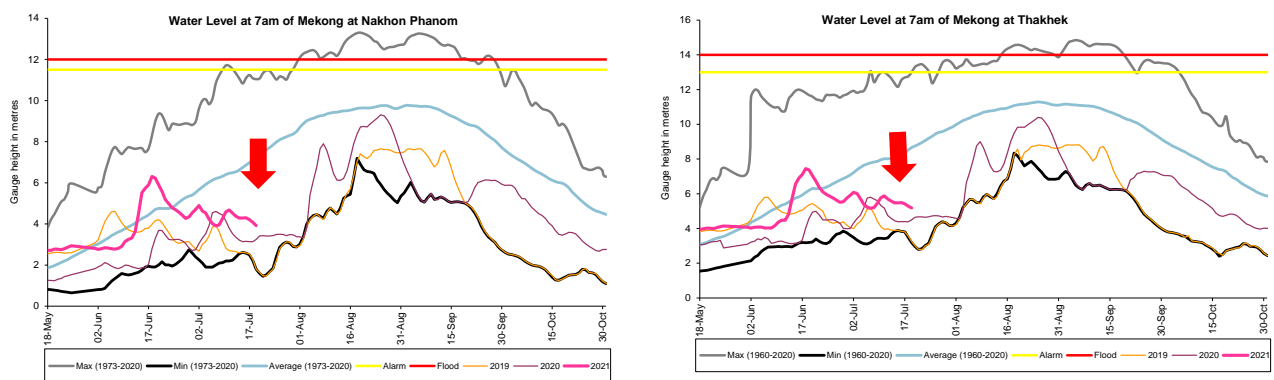


Figure 11. Water levels at Stung Treng and Kratie on the Mekong River.

At Chaktomuk on the Bassac River, the water level increased by about 0.40 m and stayed 2.65 m below its LTA; while at Koh Khel, water level went up 0.35 m but still stayed 1.79 m below its LTA. The water level at Prek Kdam on the Tonle Sap Lake rose about 0.46 m and was about 2.41 m below its LTA. The water level at the Tonle Sap Lake (observed at Kompong Luong) was similar to Prek Kdam station's water level. The increased water level was likely due to some inflow and rainfall contribution from upstream of the Tonle Sap Lake area during the report period. The water level at the Tonle Sap Lake (observed at Kompong Luong) followed the same trend of Prek Kdam station's water level.

Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 13 to 19 July 2021 at Viet Nam's Tan Chau and Chau Doc fluctuated due to daily tidal effects from the sea. The fluctuation levels were between 0.00 m and 0.86 m; they were out of the historical range of minimum level and **considered critical**.

The Tonle Sap Flow

At the end of the dry season, when water levels along the Mekong River increase, flows of the Mekong River reverse into the Tonle Sap Lake and then to the Delta. This phenomenon normally takes place from June to early August.

[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 19 July of this reporting period, it was observed that **the main inflow/reverse flow to the Tonle Sap Lake has started since 17 June 2021; however, the inflow seemed to slow down drastically starting since early July as water levels along the Mekong mainstream have dropped significantly below LTA levels**. The inflow into the Tonle Sap Lake condition in 2021 was lower than its average amount and higher than the 2020 inflow condition. Fortunately, above average rainfall is forecasted from second week of July for the LMB region; thus, the inflow into the Tonle Sap Lake is likely to rise from the current level.

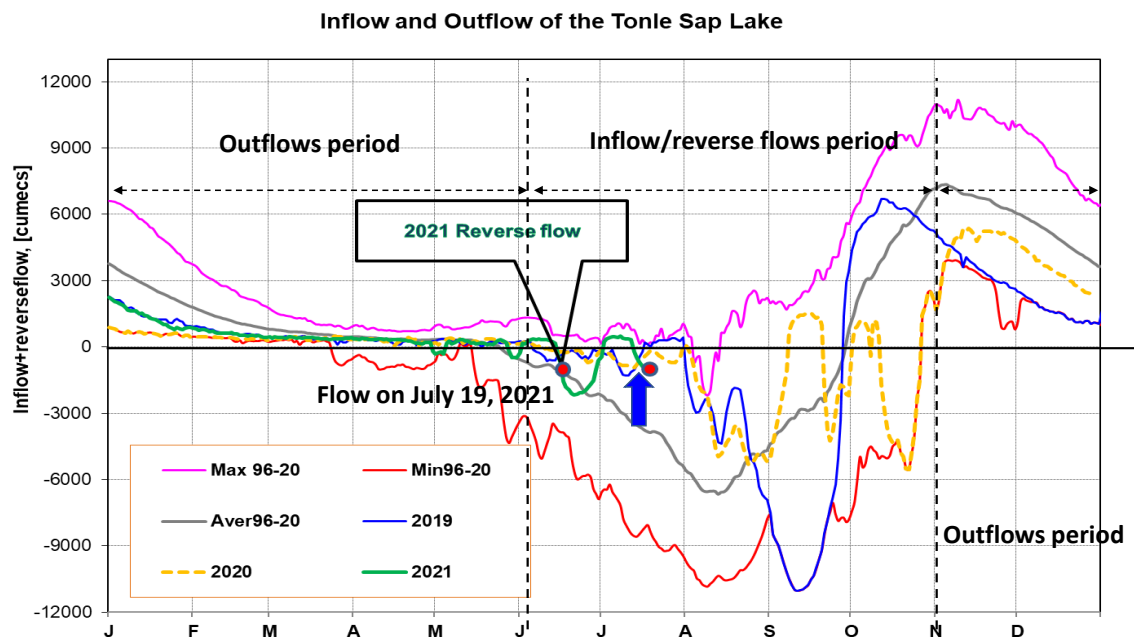


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake.

The water volume of the Tonle Sap Lake up to this point has been considered low in comparison with its LTA level. [Figure 13](#) shows seasonal changes in monthly flow volumes up to July 19 for the Lake compared with the volumes in 2018 and 2019, their LTA, and the fluctuation levels (1997–2019). It shows that up to July 19, **the water volume of the Tonle Sap**

Lake is higher than the level in 2020 during the same period. This 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.

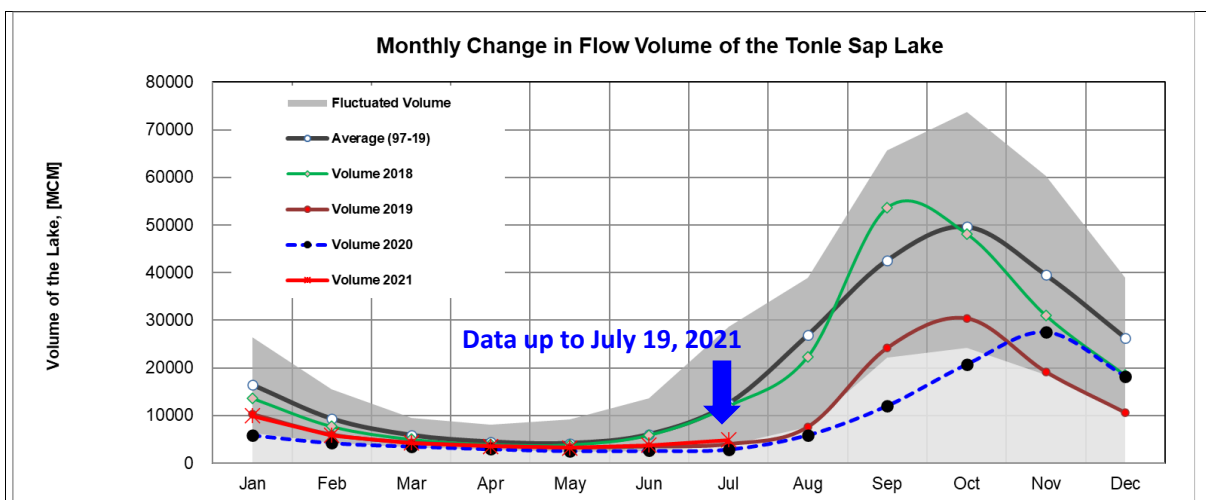


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

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	4849.54
Aug	26934.35	39015.12	7554.93	22399.65	7622.71	5941.07	
Sep	42644.05	65632.35	22180.73	53639.54	24194.19	12105.31	
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, compared with historical Min values						
	Normal condition, compared with LTA (Long term average)						
	Low volume situation, compared with LTA values						
Unit: Million Cubic Meter (1 MCM= 0.001 Km ³)							


The significant increase on flows of the Mekong River and tributaries during early (1-20) June 2021 have potentially contributed to the reverse flow into the Tonle Sap Lake in the middle of wet season of 2021. 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


From July 13 to 19, the LMB was affected by three weather factors including (i) The southwest monsoon which prevailed over the Gulf of Thailand then became weak during the second half of the week, (ii) the monsoon trough laying across the central, eastern, and lower north-eastern parts on the first day of the week, and (iii) the low-pressure cell covering upper Lao PDR and upper Viet Nam during the last day of the week. These conditions caused moderate rainfall over of the LMB for almost the entire week.


According to the MRC-Flash Flood Guidance System (MRC- FFGS) and analysis, flash flood events were detected during the reporting period in several areas of Thailand, Lao PDR, Cambodia and Viet Nam ranging from low 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 19 July.

 Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Thailand											
Date of FFG products 19/07/2021 00:00 UTC time											
01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location			
Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk
Tak	Um Phang	Northern	Low-Risk	Tak	Um Phang	Northern	Low-Risk	Uthai Thani	Lan Sak	Central	Low-Risk
Uthai Thani	Huai Kot	Central	Moderate-Risk	Uthai Thani	Huai Kot	Central	Low-Risk	Tak	Um Phang	Northern	Low-Risk
Kanchanaburi	Thong Pha Phum	Central	High-Risk	Kanchanaburi	Thong Pha Phum	Central	Moderate-Risk	Uthai Thani	Ban Rai	Central	Low-Risk
Kanchanaburi	Sangkha Buri	Central	Low-Risk	Kanchanaburi	Sangkha Buri	Central	Low-Risk	Uthai Thani	Huai Kot	Central	Moderate-Risk
								Kanchanaburi	Thong Pha Phum	Central	Moderate-Risk
								Kanchanaburi	Sangkha Buri	Central	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 19/07/2021 00:00 UTC time															
01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location							
Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	
NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 01-HOUR					NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOUR						Vientiane	Thoulakho	NAM ANG	Northwest	Low-Risk
										Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk	
										Sekong	Dakcheung	DAKDEN	Southeast	Low-Risk	

 Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Cambodia														
Date of FFG products 19/07/2021 00:00 UTC time														
01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location						
Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk
Ratana Kiri	Ta Veseng	Phlueu Thum	Northeast	Low-Risk	Ratana Kiri	Ou Chum	Tun	Northeast	Low-Risk	Ratana Kiri	Ta Veseng	Phlueu Thum	Northeast	Low-Risk
Ratana Kiri	Ou Chum	Tun	Northeast	Low-Risk	Ratana Kiri	Veun Sai	Tiem Kraom	Northeast	Low-Risk	Ratana Kiri	Ou Chum	Tun	Northeast	Low-Risk
Ratana Kiri	Veun Sai	Kang Nak	Northeast	Low-Risk	Ratana Kiri	Koun Mom	Ko Hokeb	Northeast	Low-Risk	Ratana Kiri	Veun Sai	Kang Nak	Northeast	Low-Risk
Ratana Kiri	Veun Sai	Tiem Kraom	Northeast	Low-Risk	Tboung Khmum	Memot	Kantut	Central Lowland	Low-Risk	Ratana Kiri	Veun Sai	Tiem Kraom	Northeast	Low-Risk
Ratana Kiri	Ou Chum	Meh	Northeast	Low-Risk						Ratana Kiri	Ou Chum	Meh	Northeast	Low-Risk
Ratana Kiri	Koun Mom	Ko Hokeb	Northeast	Low-Risk						Ratana Kiri	Koun Mom	Ko Hokeb	Northeast	Low-Risk
Kampong Cham	Sueng Trang	Veal Preah	Central Lowland	Low-Risk						Kampong Cham	Sueng Trang	Veal Preah	Central Lowland	Low-Risk
Kampong Cham	Sueng Trang	Sampieng Kraom	Central Lowland	Low-Risk						Kampong Cham	Sueng Trang	Sampieng Kraom	Central Lowland	Low-Risk
Tboung Khmum	Memot	Kantut	Central Lowland	Low-Risk						Kampong Thom	Baray	Kokir Thum	Northwest	Low-Risk
Tboung Khmum	Memot	Chanikar Thmei	Central Lowland	Low-Risk						Tboung Khmum	Memot	Kantut	Central Lowland	Low-Risk
										Tboung Khmum	Memot	Chanikar Thmei	Central Lowland	Low-Risk
										Tboung Khmum	Tboung Khmum	Phum Pramuoy Dabpir	Central Lowland	Low-Risk
										Tboung Khmum	Tboung Khmum	Phum Pram Dab	Central Lowland	Low-Risk
										Tboung Khmum	Tboung Khmum	Thnal Thmei	Central Lowland	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 19/07/2021 00:00 UTC time											
01-Hour Flash Flood Risk and Location				3-Hour Flash Flood Risk and Location in Vietnam				6-Hour Flash Flood Risk and Location in Vietnam			
Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks
Kon Tum	Sa Thay	Central Highlands	High-Risk	Kon Tum	Sa Thay	Central Highlands	Moderate-Risk	Kon Tum	Sa Thay	Central Highlands	Moderate-Risk
Gia Lai	Ia Grai	Central Highlands	Low-Risk	Gia Lai	Ia Grai	Central Highlands	Low-Risk	Gia Lai	Ia Grai	Central Highlands	Low-Risk
Kon Tum	Sa Thay	Central Highlands	Low-Risk	Lao Cai	Bat Xat	Northwest	Low-Risk	Kon Tum	Dak Glei	Central Highlands	Low-Risk
Binh Phuoc	Phuoc Long	Southeast	Low-Risk	Lao Cai	Sa Pa	Northwest	Low-Risk	Binh Phuoc	Phuoc Long	Southeast	Low-Risk
Dong Nai	Xuan Loc	Southeast	Low-Risk	Lao Cai	Than Uyen	Northwest	Low-Risk	Dong Nai	Xuan Loc	Southeast	Low-Risk
Ba Ria Vung Tau	Long Dat	Southeast	Low-Risk					Dong Nai	Nhon Trach	Southeast	Low-Risk
Tay Ninh	Tan Bien	Southeast	Low-Risk					Ba Ria Vung Tau	Long Dat	Southeast	Low-Risk
Kon Tum	Sa Thay	Central Highlands	Low-Risk					Tay Ninh	Tan Bien	Southeast	Low-Risk
Lao Cai	Bat Xat	Northwest	Low-Risk					Gia Lai	Chu Pah	Central Highlands	Low-Risk
Lao Cai	Sa Pa	Northwest	Low-Risk					Lao Cai	Bat Xat	Northwest	Low-Risk
Lao Cai	Than Uyen	Northwest	Low-Risk					Lao Cai	Than Uyen	Northwest	Low-Risk
								Lao Cai	Sa Pa	Northwest	Low-Risk

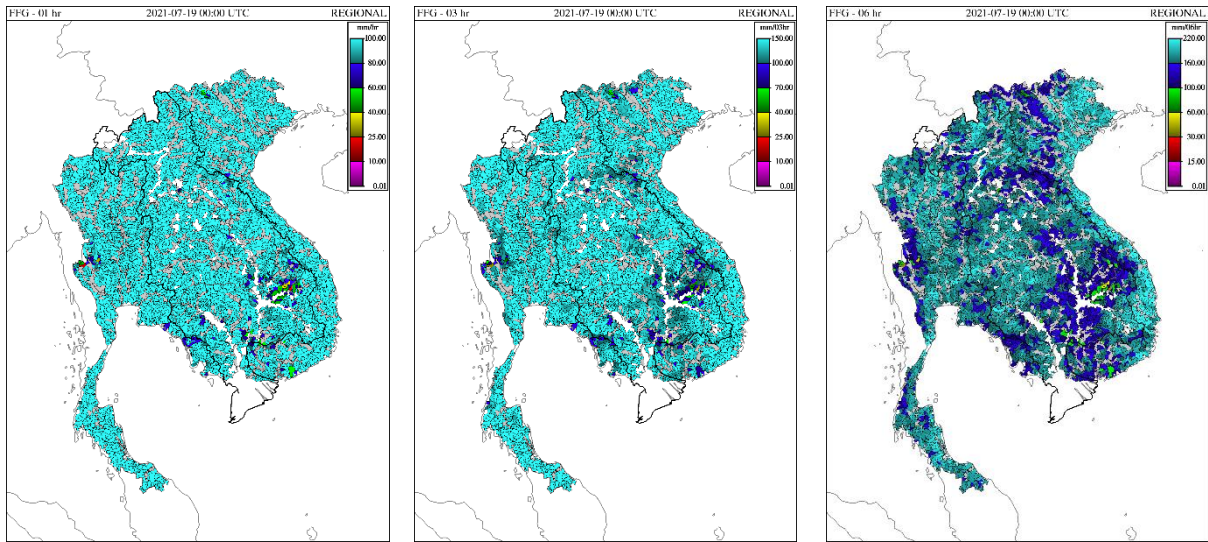


Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on July 8.

5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from 10 to 16 July 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)**

The meteorological indicator through weekly SPI from July 10 to 16 was relatively wetter than the previous week (July 3 to 9), shown in [Figure 15](#). Meteorological droughts, moderate and severe, took place in Lao PDR's Phongsaly, Luang Prabang, and Xieng Khuang in the north and Thailand's Bua Lamphu, Udon Thani, Sakon Nakhon, Mukdahan, Kalasin, Khon Kaen, Maha Sarakham, Roi Et, Yasothon, and Surin in the centre of the LMB. The conditions, on the other hand, presented very wet in north-eastern Cambodia including Stung Treng, Ratanak Kiri, Mondul Kiri, Kratie, and Kampong Cham. Other areas were normal during the reporting week.

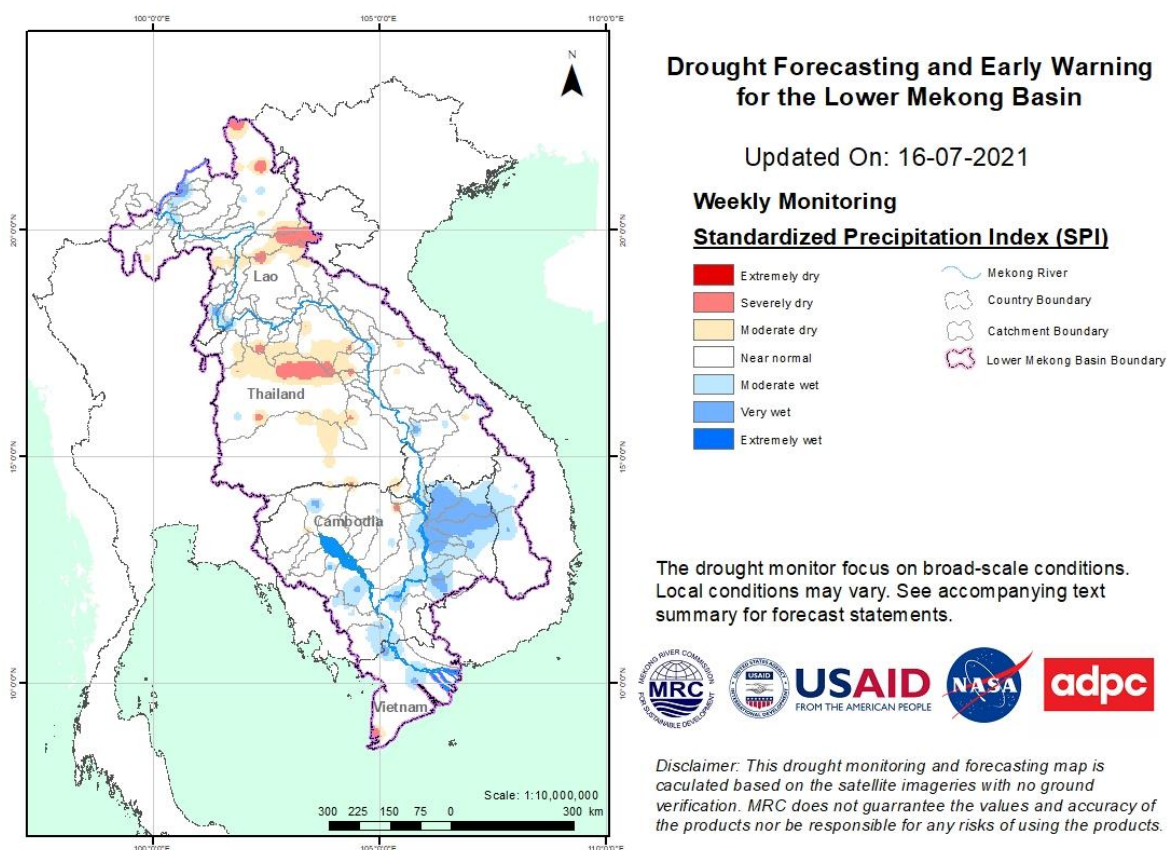


Figure 15. Weekly standardized precipitation index from 10 to 16 July 2021.

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

Soil water fraction from July 10 to 16, as displayed in [Figure 16](#), shows that the LMB region was normal and wet. No drought threat was found during the reporting period.

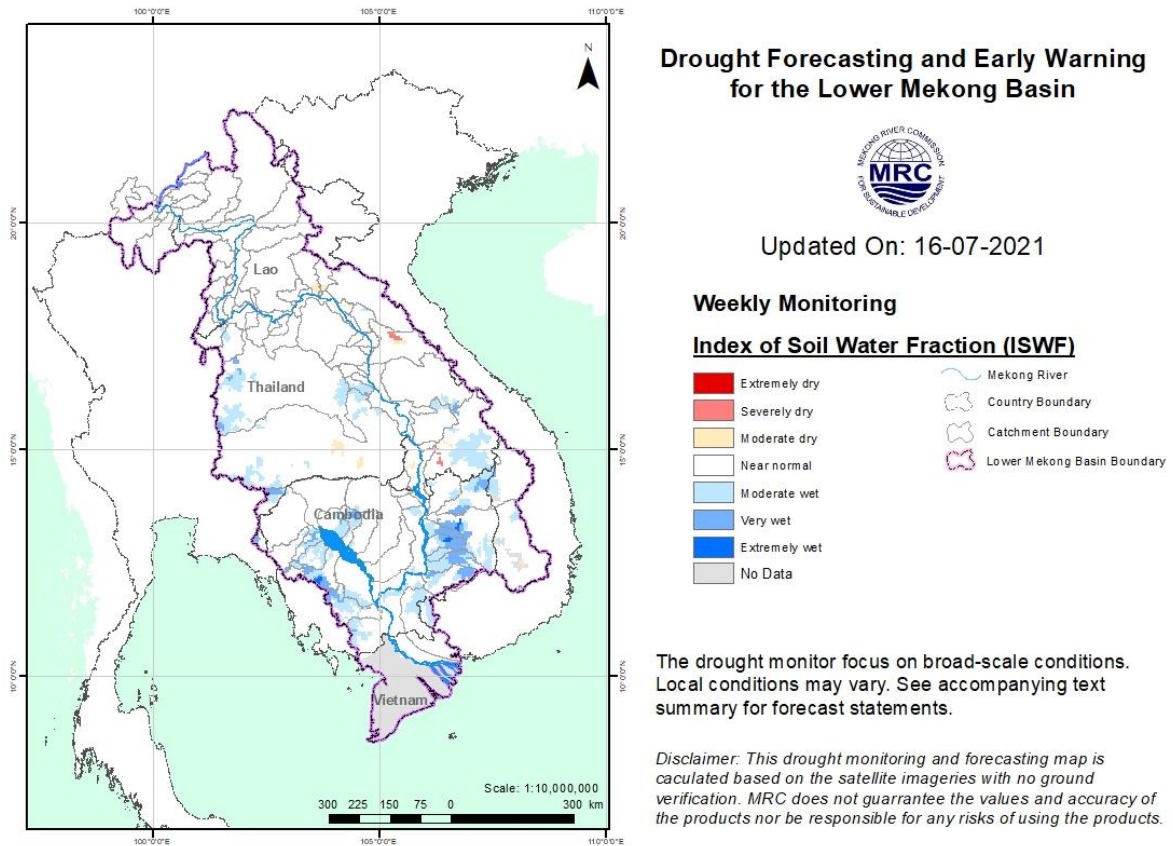


Figure 16. Weekly Soil Moisture Anomaly from 10 to 16 July 2021.

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

With a better condition of meteorological and agricultural indicators, the LMB did not face any significant threat during July 10 to 16. The weekly combined drought indicator, as displayed in [Figure 16](#), shows that the LMB was normal over the entire region.

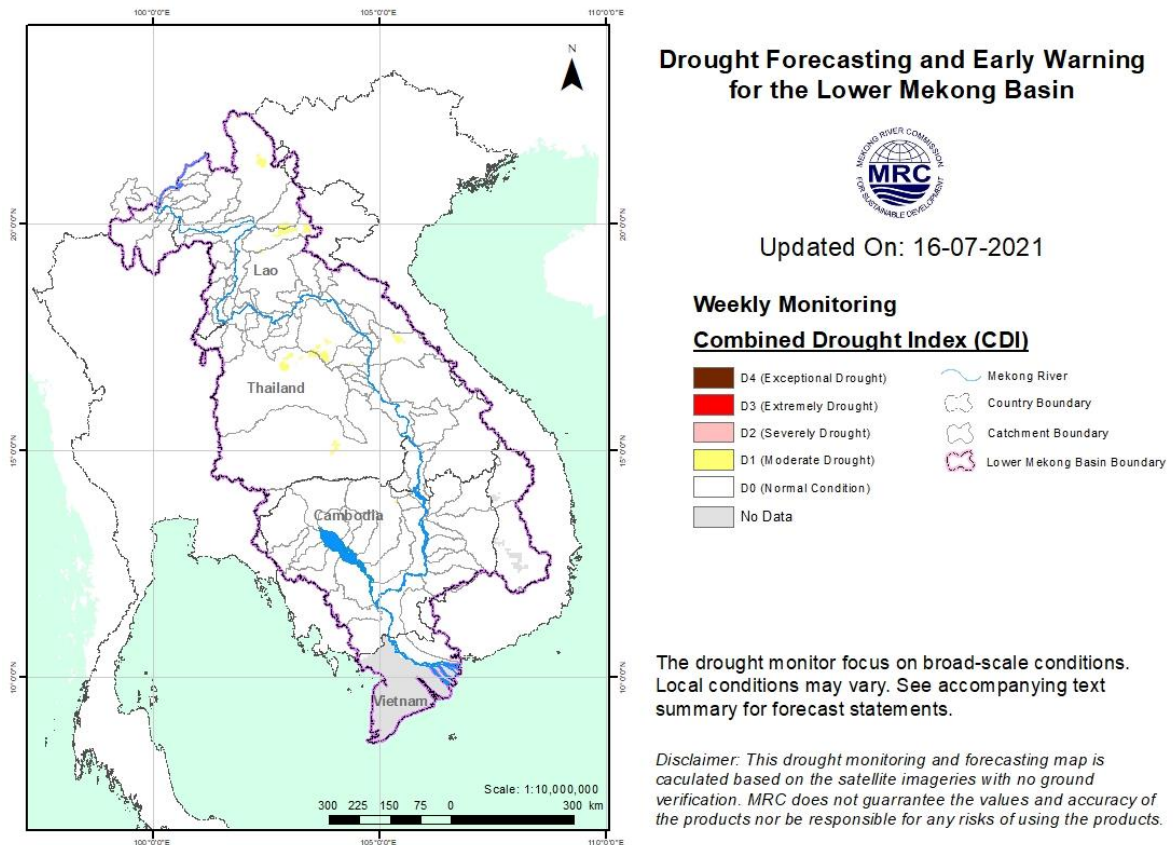


Figure 17. Weekly Combined Drought Index from 10 to 16 July 2021.

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.

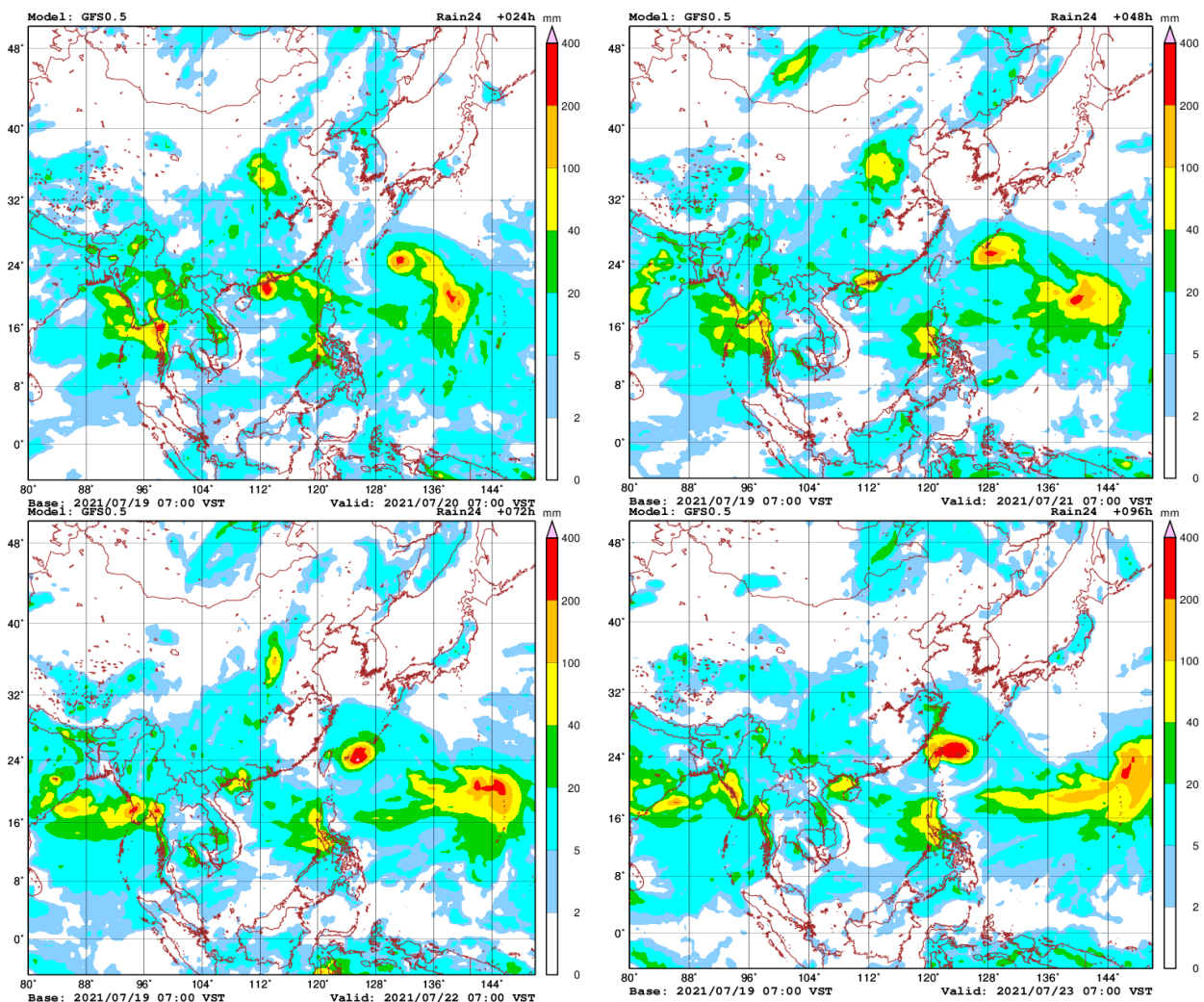
6 Weather and Water Level Forecast and Flash Flood Information

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 moderate Southwest Monsoon and low-pressure cell will continue prevailing over the LMB.

From July 20-26, moderate rainfall (20 -50 mm/24h) will likely occur in some parts of the LMB.

[Figure 18](#) shows accumulated rainfall forecast (24 h) of the GFS model from July 20-26.



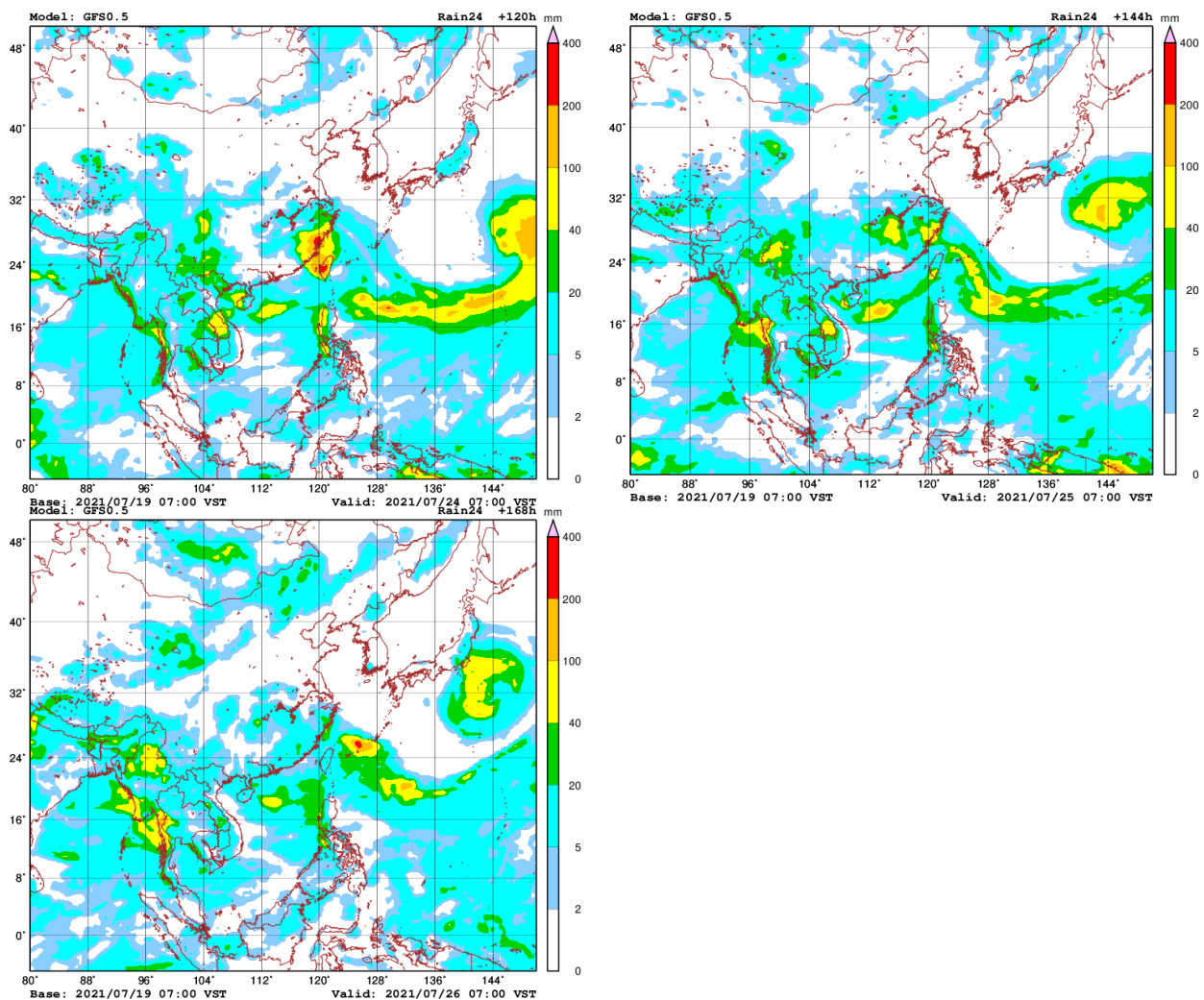


Figure 18. Accumulated rainfall forecast (24 h) based on a GFS model.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on July 19's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to slightly increase from 2.60 m to 2.81 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 slightly increase from 9.54 m to 9.85 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 increase about 0.40 m, while water level at Vientiane in Lao PDR will also increase about 0.45 m. From Nong Khai in Thailand to Paksane in Lao PDR, the water levels will rise by about 0.35 m over the next five days. Rainfall is forecasted for the area between Chiang Khan and Paksane next week.

The water levels are expected to go down lower than their LTA at Chiang Khan, Vientiane, Nong Khai, and Paksane.

Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR are forecasted to increase by about 0.26 m over the next seven days. From Khong Chiam in Thailand to Pakse in Lao PDR, the stations will likely experience a 0.35 m increase. The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR will stay lower than their LTA, with some forecasted rainfall for the areas 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 by about 0.55 m over the next seven 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 by about 0.40 m over the next seven days.

Water levels at these stations will continue to stay lower than their LTA values, particularly 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 below their LTA, 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 13 to 19 July 2021, is presented in **Annex 1**.

[Table 2](#) shows the daily flood forecasting Bulletin issued on July 19. Results of the weekly river monitoring bulletin are also available at http://ffw.mrcmekong.org/bulletin_wet.php.

6.3 Flash Flood Information

With 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 daily 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 September 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 July to October 2021 produced by the NMME.

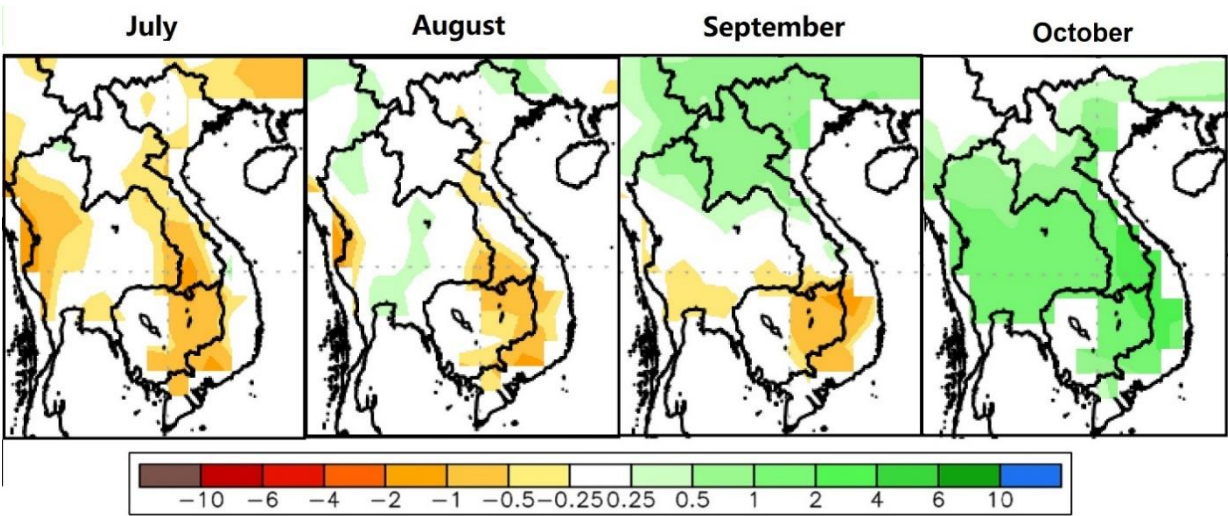


Figure 19. Daily average of monthly rainfall anomaly forecast from June to September 2021.

The ensemble prediction model forecasts that in July the LMB is likely to receive from below-average to average rainfall for the entire region; Cambodia, the Central Highlands of Viet Nam, and southern Lao PDR will be the driest areas. In August and September, eastern Cambodia and the Central Highland of Viet Nam are forecasted to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Fortunately, the models show that the LMB might receive much above average of rain during October.

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.

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 July 13-19, including the lower part in Cambodia and Viet Nam, varying from 11.70 millimetres (mm) to 247.70 mm.

Based on the forecasted satellite data, rainfall is forecasted for some areas of the LMB with value ranging from 10 mm to 100 mm for the next seven days. The forecasting model using GFS data, on the other hand, shows that significant rainfall (<100 mm) is likely to take place in the Mekong region from 20 to 26 July 2021.

7.2 Water level and its forecast

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed increase over the monitoring period from 12 to 19 July 2021. It increases about 0.45 m from 535.60 metres (m) on July 12 to 536.05 m on July 19. The outflows increased from 1,050 cubic metres per second (m³/s) on July 12 to 1,368 m³/s on July 19.

Due to below average rainfall from June 30 to July 19 and decreased flow from Jinghong upstream at the same period, water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR were decreasing, and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia were also repeatedly decreasing and staying lower than their LTA.

Over the next few days, the water levels from Chiang Khan to Vientiane and from Nakhon Phanom to Pakse are expected to increase by about 0.40 m and 0.45 m, respectively.

The flow volume of the Tonle Sap Lake is lower than its LTA. From next week, the flow might increase due to forecasted rainfall in the inflow catchments and the increased water levels along the lower part of the Mekong and Bassac rivers.

From Stung Treng to Kampong Cham, the water levels will increase but remain lower 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 early of July 2021, water levels across most monitoring stations in the LMB have dropped lower than their LTA (from upper to lower stretches within the LMB) but are likely to start increasing again from July 15 to 31 based on the predicted rainfall from satellite. 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 small amount of rainfall for the coming week as mentioned earlier in [section 6.1](#), no major flash floods are 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

With a better condition of meteorological and agricultural indicators, the LMB did not face any drought threat during July 10 to 16. The weekly combined drought indicator shows that the LMB was normal over the entire region.

The ensemble prediction model forecasts that in July the LMB is likely to receive from below-average to average rainfall for the entire region; Cambodia, the Central Highlands of Viet Nam, and southern Lao PDR will be the driest areas. In August and September, eastern Cambodia and the Central Highland of Viet Nam are forecasted to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Fortunately, the models show that the LMB might receive much above average of rain during October.

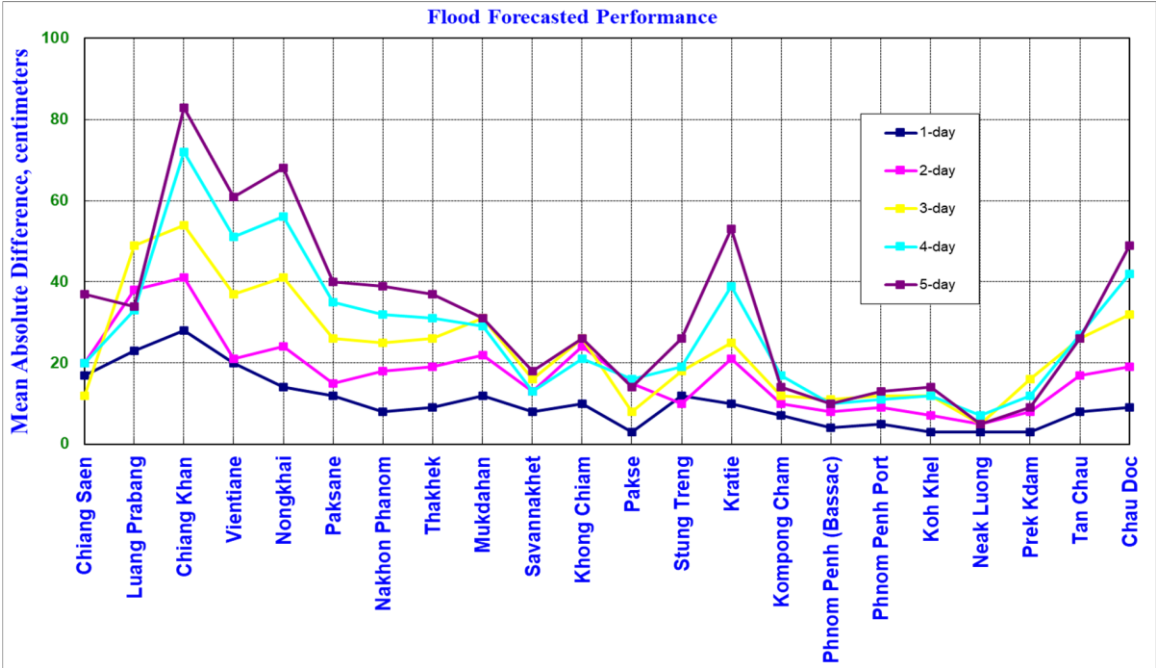
Annex 1: Performance of the weekly flood forecasting

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 13-19 July 2021.

The forecasting values from 12-19 July 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 Nong Khai due to the effect of rain 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.
- The influence of heavy rainfall caused by storms and hydropower operations from upstream, tributaries inflows and the lower part of the Mekong floodplain.
- Luang Prabang, Chiang Khan, Paksane and Savannakhet stations have been affected by hydropower operations of Xayaburi and Nam Nguem (water retention and release). Rainfall always accumulates at this spot, which could be causing rapidly high-water

levels.

- Rapid fluctuations of the water levels at Tan Chau and Chau Doc stations due to daily tidal effects of the sea in the Mekong Delta.
- Satellite rainfall data was 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 13-19 July, 2021.

Table B1: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 13-19 July, 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	17	<u>23</u>	<u>28</u>	<u>20</u>	14	12	8	9	12	8	10	3	12	10	7	4	5	3	3	3	8	9
2-day	<u>20</u>	<u>38</u>	<u>41</u>	<u>21</u>	<u>24</u>	15	18	19	<u>22</u>	13	<u>24</u>	15	10	<u>21</u>	10	8	9	7	5	8	17	19
3-day	12	<u>49</u>	54	<u>37</u>	<u>41</u>	<u>26</u>	<u>25</u>	<u>26</u>	<u>31</u>	16	<u>26</u>	8	18	<u>25</u>	12	11	12	12	5	16	<u>26</u>	<u>32</u>
4-day	<u>20</u>	<u>33</u>	72	51	56	<u>35</u>	<u>32</u>	<u>31</u>	<u>29</u>	13	<u>21</u>	16	19	<u>39</u>	17	10	11	12	7	12	<u>27</u>	<u>42</u>
5-day	<u>37</u>	<u>34</u>	83	61	68	<u>40</u>	<u>39</u>	<u>37</u>	<u>31</u>	18	<u>26</u>	14	<u>26</u>	53	14	10	13	14	5	9	<u>26</u>	<u>49</u>

Table B2: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 13-19 July, 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	71.4	<u>42.9</u>	<u>42.9</u>	57.1	71.4	57.1	57.1	57.1	71.4	57.1	71.4	71.4	71.4	57.1	<u>42.9</u>	57.1	71.4	57.1	57.1	<u>42.9</u>	57.1	57.1	57.1	<u>59.1</u>
2-day	<u>50.0</u>	66.7	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	66.7	<u>50.0</u>	66.7	83.3	<u>50.0</u>	83.3	66.7	66.7	66.7	<u>33.3</u>	66.7	66.7	66.7	16.7	66.7	66.7	66.7	66.7	<u>59.8</u>
3-day	<u>40.0</u>	60.0	60.0	60.0	60.0	<u>40.0</u>	<u>40.0</u>	<u>40.0</u>	80.0	80.0	80.0	80.0	<u>40.0</u>	<u>40.0</u>	80.0	60.0	60.0	60.0	60.0	80.0	60.0	60.0	60.0	<u>60.0</u>
4-day	<u>50.0</u>	<u>50.0</u>	75.0	75.0	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	75.0	75.0	<u>25.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	75.0	75.0	75.0	<u>50.0</u>	<u>25.0</u>	<u>55.7</u>	
5-day	66.7	66.7	<u>33.3</u>	66.7	<u>33.3</u>	<u>33.3</u>	<u>33.3</u>	<u>33.3</u>	<u>33.3</u>	66.7	<u>33.3</u>	66.7	<u>33.3</u>	66.7	66.7	66.7	66.7	66.7	66.7	66.7	<u>33.3</u>	<u>33.3</u>	<u>51.5</u>	

Table B3: Overview of performance indicators for the past 7 days from 13-19 July 2021

	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
	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
2021																				
week	10:26	00:00	-	-	08:15	07:10	07:13	09:01	08:10	08:18	07:01	08:18	0	0	0	102	64	14	3	0
month	10:30	00:00	-	-	08:15	07:10	07:21	08:36	08:26	08:14	07:17	08:18	0	0	14	272	180	48	7	38

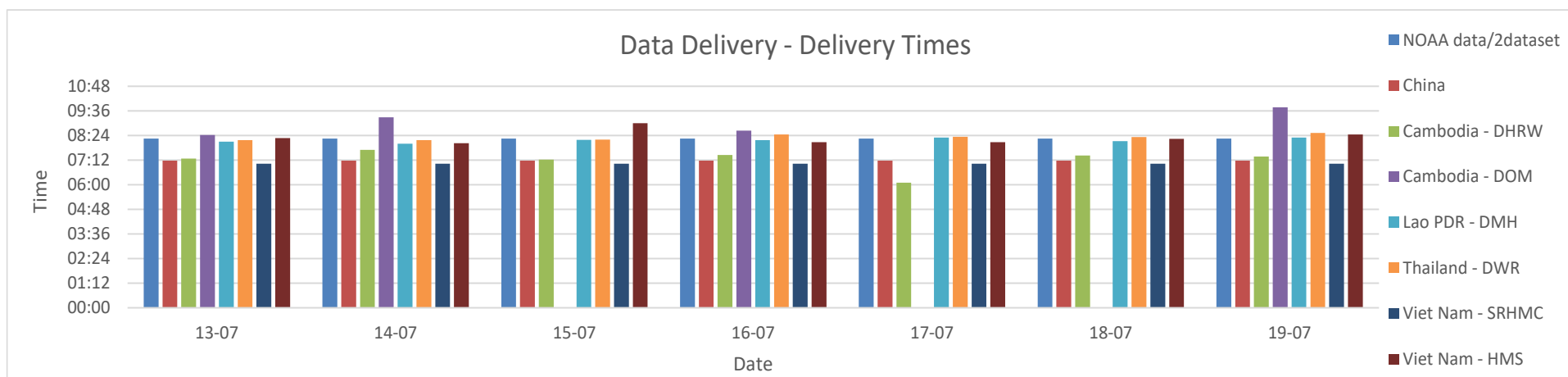


Fig. B4: Data delivery times for the past 7 days from 13-19 July 2021

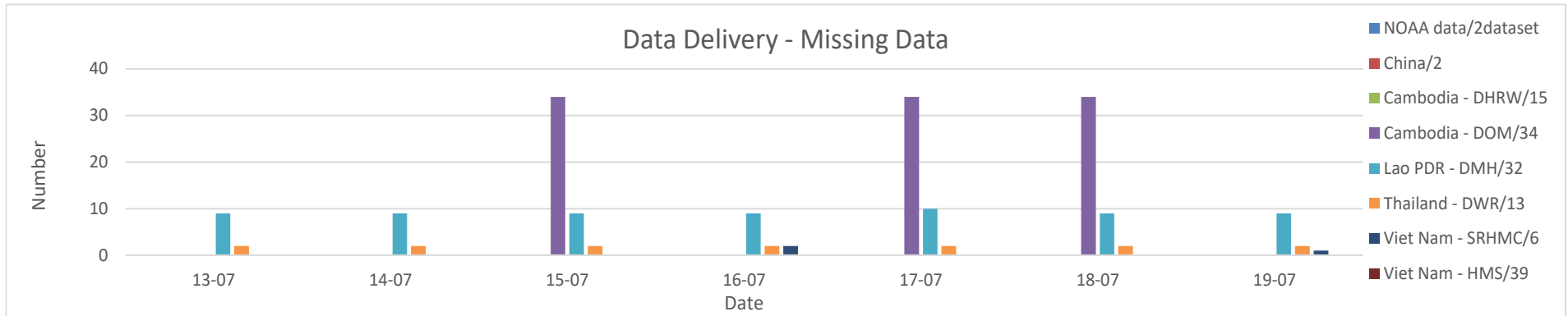


Fig. B5: Missing data for the past 7 days from 13-19 July 2021

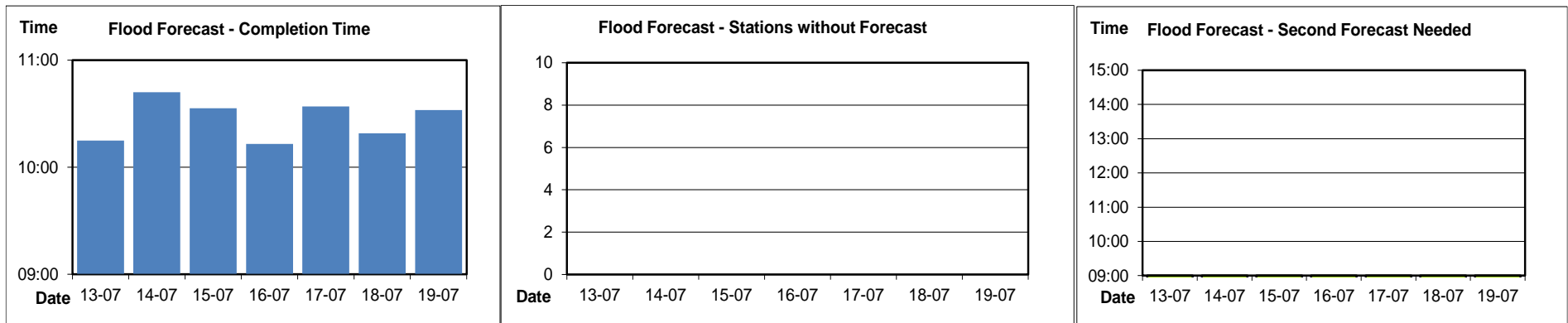


Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 13-19 July 2021



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