



**Mekong River Commission**

# **Weekly Wet Season Situation Report in the Lower Mekong River Basin 8–14 June 2021**

Prepared by  
The Regional Flood and Drought Management Centre  
16 June 2021

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## Key Messages

Key messages for this weekly report are presented below.

### **Rainfall and its forecast**

- Rainfall took place from Nong Khai in Thailand to Pakse in Lao PDR, at Chaktomuk in Cambodia, and at Tan Chau and Chau Doc in Viet Nam of the LMB, ranging from 5.50 mm to 278.80 mm.
- No significant rainfall is projected for the Mekong region from 15 to 24 June 2021.

### **Water level and its forecast**

- The outflows at Jinghong hydrological station slightly fluctuated over the monitoring period from 8 to 14 June 2021. It rose from 536.74 metres (m) on June 10 to 537.30 m on June 12 before dropping to 536.99 on June 14.
- At Chiang Saen in Thailand, the closest station to the Jinghong hydrological station, the water level significantly increased by about 1.74 m during the same period.
- The water levels across most monitoring stations were higher than their long-term average.
- The water volume of the Tonle Sap Lake during this reporting period is slightly higher than that in 2020 of the same period, but is still lower than its long-term average.
- Over the next few days, the water levels across most monitoring stations are expected to rapidly increase, putting the levels above their long term values.

### **Drought condition and its forecast**

- From 5 to 11 June 2021, all parts of the LMB were at normal condition; no threat was found during the monitoring week.
- The ensemble prediction model forecasts that in June the entire LMB is likely to receive from average to above-average rainfall; the central part of the LMB and the eastern part of Cambodia are forecasted to be the wettest areas. Moving into July, it is forecasted that Cambodia, the Central Highland of Viet Nam, and southern Lao PDR will be the driest area in the region. In August, the entire LMB region is forecasted to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Lastly, the lower part of the LMB covering eastern Cambodia and Viet Nam is likely to receive below average rainfall in September.

# 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 **8 to 14 June 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 – 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>

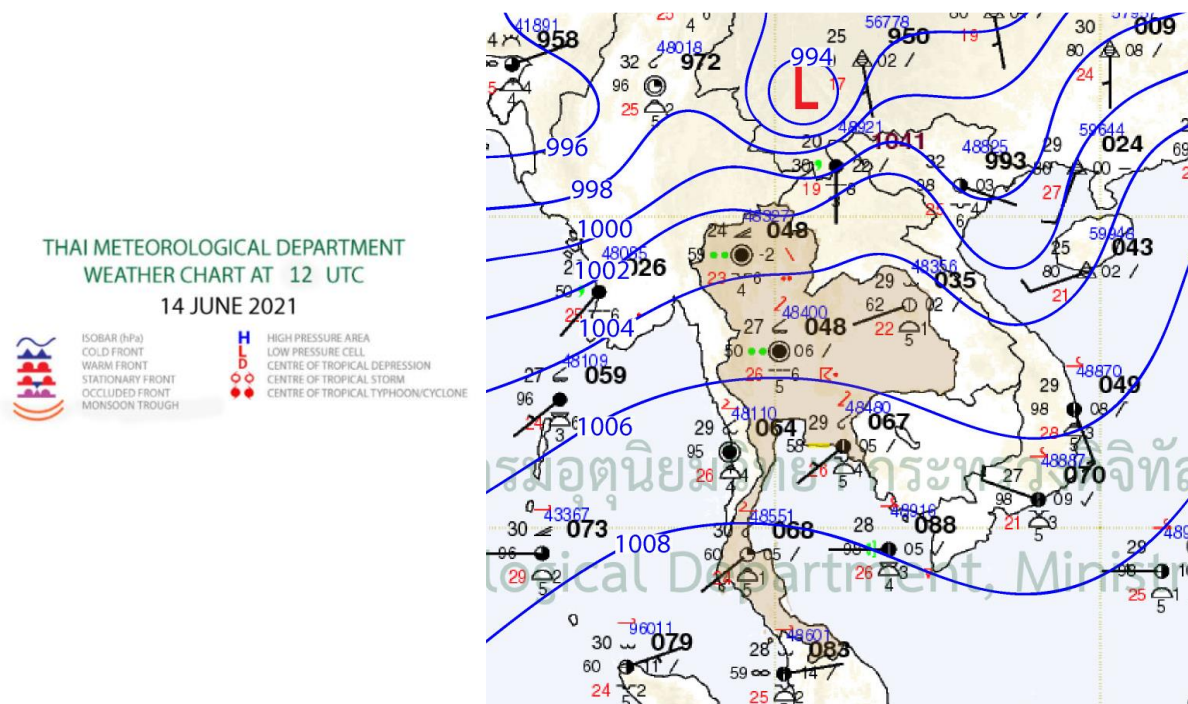


## 2 General Weather Patterns

The weather outlook bulletins for three months (June, July and August) 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 June 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 June and August.

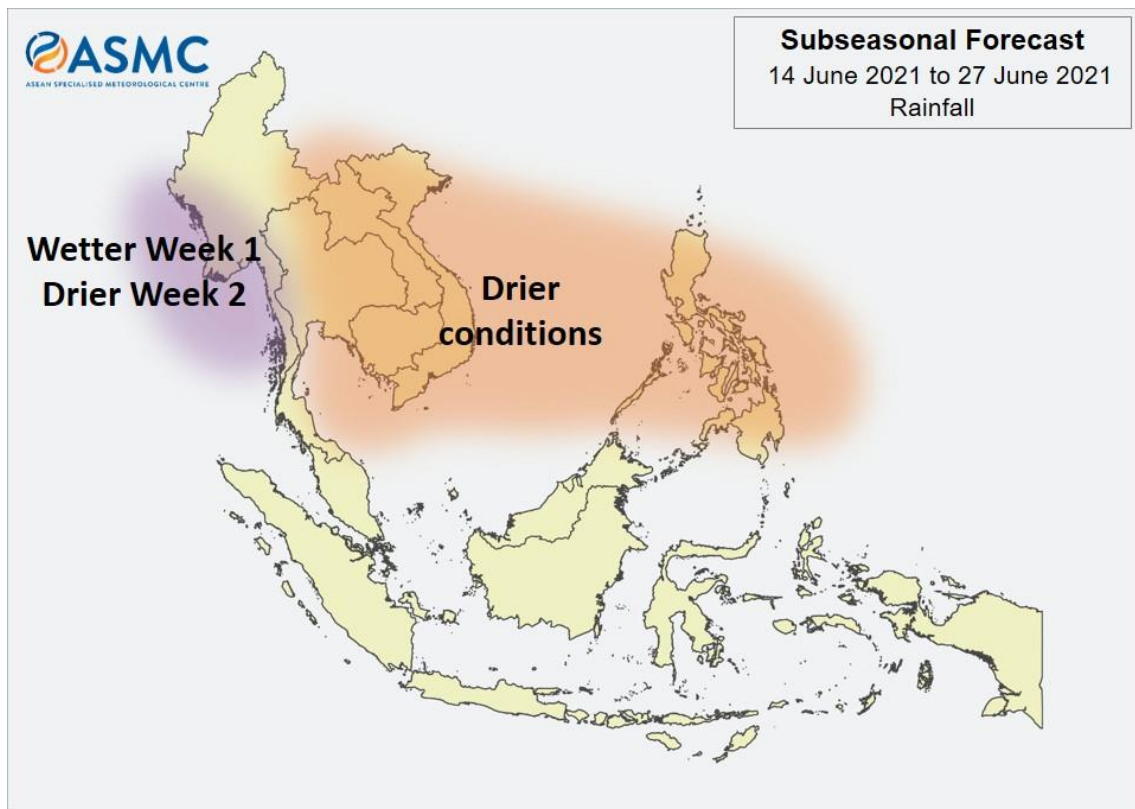
[Figure 1](#) presents the weather map of 14 June 2021, showing that a low pressure is dominating the upper part of Lao PDR and Viet Nam, including the 3S area (Sesan, Sre Pok and Sekong) in Cambodia and Viet Nam of the LMB.



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

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of warm and dry conditions is predicted over of the Mekong region covering northern Lao PDR, Thailand, Cambodia, and Viet Nam during 14–27 June 2021. Nonetheless, the southwest Monsoon weather may be in transition in the region, causing average rainfall.

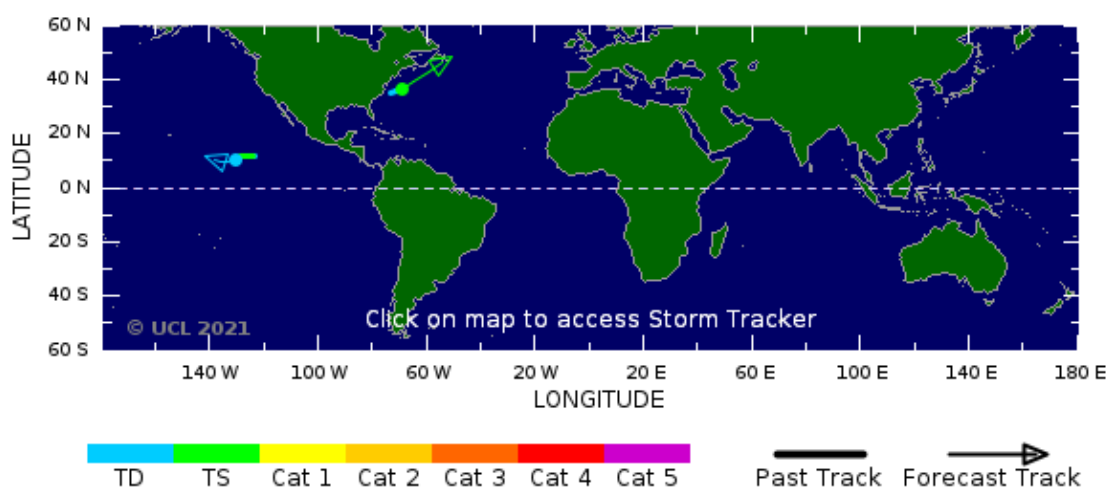
[Figure 2](#) shows the outlook of comparative warm conditions from 14 to 27 June 2021 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).



**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)

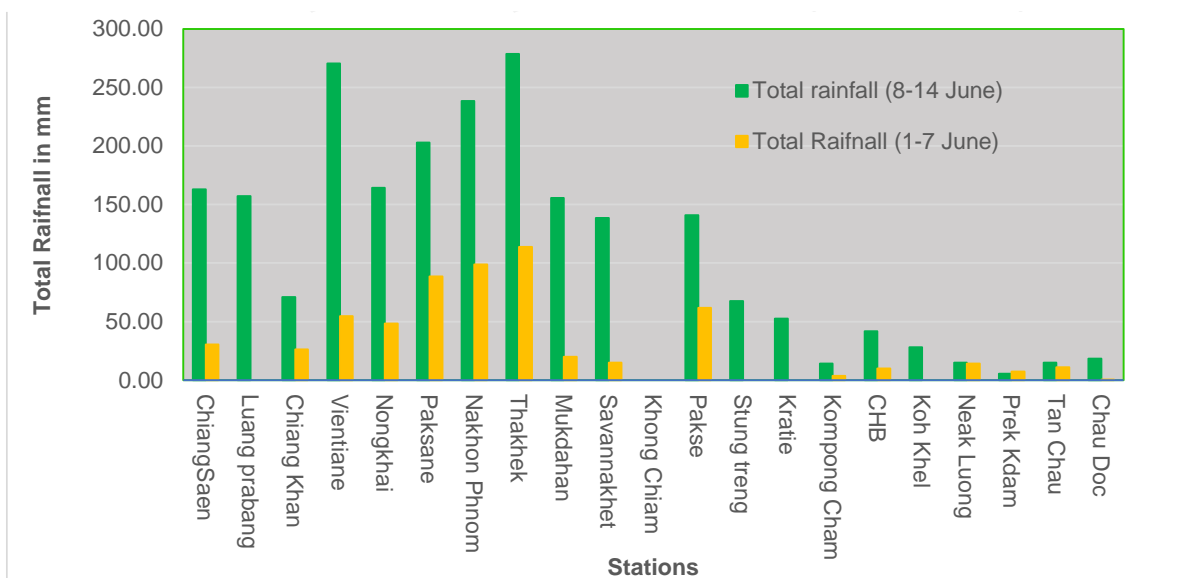
There were low-pressure lines taking place in the lower part of the LMB during 15 June 2021, as shown in [Figure 1](#), which would bring rain to some areas of the LMB. But based on a Tropical Storm Risk (TSR), as displayed in [Figure 3](#), there was no sign of tropical depression (TD), tropic storm (TS), or typhoon (TY) in the Mekong region up to 15 June 2021.



**Figure 3.** A tropical depression risk observed on 15 June 2021.

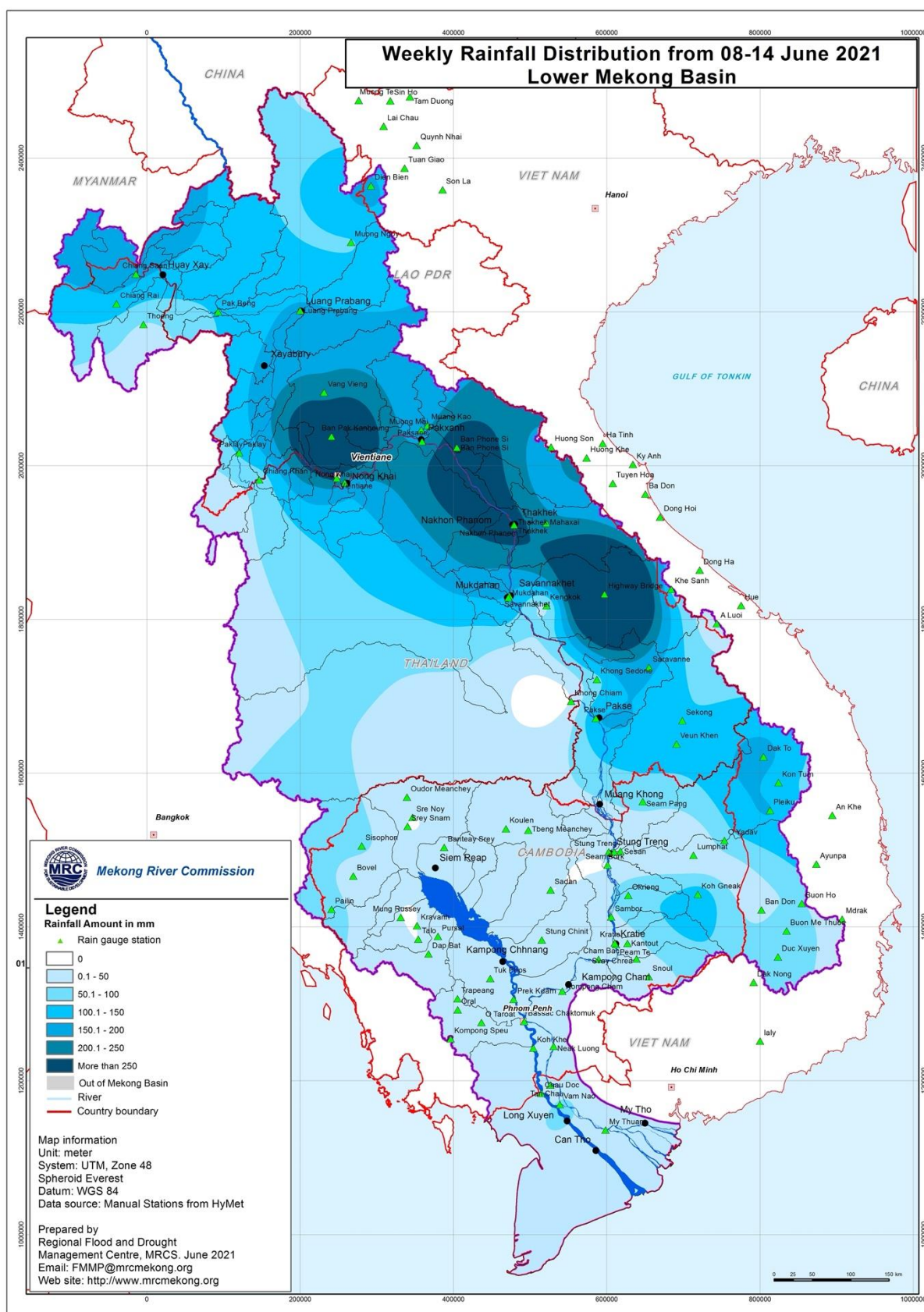
## 2.2 Rainfall patterns over the LMB

This week, rainfall focused in the areas from Chiang Saen in Thailand to Pakse in Lao PDR including the lower part in Cambodia and Viet Nam, varying from 5.30 millimetres (mm) to 278.80 mm. The highest concentration was observed from Vientiane to Thakhek in Lao PDR. The weekly total rainfall is considered high in the upper and middle parts (150 mm to 278.80 mm) of the LMB (see [Figure 4](#)).



**Figure 4.** Weekly total rainfall at key stations in the LMB during 8–14 Jun 2021.

To verify area rainfall distribution, [Figure 5](#) shows a map of the weekly accumulated rainfall based on observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 8 to 14 May 2021.



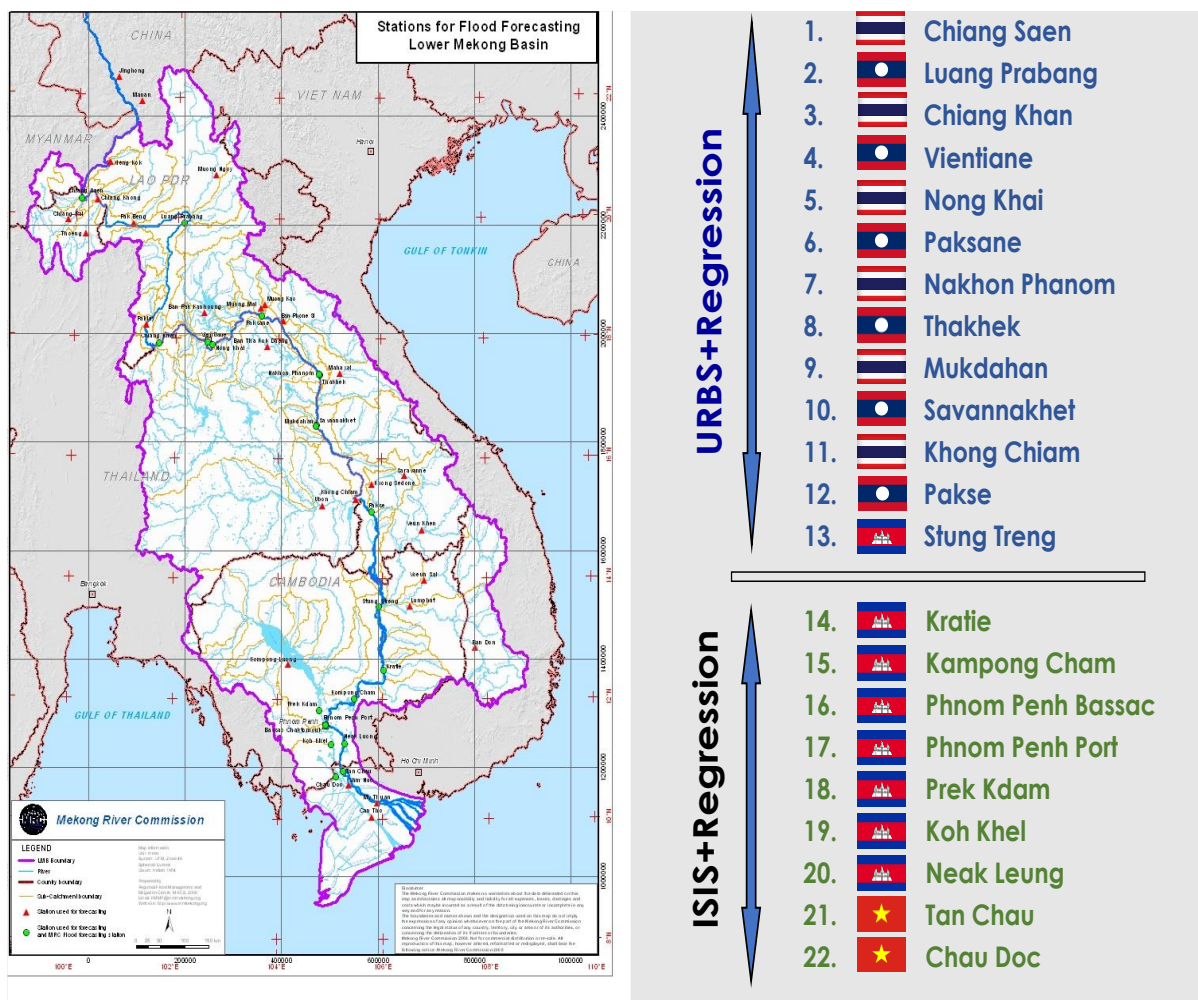
**Figure 5.** Weekly rainfall distribution over the LMB during 8–14 June 2021.



### 3 Water Levels in the Lower Mekong River

The hydrological regimes of the Mekong mainstream are illustrated by recorded WLS 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](#).

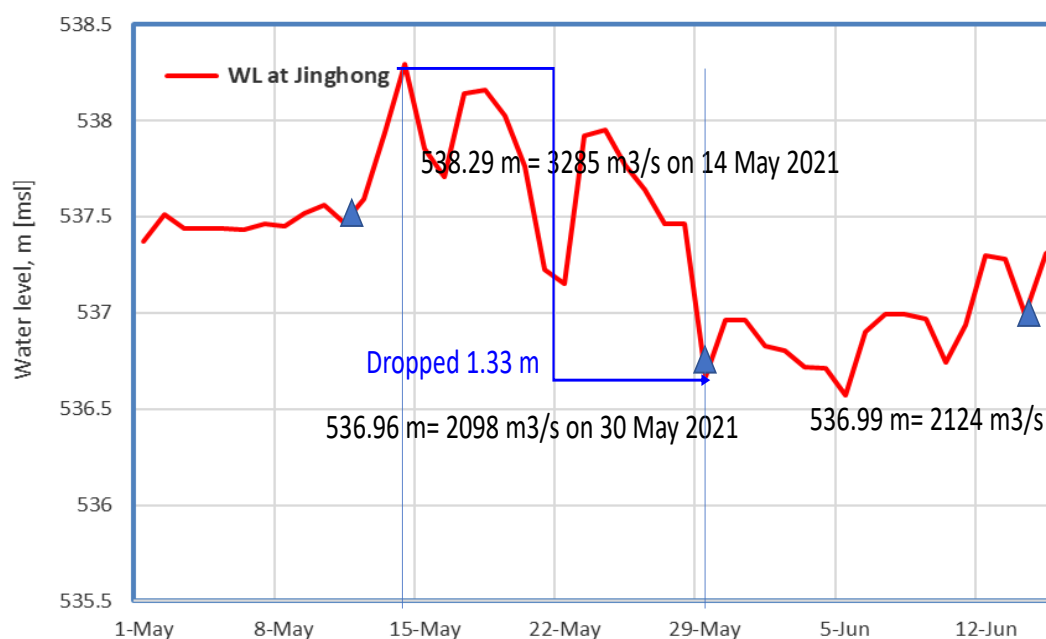


**Figure 6.** Key stations and model application for River Monitoring and Flood Forecasting.

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed a slight fluctuation over the monitoring period from 8 to 14 June 2021. It rose from 536.74 metres (m) on June 10 to 537.30 m on June 12 before dropping to 536.99 on June 14.

From mid- to the end of May, the station's outflows experienced rapid fluctuations with a dropping trend. The outflows decreased from 3,285 cubic metres per second (m<sup>3</sup>/s) on May 14 to 2,098 m<sup>3</sup>/s on May 30. Its daily average water level dropped by 1.33 m (from 538.29 m on May 14 to 536.96 m on May 30).

[Figure 7](#) below presents water level fluctuations at the Jinghong hydrological station<sup>1</sup> during 1 May – 14 June 2021.



**Figure 7.** Water level at the Jinghong hydrological station during 1 May – 14 June 2021.

Due to the influence of heavy rainfall from 8 to 14 June, water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR, and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia were higher than their LTA during 8–14 June 2021.

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.

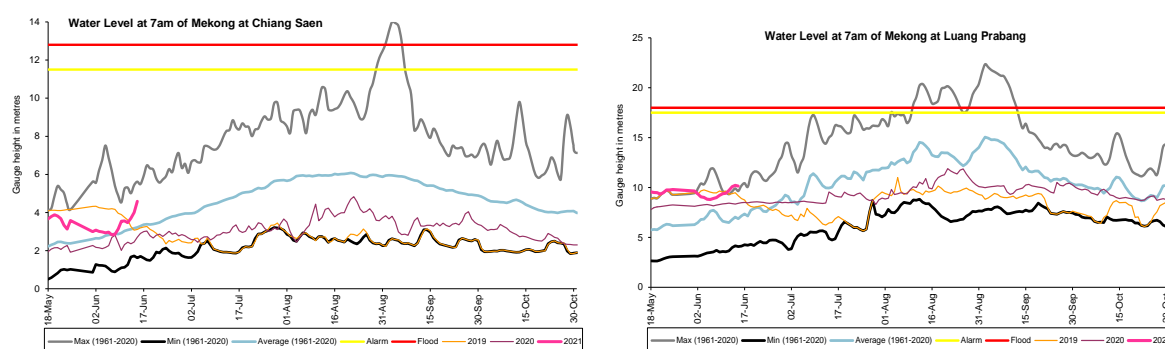
<sup>1</sup> Near-real time data of hydro-meteorological monitoring at the Jinghong hydrological station is available at <https://portal.mrcmekong.org/monitoring/river-monitoring-telemetry>.

## Chiang Saen and Luang Prabang

The water level from 8 to 14 June 2021 at Thailand's Chiang Saen rapidly increased from 2.85 m to 4.59 metres (m), representing a rise of 1.74 m over the week. The level was about 1.37 m higher than its LTA and was significantly higher than last week's level.

The water level at Luang Prabang station in Lao PDR also saw a significant increase, raising from 8.99 m to 10.22 m during the reporting period. This level shows 0.49 m above its historical maximum value. The trend – of 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.**



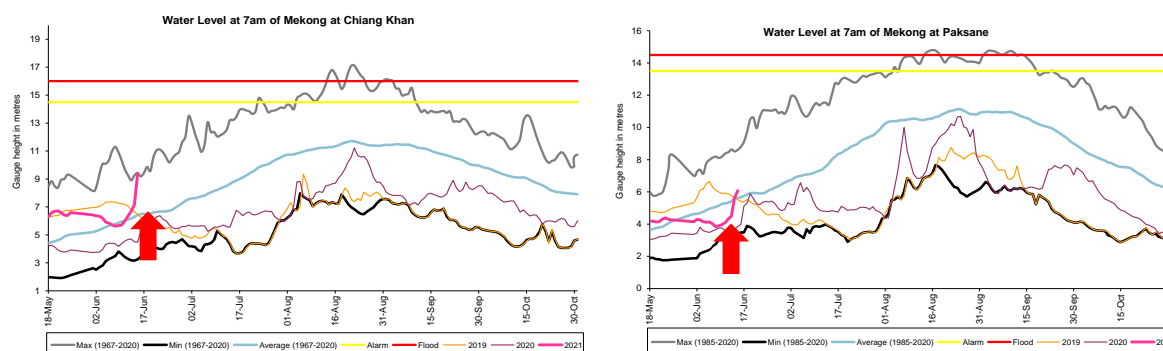
**Figure 8.** Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR.

## Chiang Khan, Vientiane-Nong Khai and Paksane

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) also rapidly increased from 5.62 m to 7.15 m, showing 0.87 m higher than its Long-Term- Average (LTA).

The water level downstream at Vientiane in Lao PDR followed the upstream trend. It jumped from 3.20 m to 4.10 m and was about 0.91 m higher than its LTA. At Nong Khai station in Thailand, the water level also increased. It rose about 1.12 m but was about 0.05 m lower than its LTA, increasing from 2.73 m to 3.85 m. The water level at Paksane in Lao PDR increased by about 1.78 m and reached its LTA, rising from 3.83 m to 6.45 m. The increased level was probably influenced by heavy rainfall and Nam Ngum dam operation located upstream.

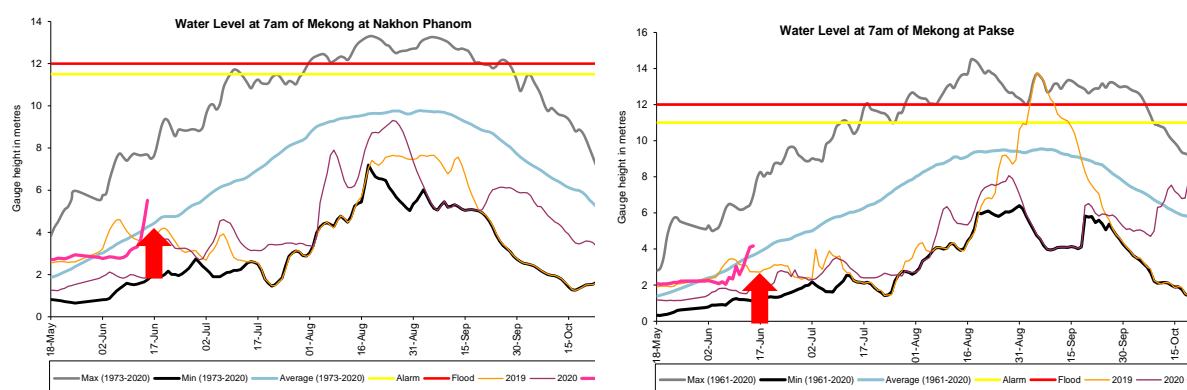
The water levels at Chiang Khan and Paksane are shown in [Figure 9](#) below.



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

## Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR significantly increased by about 1.60 m and were about 0.40 m above their LTA (see [Figure 10](#)).

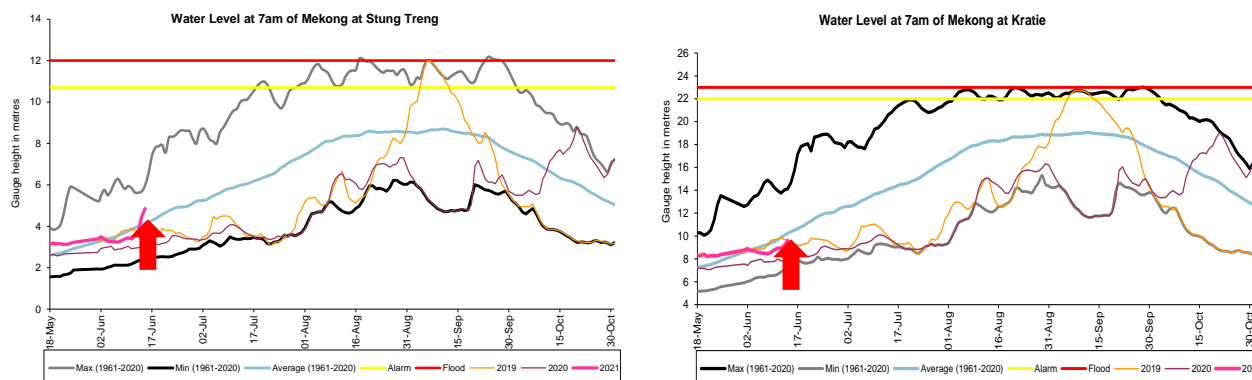


**Figure 10.** Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

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

Through a contribution of flows and rainfall from the upstream part of the Mekong River and the 3S river (Sekong, Se San and Sre Pok), the water levels from Stung Treng to Kratie in Cambodia increased. This week water level at Stung Treng was about 0.38 m higher than its LTA, while at Kratie it was about 0.61 m lower than its LTA (see [Figure 11](#)). The water level at Kompong Cham increased about 0.70 m but still stayed 1.32 m below its LTA.





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

At Chaktomuk and Koh Khel on the Bassac River, the water level increased by about 0.47 m and stayed 0.65 m below its LTA. The water level at Prek Kdam on the Tonle Sap Lake increased about 0.40 m but was still about 1 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 low inflow and a rainfall contribution from upstream of the Tonle Sap Lake area. The water level at the Tonle Sap Lake (observed at Kompong Luong) followed the same trend of Prek Kdam station's water level.

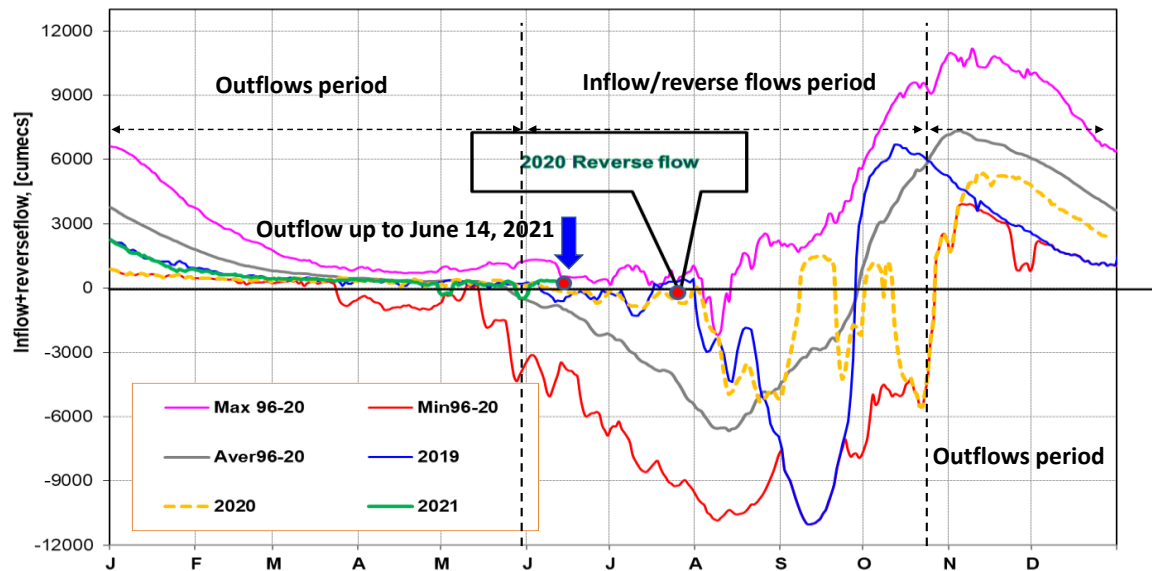
### Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 8 to 15 June 2021 at Viet Nam's Tan Chau and Chau Doc fluctuated due to daily tidal effects from the sea. The fluctuation levels were between -0.30 m and 0.84 m. This fluctuation levels have been out of the historical range between maximum and minimum levels for almost six months and **considered critical**.

### The Tonle Sap Flow

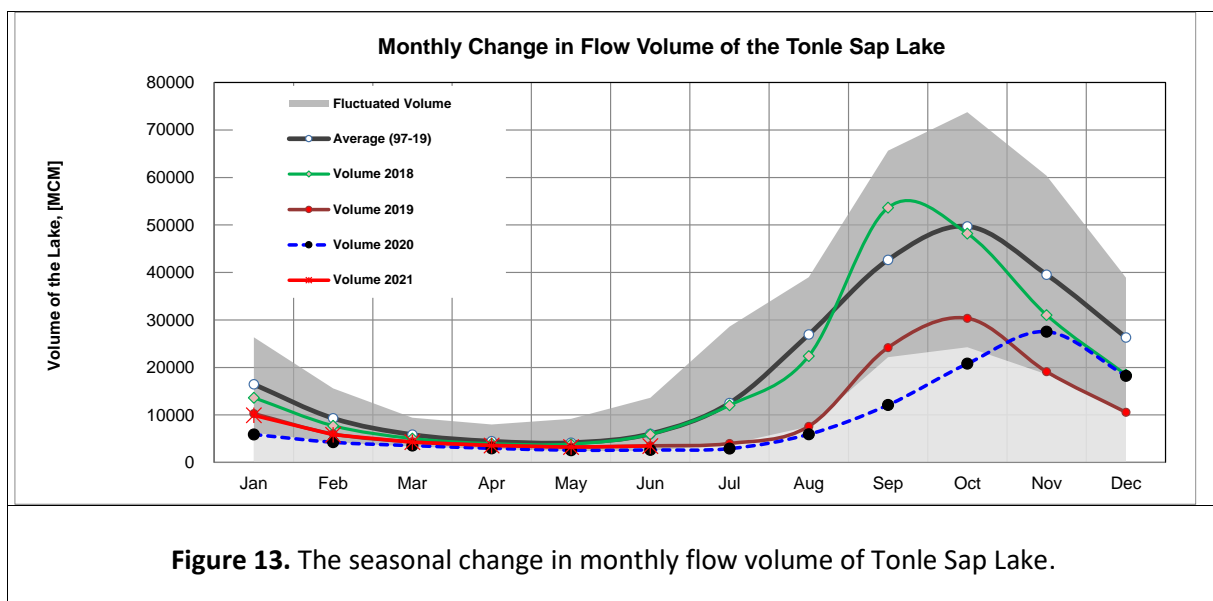
At the end of the dry season, when water levels along the Mekong River increase, flows of the Mekong River reverse into the Tonle Sap Lake and then to the Delta. This phenomenon normally takes place from June to early August.

[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 14 June of this reporting period, it is observed that **the main inflow/reverse flow to the Tonle Sap Lake has not started yet**. The outflow condition in 2021 was lower than its average flow but was similar to the 2020 flow condition. Since the water level at Prek Kdam on the Tonle Sap River rapidly increased and moved lower than its LTA value, it could be inferred that the flows at the Tonle Sap Lake also increased during this reporting period. However, the outflow of the Tonle Sap Lake is expected to slightly increase starting from next week due to some predicted rainfall from inflow catchments.



**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 June 14 for the Lake compared with the volumes in 2018 and 2019, their LTA, and the fluctuation levels (1997–2019). It shows that up to June 14, **the water volumes of the Tonle Sap Lake remained stable and were higher than the level in 2020 and close to that of 2019 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<br>(97-19) [MCM]                         | Max Volume<br>[MCM] | Min Volume<br>[MCM] | Volume 2018<br>[MCM] | Volume 2019<br>[MCM] | Volume 2020<br>[MCM] | Volume 2021<br>[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              | 3469.36              |
| Jul   | 12502.58  | 28599.56            | 3832.51             | 12024.96             | 4001.99              | 2925.86              |                      |
| 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> ) |   |                     |                     |                      |                      |                      |                      |

The decreased outflows from the Mekong River and tributaries of the Tonle Sap Lake from January to May 2021 dry season have resulted in a lower flow in the early 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 June 8 to 14, the LMB was affected by two weather factors including (i) the Southwest Monsoon which strengthened during the weekend, and (ii) the circulation of tropical storm *Koguma* on the last day of the weekend; A monsoon depression transformed to be an active low-pressure cell over the upper part of the sea in Viet Nam before intensifying to become the tropical storm namely *Koguma* in the afternoon of June 11. From there, it moved north-west towards over the Gulf of Tonkin, Viet Nam in the afternoon of June 12 before causing landfall in Thanh Hoa province of Viet Nam in the morning of June 13. This circulation covered upper and middle parts of the LMB on the last day of the week (June 8 to 14), causing an increase in both amount and distribution of rainfall.

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 Lao PDR, Thailand and Viet Nam with the impacts ranging from low to high level as shown in [Figure 14](#) and [Table 2](#).

**Table 2.** Detected flash flood in Lao PDR, Thailand, and Viet Nam on June 13

| 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 13/06/2021 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    |
| Xiangkhuang  | Morkmay    | KHANGVIENG      | Northeast      | Low-Risk      | Xiangkhuang                           | Morkmay    | KHANGVIENG      | Northeast      | Low-Risk      | Xiangkhuang                           | Morkmay    | KHANGVIENG    | Northeast      | Low-Risk      |
| Bolikhamway  | Viengthong | PAHOK           | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | PAHOK           | Central Laos   | Low-Risk      | Xiangkhuang                           | Morkmay    | NAMBUAK       | Northeast      | Low-Risk      |
| Bolikhamway  | Viengthong | PHAPHIENG       | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | PHAPHIENG       | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | PAHOK         | Central Laos   | Low-Risk      |
| Bolikhamway  | Viengthong | VANGPENE        | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | VANGPENE        | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | PHAPHIENG     | Central Laos   | Low-Risk      |
| Bolikhamway  | Viengthong | HINDAM          | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | KOKKIENG        | Central Laos   | Moderate-Risk | Bolikhamway                           | Viengthong | VANGPENE      | Central Laos   | Low-Risk      |
| Bolikhamway  | Viengthong | KOKKIENG        | Central Laos   | High-Risk     | Bolikhamway                           | Khamkeut   | PHAPOUN         | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | HINDAM        | Central Laos   | Low-Risk      |
| Bolikhamway  | Khamkeut   | PHAKHORT        | Central Laos   | Low-Risk      | Bolikhamway                           | Khamkeut   | PHONESI         | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | KOKKIENG      | Central Laos   | Moderate-Risk |
| Bolikhamway  | Khamkeut   | PHAPOUN         | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | YORTKAEB        | Central Laos   | Low-Risk      | Bolikhamway                           | Khamkeut   | PHAKHORT      | Central Laos   | Low-Risk      |
| Bolikhamway  | Khamkeut   | PHONESI         | Central Laos   | Low-Risk      | Bolikhamway                           | Khamkeut   | NAMSANGIN       | Central Laos   | High-Risk     | Bolikhamway                           | Khamkeut   | PHAPOUN       | Central Laos   | Low-Risk      |
| Bolikhamway  | Viengthong | YORTKAEB        | Central Laos   | Moderate-Risk | Khammuane                             | Nakai      | THAM ONH        | Center of Laos | Low-Risk      | Bolikhamway                           | Khamkeut   | PHONESI       | Central Laos   | Low-Risk      |
| Bolikhamway  | Khamkeut   | NAMSANGIN       | Central Laos   | High-Risk     | Bolikhamway                           | Khamkeut   | PAUNGLAN        | Central Laos   | Low-Risk      | Bolikhamway                           | Viengthong | YORTKAEB      | Central Laos   | Low-Risk      |
| Khammuane  | Nakai      | MAI             | Center of Laos | Low-Risk      | Bolikhamway                           | Khamkeut   | NAPHOUANG       | Central Laos   | Moderate-Risk | Bolikhamway                           | Khamkeut   | NAMSANGIN     | Central Laos   | Moderate-Risk |
| Khammuane  | Nakai      | PUU             | Center of Laos | Low-Risk      | Bolikhamway                           | Khamkeut   | PAKHA           | Central Laos   | Low-Risk      | Khammuane                             | Nakai      | MAI           | Center of Laos | Low-Risk      |
| Khammuane  | Nakai      | THAM ONH        | Center of Laos | Low-Risk      | Khammuane                             | Hinboon    | PHON XAI        | Center of Laos | Low-Risk      | Khammuane                             | Nakai      | PUU           | Center of Laos | Low-Risk      |
| Bolikhamway  | Khamkeut   | PAUNGLAN        | Central Laos   | Low-Risk      | Khammuane                             | Hinboon    | PHON MENH       | Center of Laos | Low-Risk      | Khammuane                             | Nakai      | THAM ONH      | Center of Laos | Low-Risk      |
| Bolikhamway  | Khamkeut   | NAPHOUANG       | Central Laos   | High-Risk     | Khammuane                             | Hinboon    | VANG TA KHONG   | Center of Laos | Moderate-Risk | Bolikhamway                           | Khamkeut   | PAUNGLAN      | Central Laos   | Low-Risk      |
| Bolikhamway  | Khamkeut   | PHONESI         | Central Laos   | Low-Risk      | Khammuane                             | Hinboon    | PHON PHENG      | Center of Laos | Low-Risk      | Bolikhamway                           | Khamkeut   | NAPHOUANG     | Central Laos   | Moderate-Risk |
| Bolikhamway  | Khamkeut   | PAKHA           | Central Laos   | Low-Risk      | Khammuane                             | Hinboon    | MOUANG NAM SANG | Center of Laos | Moderate-Risk | Bolikhamway                           | Khamkeut   | PAKHA         | Central Laos   | Low-Risk      |
| Bolikhamway  | Pakkading  | NABOY           | Central Laos   | Low-Risk      | Khammuane                             | Hinboon    | KA TAIB         | Center of Laos | Low-Risk      | Vientiane                             | Thoulakho  | NAM ANG       | Northwest      | Low-Risk      |
| Khammuane  | Hinboon    | PHON XAI        | Center of Laos | Low-Risk      | Khammuane                             | Nakai      | HOUA PHOU ARK   | Center of Laos | Low-Risk      | Vientiane                             | Vangvieng  | KEOKUANG      | Northwest      | Low-Risk      |
| Khammuane  | Hinboon    | PHON MENH       | Center of Laos | Low-Risk      | Khammuane                             | Nhommalat  | SANG            | Center of Laos | Low-Risk      | Vientiane                             | Vangvieng  | NAMPAT NEUA   | Northwest      | Low-Risk      |
| Khammuane  | Hinboon    | THONG KHA       | Center of Laos | Low-Risk      | Khammuane                             | Mahaxay    | VANG POUN       | Center of Laos | Low-Risk      | Vientiane                             | Feuang     | MOUANGFOUANG  | Northwest      | Low-Risk      |
| Khammuane  | Hinboon    | VANG TA KHONG   | Center of Laos | Moderate-Risk | Savannakhet                           | Xaybuly    | NONGSAPHANG     | Southern       | Low-Risk      | Bolikhamway                           | Pakkading  | NABOY         | Central Laos   | Low-Risk      |
| Khammuane  | Hinboon    | PHON PHENG      | Center of Laos | Low-Risk      | Savannakhet                           | Xaybuly    | KHAMINONSOUNG   | Southern       | Low-Risk      | Bolikhamway                           | Pakkading  | THONGNAMI     | Central Laos   | Low-Risk      |
| Khammuane  | Hinboon    | MOUANG NAM SANG | Center of Laos | High-Risk     | Savannakhet                           | Xaybuly    | KENGHERD        | Southern       | Low-Risk      | Khammuane                             | Hinboon    | PHON XAI      | Center of Laos | Low-Risk      |
| Khammuane  | Hinboon    | KA TAIB         | Center of Laos | Low-Risk      | Savannakhet                           | Xaybuly    | PHAKKHAGNA      | Southern       | Low-Risk      | Khammuane                             | Hinboon    | PHON MENH     | Center of Laos | Low-Risk      |
| Khammuane  | Mahaxay    | LAO             | Center of Laos | Low-Risk      |                                       |            |                 |                |               | Khammuane                             | Hinboon    | THONG KHA     | Center of Laos | Low-Risk      |
| Khammuane  | Nhommalat  | SOM SA ART      | Center of Laos | Low-Risk      |                                       |            |                 |                |               | Khammuane                             | Hinboon    | VANG TA KHONG | Center of Laos | Moderate-Risk |
| Khammuane  | Nakai      | HOUA PHOU ARK   | Center of Laos | Low-Risk      |                                       |            |                 |                |               | Khammuane                             | Hinboon    | PHON PHENG    | Center of Laos | Low-Risk      |

| Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Thailand |                    |              |               |                                       |                    |                     |            |                                       |                  |              |            |  |
|---|--------------------|--------------|---------------|---------------------------------------|--------------------|---------------------|------------|---------------------------------------|------------------|--------------|------------|--|
| Date of FFG products 13/06/2021 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 |  |
| Nakhon Phanom   | Nakae              | Northeastern | Low-Risk      | Udon Thani                            | Nong Han           | Northeastern        | Low-Risk   | Nakhon Phanom                         | Nakae            | Northeastern | Low-Risk   |  |
| Nakhon Phanom   | Nakae              | Northeastern | Low-Risk      | Sakon Nakhon                          | Song Dao           | Northeastern        | Low-Risk   | Nakhon Phanom                         | Nakae            | Northeastern | Low-Risk   |  |
| Udon Thani  | Prajak Silapakom   | Northeastern | Low-Risk      | Sakon Nakhon                          | Muang Sakon Nakhon | Northeastern        | Low-Risk   | Udon Thani                            | Na Yung          | Northeastern | Low-Risk   |  |
| Udon Thani  | Nong Han           | Northeastern | Moderate-Risk | Mukdahan                              | Kamchai            | Northeastern        | Low-Risk   | Udon Thani                            | Prajak Silapakom | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Sawang Daen Din    | Northeastern | Low-Risk      | Mukdahan                              | Kamchai            | Northeastern        | Low-Risk   | Udon Thani                            | Nong Han         | Northeastern | Low-Risk   |  |
| Udon Thani  | Wang Sam Mo        | Northeastern | Low-Risk      | Mukdahan                              | Dong Luang         | Northeastern        | Low-Risk   | Udon Thani                            | Wang Sam Mo      | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Song Dao           | Northeastern | Low-Risk      | Kalasin                               | Sam Chai           | Northeastern        | Low-Risk   | Sakon Nakhon                          | Song Dao         | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Song Dao           | Northeastern | Low-Risk      | Kalasin                               | Sam Chai           | Northeastern        | Low-Risk   | Sakon Nakhon                          | Song Dao         | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Akat Amnuai        | Northeastern | Low-Risk      | Roi Et                                | Muaiwadi           | Northeastern        | Low-Risk   | Sakon Nakhon                          | Akat Amnuai      | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Phannanikhom       | Northeastern | Low-Risk      | Roi Et                                | Phon Thong         | Northeastern        | Low-Risk   | Sakon Nakhon                          | Phannanikhom     | Northeastern | Low-Risk   |  |
| Nakhon Phanom   | Na Wa              | Northeastern | Low-Risk      | Kalasin                               | Kuchi Narai        | Northeastern        | Low-Risk   | Nakhon Phanom                         | Na Wa            | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Muang Sakon Nakhon | Northeastern | Low-Risk      | Kalasin                               | Khao Wong          | Northeastern        | Low-Risk   | Sakon Nakhon                          | Muang Sakon Nai  | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Muang Sakon Nakhon | Northeastern | Low-Risk      | Phangnga                              | Khura Buri         | Southern-West Coast | Low-Risk   | Sakon Nakhon                          | Muang Sakon Nai  | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Phang Khon         | Northeastern | Low-Risk      |                                       |                    |                     |            | Sakon Nakhon                          | Phang Khon       | Northeastern | Low-Risk   |  |
| Udon Thani  | Wang Sam Mo        | Northeastern | Low-Risk      |                                       |                    |                     |            | Kalasin                               | Somdet           | Northeastern | Low-Risk   |  |
| Kalasin   | Somdet             | Northeastern | Low-Risk      |                                       |                    |                     |            | Kalasin                               | Somdet           | Northeastern | Low-Risk   |  |
| Kalasin   | Somdet             | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Kamchai          | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Phannanikhom       | Northeastern | Low-Risk      |                                       |                    |                     |            | Kalasin                               | Na Khu           | Northeastern | Low-Risk   |  |
| Sakon Nakhon  | Phon Na Kaeo       | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Kamchai          | Northeastern | Low-Risk   |  |
| Mukdahan  | Kamchai            | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Dong Luang       | Northeastern | Low-Risk   |  |
| Kalasin   | Na Khu             | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Kamchai          | Northeastern | Low-Risk   |  |
| Mukdahan  | Kamchai            | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Kamchai          | Northeastern | Low-Risk   |  |
| Mukdahan  | Dong Luang         | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Muang Mukdahan   | Northeastern | Low-Risk   |  |
| Mukdahan  | Kamchai            | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Nikom Kham Soi   | Northeastern | Low-Risk   |  |
| Mukdahan  | Kamchai            | Northeastern | Low-Risk      |                                       |                    |                     |            | Mukdahan                              | Dong Luang       | Northeastern | Low-Risk   |  |
| Mukdahan  | Muang Mukdahan     | Northeastern | Low-Risk      |                                       |                    |                     |            | Udon Thani                            | Si That          | Northeastern | Low-Risk   |  |
| Mukdahan  | Nikom Kham Soi     | Northeastern | Low-Risk      |                                       |                    |                     |            | Udon Thani                            | Non Sa-at        | Northeastern | Low-Risk   |  |
| Kalasin   | Huai Phung         | Northeastern | Low-Risk      |                                       |                    |                     |            | Udon Thani                            | Si That          | Northeastern | Low-Risk   |  |
| Mukdahan  | Dong Luang         | Northeastern | Low-Risk      |                                       |                    |                     |            | Kalasin                               | Sam Chai         | Northeastern | 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 13/06/2021 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   |  |
| Nghe An   | Tuong Duong   | North Central | Low-Risk      | Nghe An   | Con Cuong    | North Central | Low-Risk      | Nghe An   | Tuong Duong   | North Central | Low-Risk      |  |
| Nghe An   | Con Cuong     | North Central | Moderate-Risk | Nghe An   | Thanh Chuong | North Central | High-Risk     | Nghe An   | Thanh Chuong  | North Central | Moderate-Risk |  |
| Nghe An   | Thanh Chuong  | North Central | High-Risk     | Quang Binh                                      | Minh Hoa     | North Central | High-Risk     | Quang Binh                                      | Minh Hoa      | North Central | Moderate-Risk |  |
| Quang Binh  | Minh Hoa      | North Central | High-Risk     | Quang Binh                                      | Bo Trach     | North Central | Moderate-Risk | Quang Binh                                      | Bo Trach      | North Central | Moderate-Risk |  |
| Quang Binh  | Bo Trach      | North Central | Moderate-Risk | Quang Binh                                      | Quang Ninh   | North Central | Low-Risk      | Quang Binh                                      | Quang Ninh    | North Central | Low-Risk      |  |
| Quang Binh  | Quang Ninh    | North Central | Low-Risk      | Son La  | Yen Chau     | Northwest     | Low-Risk      | Lao Cai   | Than Uyen     | Northwest     | Low-Risk      |  |
| Son La  | Yen Chau      | Northwest     | Low-Risk      | Nghe An   | Tuong Duong  | North Central | Low-Risk      | Son La  | Yen Chau      | Northwest     | Low-Risk      |  |
| Nghe An   | Quynh Luu     | North Central | Low-Risk      | Ha Tinh   | Duc Tho      | North Central | Low-Risk      | Nghe An   | Quynh Luu     | North Central | Low-Risk      |  |
| Nghe An   | Tan Ky        | North Central | Low-Risk      | Ha Tinh   | Huong Son    | North Central | Moderate-Risk | Nghe An   | Con Cuong     | North Central | Moderate-Risk |  |
| Ha Tinh   | Duc Tho       | North Central | Low-Risk      | Ha Tinh   | Huong Khe    | North Central | Moderate-Risk | Hoa Binh  | Ky Son        | Northwest     | Low-Risk      |  |
| Ha Tinh   | Huong Son     | North Central | High-Risk     | Nghe An   | TX. Cua Lo   | North Central | Low-Risk      | Nghe An   | Quy Chau      | North Central | Low-Risk      |  |
| Ha Tinh   | Huong Khe     | North Central | High-Risk     | Ha Tinh   | Nghi Xuan    | North Central | Low-Risk      | Nghe An   | Que Phong     | North Central | Low-Risk      |  |
| Ha Tinh   | Cam Xuyen     | North Central | Low-Risk      | Nghe An   | Anh Son      | North Central | High-Risk     | Nghe An   | Tan Ky        | North Central | Low-Risk      |  |
| Quang Binh  | Tuyen Hoa     | North Central | Low-Risk      | Ha Tinh   | TX. Ha Tinh  | North Central | Low-Risk      | Ha Tinh   | Duc Tho       | North Central | Low-Risk      |  |
| Ha Tinh   | Thach Ha      | North Central | Low-Risk      | Ha Tinh   | Cam Xuyen    | North Central | Low-Risk      | Ha Tinh   | Huong Son     | North Central | Moderate-Risk |  |
| Ha Tinh   | TX. Hong Linh | North Central | Low-Risk      | Ha Tinh   | Ky Anh       | North Central | Low-Risk      | Ha Tinh   | Huong Khe     | North Central | Moderate-Risk |  |
| Nghe An   | TP. Vinh      | North Central | Low-Risk      | Quang Binh                                      | Quang Trach  | North Central | Low-Risk      | Ha Tinh   | Cam Xuyen     | North Central | Low-Risk      |  |
| Nghe An   | TX. Cua Lo    | North Central | Low-Risk      |   |              |               |               | Quang Binh                                      | Tuyen Hoa     | North Central | Low-Risk      |  |
| Ha Tinh   | Nghi Xuan     | North Central | Moderate-Risk |   |              |               |               | Quang Binh                                      | Minh Hoa      | North Central | Moderate-Risk |  |
| Nghe An   | Anh Son       | North Central | Low-Risk      |   |              |               |               | Ha Tinh   | TX. Hong Linh | North Central | Low-Risk      |  |
| Nghe An   | Anh Son       | North Central | High-Risk     |   |              |               |               | Nghe An   | TP. Vinh      | North Central | Low-Risk      |  |
| Ha Tinh   | TX. Ha Tinh   | North Central | Low-Risk      |   |              |               |               | Nghe An   | TX. Cua Lo    | North Central | Low-Risk      |  |
| Ha Tinh   | Cam Xuyen     | North Central | Moderate-Risk |   |              |               |               | Ha Tinh   | Nghi Xuan     | North Central | Low-Risk      |  |
| Ha Tinh   | Ky Anh        | North Central | Low-Risk      |   |              |               |               | Nghe An   | Anh Son       | North Central | Moderate-Risk |  |
| Quang Binh  | Quang Trach   | North Central | Moderate-Risk |   |              |               |               | Ha Tinh   | TX. Ha Tinh   | North Central | Low-Risk      |  |
|   |               |               |               |   |              |               |               | Ha Tinh   | Ky Anh        | North Central | Low-Risk      |  |
|   |               |               |               |   |              |               |               | Quang Binh                                      | Quang Trach   | North Central | Low-Risk      |  |

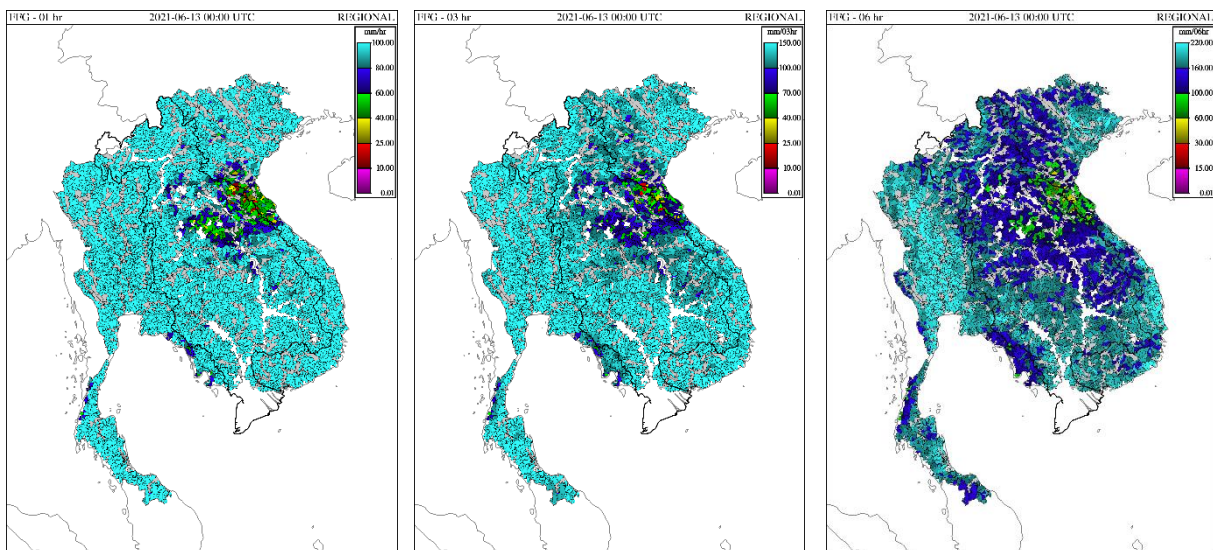


Figure 14. Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on June 13.



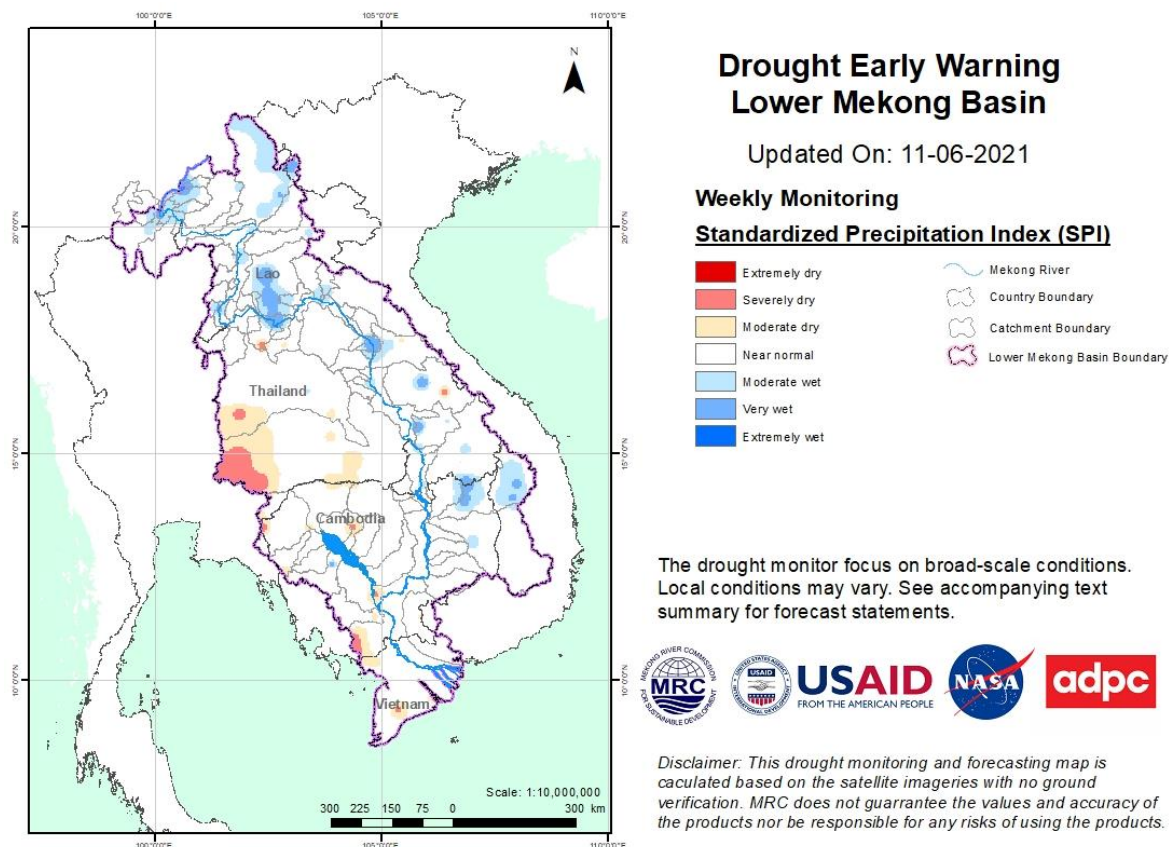
## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from 05 to 11 June 2021

Drought monitoring data for 2021 are available from Saturday to Friday every week; thus, the reporting period is normally delayed by three days compared to Flood and Flash Flood reports. We adopt the Index of Soil Water Fraction (ISWF) data obtained from FFGS to represent soil moisture of agricultural indicator for both dry and wet seasons.

- **Weekly Standardised Precipitation Index (SPI1)**

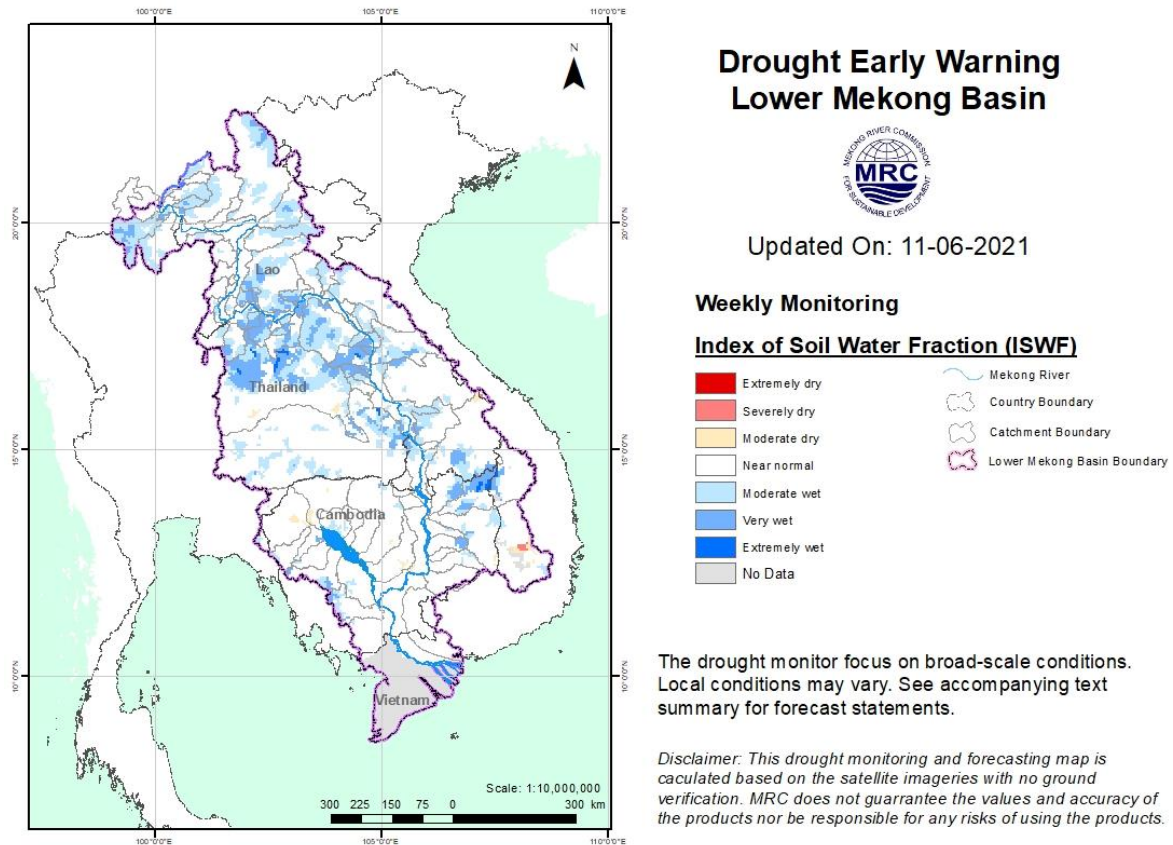
Meteorological drought conditions from 5 to 11 June 2021, as shown in [Figure 13](#), were normal and wet in most parts of the LMB except in Thailand's Nakhon Ratchasima, and Chaiyaphum, Cambodia's Kampot, and Viet Nam's Bac Lieu where moderate and severe droughts occurred. In general, the region received from average to above average rainfall during the reporting week.



**Figure 15.** Weekly standardized precipitation index from 05 to 11 June 2021.

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

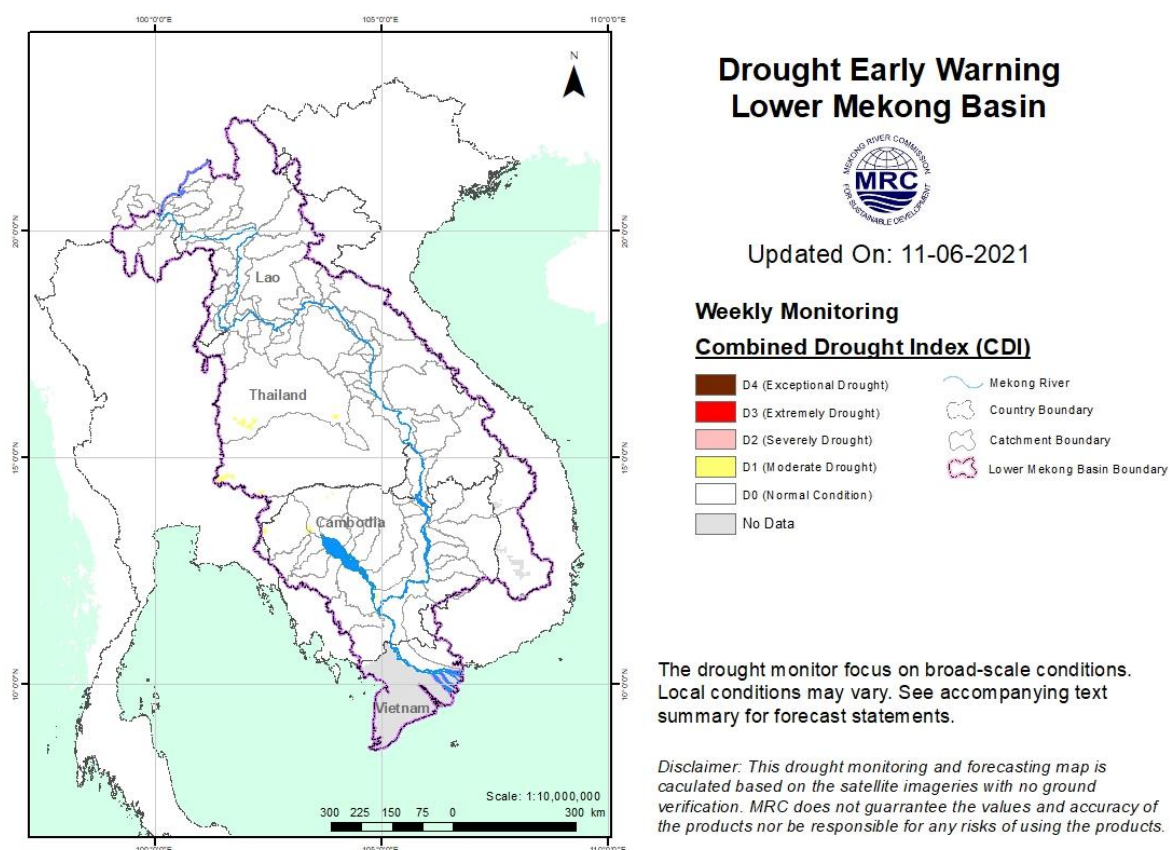
Unlike last week, soil moisture conditions from 5 to 11 June 2021, as shown in [Figure 14](#), shows that half of the upper part of the region was relatively wet while half of the lower part was mostly normal. This indicates that the region did not experience any agricultural drought.



**Figure 16.** Weekly Soil Moisture Anomaly from 5 to 11 June 2021.

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

The overall drought conditions through combined drought index from 5 to 11 June 2021, as displayed in Figure 15, indicates a normal condition over the entire LMB region. No threat was found for the LMB during the reporting week.



**Figure 17.** Weekly Combined Drought Index from 05 to 11 June 2021.

More information on Drought Forecasting and Early Warning (DFEW) as well as the explanation is available here: <http://droughtforecast.mrcmekong.org/templates/view/our-product>. DFEW provides not only weekly monitoring and forecasting information but also a three-month forecast of drought indicators with seasonal outlook which are updated every month based on international weather forecast models. Details on drought forecast are described in section 6.4 of this report.



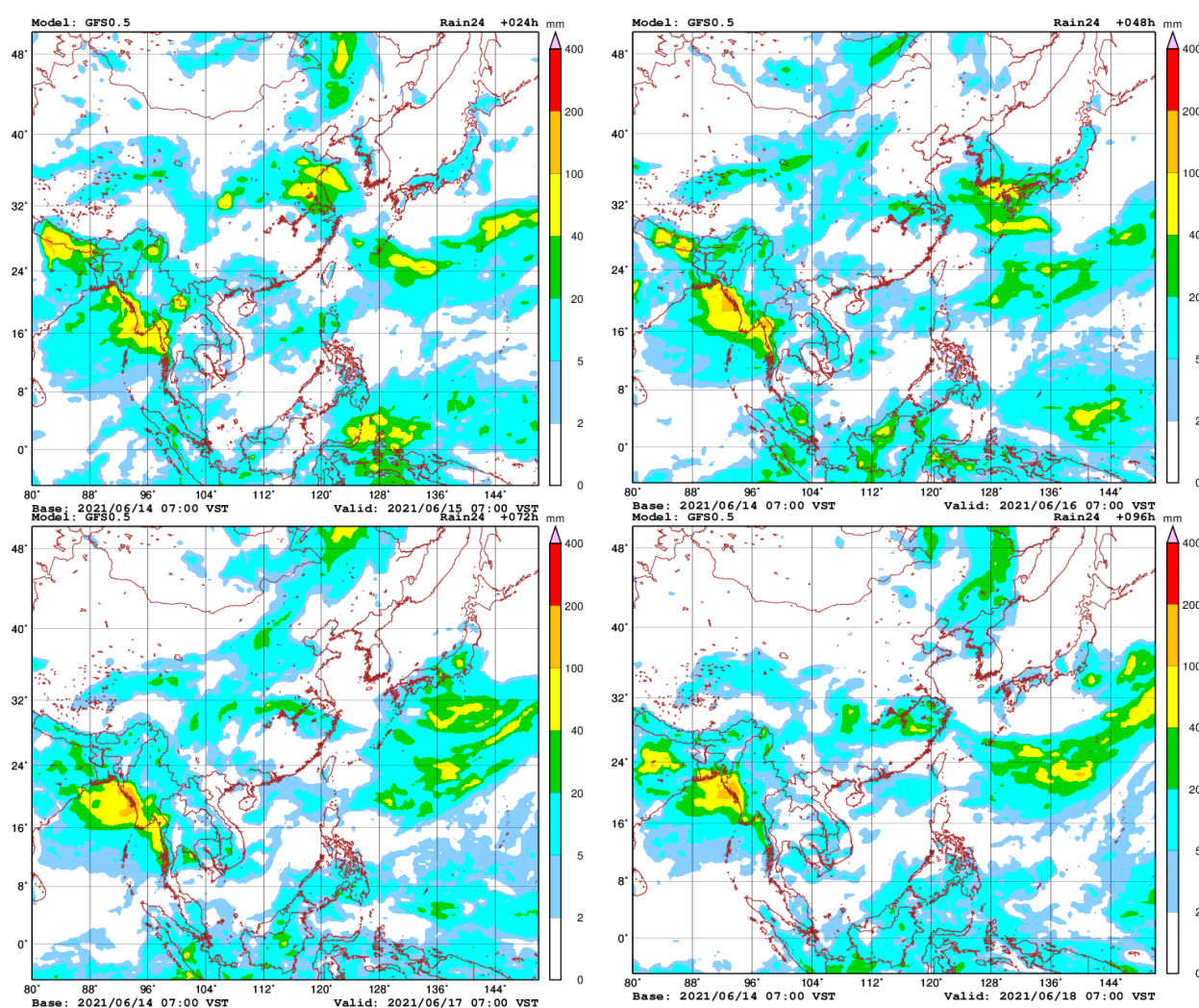
## 6 Weather and Water Level Forecast and Flash Flood Information

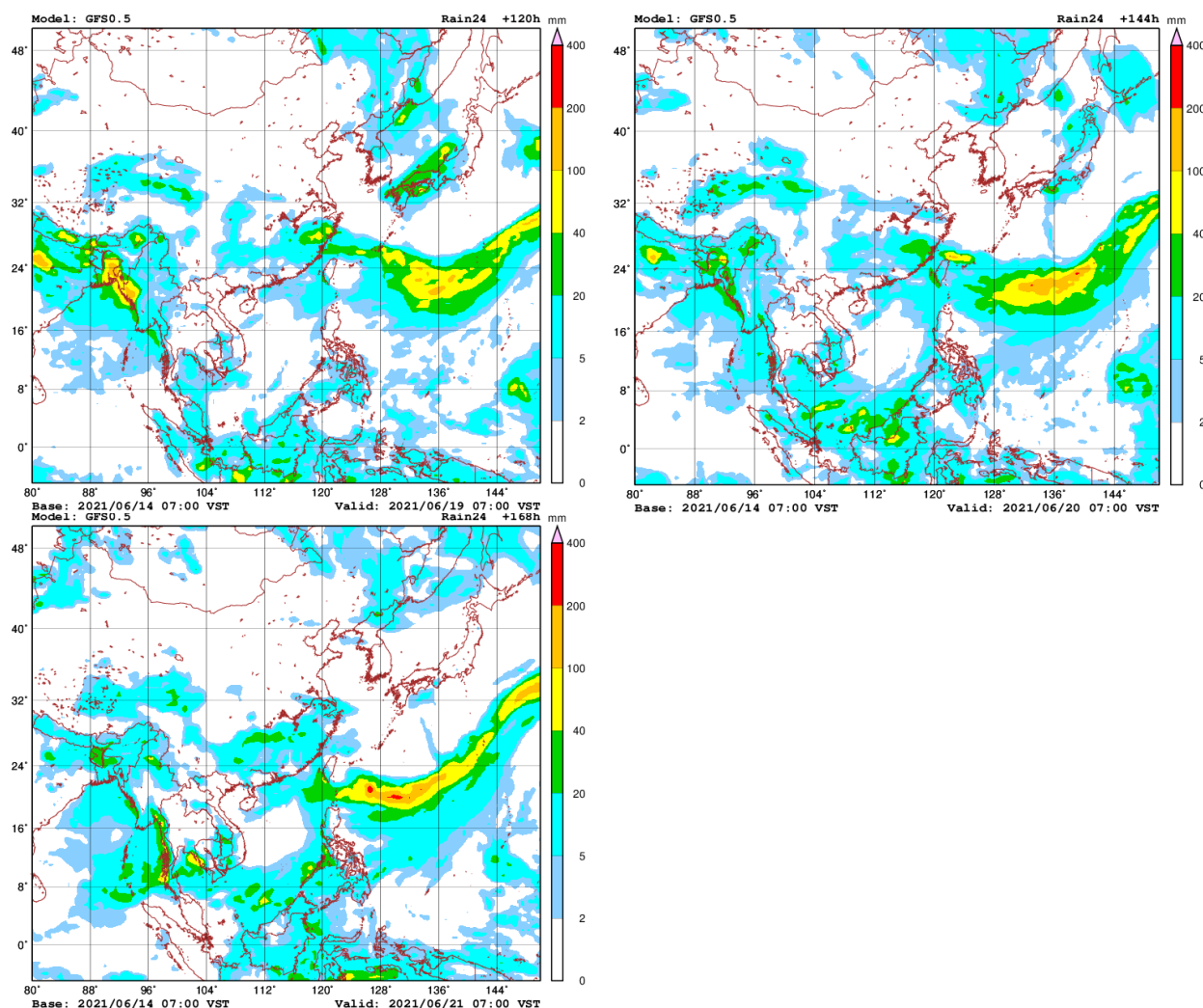
### 6.1 Weather and rainfall forecast

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

From June 15 to 21, small rainfall (5–10 mm/24 h) and moderate rainfall (20–40 mm/24 h) will likely occur in some parts of the LMB.

[Figure 18](#) shows accumulated rainfall forecast (24 h) of the GFS model from 15 to 21 June 2021.





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

## 6.2 Water level forecast

### Chiang Saen and Luang Prabang

Based on June 15's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 4.99 m to 5.55 m over the next five days. The trend will keep the water level at this station above its LTA.

For Luang Prabang in Lao PDR, the water level will increase from 10.14 m to 11.45 m during next five days. The current water level is higher than its maximum value. Precipitation is forecasted for the areas 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 by about 1.40 m, and about 3.00 m at Vientiane in Lao PDR. From Nong Khai in Thailand to Paksane in Lao PDR, the water levels will increase by about 2.60 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 rise above their LTAs 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 forecast 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 see a higher increase by about 2 m. The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR will stay higher 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 increase by about 1.30 m over the next seven days. Precipitation is forecasted for the area between Stung Treng and Kratie 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 0.98 m over the next seven days.

Despite this trend of increased water levels, the 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 8–14 June 2021, is presented in [Annex 1](#)

[Table 2](#) shows the daily flood forecasting Bulletin issued on June 15. 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**

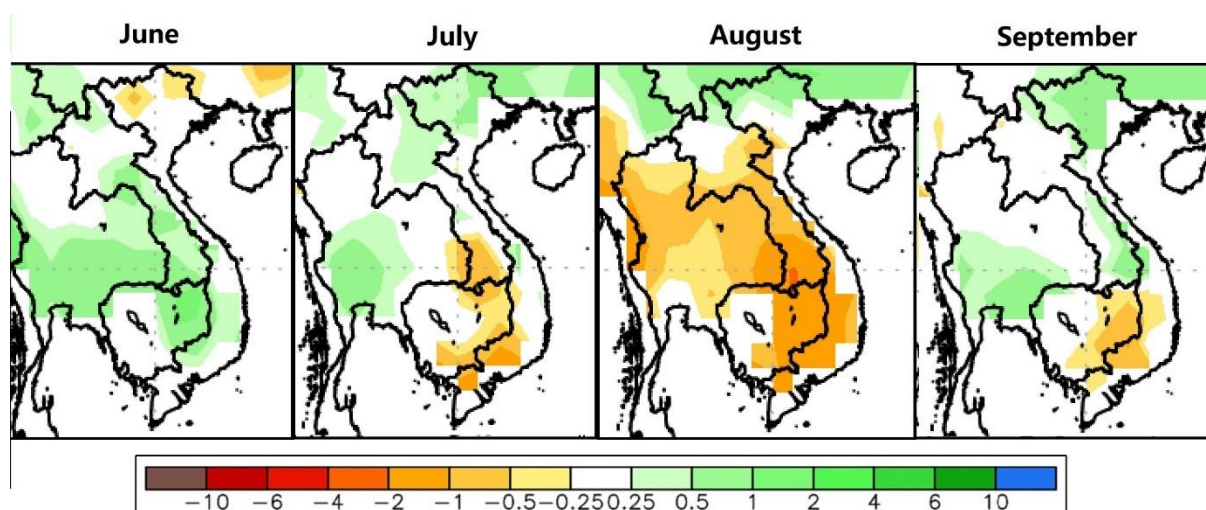
With rainfall forecasted for next week, flash flood events can be expected to happen in the LMB. Local heavy rain in a short period of time is also possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice daily at: <http://ffw.mrcmekong.org/ffg.php>.

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 June to September 2021 produced by the NMME.



**Figure 19.** Daily average of monthly rainfall anomaly forecast from April to July 2021.

The ensemble prediction model forecasts that in June the entire LMB is likely to receive from average to above-average rainfall; the central part of the LMB and the eastern part of Cambodia are forecasted to be the wettest areas. Moving into July, it is forecasted that Cambodia, the Central Highlands of Viet Nam, and southern Lao PDR will be the driest areas in the region. In August, the entire LMB region is most likely to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Lastly, the lower part of the LMB covering eastern Cambodia and Viet Nam is anticipated to receive below average rainfall in September.

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

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



## Mekong Bulletin

Mekong River Commission Secretariat (MRCS)
























Regional Flood and Drought Management Centre (RFDMC)

P.O. Box 623 #576, National Road #2, Chak Angre Krom, Meanchey, Phnom Penh, Cambodia

Tel: (855-23) 425353, Fax: (855-23) 425363, Email: floodforecast@mrcmekong.org

River Flood Forecast: 16 June - 20 June 2021

Date: 15 June 2021

| Location            | Country   | 24-hr<br>Observed<br>Rainfall<br>(mm) | Zero<br>gauge<br>above<br>M.S.L.<br>(m) | Flood<br>level (m) | Alarm<br>level (m) | Observed W. level<br>against zero gauge<br>(m) |        | Forecasted Water Levels (m) |        |        |        |       |    | There is currently no<br>flood warning in place<br>at monitoring sites on<br>the Mekong |    |    |    |   |   |
|---------------------|---|---------------------------------------|---|--------------------|--------------------|--|--------|-----------------------------|--------|--------|--------|-------|----|---|----|----|----|---|---|
|                     |   | 14-Jun                                |   |                    |                    | 15-Jun   | 16-Jun | 17-Jun                      | 18-Jun | 19-Jun | 20-Jun | 15    | 16 | 17  | 18 | 19 | 20 |   |   |
| Jinghong            |    | 4.5                                   |   |                    |                    | 536.99   | 537.31 |                             |        |        |        |       |    | ↑   | ×  | ×  | ×  | × | × |
| Chiang Saen         |    | 92.0                                  | 357.110                                 | 12.80              | 11.50              | 4.00   | 4.59   | 5.31                        | 5.58   | 5.66   |        |       |    | ↑   | ↑  | ↑  |    | ★ | ★ |
| Luang Prabang       |    | 45.0                                  | 267.195                                 | 18.00              | 17.50              | 10.22  | 10.14  | 10.59                       | 11.20  | 11.45  | 11.52  | 11.45 |    | ↑   | ↑  | ↑  | ↑  |   |   |
| Chiang Khan         |    | 3.5                                   | 194.118                                 | 16.00              | 14.50              | 7.15   | 9.35   | 9.78                        | 10.25  | 10.85  |        |       |    | ↑   | ↑  | ↑  | ↑  | ★ | ★ |
| Vientiane           |    | 0.0                                   | 158.040                                 | 12.50              | 11.50              | 4.10   | 4.75   | 6.50                        | 6.90   | 7.33   | 7.88   | 8.10  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Nongkhai            |    | 0.0                                   | 153.648                                 | 12.20              | 11.40              | 3.85   | 4.30   | 5.80                        | 6.18   | 6.59   |        |       |    | ↑   | ↑  | ↑  | ↑  | ★ | ★ |
| Paksane             |    | 1.1                                   | 142.125                                 | 14.50              | 13.50              | 5.61   | 6.07   | 6.50                        | 7.50   | 7.80   | 8.10   | 8.45  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Nakhon Phanom       |    | 1.9                                   | 130.961                                 | 12.00              | 11.50              | 4.50   | 5.52   | 5.78                        | 6.05   | 6.58   |        |       |    | ↑   | ↑  | ↑  | ↑  | ★ | ★ |
| Thakhek             |    | 1.1                                   | 129.629                                 | 14.00              | 13.00              | 5.69   | 6.55   | 6.81                        | 7.10   | 7.64   | 7.83   | 8.00  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Mukdahan            |    | 1.4                                   | 124.219                                 | 12.50              | 12.00              | 4.41   | 5.05   | 5.60                        | 5.80   | 6.01   |        |       |    | ↑   | ↑  | ↑  | ↑  | ★ | ★ |
| Savannakhet         |  | 0.0                                   | 125.410                                 | 13.00              | 12.00              | 1.86   | 2.00   | 2.25                        | 2.37   | 2.49   | 2.60   | 2.65  |    | ↑   | ↑  | ↑  | ↑  | ↑ |   |
| Khong Chiam         |  | 0.0                                   | 89.030                                  | 14.50              | 13.50              | 5.16   | 5.43   | 6.16                        | 6.76   | 7.10   |        |       |    | ↑   | ↑  | ↑  | ↑  | ★ | ★ |
| Pakse               |  | 0.0                                   | 86.490                                  | 12.00              | 11.00              | 4.10   | 4.17   | 4.55                        | 4.86   | 5.10   | 5.33   | 5.53  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Stung Treng         |  | 4.0                                   | 36.790                                  | 12.00              | 10.70              | 4.48   | 4.86   | 4.95                        | 5.30   | 5.56   | 5.76   | 5.95  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Kratie              |  | nr                                    | -0.101                                  | 23.00              | 22.00              | 9.62   | 10.67  | 11.21                       | 11.33  | 11.70  | 12.00  | 12.23 |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Kompong Cham        |  | 0.6                                   | -0.930                                  | 16.20              | 15.20              | 4.19   | 4.66   | 5.57                        | 6.12   | 6.25   | 6.63   | 6.95  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Phnom Penh (Bassac) |  | 4.4                                   | -1.020                                  | 12.00              | 10.50              | 2.27   | 2.42   | 2.84                        | 3.10   | 3.16   | 3.35   | 3.46  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Phnom Penh Port     |  | -                                     | 0.070                                   | 11.00              | 9.50               | 1.29   | 1.44   | 1.86                        | 2.12   | 2.20   | 2.40   | 2.53  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Koh Khel (Bassac)   |  | nr                                    | -1.000                                  | 8.40               | 7.90               | 2.31   | 2.47   | 2.78                        | 3.17   | 3.22   | 3.40   | 3.50  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Neak Luong          |  | 5.8                                   | -0.330                                  | 8.00               | 7.50               | 1.46   | 1.62   | 1.90                        | 2.35   | 2.61   | 2.67   | 2.85  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Prek Kdam           |  | nr                                    | 0.080                                   | 10.00              | 9.50               | 1.36   | 1.42   | 1.75                        | 2.00   | 2.08   | 2.28   | 2.40  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Tan Chau            |  | 4.0                                   | 0.000                                   | 4.50               | 3.50               | -0.37  | -0.28  | -0.10                       | 0.15   | 0.47   | 0.80   | 0.99  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |
| Chau Doc            |  | 7.0                                   | 0.000                                   | 4.00               | 3.00               | -0.43  | -0.30  | -0.10                       | 0.15   | 0.47   | 0.80   | 1.01  |    | ↑   | ↑  | ↑  | ↑  | ↑ | ↑ |

### REMARKS:

nr: not available.

nr: no rain.

| LEGEND  |                   |
|---|-------------------|
| rising water level  | ↑                 |
| stable water level  | →                 |
| falling water level   | ↓                 |
| alarm stage   | Yellow background |
| alarm situation   | Orange background |
| flood stage   | Red background    |
| no data available   | ×                 |
| 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

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

During this reporting week, rainfall took place from Chiang Saen in Thailand to Pakse in Lao PDR, including the lower part of the LMB at Chaktomuk in Cambodia and Tan Chau and Chau Doc in Viet Nam, varying from 5.50 mm to 278.80 mm.

Based on the forecasted satellite data, rainfall is forecasted for some areas of the LMB, with value ranging from 50 mm to 180 mm for the next seven days. The forecasting model using GFS data, on the other hand, shows that no significant rainfall (>70 mm) is likely to take place in the Mekong region from 16 to 24 June 2021.

### 7.2 Water level and its forecast

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed a slight fluctuation over the monitoring period from 8 to 14 June 2021. It rose from 536.74 m on June 10 to 537.30 m on June 12 before dropping to 536.99 m on June 14.

From mid- to the end of May, the station's outflows experienced rapid fluctuations with a dropping trend. The outflows decreased from 3,285 m<sup>3</sup>/s on May 14 to 2,098 m<sup>3</sup>/s on May 30. Its daily average water level dropped by 1.33 m.

Due to the influence of heavy rainfall from 8 to 14 June, water levels across most monitoring stations from Chiang Saen in Thailand to Thakhek in Lao PDR, and from the stretches of the river between Stung Treng, Kratie and Kompong Cham in Cambodia rose significantly and were 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 1.50 m and 1.35 m, respectively.

The flow volume of the Tonle Sap Lake is lower than its LTA. From next week, the flow might continue to increase due to predicted 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 close to 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 beginning of March 2021, water levels across most monitoring stations in the LMB had moved higher than their LTA (from upper to lower stretches within the LMB) but started decreasing again in late May. However, during the monitoring period, they increased significantly. Like many parts of the world, the Mekong region was affected by the prolonged

El Nino event, the phenomenon that usually causes extreme heat and insufficient rainfall. This climate change impact has been observed since 2019 and 2020. For a more complete preliminary analysis of the hydrological conditions in the LMB over January–July 2020, see this [Situation Report](#), and for July–December 2020, 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 and moderate amount of rainfall for the coming week as mentioned earlier in [section 6.1](#), major flash floods are expected in the LMB during next week. Local heavy rain in a short period of time is also possible with unexpected short flash floods.

### **7.4 Drought condition and its forecast**

From 5 to 11 June 2021, the whole part of LMB was normal; no thread was found for the LMB during the reporting week.

The ensemble prediction model forecasts that in June the entire LMB is likely to receive from average to above-average rainfall; the central part of the LMB and the eastern part of Cambodia are forecasted to be the wettest areas. Moving into July, it is forecasted that Cambodia, the Central Highland of Viet Nam, and southern Lao PDR will be the driest area in the region. In August, the entire LMB region is forecasted to experience some meteorological drought, a situation when there is a prolonged period with less than average rainfall. Lastly, the lower part of the LMB covering eastern Cambodia and Viet Nam is likely to receive below average rainfall in September.

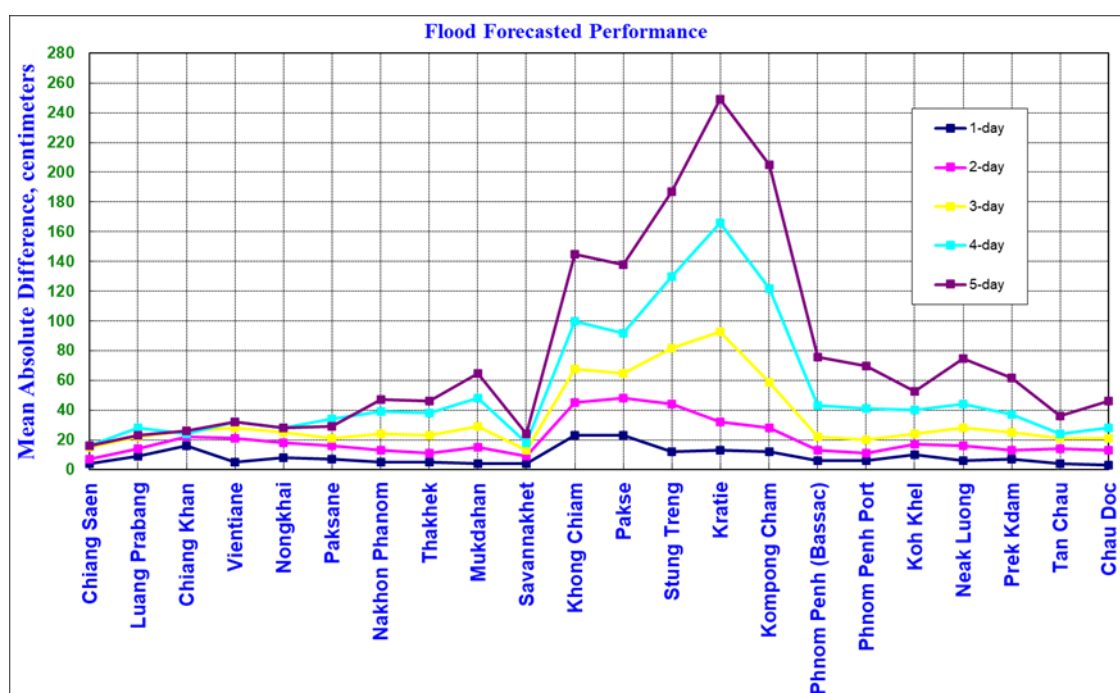
## Annex 1: Performance of the weekly flood forecasting

### 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 8 to 14 June 2021.

The forecasting values from 8 to 14 June 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 Khong Chiam to Kompong Cham due to the effect of heavy rain in this area during the report period.



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

- Missing 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 8–14 June 2021.

**Table B1:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 8 to 14 June 2021 in cm

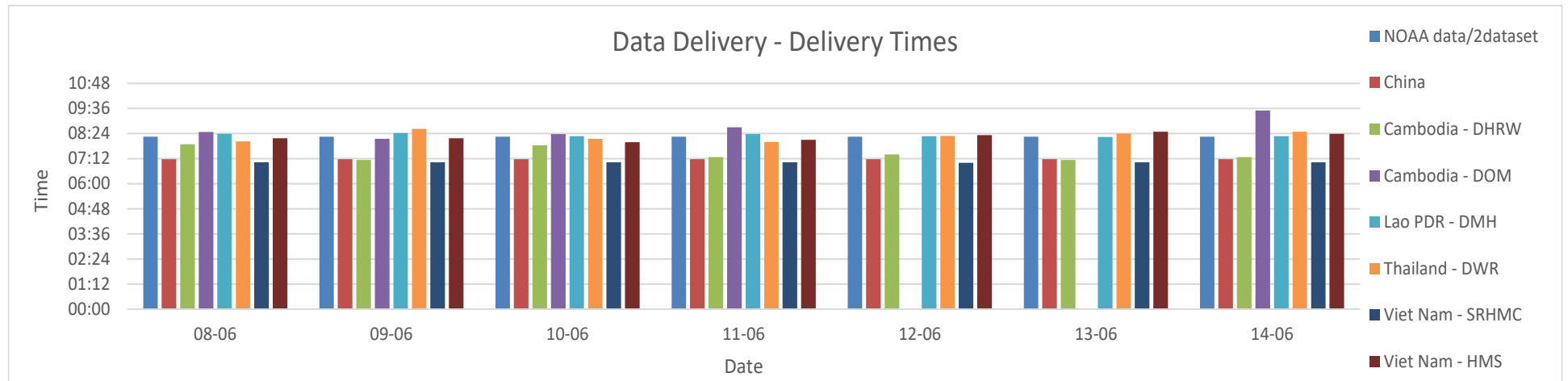
| Lead-time Forecasted | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane | Nongkhai  | Paksane   | Nakhon Phanom | Thakhek   | Mukdahan  | Savannakhet | Khong Chiam | Pakse     | Stung Treng | Kratie    | Kompong Cham | Phnom Penh (Bassac) | Phnom Penh Port | Koh Khel  | Neak Luong | Prek Kdam | Tan Chau  | Chau Doc  |
|----------------------|-------------|---------------|-------------|-----------|-----------|-----------|---------------|-----------|-----------|-------------|-------------|-----------|-------------|-----------|--------------|---------------------|-----------------|-----------|------------|-----------|-----------|-----------|
| 1-day                | <u>25</u>   | <u>25</u>     | <u>25</u>   | 10        | 10        | 10        | 10            | 10        | 10        | 10          | 10          | 10        | 10          | 10        | 10           | 10                  | 10              | 10        | 10         | 10        | 10        | 10        |
| 2-day                | <u>50</u>   | <u>50</u>     | <u>50</u>   | <u>25</u> | <u>25</u> | <u>25</u> | <u>25</u>     | <u>25</u> | <u>25</u> | <u>25</u>   | <u>25</u>   | <u>25</u> | <u>25</u>   | <u>25</u> | <u>25</u>    | 10                  | 10              | 10        | 10         | 10        | 10        | 10        |
| 3-day                | <u>50</u>   | <u>50</u>     | <u>50</u>   | <u>25</u> | <u>25</u> | <u>25</u> | <u>25</u>     | <u>25</u> | <u>25</u> | <u>25</u>   | <u>25</u>   | <u>25</u> | <u>25</u>   | <u>25</u> | <u>25</u>    | 10                  | 10              | 10        | 10         | 10        | 10        | 10        |
| 4-day                | 75          | 75            | <u>50</u>   | <u>50</u> | <u>50</u> | <u>50</u> | <u>50</u>     | <u>50</u> | <u>50</u> | <u>50</u>   | <u>50</u>   | <u>50</u> | <u>50</u>   | <u>50</u> | <u>50</u>    | 10                  | <u>25</u>       | 10        | <u>25</u>  | <u>25</u> | 10        | 10        |
| 5-day                | 75          | 75            | <u>50</u>   | <u>50</u> | <u>50</u> | <u>50</u> | <u>50</u>     | <u>50</u> | <u>50</u> | <u>50</u>   | <u>50</u>   | <u>50</u> | <u>50</u>   | <u>50</u> | <u>50</u>    | <u>25</u>           | <u>25</u>       | <u>25</u> | <u>25</u>  | <u>25</u> | <u>25</u> | <u>25</u> |

**Table B2:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 8 to 14 June 2021 in %

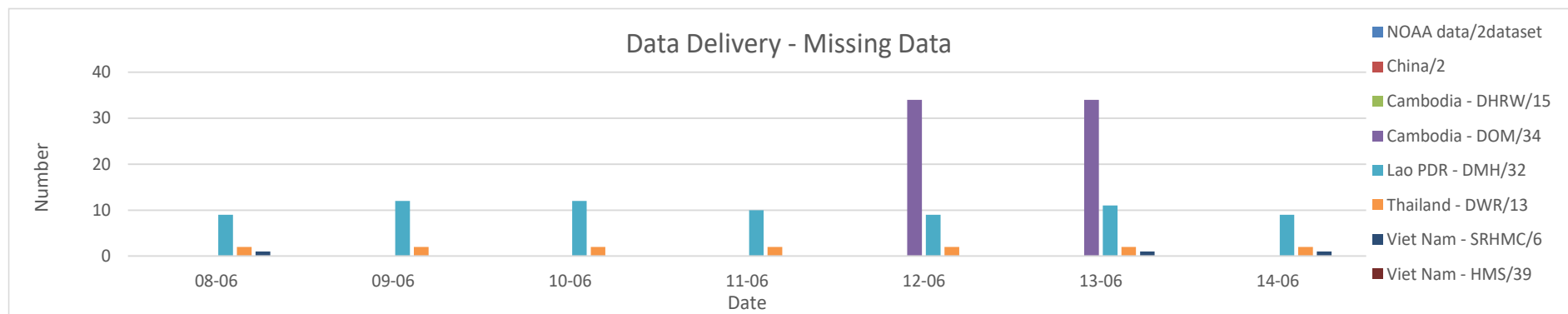
| Lead-time Forecasted | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane   | Nongkhai    | Paksane     | Nakhon Phanom | Thakhek     | Mukdahan    | Savannakhet | Khong Chiam | Pakse       | Stung Treng | Kratie      | Kompong Cham | Phnom Penh (Bassac) | Phnom Penh Port | Koh Khel    | Neak Luong  | Prek Kdam   | Tan Chau    | Chau Doc    | Average     |
|----------------------|-------------|---------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|---------------------|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1-day                | 85.7        | 71.4          | 85.7        | 71.4        | <u>42.9</u> | <u>42.9</u> | 57.1          | 14.3        | 57.1        | 100.0       | <u>28.6</u> | 14.3        | <u>42.9</u> | <u>42.9</u> | 100.0        | 71.4                | 71.4            | 85.7        | 100.0       | 71.4        | 57.1        | 71.4        | <b>63.0</b> |
| 2-day                | 66.7        | 83.3          | 66.7        | 83.3        | 66.7        | 66.7        | 66.7          | 66.7        | <u>50.0</u> | 100.0       | 66.7        | <u>33.3</u> | <u>50.0</u> | 66.7        | 100.0        | <u>50.0</u>         | <u>33.3</u>     | 83.3        | <u>50.0</u> | 66.7        | 66.7        | <u>33.3</u> | <b>64.4</b> |
| 3-day                | 60.0        | 100.0         | <u>40.0</u> | 60.0        | 60.0        | <u>40.0</u> | <u>40.0</u>   | <u>20.0</u> | <u>20.0</u> | 100.0       | 60.0        | <u>40.0</u> | <u>20.0</u> | <u>40.0</u> | 60.0         | 80.0                | 80.0            | 80.0        | 60.0        | <u>40.0</u> | 0.0         | 0.0         | <b>50.0</b> |
| 4-day                | 75.0        | 100.0         | <u>25.0</u> | 75.0        | 75.0        | <u>50.0</u> | <u>50.0</u>   | <u>50.0</u> | <u>25.0</u> | 100.0       | <u>25.0</u> | <u>50.0</u> | 75.0        | <u>50.0</u> | 75.0         | <u>25.0</u>         | 100.0           | <u>25.0</u> | 100.0       | 75.0        | <u>25.0</u> | 0.0         | <b>56.8</b> |
| 5-day                | 0.0         | 66.7          | 0.0         | <u>33.3</u> | <u>33.3</u> | 0.0         | 0.0           | <u>33.3</u> | 0.0         | 100.0       | 0.0         | <u>33.3</u> | 66.7        | 100.0       | 66.7         | 100.0               | 100.0           | 100.0       | 100.0       | 66.7        | 66.7        | <u>33.3</u> | <b>50.0</b> |

**Table B3: Overview of performance indicators for the past 7 days from 8 to 14 June 2021**

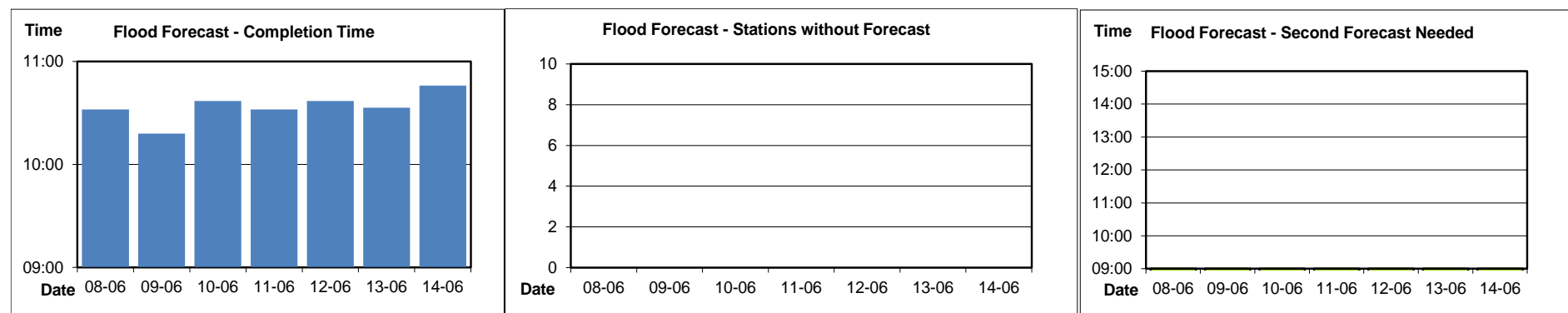
|       | FF time sent                 |                           |                               |                               | Arrival time of input data |       |                 |                |               |                |                  |                | Missing data (number-mainstream 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  | 10:33                        | 00:00                     | -                             | -                             | 08:15                      | 07:10 | 07:25           | 08:38          | 08:18         | 08:16          | 07:00            | 08:13          | 0   | 0       | 0                  | 68                | 72               | 14                | 3                  | 0                 |
| month | 10:33                        | 00:00                     | -                             | -                             | 08:15                      | 07:10 | 07:45           | 08:16          | 08:39         | 08:19          | 07:22            | 08:14          | 0   | 0       | 14                 | 68                | 0                | 14                | 3                  | 38                |
|       |                              |                           |                               |                               |                            |       |                 |                |               |                |                  |                |   |         |                    |                   |                  |                   |                    |                   |



**Fig. B4: Data delivery times for the past 7 days from 8 to 14 June 2021**



**Fig. B5: Missing data for the past 7 days from 8 to 14 June 2021**



**Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 8 to 14 June 2021**



## Mekong River Commission Secretariat

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