



**Mekong River Commission**

# **Weekly Wet Season Situation Report in the Lower Mekong River Basin 20-26 July 2021**

Prepared by  
The Regional Flood and Drought Management Centre  
27 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 Sean in Thailand to Pakse in Lao PDR, including the lower part in Cambodia and Viet Nam, varying from 3.00 millimetres (mm) to 252.90 mm.
- There will be significant rainfall for the next 5 days in the Mekong region from 27 July to 01 August 2021 because of low-pressure dominating in the Mekong region.

### Water level and its forecast

- The outflows at Jinghong hydrological station showed slightly decrease over the monitoring period from 20 to 26 July 2021. It was down about 0.17 m from 536.07 metres (m) on July 20 to 535.90 m on July 26. The outflows decreased from 1,375 cubic metres per second (m<sup>3</sup>/s) on July 20 to 1,261 m<sup>3</sup>/s on July 26.
- Amid low flow from Jinghong upstream, the above average rainfall from 20 to 26 July in the LMB has made water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR increase; and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia water levels were also repeatedly increasing and staying higher than their LTA.
- The water volume of the Tonle Sap Lake during this reporting period was slightly higher than that in 2019 and 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 and are forecasted to stay above their long-term value in some stations.

### Drought condition and its forecast

- Drought conditions of the LMB from July 17 to 23 were normal and wet in all over the region. No drought threat was found during the monitoring week.
- For the upcoming three-month forecast, the LMB is likely to receive much below average rainfall in August mainly in the central and southern parts of the region; September is forecasted to be extremely wet in the north, moderately wet and normal in the middle, and normal and moderately dry in southern areas of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB.

# 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 **20-26 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](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>

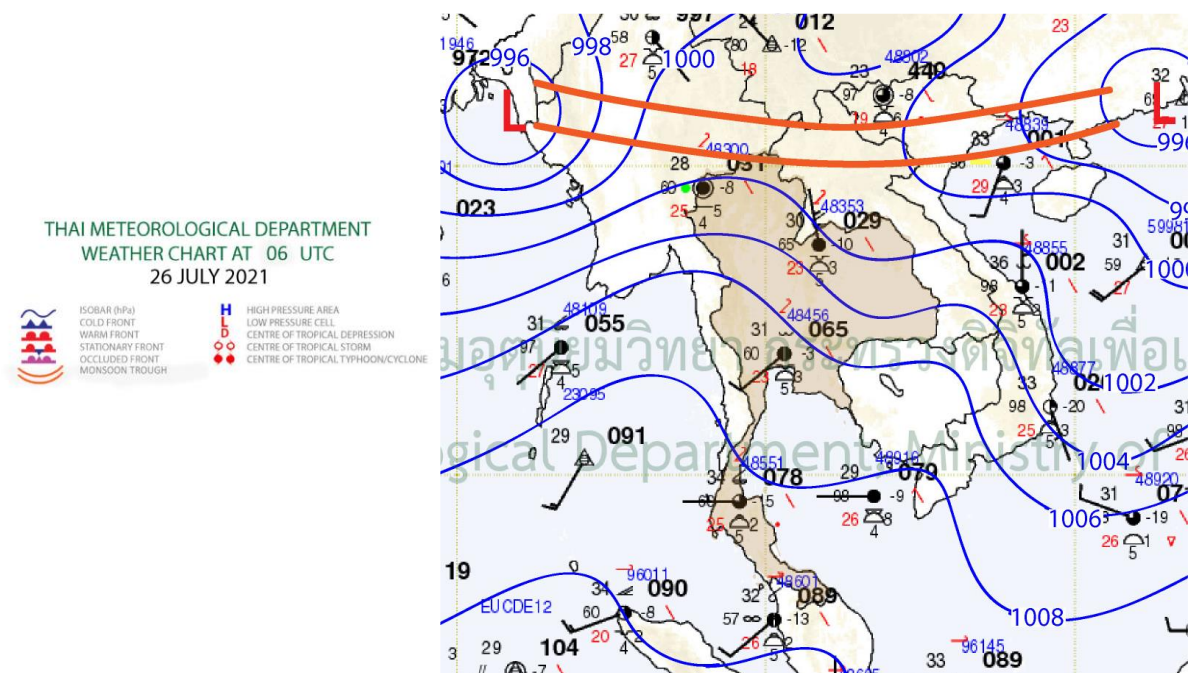


## 2 General Weather Patterns

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 continue from July to early August which 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 early August.

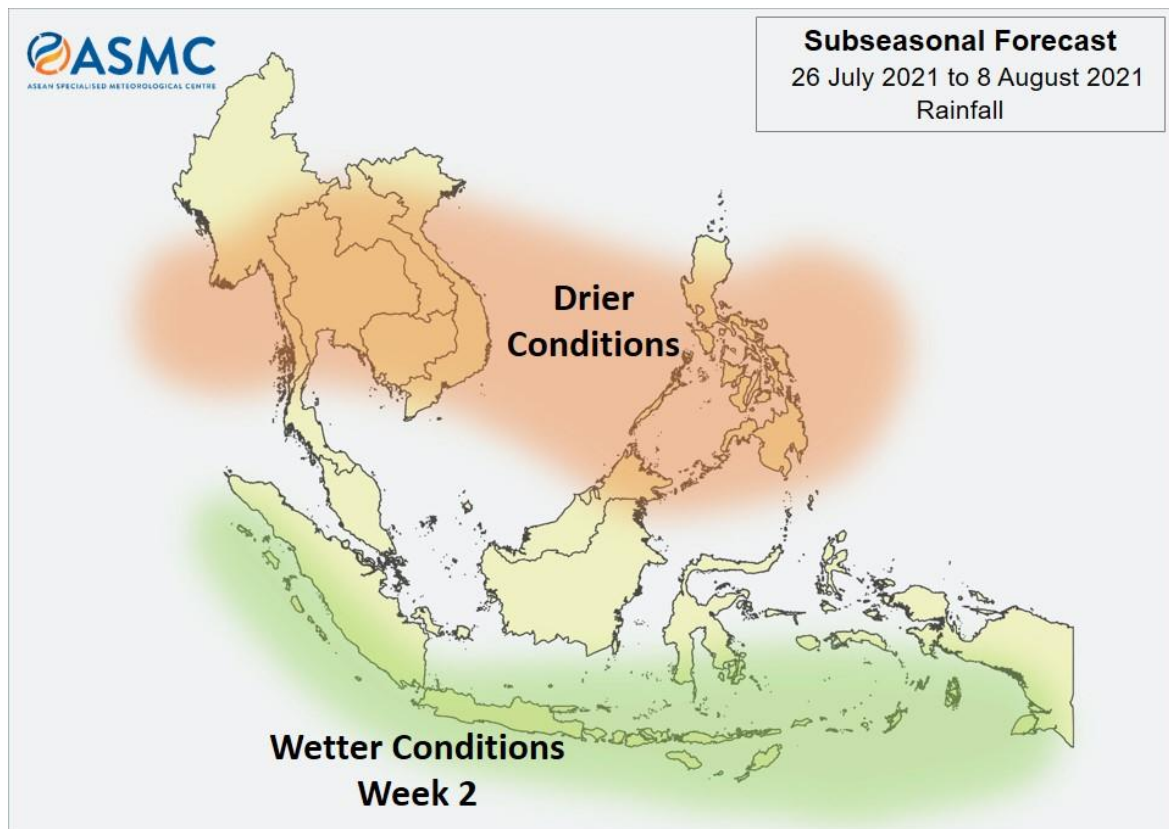
[Figure 1](#) presents the weather map of 26 July 2021, showing that a low pressure is dominating the upper part of Lao PDR and Viet Nam that might affect the 3S area (Sesan, Sre Pok, and Sekong) in Cambodia and Viet Nam of the LMB.



**Figure 1.** Summary of weather conditions over the LMB.

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of drier condition is predicted over of the lower part in Mekong region covering Cambodia and Viet Nam from 26 July to 8 August 2021, during the 4<sup>th</sup> week of July and 1<sup>st</sup> week of August. Nonetheless, the Northern part of Thailand and Lao PDR is likely dominated by warm condition, which may receive average rainfall in general.

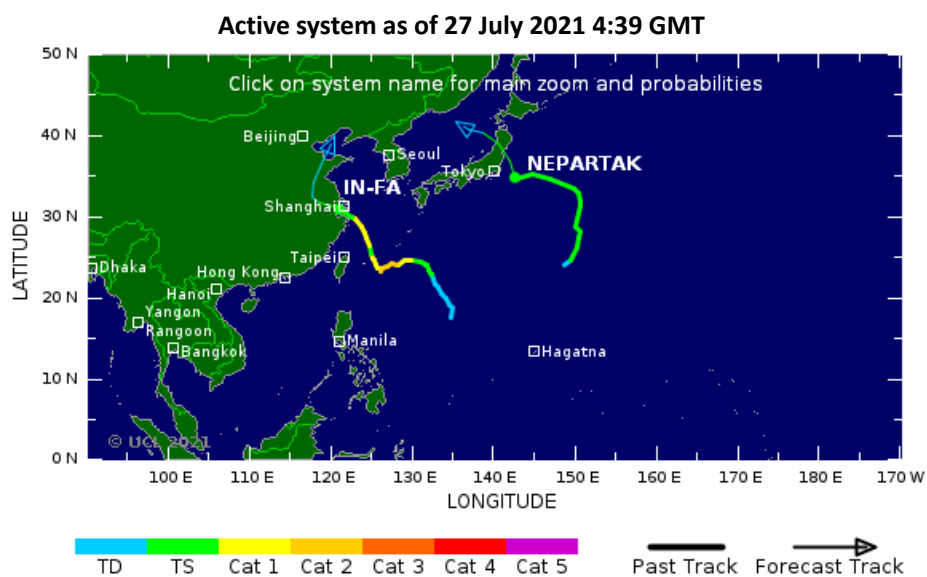
[Figure 2](#) shows the outlook of comparative warm conditions from 12-25 July 2021 covering the whole LMB region based on results from the NCEP model (National Centres for Environmental Prediction).



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

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

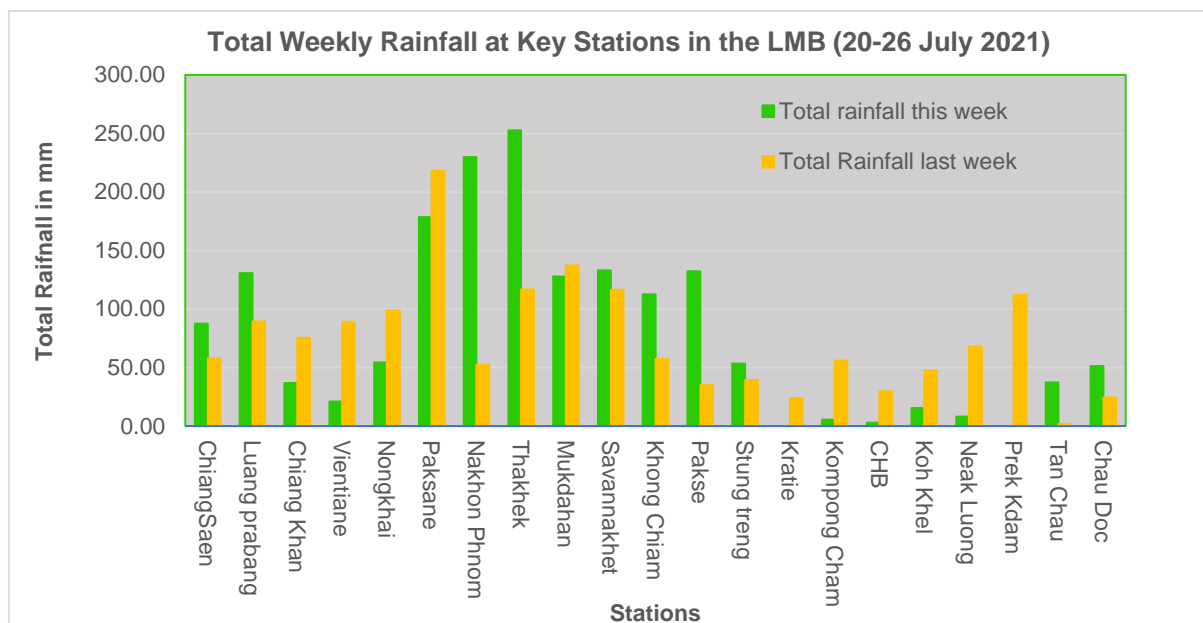
There were low-pressure lines taking place in the lower part of the LMB during 26 July 2021, as shown in [Figure 1](#), which would bring rain to some areas of the LMB. But based on the Tropical Storm Risk (TSR), as displayed in [Figure 3](#), there was no sign of tropical depression (TD), tropical storm (TS), or typhoon (TY) in the Mekong region up to 26 July 2021.



**Figure 3.** A tropical depression risk observed on 26 July 2021.

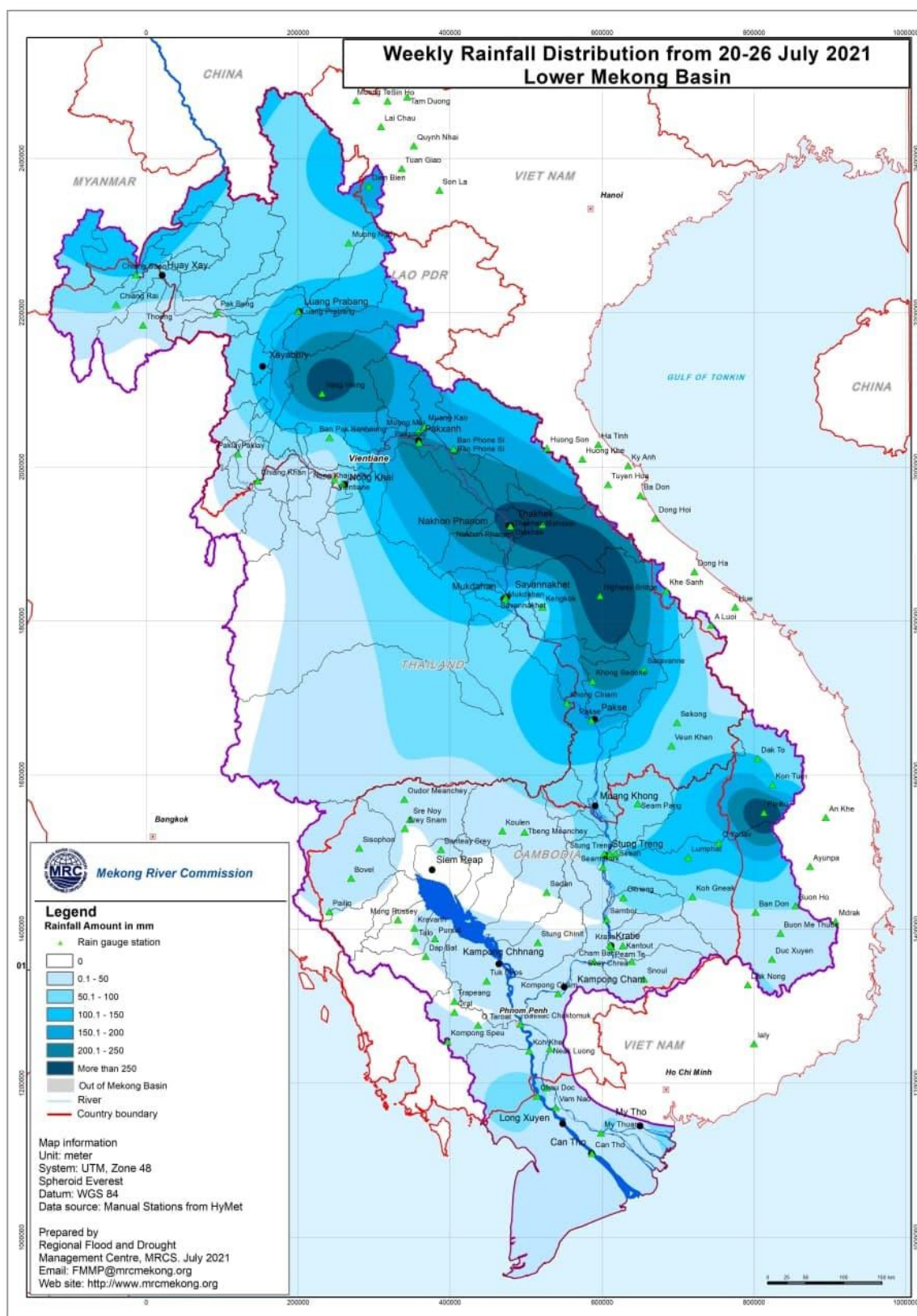
## 2.2 Rainfall patterns over the LMB

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 3.00 mm to 252.90 mm. The weekly total rainfall from 20 to 26 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 20-26 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 20 to 26 July 2021.



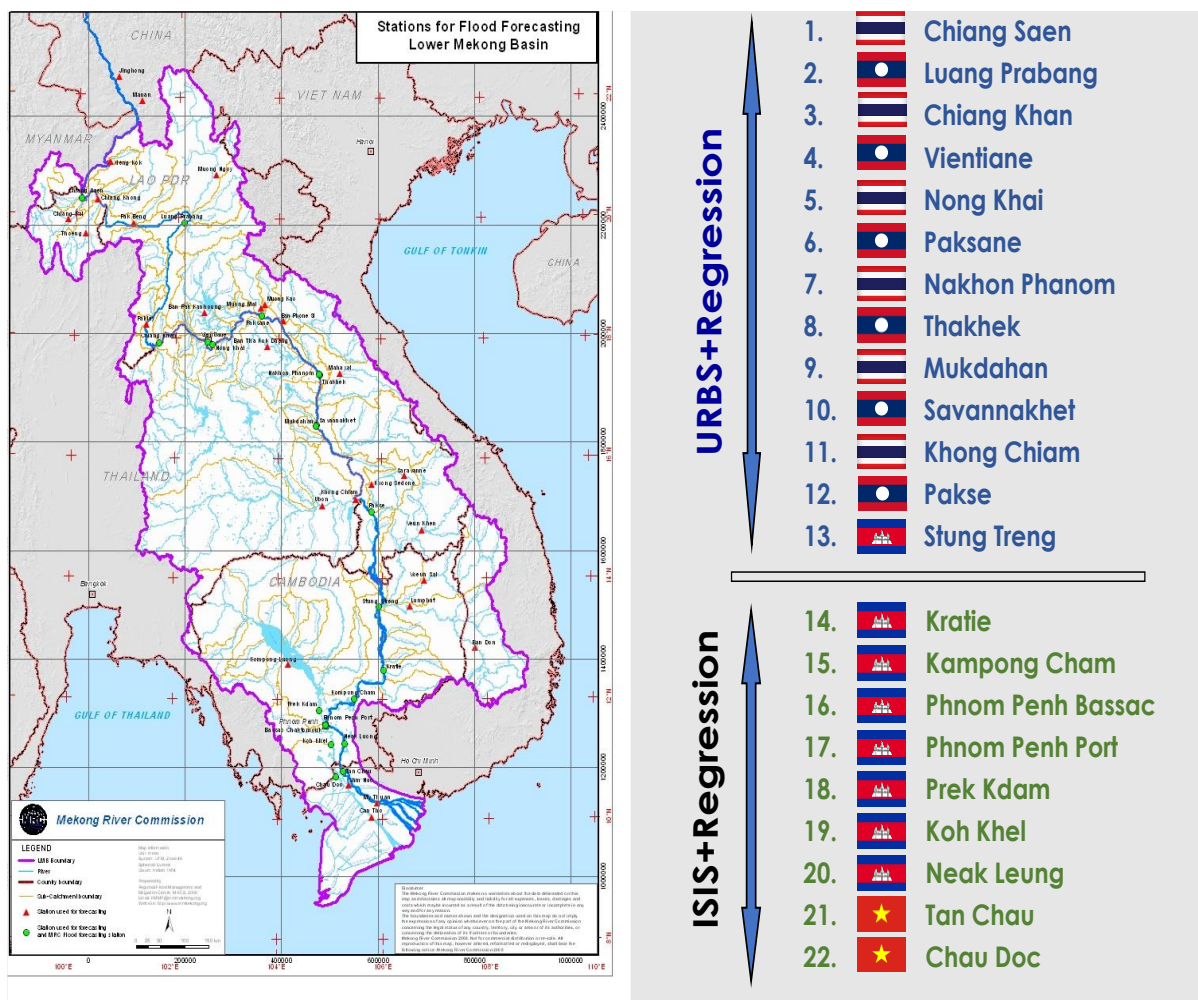
**Figure 5.** Weekly rainfall distribution over the LMB during 20-26 July 2021.



### 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.

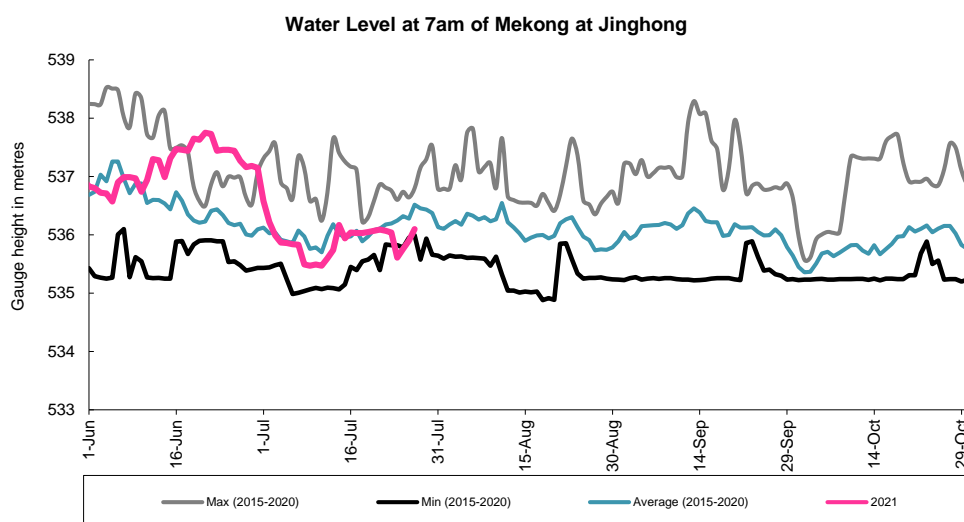
The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in [Figure 6](#). The hydrograph for each key station is available from the MRC's 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 slightly decrease over the monitoring period from 20 to 26 July 2021. It was down about 0.17 m from 536.07 metres (m) on July 20 to 535.90 m on July 26. The outflows decreased from 1,375 cubic metres per second (m<sup>3</sup>/s) on July 20 to 1,261 m<sup>3</sup>/s on July 26.

[Figure 7](#) below presents water level fluctuations at the Jinghong hydrological station<sup>1</sup>, showing the levels from 20 to 26 July 2021 are close to the minimum levels.



**Figure 7.** Water level at the Jinghong hydrological station during 1 – 26 July 2021.

Amid low flow from Jinghong upstream, the above average rainfall from 20 to 26 July in the LMB has made water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR suddenly increase; and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia were also repeatedly increasing and staying above 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

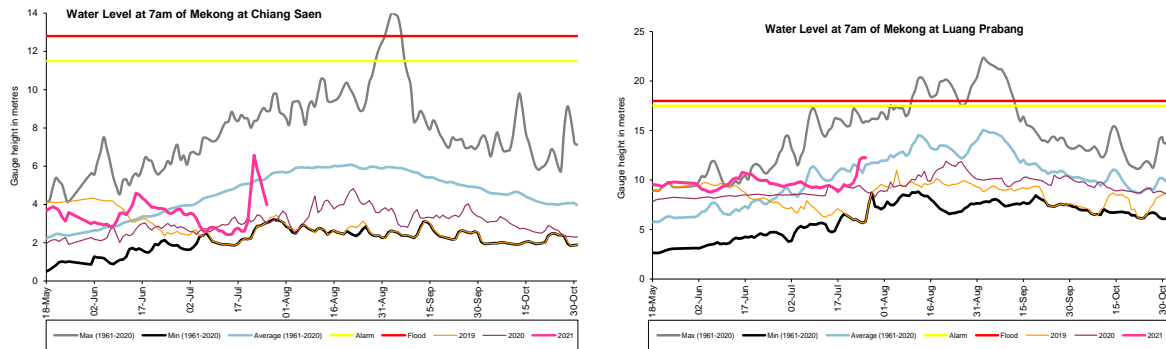
The water level from 20 to 26 July 2021 at Thailand’s Chiang Saen increased from 3.10 metres (m) to 3.98 m, showing about 1. 41 m lower than its LTA.

Similarly, the water level at Luang Prabang station in Lao PDR also rapidly increased, rising from 9.36 m to 12.26 m during the reporting period. This level shows 0.71 m higher 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

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

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.**



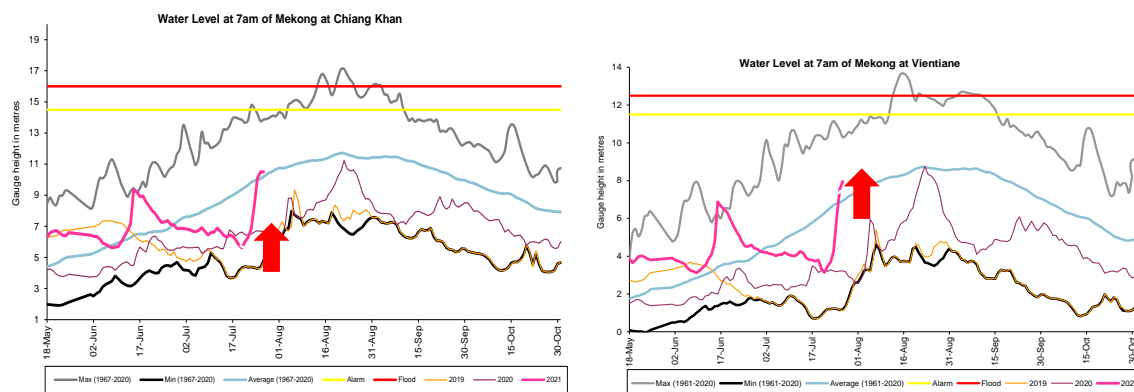
**Figure 8.** Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

### Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) suddenly increased during the reporting week, July 20 to 26, from 5.61 m to 10.50 m and showing 0.30 m higher than its Long-Term- Average (LTA).

The water level downstream at Vientiane in Lao PDR followed the upstream trend. Water level also suddenly increased from 3.34 m to 7.96 m and was about 1.03 m higher than its LTA from July 20 to 26. At Nong Khai station in Thailand, the water level increased rapidly. It rises about 4.64 m, increasing from 3.00 m down to 7.64 m but still showing 0.10 m lower than its LTA. The water level at Paksane in Lao PDR also increased by about 2.99 m, rising from 4.80 m up to 7.79 m. Although, there was a rapid change of WL due to heavy rainfall in the surrounding areas, the water levels at this station were still lower than its LTA. The increased level was obviously due to heavy rainfall and together with the effect by the Nam Ngum dam operation located upstream.

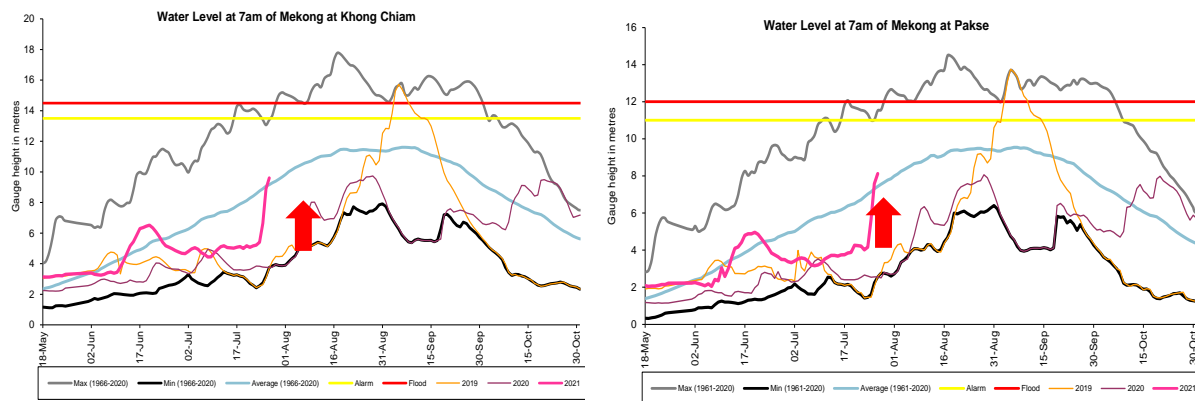
The water levels at Chiang Khan and Vientiane are shown in [Figure 9](#) below.



**Figure 9.** Water levels at Chiang Khan in Thailand and Veintiane in Lao PDR.

## Nakhon Phanom to Pakse

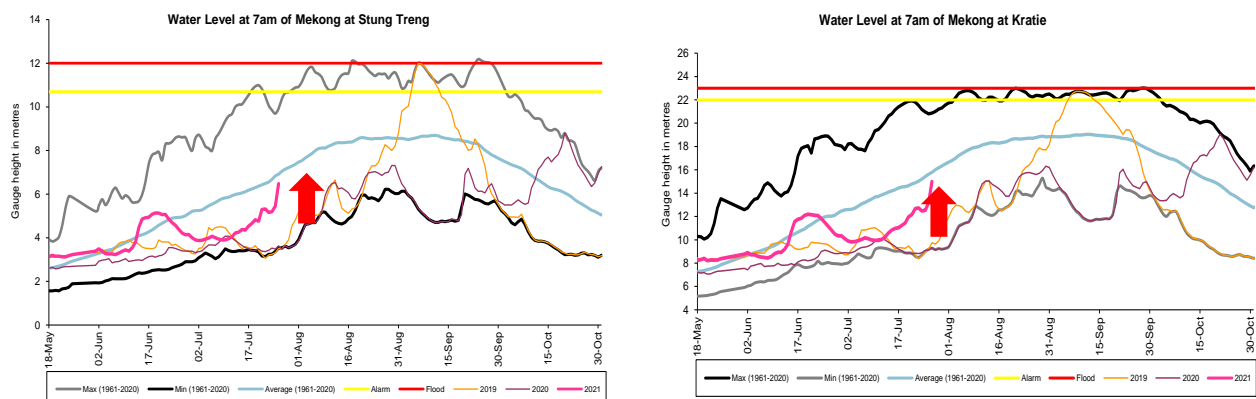
The water levels from Nakhon Phanom in Thailand to Savannkhet in Lao PDR rapidly increased by about 2.50 m, while those from Khong Chaim in Thailand to Pakse in Lao PDR speedily increased about 3.20 m (see [Figure 10](#)), showing these stations were about 0.25 m higher than their LTA.



**Figure 10.** Weekly water levels at Khong Chiam 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 abruptly increase during 20-26 July 2021. This week water level at Stung Treng and Kratie increased about 1.72 m and 1.21 m, respectively, but still showed about 0.50 lower than their LTA (see [Figure 11](#)). The water level at Kompong Cham rose about 0.94 m but still stayed 3.19 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 0.60 m and stayed 2.65 m below its LTA; while at Koh Khel, water level went up 0.61 m but still stayed 2.50 m below its LTA. The water level at Prek Kdam on the Tonle Sap Lake rose about 0.62 m and was still



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.

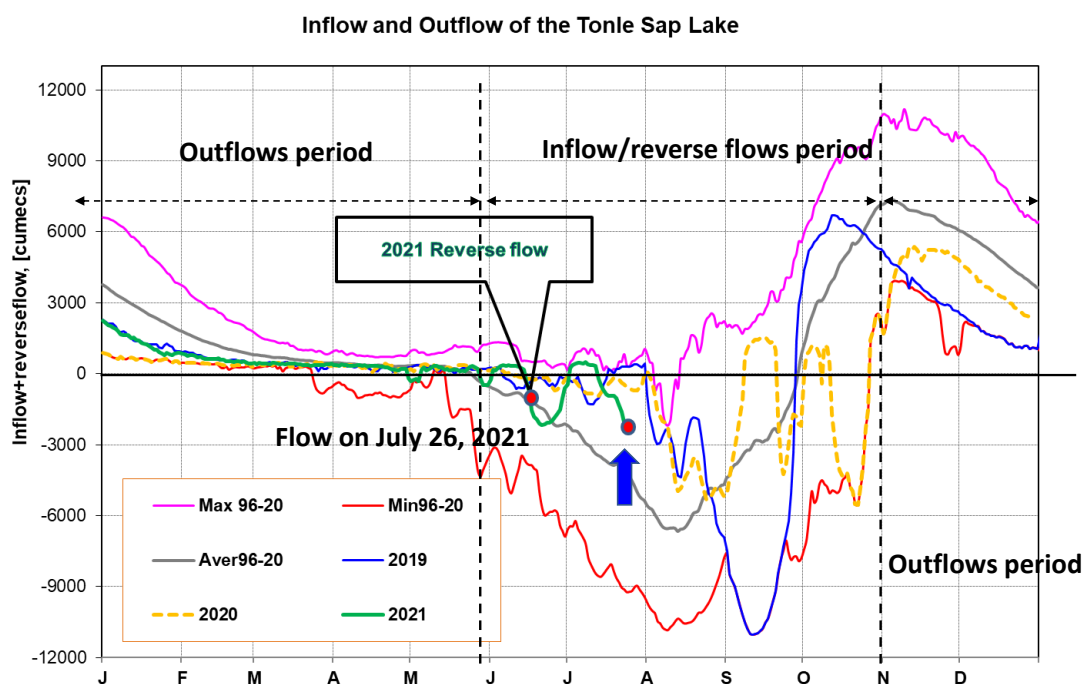
### Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 20 to 26 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 0.51 m and 0.85 m; they were in between historical range of maximum and minimum levels and **considered normal**.

### The Tonle Sap Flow

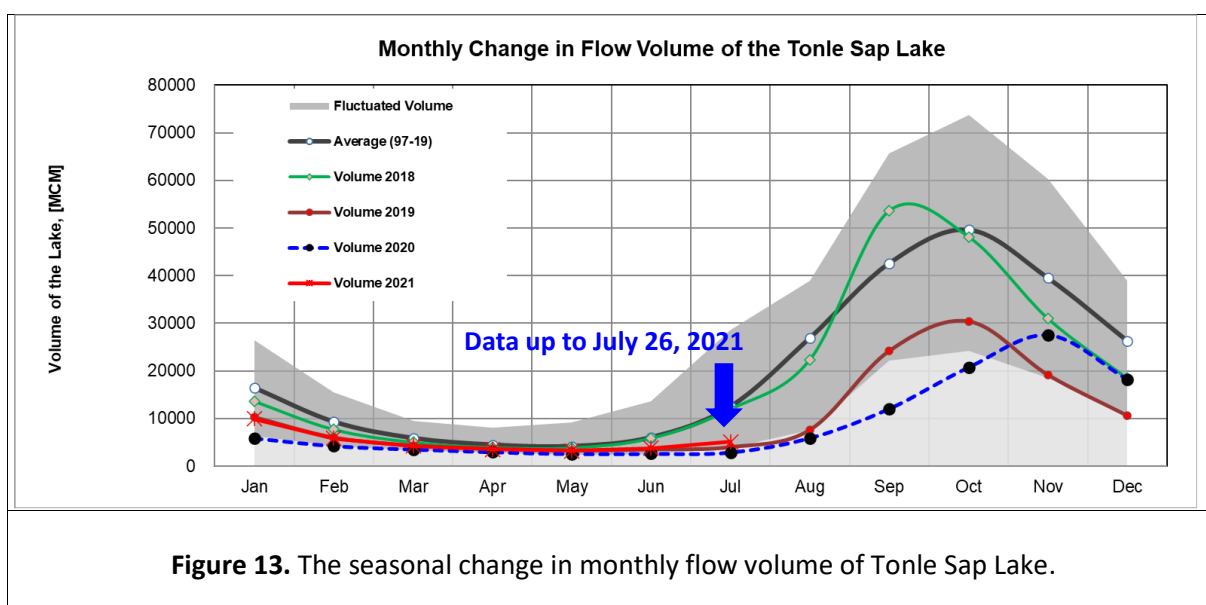
At the end of the dry season, when water levels along the Mekong River increase, flows of the Mekong River reverse into the Tonle Sap Lake and then to the Delta. This phenomenon normally takes place from June to early August.

[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 26 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 went up again in this week as water levels along the Mekong mainstream have rosed significantly due to heavy rainfall in the region**. The inflow into the Tonle Sap Lake condition in 2021 was lower than its average amount and higher than the 2019 and 2020 inflow condition. Fortunately, above average rainfall is forecasted from in 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 26, **the water volume of the Tonle Sap Lake is higher than the levels in 2019 and 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	5106.12
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, 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 <sup>3</sup> )							

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 20 to 26, the LMB was affected by three weather factors including (i) The monsoon trough layed across upper Viet Nam and upper north Thailand during the first half of the week toward the low-pressure cell over the SEA, (ii) The tropical storm Cempaka from 19 to 23 July, its active low-pressure cell over the coast of upper Viet Nam and Gulf of Tonkin, and (iii) the active southwest monsoon prevailed over the Gulf of Thailand. These conditions caused moderate and heavy rainfall from upper to middle parts of the LMB during the week.


According to the MRC-Flash Flood Guidance System (MRC- FFGS) and analysis, flash flood events were detected during the reporting period in several areas of the LMB ranging from low to hight level as shown in [Figure 14](#) and [Table 2](#).

**Table 2.** Detected flash flood in Thailand, Lao PDR, Cambodia, and Viet Nam on 24 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		24/07/2021 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	Provinces	Districts	Region	Level Risk
Ubon Ratchathani	Sirinthon	Northeastern	Low-Risk	Sakon Nakhon	Muang Sakon Nakhon	Northeastern	Low-Risk	Ubon Ratchathani	Sirinthon	Northeastern	Low-Risk				
Sakon Nakhon	Akat Amnuai	Northeastern	Low-Risk	Trad	Muang Trat	Eastern	Low-Risk	Sakon Nakhon	Akat Amnuai	Northeastern	Low-Risk				
Nakhon Phanom	Na Wa	Northeastern	Low-Risk	Kanchanaburi	Thong Pha Phum	Central	Low-Risk	Nakhon Phanom	Na Wa	Northeastern	Low-Risk				
Sakon Nakhon	Muang Sakon Nakhon	Northeastern	Low-Risk	Phangnga	Khura Buri	Southern-West Coast	Low-Risk	Sakon Nakhon	Muang Sakon Nakhon	Northeastern	Low-Risk				
Sakon Nakhon	Phang Khon	Northeastern	Low-Risk					Sakon Nakhon	Phang Khon	Northeastern	Low-Risk				
Nakhon Phanom	Phon Sawan	Northeastern	Low-Risk					Nakhon Phanom	Phon Sawan	Northeastern	Low-Risk				
Ubon Ratchathani	Sirinthon	Northeastern	Low-Risk					Kalasin	Sam Chai	Northeastern	Low-Risk				
Trad	Muang Trat	Eastern	Low-Risk					Ubon Ratchathani	Sirinthon	Northeastern	Low-Risk				
Kanchanaburi	Thong Pha Phum	Central	Low-Risk					Roi Et	Phon Thong	Northeastern	Low-Risk				
Phangnga	Khura Buri	Southern-West Coast	Low-Risk					Trad	Muang Trat	Eastern	Low-Risk				
								Kanchanaburi	Thong Pha Phum	Central	Low-Risk				
								Phangnga	Khura Buri	Southern-West Coast	Low-Risk				

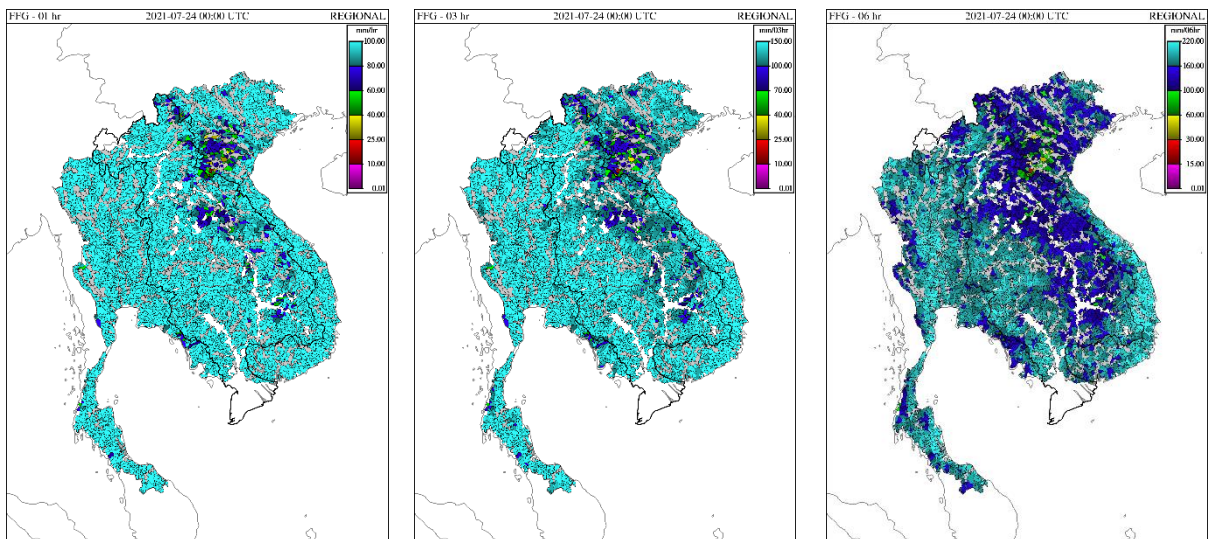
  

Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Lao PDR															
Date of FFG products		24/07/2021 00:00 UTC time													
01-Hour Flash Flood Risk and Location					03-Hour Flash Flood Risk and Location					06-Hour Flash Flood Risk and Location					
Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Level Risk
Savannakhet	Phine	PHAY	Southern	Low-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk	Low-Risk
Bolikhambay	Khamkeut	NAPHOUANG	Central Laos	Low-Risk	Bolikhambay	Khamkeut	NAPHOUANG	Central Laos	Low-Risk	Savannakhet	Phine	PHAY	Southern	Low-Risk	Low-Risk
Xiangkhuan	Khoune	POUNG	Northeast	Low-Risk	Xiangkhuan	Khoune	POUNG	Northeast	Low-Risk	Bolikhambay	Khamkeut	NAPHOUANG	Central Laos	Low-Risk	Low-Risk
Phongsaly	Samphanh	SENLOUANG MAI	North	Low-Risk	Phongsaly	Samphanh	SENLOUANG MAI	North	Low-Risk	Xiangkhuan	Khoune	POUNG	Northeast	Low-Risk	Low-Risk
Luangprabang	Pak xeng	NAMAI	North	Low-Risk	Luangprabang	Pak xeng	NAMAI	North	Low-Risk	Phongsaly	Nhot ou	HOUAYK/	North	Low-Risk	Low-Risk
Luangprabang	Viangkham	VANGBAI	North	Low-Risk	Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk	Phongsaly	Samphanh	NAM ON	North	Low-Risk	Low-Risk
Khammuane	Hinboon	PHON XAI	Center of Laos	Low-Risk	Savannakhet	Xaybuly	NONGSAPHANG	Southern	Low-Risk	Phongsaly	Samphanh	NAMING	North	Low-Risk	Low-Risk
Khammuane	Hinboon	MOUANG NAM SANG	Center of Laos	Low-Risk	Savannakhet	Xaybuly	PHAKKHAGNA	Southern	Low-Risk	Phongsaly	Samphanh	SENLOU/	North	Low-Risk	Low-Risk
Savannakhet	Xaybuly	NONGSAPHANG	Southern	Low-Risk	Sekong	Lamarm	KANONG MAI	Southeast	Low-Risk	Luangprabang	Ngoi	HUAYNO/	North	Low-Risk	Low-Risk
Savannakhet	Xaybuly	KHAMNONSOUNG	Southern	Low-Risk	Phongsaly	May	HOUANENE	North	Moderate-Risk	Luangprabang	Pak xeng	NAMAI	North	Low-Risk	Low-Risk
Savannakhet	Xaybuly	PHAKKHAGNA	Southern	Low-Risk	Huaphanh	Xamtay	HOUAYSAMONG	Eastern	Low-Risk	Luangprabang	Viangkhar	VANGBAI	North	Low-Risk	Low-Risk
Sekong	Lamarm	KANONG MAI	Southeast	Low-Risk	Huaphanh	Xamtay	GNORT-INN	Eastern	Low-Risk	Luangprabang	Viangkhar	HUAYK/	North	Low-Risk	Low-Risk
Phongsaly	May	HOUAYHAO	North	Low-Risk	Huaphanh	Xamtay	NAMMORN	Eastern	Low-Risk	Luangprabang	Viangkhar	HATKAI	North	Low-Risk	Low-Risk
Phongsaly	May	HOUANENE	North	Moderate-Risk	Huaphanh	Xamtay	LONGKUANG	Eastern	Low-Risk	Luangprabang	Viangkhar	NAYAEN	North	Low-Risk	Low-Risk
Huaphanh	Xamtay	HOUAYSAMONG	Eastern	Low-Risk	Huaphanh	Xamneua	SATHORN	Eastern	Low-Risk	Khammuane	Hinboon	PHON XA	Center of	Low-Risk	Low-Risk
Huaphanh	Xamtay	GNORT-INN	Eastern	Low-Risk	Huaphanh	Viangxay	TA-AN	Eastern	Low-Risk	Khammuane	Hinboon	MOUANG	Center of	Low-Risk	Low-Risk
Huaphanh	Xamtay	NAMMORN	Eastern	Moderate-Risk	Huaphanh	Xamtay	PHAKHAO	Eastern	Low-Risk	Khammuane	Thakhek	LAO PHO	Center of	Low-Risk	Low-Risk
Huaphanh	Xamtay	LONGKUANG	Eastern	Low-Risk	Xiangkhuan	Nonghed	DAN	Northeast	Low-Risk	Savannakhet	Xaybuly	NONGSA	Southern	Low-Risk	Low-Risk
Huaphanh	Xamneua	SATHORN	Eastern	Low-Risk	Xiangkhuan	Kham	YORTLIENG	Northeast	Low-Risk	Savannakhet	Xaybuly	KHAMNO/	Southern	Low-Risk	Low-Risk
Huaphanh	Viangxay	TA-AN	Eastern	Moderate-Risk	Xiangkhuan	Nonghed	PHAPHEU	Northeast	Low-Risk	Savannakhet	Xaybuly	PHAKKH/	Southern	Low-Risk	Low-Risk
Huaphanh	Xamtay	PHALOM	Eastern	Low-Risk						Sekong	Kaleum	TIN	Southeast	Low-Risk	Low-Risk
Huaphanh	Xamtay	PHAKHAO	Eastern	Low-Risk						Sekong	Kaleum	STTHORI	Southeast	Low-Risk	Low-Risk
Huaphanh	Huameuang	KADAENG	Eastern	Low-Risk						Sekong	Lamarm	KANONG	Southeast	Low-Risk	Low-Risk
Xiangkhuan	Nonghed	DAN	Northeast	Low-Risk						Sekong	Lamarm	KADONE	Southeast	Low-Risk	Low-Risk
Xiangkhuan	Kham	YORTLIENG	Northeast	Low-Risk						Sekong	Dakcheun	DAKPORI	Southeast	Low-Risk	Low-Risk
Xiangkhuan	Nonghed	PHAPHEU	Northeast	Moderate-Risk						Phongsaly	May	HOUANE	North	Moderate-Risk	Moderate-Risk
Xiangkhuan	Morkmay	NAMKEUNG	Northeast	Low-Risk						Huaphanh	Xamtay	HINTANG	Eastern	Low-Risk	Low-Risk
Xiangkhuan	Morkmay	PAKHUANG	Northeast	Low-Risk						Huaphanh	Xamtay	HOUAYS/	Eastern	Low-Risk	Low-Risk
										Huaphanh	Xamtay	GNORT-II	Eastern	Low-Risk	Low-Risk
										Huaphanh	Xamtay	NAMMOR	Eastern	Moderate-Risk	Moderate-Risk

<div>  <div>Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Cambodia</div> </div>															
Date of FFG products 24/07/2021 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	
Rafana Kiri	Ou Chum	Tun	Northeast	Low-Risk	NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOUR					Rafana Kiri	Ou Chum	Tun	Northeast	Low-Risk	
Rafana Kiri	Veun Sai	Tiem Kraom	Northeast	Low-Risk						Rafana Kiri	Veun Sai	Tiem Kraom	Northeast	Low-Risk	
Rafana Kiri	Koun Mom	Ko Hokseb	Northeast	Low-Risk						Rafana Kiri	Koun Mom	Ko Hokseb	Northeast	Low-Risk	

<div>  <div>Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Viet Nam</div> </div>															
Date of FFG products 24/07/2021 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				
Gia Lai	Duc Co	Central Highlands	Low-Risk	Hoa Binh	Da Bac	Northwest	Low-Risk	Gia Lai	Duc Co	Central Highlands	Low-Risk				
Hoa Binh	Da Bac	Northwest	Low-Risk	Lai Chau	Muong Lay	Northwest	Low-Risk	Quang Tri	Huong Hoa	North Central	Low-Risk				
Lai Chau	Muong Lay	Northwest	Low-Risk	Son La	Moc Chau	Northwest	Low-Risk	Ha Tinh	Huong Son	North Central	Low-Risk				
Son La	Moc Chau	Northwest	Low-Risk	Hoa Binh	Mai Chau	Northwest	Low-Risk	Hoa Binh	Da Bac	Northwest	Low-Risk				
Hoa Binh	Mai Chau	Northwest	Low-Risk	Nghe An	Tuong Duong	North Central	Moderate-Risk	Lai Chau	Muong Te	Northwest	Low-Risk				
Nghe An	Tuong Duong	North Central	Moderate-Risk	Nghe An	Que Phong	North Central	Low-Risk	Lai Chau	Muong Lay	Northwest	Low-Risk				
Nghe An	Que Phong	North Central	Low-Risk	Nghe An	Quy Chau	North Central	Low-Risk	Son La	Moc Chau	Northwest	Low-Risk				
Nghe An	Quy Chau	North Central	Low-Risk	Son La	Song Ma	Northwest	Low-Risk	Son La	Phu yen	Northwest	Low-Risk				
Son La	Song Ma	Northwest	Moderate-Risk	Thanh Hoa	Quan Hoa	North Central	Low-Risk	Hoa Binh	Da Bac	Northwest	Low-Risk				
Thanh Hoa	Quan Hoa	North Central	Low-Risk	Thanh Hoa	Ba Thuoc	North Central	Low-Risk	Hoa Binh	Mai Chau	Northwest	Low-Risk				
Thanh Hoa	Ba Thuoc	North Central	Low-Risk	Thanh Hoa	Quan Son	North Central	Low-Risk	Lao Cai	Bao Yen	Northwest	Low-Risk				
Thanh Hoa	Quan Son	North Central	Low-Risk	Nghe An	Con Cuong	North Central	Low-Risk	Thanh Hoa	Thuong Xuan	North Central	Low-Risk				
Nghe An	Que Phong	North Central	Moderate-Risk	Nghe An	Tuong Duong	North Central	Low-Risk	Nghe An	Que Phong	North Central	Low-Risk				
Nghe An	Con Cuong	North Central	Low-Risk	Nghe An	Ky Son	Northwest	High-Risk	Nghe An	Tuong Duong	North Central	Moderate-Risk				
Nghe An	Ky Son	Northwest	High-Risk					Nghe An	Quy Chau	North Central	Low-Risk				
								Thanh Hoa	Muong Lat	North Central	Low-Risk				
								Son La	Song Ma	Northwest	Low-Risk				
								Son La	Yen Chau	Northwest	Low-Risk				
								Thanh Hoa	Muong Lat	North Central	Low-Risk				
								Thanh Hoa	Quan Hoa	North Central	Low-Risk				
								Thanh Hoa	Ba Thuoc	North Central	Low-Risk				
								Thanh Hoa	Muong Lat	North Central	Low-Risk				
								Thanh Hoa	Quan Son	North Central	Low-Risk				
								Nghe An	Que Phong	North Central	Moderate-Risk				
								Nghe An	Con Cuong	North Central	Low-Risk				
								Nghe An	Tuong Duong	North Central	Low-Risk				
								Nghe An	Ky Son	Northwest	High-Risk				



**Figure 14.** Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on July 24.

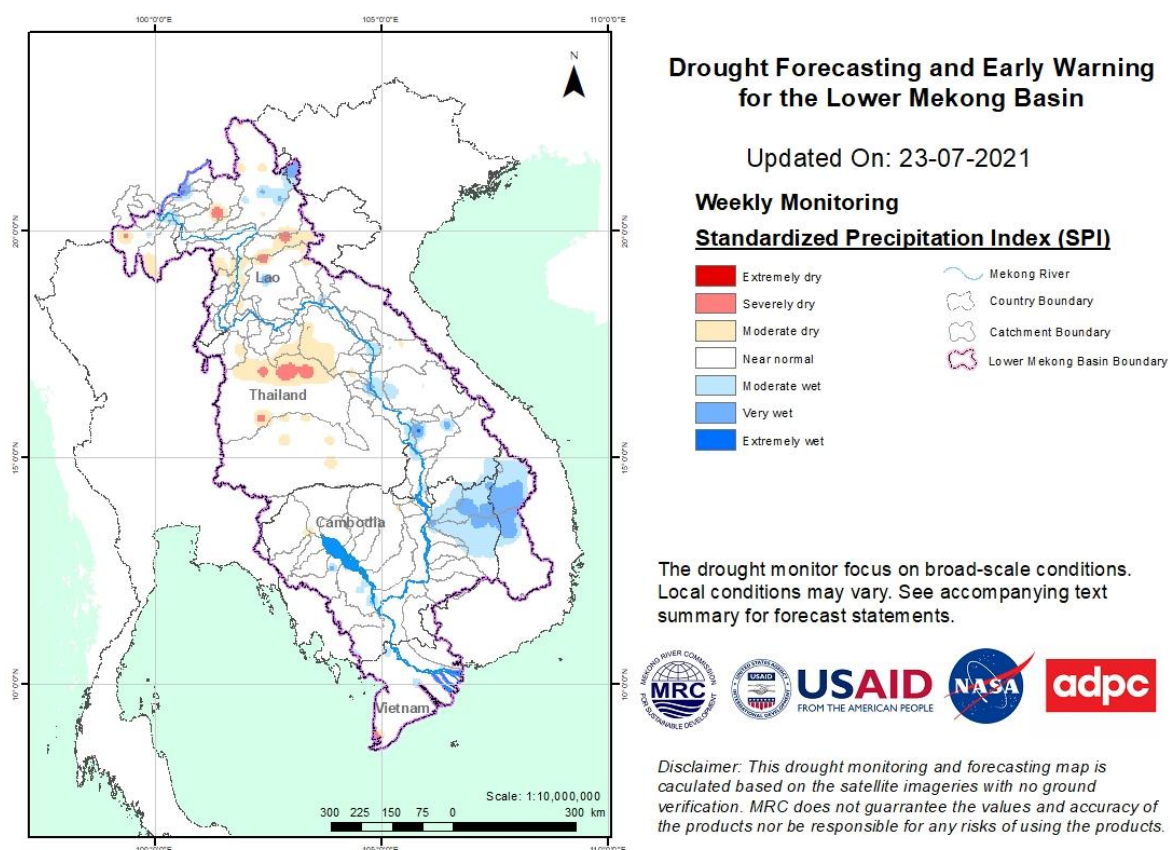
## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from 17 to 23 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)**

Meteorological indicator of SPI from July 17 to 23, as shown in [Figure 15](#), shows that the LMB was moderately and severely dry in some areas in the north and central of the region including Luangnamtha, Oudomxay, Luang Prabang, Xayaburi, Xieng Khuang of Lao PDR and Loei, Nong Bua Lampu, Udon Thani, Skon Nakhon, Kalasin, and Khon Kaen of Thailand. The conditions, however, were not significant as they took place in small extent and scattered in different locations. Other areas were normal except the 3S which was ultimately wet.

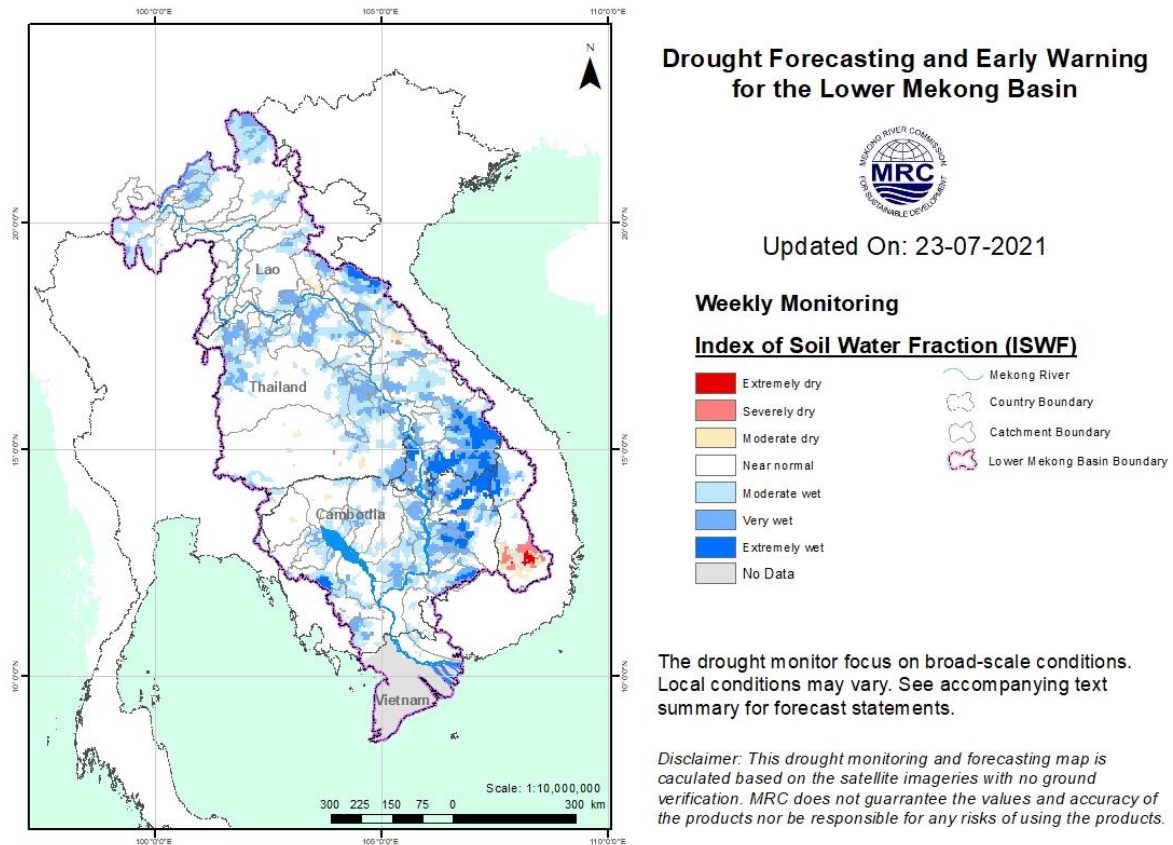


**Figure 15.** Weekly standardized precipitation index from 17 to 23 July 2021.



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

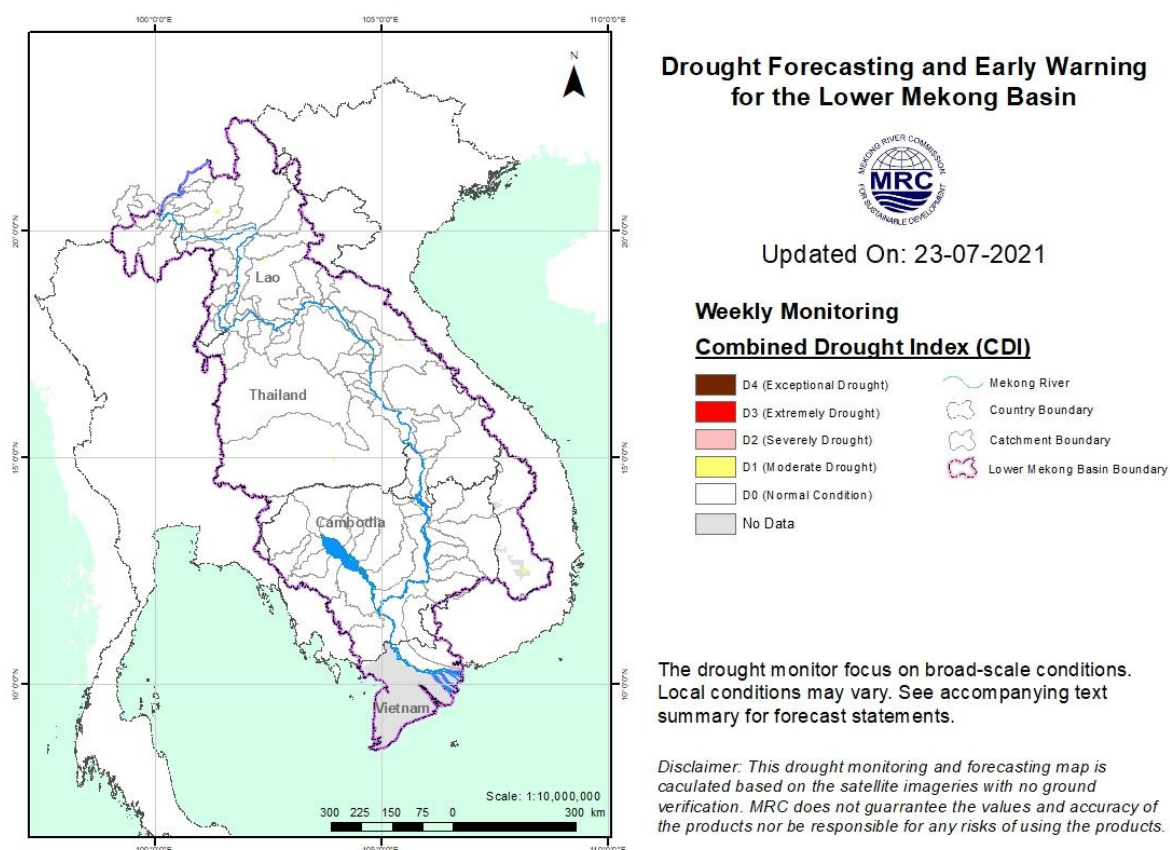
Soil water fraction from July 17 to 23, as displayed in [Figure 16](#), shows that the LMB region was normal and extremely wet in most parts of the LMB except Dak Lak of Viet Nam where soil moisture was moderately and severely dry. Like SPI, ISWF in and around 3S area was extremely wet.



**Figure 16.** Weekly Soil Moisture Anomaly from 17 to 23 July 2021.

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

With such preferable conditions of both SPI and ISWF, the combined drought indicator shows that the LMB were normal all over the place. This means that the region did not face any drought threat throughout the monitoring week from July 17 to 23, as displayed in [Figure 17](#).



**Figure 17.** Weekly Combined Drought Index from 17 to 23 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.

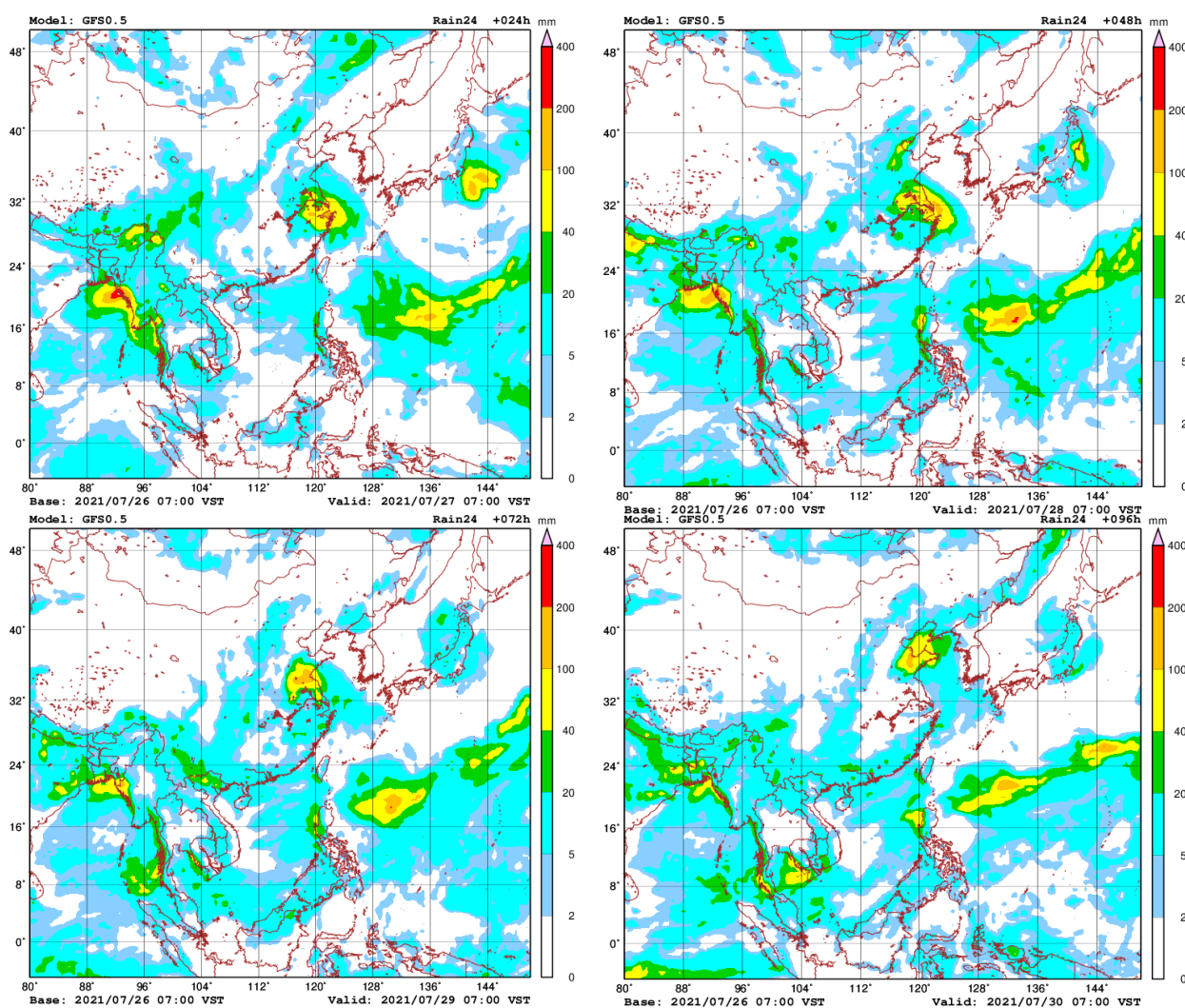
## 6 Weather and Water Level Forecast and Flash Flood Information

### 6.1 Weather and rainfall forecast

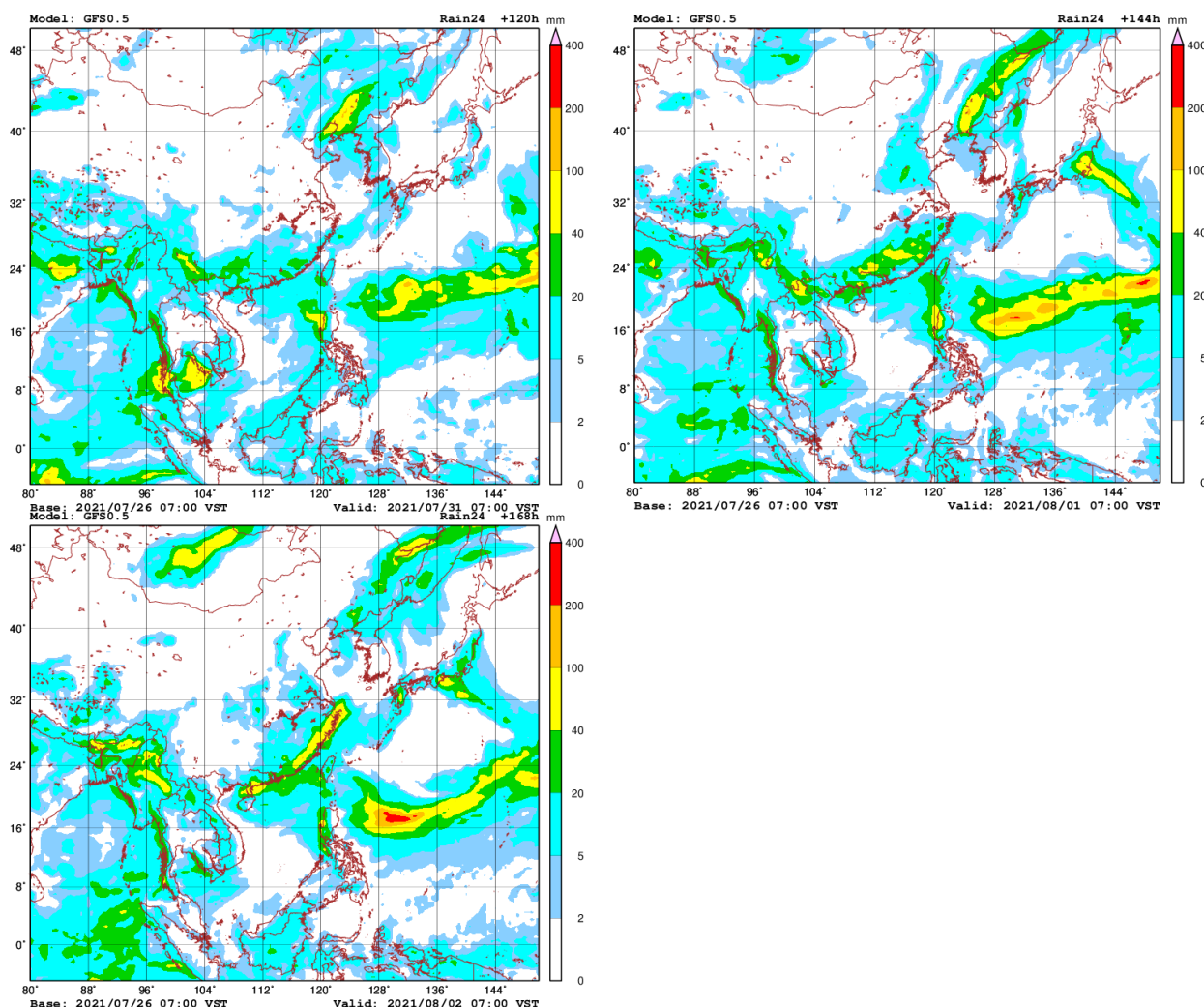
Based on the analysis of the synoptic meteorological information and result from the Global Forecast System (GFS) model, in the coming week, the moderate Southwest Monsoon and low-pressure cell will continue prevailing over the LMB.

From July 27 to August 2, small rainfall (5 -20 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 27 to August 2.







**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 26's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 3.98 m to 5.05 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 decrease from 12.26 m to 12.88 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 decrease about 0.25 m. But from Nong Khai in Thailand to

Paksane in Lao PDR, the water levels will rise by about 0.55 m over the next five days. Rainfall is forecasted for the area of Paksane next week.

The water levels are expected to go up above 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 1.50 m over the next seven days. From Khong Chiam in Thailand to Pakse in Lao PDR, the stations will likely experience a 2.00 m step-up. The water levels from Nakhon Phanom in Thailand to Savannakhet 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 2.50 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 1.60 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 20 to 26 July 2021, is presented in **Annex 1**.

[Table 2](#) shows the daily flood forecasting Bulletin issued on July 26. Results of the weekly river monitoring bulletin are also available at [http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php).

## **6.3 Flash Flood Information**

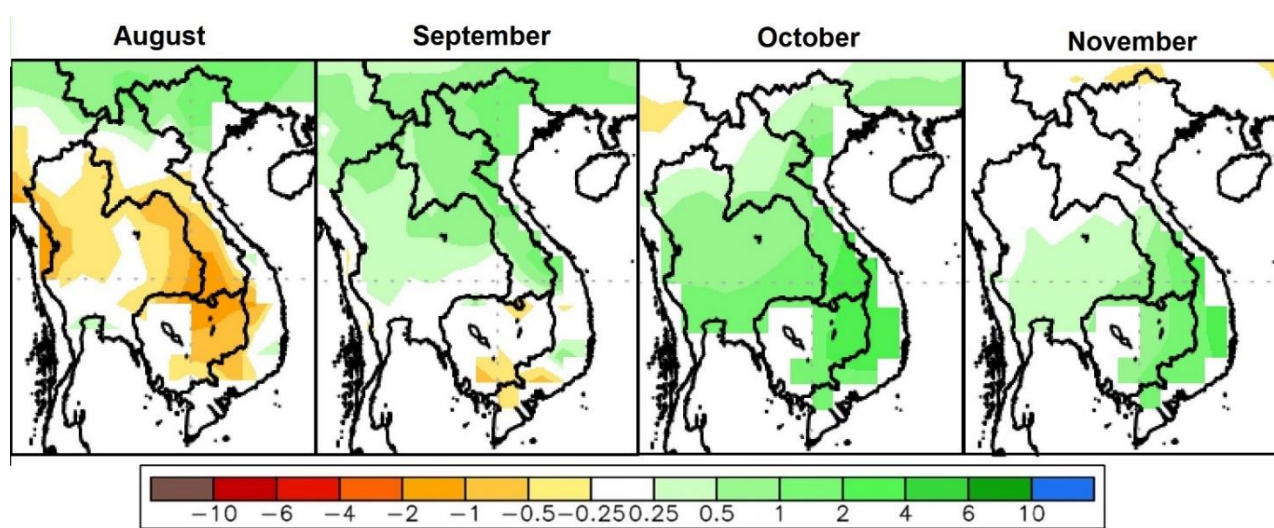
With small rainfall forecasted for next week, flash floods with high level are not expected to take place in the LMB. However, local heavy rain in a short period of time is possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated 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 August to November 2021 produced by the NMME.



**Figure 19.** Daily average of monthly rainfall anomaly forecast from August to November 2021.

The ensemble prediction model based on the initial conditions in July reveals that the LMB is likely to receive much below average rainfall in August mainly in the central and southern parts of the region; September is forecasted to be extremely wet in the north, moderately wet and normal in the middle, and normal and moderately dry in southern areas of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB.

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

**Table 2. Weekly River Monitoring Bulletin.**



## Mekong Bulletin

Mekong River Commission Secretariat (MRCS)
























Regional Flood and Drought Management Centre (RDFMC)

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: 27 July - 31 July 2021

Date: 26 July 2021

Location	Country	24-hr Observed Rainfall (mm)	Zero gauge above M.S.L (m)	Flood level (m)	Alarm level (m)	Observed W. level against zero gauge (m)		Forecasted Water Levels (m)					There is currently no flood warning in place at monitoring sites on the Mekong						
		25-Jul				26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	26	27	28	29	30	31		
Jinghong		20.0				535.76	535.90							↑	×	×	×	×	×
Chiang Saen		12.0	357.110	12.80	11.50	4.59	3.98	3.62	3.42	3.35	3.40	3.43		↓	↓	↓	↓	↓	↓
Luang Prabang		58.8	267.195	18.00	17.50	12.28	12.26	12.58	12.20	12.00	11.87	11.80		↑	↑	↓	↓	↓	↓
Chiang Khan		0.0	194.118	16.00	14.50	10.10	10.50	10.23	9.93	9.75	9.63	9.60		↑	↑	↓	↓	↓	↓
Vientiane		0.0	158.040	12.50	11.50	5.99	7.53	8.15	7.83	7.50	7.30	7.15		↑	↑	↓	↓	↓	↓
Nongkhai		0.0	153.648	12.20	11.40	5.04	6.95	7.82	7.45	7.08	6.84	6.65		↑	↑	↓	↓	↓	↓
Paksane		96.7	142.125	14.50	13.50	5.11	6.35	8.02	8.57	8.40	8.16	8.00		↑	↑	↑	↓	↓	↓
Nakhon Phanom		0.7	130.961	12.00	11.50	5.49	6.04	6.78	7.61	7.86	7.75	7.60		↑	↑	↑	↑	↓	↓
Thakhek		1.2	129.629	14.00	13.00	6.45	7.20	8.01	8.92	9.20	9.05	8.87		↑	↑	↑	↑	↓	↓
Mukdahan		7.0	124.219	12.50	12.00	5.87	6.52	6.98	7.51	7.95	8.10	8.00		↑	↑	↑	↑	↑	↑
Savannakhet		0.0	125.410	13.00	12.00	3.65	4.65	4.95	5.15	5.40	5.50	5.45		↑	↑	↑	↑	↑	↑
Khong Chiam		11.0	89.030	14.50	13.50	6.64	8.89	9.78	10.35	11.13	11.66	11.90		↑	↑	↑	↑	↑	↑
Pakse		11.5	86.490	12.00	11.00	5.64	7.58	8.33	8.68	9.25	9.63	9.80		↑	↑	↑	↑	↑	↑
Stung Treng		nr	36.790	12.00	10.70	5.45	6.48	7.85	8.42	8.69	8.99	9.20		↑	↑	↑	↑	↑	↑
Kratie		nr	-0.101	23.00	22.00	12.54	13.18	14.56	16.03	16.65	16.96	17.30		↑	↑	↑	↑	↑	↑
Kompong Cham		nr	-0.930	16.20	15.20	6.86	7.06	7.90	9.30	10.85	11.48	11.81		↑	↑	↑	↑	↑	↑
Phnom Penh (Bassac)		nr	-1.020	12.00	10.50	3.80	3.85	4.15	4.73	5.43	5.78	5.90		↑	↑	↑	↑	↑	↑
Phnom Penh Port		-	0.070	11.00	9.50	2.82	2.87	3.18	3.76	4.46	4.81	4.93		↑	↑	↑	↑	↑	↑
Koh Khel (Bassac)		8.4	-1.000	8.40	7.90	3.68	3.71	3.95	4.40	5.00	5.30	5.37		↑	↑	↑	↑	↑	↑
Neak Luong		1.8	-0.330	8.00	7.50	2.56	2.64	2.78	3.22	4.00	4.72	4.99		↑	↑	↑	↑	↑	↑
Prek Kdam		nr	0.080	10.00	9.50	2.95	2.97	3.20	3.69	4.30	4.60	4.69		↑	↑	↑	↑	↑	↑
Tan Chau		0.0	0.000	4.50	3.50	0.86	0.57	0.42	0.32	0.22	0.14	0.08		↓	↓	↓	↓	↓	↓
Chau Doc		0.0	0.000	4.00	3.00	0.82	0.27	-0.01	-0.17	-0.26	-0.30	-0.25		↓	↓	↓	↓	↓	↓

### REMARKS:

nr: not available.

nr: no rain.

LEGEND	
rising water level	↑
stable water level	→
falling water level	↓
alarm stage	↑
alarm situation	↑
flood stage	↑
no data available	X
as suggested by Thailand, forecasted values are not displayed pending further improvement of the system	★

**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 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

*K. Sothea*

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/bulletin_wet.php); <http://ffw.mrcmekong.org/reportflood.php>

## 7 Summary and Possible Implications

### 7.1 Rainfall and its forecast

Rain was observed from Chiang Saen in Thailand to Pakse in Lao PDR during July 20-26, including the lower part in Cambodia and Viet Nam, varying from 3.00 mm to 252.90 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, moreover, shows that significant rainfall (<100 mm) is likely to take place in the Mekong region from 27 July to 01 August 2021.

### 7.2 Water level and its forecast

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed slightly decrease over the monitoring period from 20 to 26 July 2021. It was down about 0.17 m from 536.07 metres (m) on July 20 to 535.90 m on July 26. The outflows decreased from 1,375 cubic metres per second (m<sup>3</sup>/s) on July 20 to 1,261 m<sup>3</sup>/s on July 26.

Due to above average rainfall from July 19 to 23 in upstream areas 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 significantly increasing, putting WL at 6 stations higher 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 0.30 m and 0.50 m, respectively.

The flow volume of the Tonle Sap Lake is lower than its LTA. From next week, the flow will increase due to the 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 rise above 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 rising from July 27 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 moderate 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**

Drought conditions of the LMB from July 17 to 23 were normal and wet in all over the region. No drought threat was found during the monitoring week.

For the upcoming three-month forecast, the LMB is likely to receive much below average rainfall in August mainly in the central and southern parts of the region; September is forecasted to be extremely wet in the north, moderately wet and normal in the middle, and normal and moderately dry in southern areas of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB.



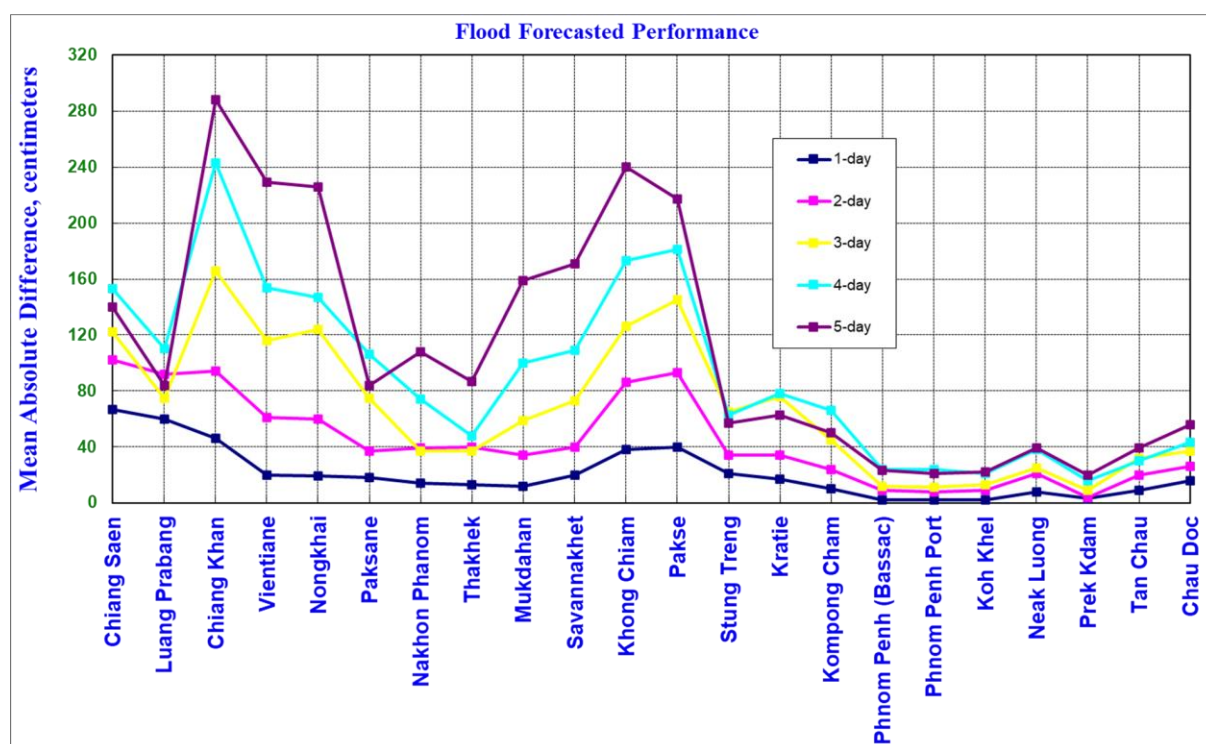
## Annex 1: Performance of the weekly flood forecasting

### 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 20-26 July 2021.

The forecasting values from 20-26 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 Chiang Khan to Khong Chiam 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 20-26 July, 2021.



**Table B1:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 20-26 July, 2021 in cm

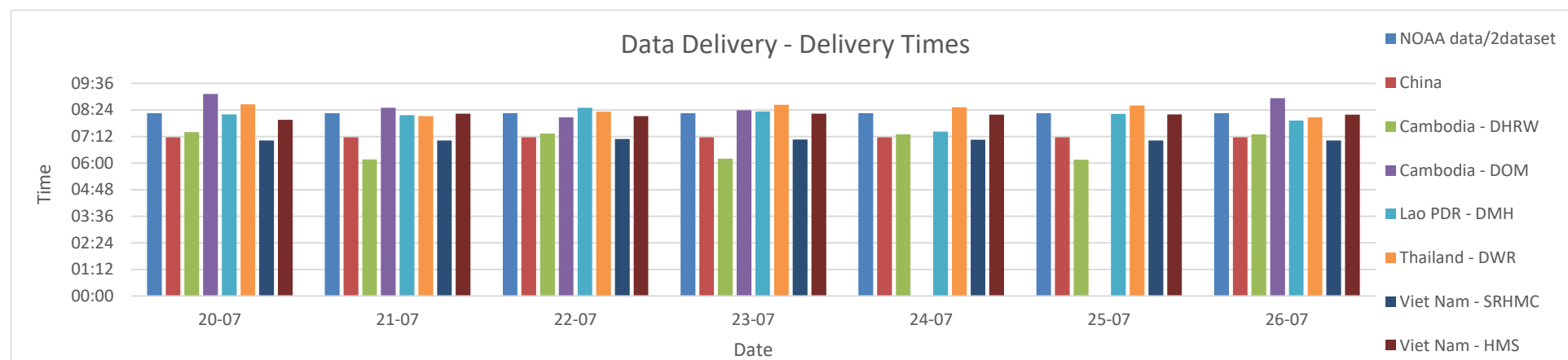
Lead-time Forecasted	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Thakhek	Mukdahan	Savannakhet	Khong Chiam	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Phnom Penh Port	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
1-day	67	60	<u>46</u>	<u>20</u>	19	18	14	13	12	<u>20</u>	<u>38</u>	<u>40</u>	<u>21</u>	17	10	2	2	2	8	3	9	16
2-day	102	92	94	61	60	<u>37</u>	<u>39</u>	<u>40</u>	<u>34</u>	<u>40</u>	86	93	<u>34</u>	<u>34</u>	<u>24</u>	9	8	9	<u>21</u>	4	<u>20</u>	<u>26</u>
3-day	122	75	166	116	124	75	<u>37</u>	<u>37</u>	59	73	126	145	65	76	<u>45</u>	12	11	13	<u>25</u>	9	<u>32</u>	<u>37</u>
4-day	153	110	243	154	147	106	74	<u>48</u>	100	109	173	181	63	78	66	<u>24</u>	<u>24</u>	<u>21</u>	<u>38</u>	16	<u>30</u>	<u>43</u>
5-day	140	84	288	229	226	84	108	87	159	171	240	217	57	63	<u>50</u>	<u>23</u>	<u>21</u>	<u>22</u>	<u>39</u>	<u>20</u>	<u>39</u>	56

**Table B2:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 20-26 July, 2021 in %

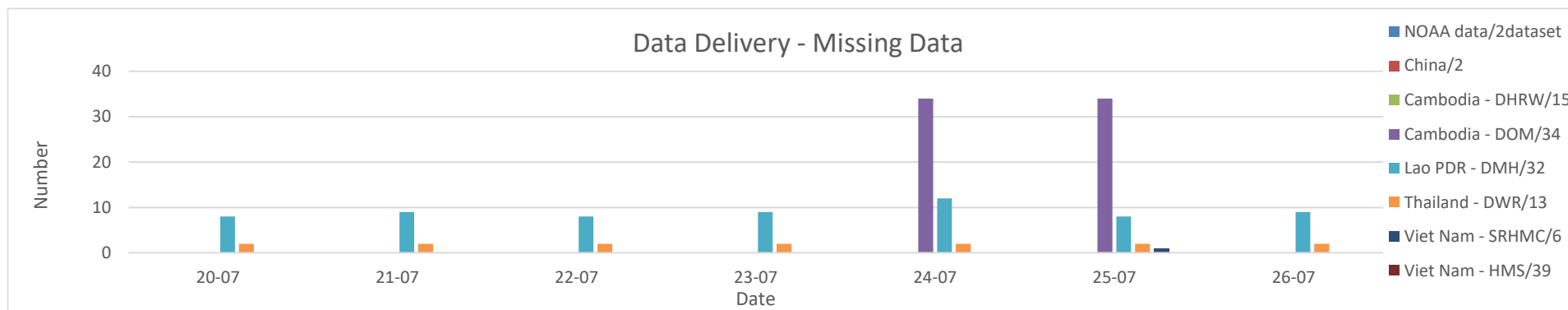
Lead-time Forecasted	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Thakhek	Mukdahan	Savannakhet	Khong Chiam	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Phnom Penh Port	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc	Average
1-day	57.1	57.1	71.4	57.1	71.4	57.1	71.4	71.4	57.1	57.1	71.4	71.4	71.4	57.1	57.1	71.4	71.4	71.4	<u>42.9</u>	71.4	57.1	57.1	<b>63.6</b>
2-day	66.7	<u>33.3</u>	66.7	<u>50.0</u>	66.7	<u>50.0</u>	83.3	<u>33.3</u>	<u>50.0</u>	66.7	<u>50.0</u>	66.7	<u>50.0</u>	66.7	<u>50.0</u>	66.7	66.7	<u>50.0</u>	<u>50.0</u>	66.7	<u>50.0</u>	<u>33.3</u>	<b>56.1</b>
3-day	60.0	60.0	<u>40.0</u>	60.0	60.0	60.0	<u>40.0</u>	<u>40.0</u>	60.0	<u>40.0</u>	60.0	60.0	60.0	80.0	60.0	60.0	60.0	80.0	<u>40.0</u>	80.0	60.0	60.0	<b>58.2</b>
4-day	75.0	<u>50.0</u>	75.0	<u>50.0</u>	<u>50.0</u>	75.0	<u>25.0</u>	<u>25.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	75.0	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>25.0</u>	75.0	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<b>52.3</b>
5-day	<u>33.3</u>	66.7	66.7	66.7	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>	66.7	66.7	66.7	66.7	66.7	<u>33.3</u>	<u>33.3</u>	66.7	<u>33.3</u>	66.7	<b>53.0</b>

**Table B3: Overview of performance indicators for the past 7 days from 20-26 July 2021**

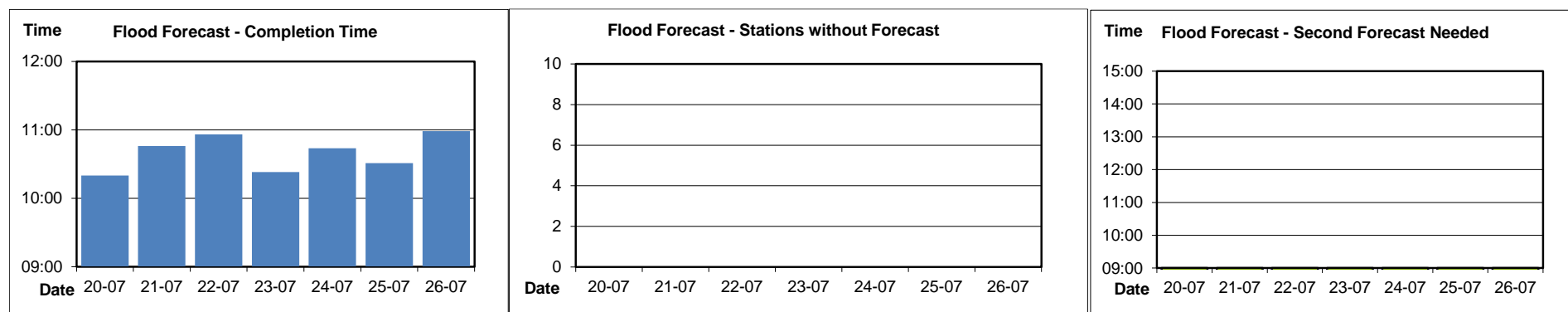
	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
2021	FF completed and sent (time)	Stations without forecast	FF2 completed and sent (time)	Weather data available (time)	NOAA data	China	Cambodia - DHRW	Cambodia - DOM	Lao PDR - DMH	Thailand - DWR	Viet Nam - SRHMC	Viet Nam - HMS	NOAA data/2dataset	China/2	Cambodia - DHRW/15	Cambodia - DOM/34	Lao PDR - DMH/32	Thailand - DWR/13	Viet Nam - SRHMC/6	Viet Nam - HMS/39
week	10:39	00:00	-	-	08:15	07:10	06:50	08:36	08:06	08:24	07:02	08:09	0	0	0	68	63	14	1	0
month	10:30	00:00	-	-	08:15	07:10	07:21	08:36	08:26	08:14	07:17	08:11	0	0	14	272	243	48	7	38



**Fig. B4: Data delivery times for the past 7 days from 20-26 July 2021**



**Fig. B5: Missing data for the past 7 days from 20-26 July 2021**



**Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 20-26 July 2021**



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