



**Mekong River Commission**

# **Weekly Wet Season Situation Report in the Lower Mekong River Basin 21-27 June 2022**

Prepared by  
The Regional Flood and Drought Management Centre  
28 June 2022

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## Key Messages

Key messages for this weekly report are presented below.

### Rainfall and its forecast

- Rainfall focused in the areas from Chiang Saen in Thailand to Tan Chau and Chau Doc in Viet Nam, including the middle and lower parts in Lao PDR and Cambodia, varying from 0.30 millimetres (mm) to 146.30 mm.
- There will be average rainfalls for the next 5 days over the Mekong region from 28 June to 03 July 2022 because there will be a low pressure dominating the Mekong region.

### Water level and its forecast

- According to MRC's observed water level at Jinghong, there was a significant decrease in water level of about 1.04 m from 536.64 m and 535.60 m from 21 to 27 June 2022. The current level is staying about 0.74 m lower than its Long-Term-Average (2015-2021) value.
- Water levels of monitoring station at Chiang Saen in Thailand increased about 0.34 m from 21 to 27 June 2022, but still stayed about 0.20 m lower than its LTA level, which is considered critical.
- Water level (WL) from Chiang Khan in Thailand from 21 to 27 June 2022 decreased by about 0.60 m (about 0.20 m higher than its LTA value), while water level at Vientiane decreased about 0.45 m and still stayed about 0.51 m higher than its LTA level, which considered normal. Water levels at Nong Khai decreased 0.51 m and at Paksane decreased about 0.31 m, staying about 0.44 m and 0.67 m lower than their LTA value, respectively, considered critical.
- Water levels from Nakhon Phanom in Thailand and Pakse in Lao PDR decreased between 0.15 m and 0.60 m. The current WLs at these stations were staying about 1.00 m lower than their LTA value, considered **critical**. From the stretches of the river from Stung Treng to Kratie significantly decreased about 0.15 m and 0.10 m, staying 0.54 m and 1.11 m lower than their LTA level, respectively, considered a critical condition.
- Water levels from Kompong Cham down to Chaktomuk, Koh Khel and Phnom Penh Port to Prek Kdam in Cambodia decreased about 0.02 m and 0.25 m, staying between 0.40m and 1.00 m lower than their LTA level.
- The current water levels from Chiang Khan in Thailand to Vientiane in Lao PDR are higher than their LTA value. Most of the stations have WL lower than their LTA value. WLs at the 2 tidal stations at Tan Chau and Chau Doc were below their LTA value due to tidal effect during this monitoring period.

- Over the next five days, the water levels across most monitoring stations are expected to go down and stay lower than their long-term average value in most stations.

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

- During June 19-25, the LMB was facing some moderate and severe meteorological droughts across the region from the north to the south. The combined drought index of both meteorological and agricultural indicators shows some short-term moderate and severe droughts taking place in **Loei, Nong Bua Lamphu, Udon Thani, Mukdahan, Khammuane, Roi Et, Yasothon, Amnat Charoen, Ubon Ratchathani, Si Saket, Surin, Preah Vihea, Siem Reap, Banteay Meanchey, Ratana Kiri, and Gia Lai**. Being short-term droughts, they do not pose any serious threat yet to the local communities.
- For the upcoming three months' forecasts, the LMB is likely to receive below-average rainfall **in July and August** with equivalent from **moderate to severe meteorological droughts**. Below-average rainfall is also forecasted for the lower part of the region covering **Cambodia and Viet Nam during this coming September with moderate drought**. While in October and November the LMB is likely to receive more than average rainfall, meaning no drought threat is predicted for 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 **21-27 June 2022**. The trend and outlook for water levels are also presented.

This analysis is based on the daily hydro-meteorological data provided by the Mekong River Commission (MRC) Member Countries (MCs) – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. All the water levels indicated in this report refer to an above zero gauge of each station.

The report covers the following topics that are updated weekly:

- General weather patterns, including rainfall patterns over the LMB
- Water levels in the LMB, including in the Tonle Sap Lake
- Flash flood and drought situation in the LMB
- Weather, water level and flash flood forecast, and
- Possible implications.

Mekong River water levels are updated daily and can be accessed from:  
[http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php).

Drought monitoring and forecasting information is available at:  
<http://droughtforecast.mrcmekong.org>

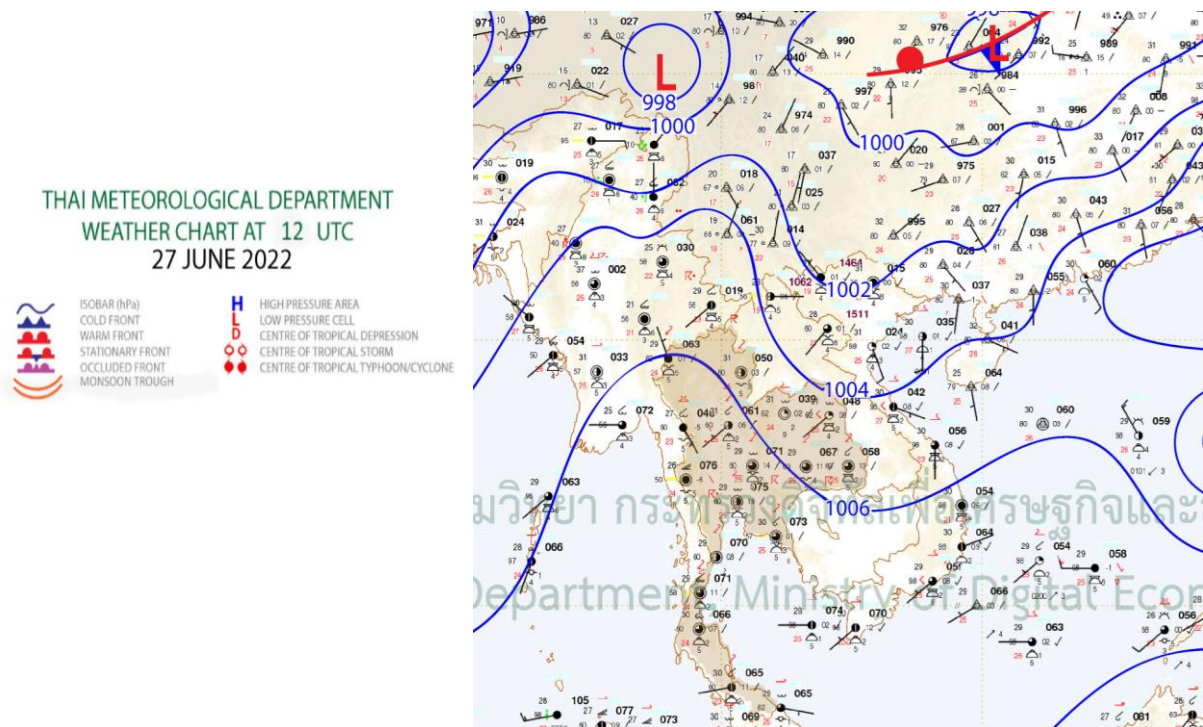
Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

## 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.

From middle of June 2022, accumulated rainfall has significantly dropped over the LMB with gradually decreasing water levels in both mainstream and tributaries. The data from the TMD predict that abundant rainfall will happen again in the 3<sup>rd</sup> week of June because of the coming back low-pressure trough moving downward in the LMB. From June to July, the low-pressure trough is going to prevail over the Mekong region bringing rainfalls for the start of rainy season period in 2022.

[Figure 1](#) presents the weather map of 27 June 2022, showing low-pressure dominating the upper part of the Mekong region, which might bring some rains for the next few days. The average rainfall is also predicted over the middle and lower parts of LMB, including northern Thailand, Lao PDR and Viet Nam and the 3S area (Sesan, Sre Pok, and Sekong) of Cambodia and Viet Nam.



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

According to the ASEAN Specialised Meteorological Centre (ASMC), the highest probability of warm and wet conditions is predicted over the lower part of the Mekong region from 27 June to 10 July 2022. Moreover, the Mekong region is likely dominated by warm and wet conditions, which may bring rainfall and warm temperatures in general to the upper and lower parts of the LMB. **Figure 2** shows the outlook of weather condition from 27 June to 10 July 2022 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

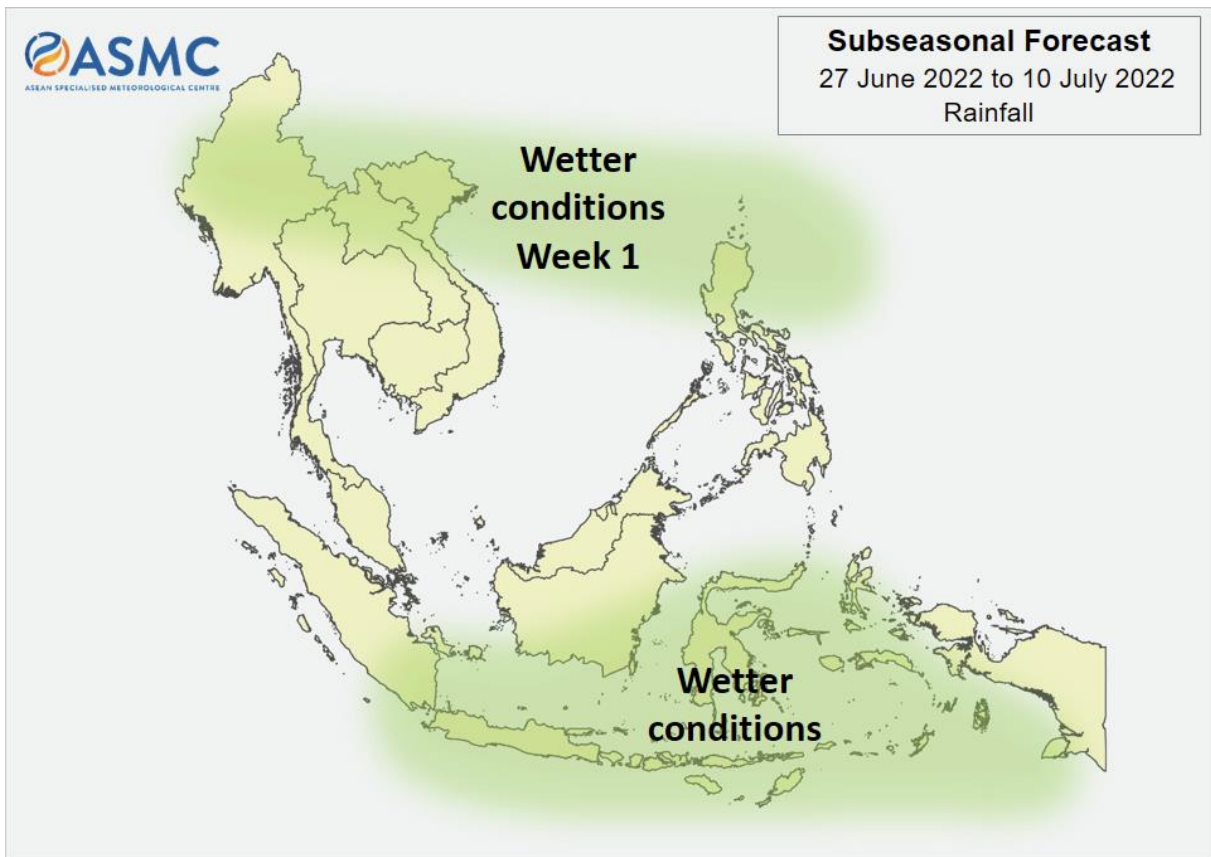


Figure 2. Outlook of wet and dry conditions over the Asian countries by ASMC.

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

There is no sign of Tropical Storm moving from the Sea to the LMB between 21 and 28 June 2022, a low- pressure line is still presenting as shown in [Figure 1](#). No storms movement detected on June 20 in the LMB, as displayed in [Figure 3](#).

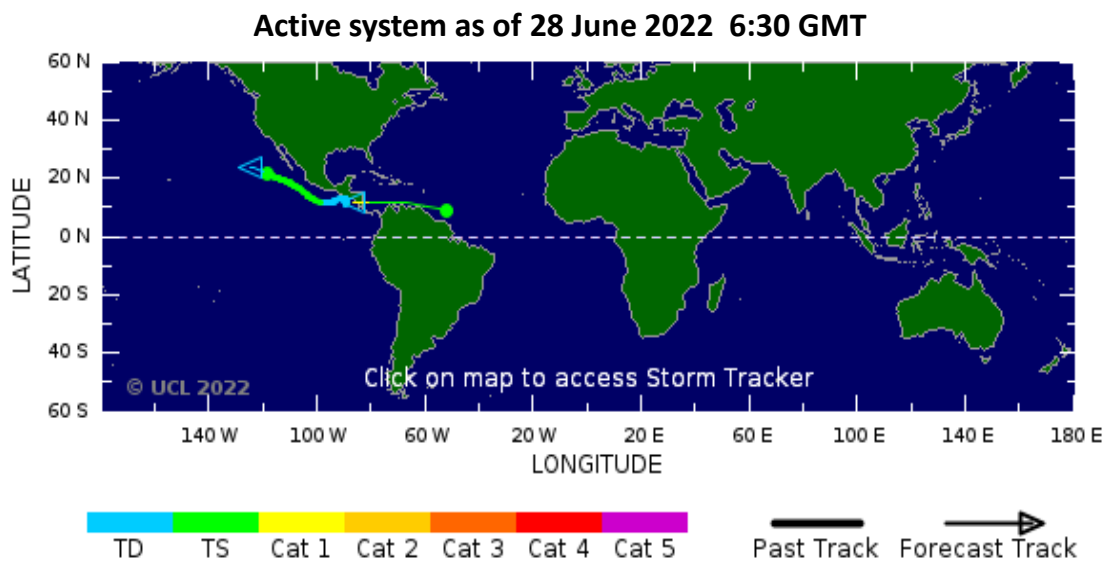
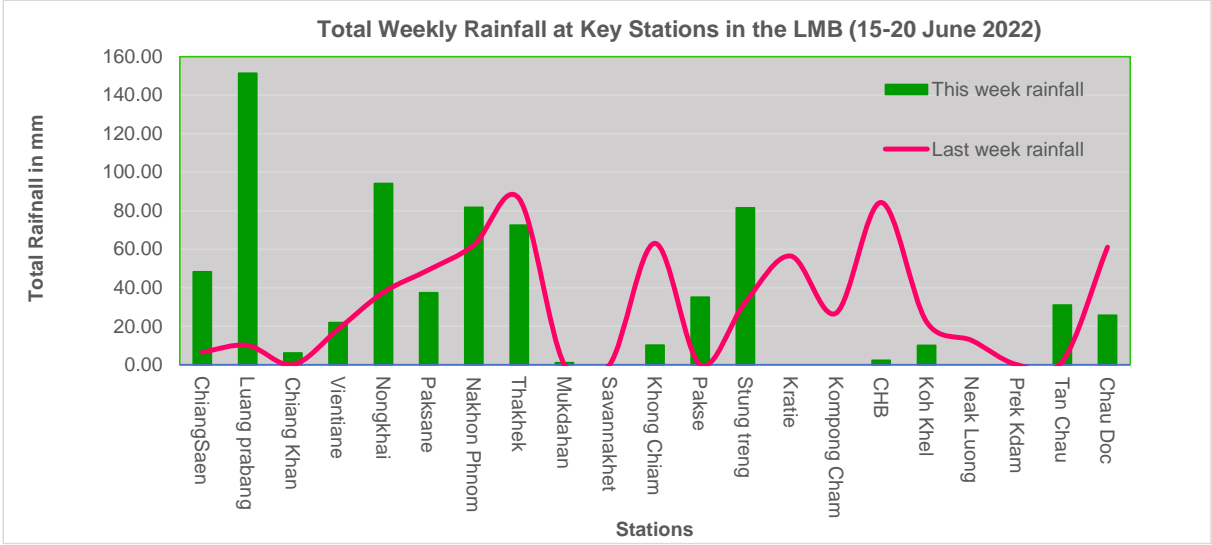


Figure 3. A tropical depression risk observed on 28 June 2022.

**2.2 Rainfall patterns over the LMB**

This week from 21 to 27 June 2022, rainfall was observed from the upper to lower part starting from Chiang Saen in Thailand to Tan Chau and Chau Doc in Viet Nam of the Lower Mekong Basin, varied from 0.30 mm to 136.40 mm. The highest rainfall of this week report concentrated in Paksane area of Lao PDR, which reached up to 136.40 mm. The total rainfall this week was smaller in the lower part, compared with last week rainfall taking place in the Mekong region. (See shown in [Figure 4](#)).



**Figure 4.** Weekly total rainfall at key stations in the LMB during 21-27 June 2022.

To verify area rainfall distribution, [Figure 5](#) shows a map of the weekly accumulated rainfall based on observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 21 to 27 June 2022.

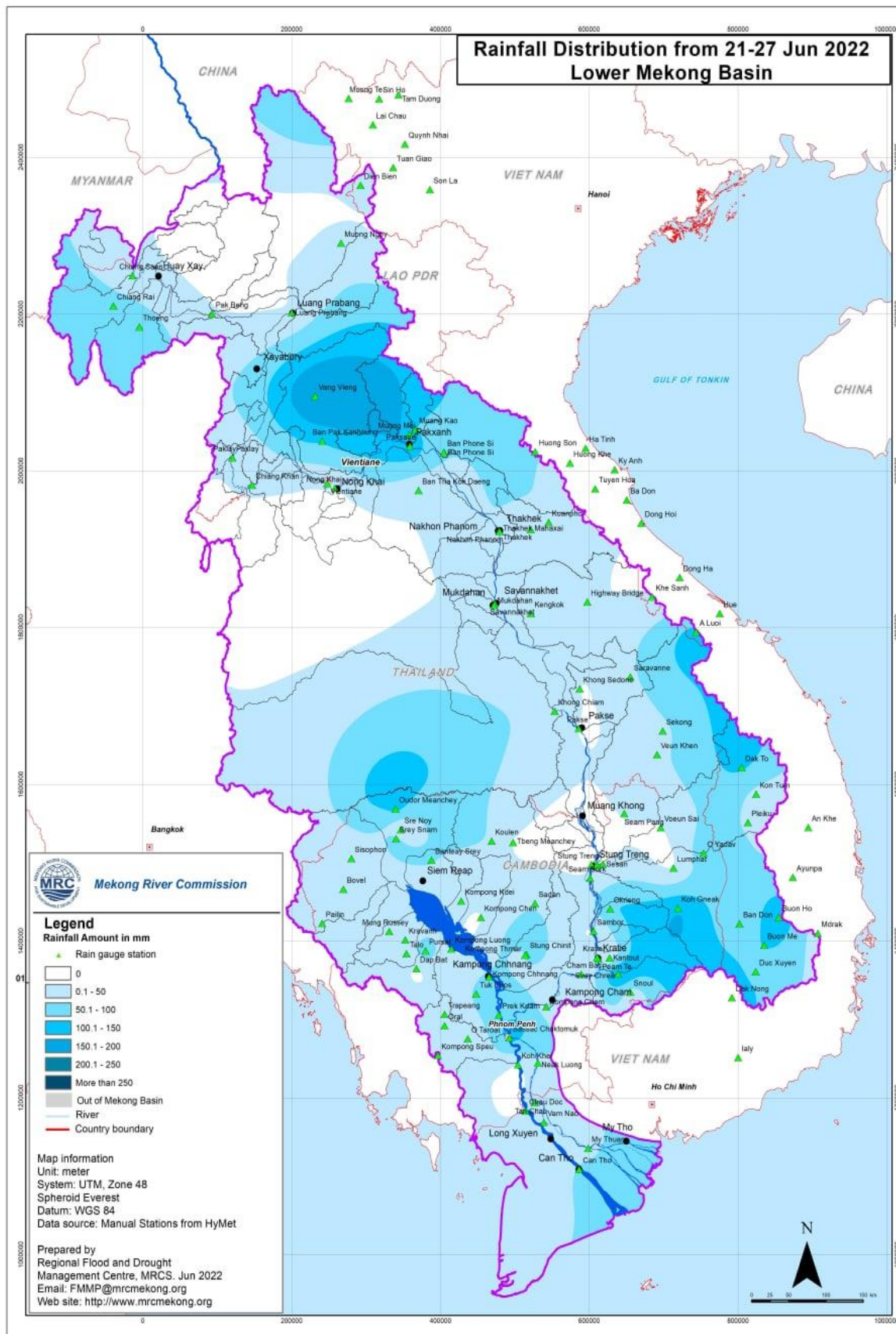
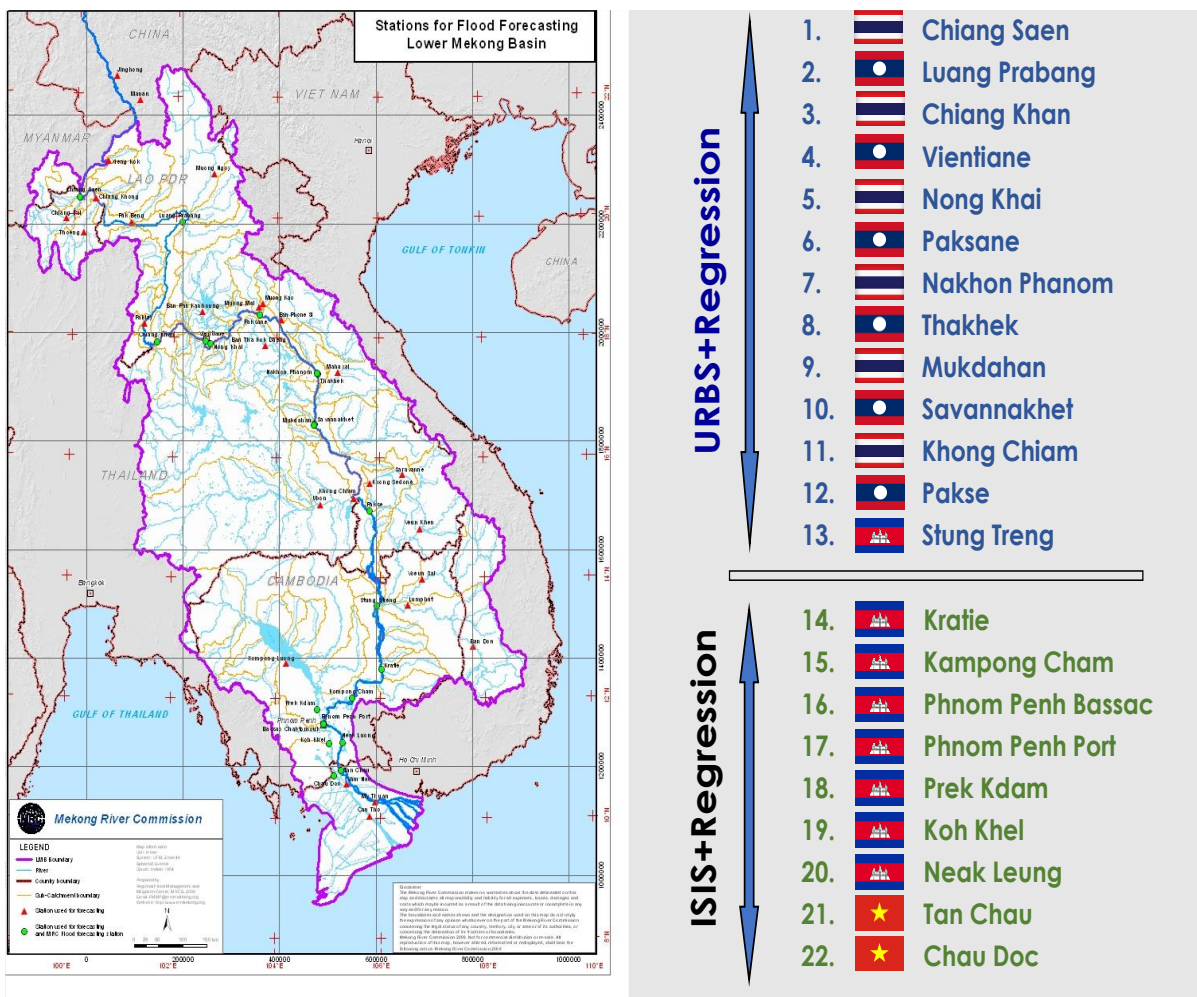


Figure 5. Weekly rainfall distribution over the LMB during 21-27 June 2022.

### 3 Water Levels in the Lower Mekong River

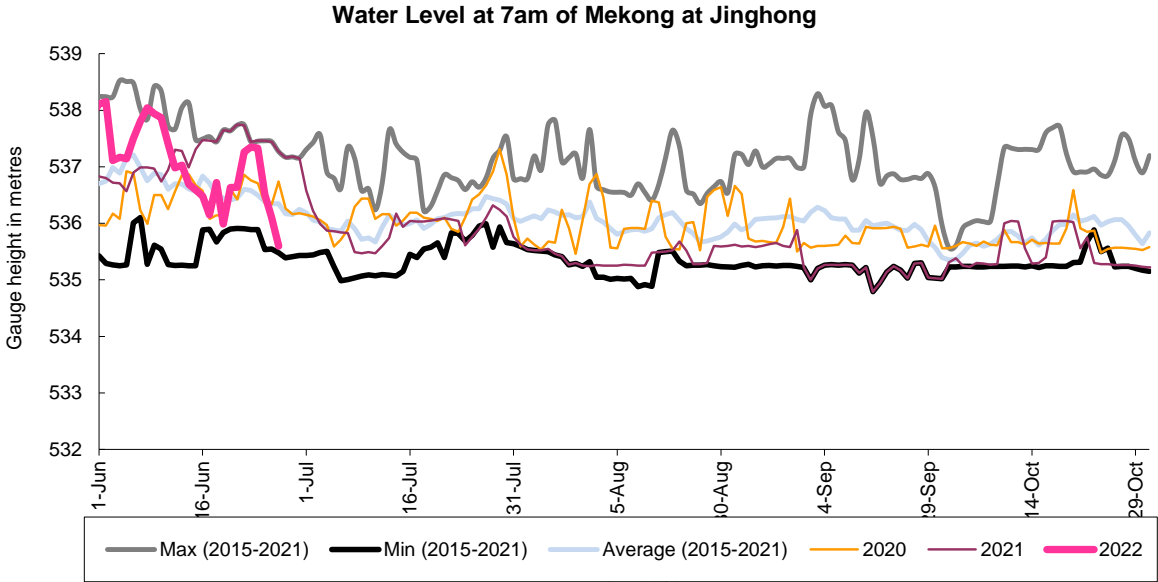
The hydrological regimes of the Mekong mainstream are illustrated by recorded water levels and flows at key mainstream stations: at Chiang Saen in Thailand to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane in Lao PDR to present flows generated by climate conditions in the upper part of the LMB; at Pakse in Lao PDR to investigate flows influenced by inflows from the larger Mekong tributaries; at Kratie in Cambodia to capture overall flows of the Mekong Basin; and at Viet Nam’s Tan Chau and Chau Doc to monitor flows to the Delta.

The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in [Figure 6](#). The hydrograph for each key station is available from the MRC’s River Flood Forecasting: <http://ffw.mrcmekong.org/overview.php>. The weekly water levels and rainfall at each key station are summarised in [Annex A](#).



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

According to MRC’s observed water level at Jinghong, it showed significantly decreased WLS from **536.64 m and 535.60 m from 21 to 27 June 2022 (recorded on 7:00 am)**. The current level is staying about 0.74 m lower than its Long-Term-Average (LTA: 2015-2021) value. The outflow at Jinghong station decreased from 1,790.00 m<sup>3</sup>/s to 1,050.00 m<sup>3</sup>/s from 21 to 27 June 2022. [Figure 7](#) below presents water level that increased at the Jinghong hydrological station<sup>1</sup>, indicating the trend of fluctuating water level up to 27 June 2022



**Figure 7.** Water level at the Jinghong hydrological station during 21-27 June 2022.

Along with the fluctuation of outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand increased about 0.34 m from 21 to 27 June 2022, staying about 0.20 m lower than its LTA level, **which is considered critical situation**.

However, water level at Chiang Khan in Thailand from 21 to 27 June 2022 decreased about 0.61 m and stayed about 0.20 m higher than its LTA value, while water level at Vientiane decreased about 0.45 m but still stayed about 0.51 m higher than its LTA level, which **considered normal**. Water levels at Nong Khai decreased 0.51 m and at Paksane decreased about 0.31 m, staying about 0.44 m and 0.67 m lower than their LTA value, respectively **considered critical**.

Water levels from Nakhon Phanom in Thailand and Pakse in Lao PDR decreased between 0.35 m and 0.60 m. The current WLS at Thakhek, Mukdahan, Sannakhet and Pakse were staying about 0.50 m and 1.30 m lower than their LTA level, considering **critical**. From the stretches of the river from Stung Treng to Kratie, water level decreased from 0.15 m to 0.10 m, staying 0.54 m and 1.11 m lower than their LTA level, respectively, considering **critical**.

Water levels from Kompong Cham down to Chaktomuk, Koh Khel and Phnom Penh Port to Prek Kdam in Cambodia decreased between 0.20 m and 0.50 m, staying between 0.50 m and 1.60 m lower than their LTA level considering **critical**.

<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>.

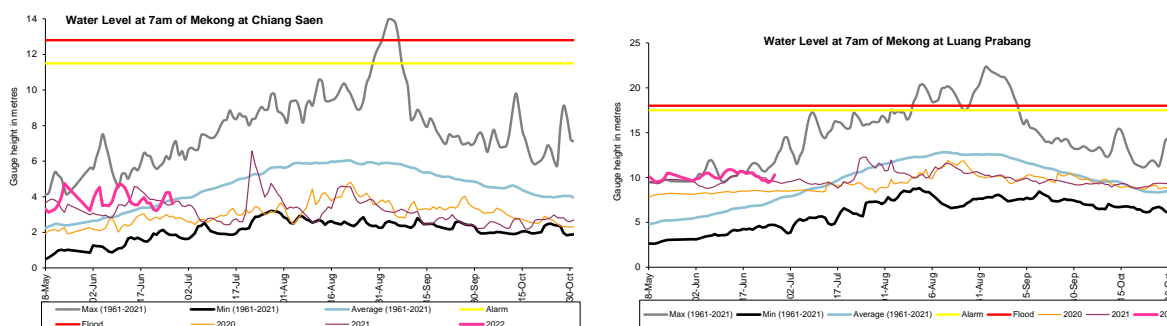
Except water levels at Luang Prabang, Chiang Khan and Vientiane, the rest of water levels at key stations were lower than their LTA value. The tidal stations at Tan Chau and Chau Doc have WL below their LTA value due to tidal effect during this monitoring period.

Based on hydrological phenomenon, the contribution of inflow water from the upstream of Lancang-Mekong in China to the Mekong mainstream is from 16% to 18% in total during the wet season from June to October. The whole inflow of water into the LMB is influenced by rainfall at the Mekong mainstream and its tributaries during the wet season.

### Chiang Saen and Luang Prabang

The water level from 21 to 27 June 2022 at Thailand’s Chiang Saen increased from 3.28 m to 3.62 m, showing 0.20 m lower than its Long-Term-Average (LTA) value, which considered critical. The water level at Luang Prabang station in Lao PDR fluctuated between 10.18 m and 10.30 m during the reporting period. This level shows 1.45 m lower than its long-term-maximum value (about 2.83 m higher than its LTA value). The trend – sometimes higher or lower to its historical maximum and LTA values – has been observed since early 2022. The phenomenon was potentially caused by upstream dam operations, downstream Xayaburi dam, and heavy rainfall in the surrounding areas. The water levels at Chiang Saen and Luang Prabang are shown in [Figure 8](#) below.

Being situated between the upstream (Nam Beng, Nam Ou, Nam Suong, and Nam Khan) and downstream (Xayaburi) hydropower dams, the Luang Prabang station has a unique characteristic as it is influenced by the operations of all its surrounding dams. **Thus, the water level at this station can possibly change very rapidly during the early of wet and dry season.**



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

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

The water level at Chiang Khan in Thailand (downstream of the Xayaburi dam) decreased from 7.78 m to 7.17m during the reporting week. It showed 0.20 m higher than its LTA value. The water level downstream at Vientiane in Lao PDR followed the upstream trend. It also decreased from 4.85 m to 4.40 m and was about 0.51 m higher than its LTA during 21-27 June 2022. At Nong Khai station in Thailand, the water level was down during the reporting period. It decreased about 0.51 m from 4.62 m to 4.11 m and showing 0.44 m lower than its LTA. At Paksane in Lao PDR, water levels decreased about 0.31 m, dropping from 5.90 m to 5.59 m. The water levels at this station were about 0.44 m and 0.67 m lower than their LTA level. The recently decreased water levels were obviously due to the low rainfall in the sub-catchment area, amid the inflows and water storing from upstream. The water levels at Vientiane and Paksane are shown in [Figure 9](#) below.



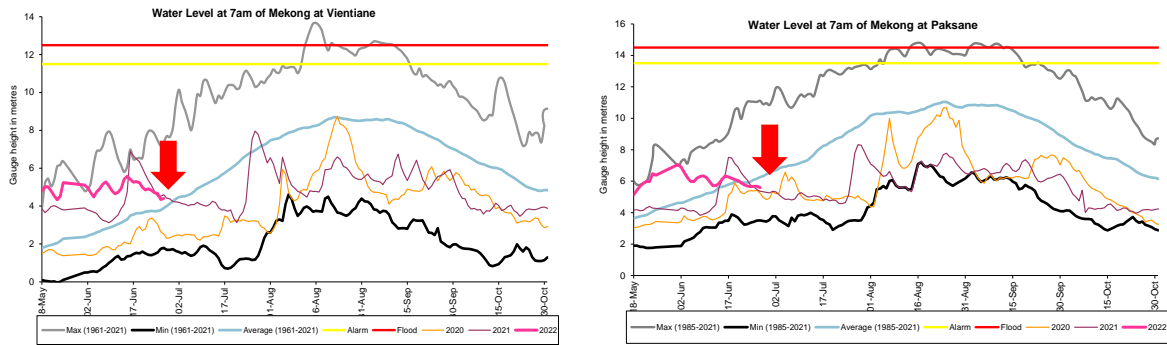


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

### Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were decreasing between 0.15 m and 0.70 m due to less rainfalls and inflow from upstream. **Water levels at these stations are still staying about 1.00 m than their LTA level, which considered critical.** [Figure 10](#) shows the water levels at Nakhon Phanom and Pakse stations.

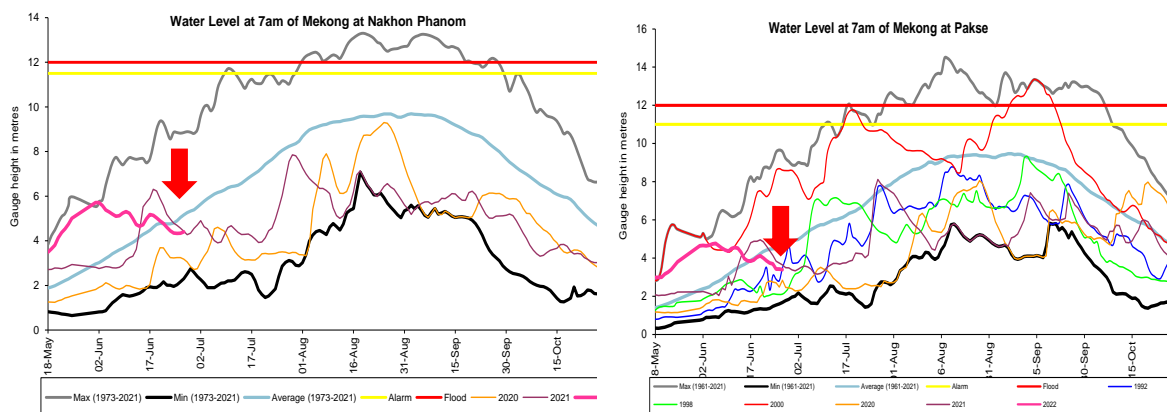
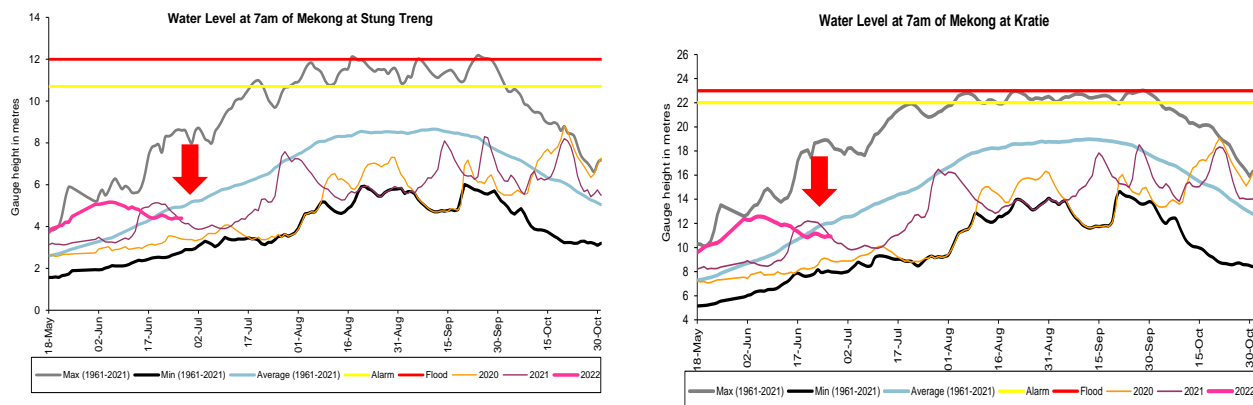


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

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

Following the same trend from the upstream part of the Mekong River and the 3S river (Sekong, Se San, and Sre Pok), the water levels from Stung Treng to Kratie in Cambodia were decreasing during 21-27 June 2022. This week water level at Stung Treng and Kratie decreased about 0.15 m and 0.10 m, respectively, pushing water levels about 0.54 m and 1.11 m below their LTA (as showed in [Figure 11](#)). The water level at Kompong Cham station increased about 0.07 m and was about 1.63 m lower than its LTA. Generally, the **Water levels at these stations were lower than their LTA, which considered critical.**



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

At Chaktomuk on the Bassac River, due to less rainfall and contributed flows from upstream catchment, the water level was down by about 0.05 m and stayed 1.09 m lower than its LTA value; while at Koh Khel, water level decreased about 0.04 m, staying 0.34 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake decreased about 0.03 m and was about 0.87 m lower than its LTA value. The water level at the Tonle Sap Lake (observed at Kampong Luong) was similar to Prek Kdam station's water level. The recently decreased water level was because of less rainfall and low inflow contributed from upstream of the Tonle Sap Lake area during the reporting period. The water level at the Tonle Sap Lake (observed at Kampong Luong) followed the same trend of Prek Kdam station's water level. **Water levels at most of these stations were staying lower than their LTA level, which considered abnormal.**

### Tidal stations at Tan Chau and Chau Doc

Like last week, the water levels from 21 to 27 June 2022 at Viet Nam's Tan Chau and Chau Doc were fluctuating due to daily tidal effects from the sea. The fluctuation levels were between 0.32 m and 1.31 m; they were in between the range of their LTA and historical minimum levels and **considered critical**. The current water levels at Tan Chau and Chau Doc are higher than their LTA levels up to 27 June 2022.

### The Tonle Sap Flow

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

[Figure 12](#) shows the seasonal changes of the inflow/reverse flow and the inflow of the TSL at Prek Kdam in comparison with the flows of 2019 and 2020, and their LTA level (1997-2020). Up to June 27 of this reporting period, **it was observed that the main inflow into Tonle Sap Lake increased due to less rainfall and inflows from upstream**. This increased inflow into the Tonle Sap Lake was most likely caused by low inflows and less rainfall from the catchment area. Up to present, the inflow into the Tonle Sap Lake condition in 2022 is higher than 2019, 2020, 2021 and even its LTA (1997-2021) inflow conditions. For next week, some rainfall is forecasted for the Tonle Sap area; thus, the outflow from the Tonle Sap Lake is likely continuing to drop from the current level.

Inflow and Outflow of the Tonle Sap Lake

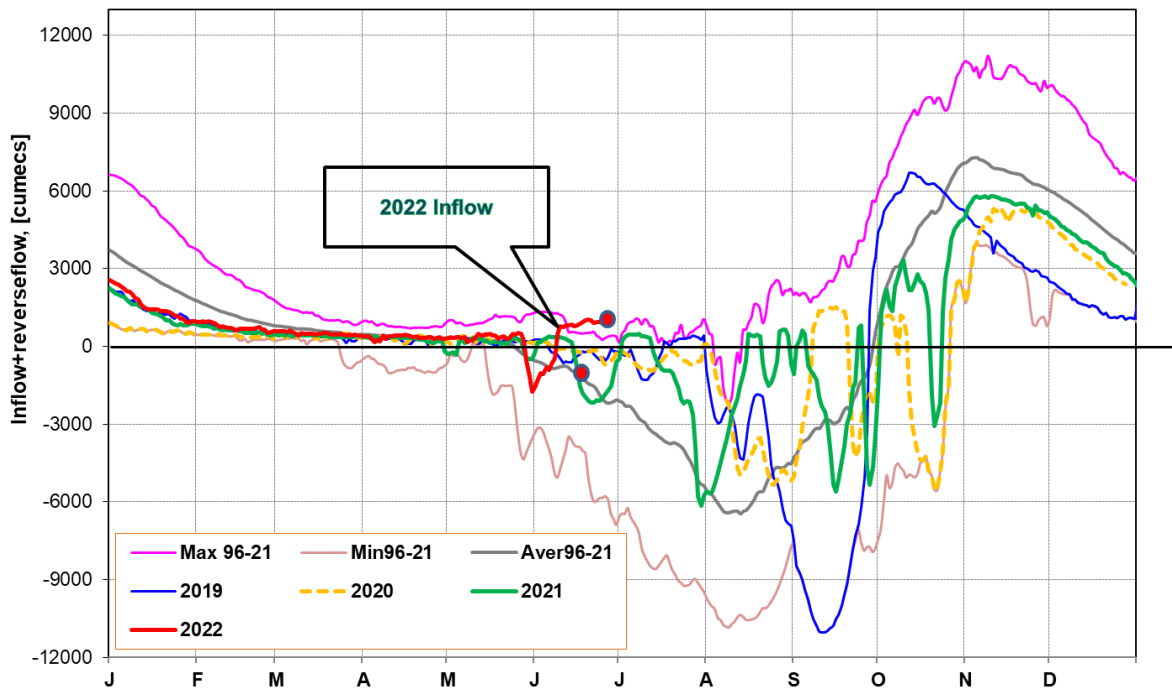
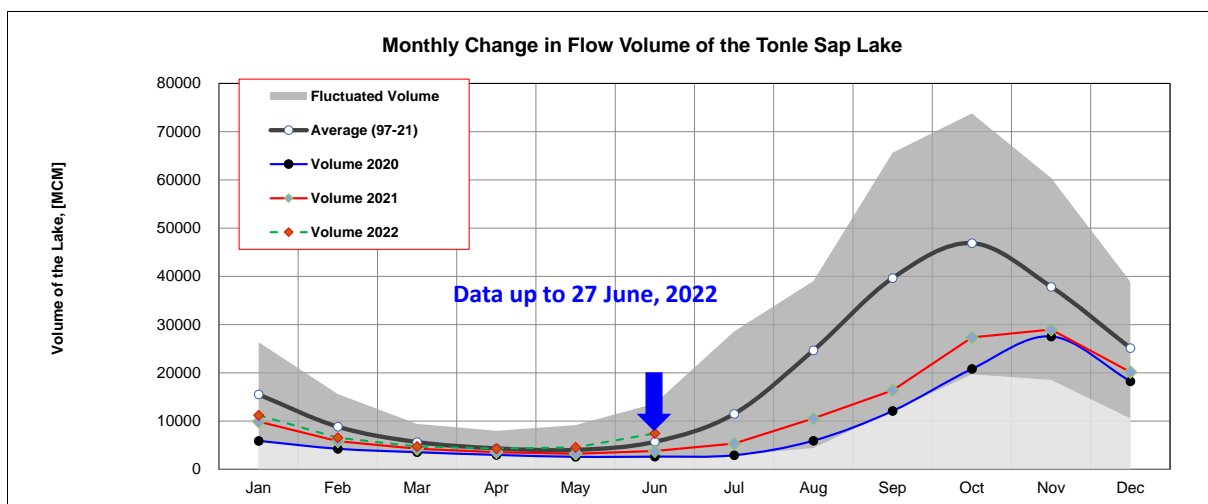


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake

Figure 13 shows seasonal changes in monthly flow volumes up to 27 June 2022 for the Lake compared with the volumes in 2019, 2020, 2021 and their LTA, and the fluctuation levels (1997–2021). It shows that up to June 27, **the water volume of the Tonle Sap Lake was even higher than 2019, 2020, 2021 and its LTA (130%), during the same period**. The figure is displayed in Table 1, which indicates that the Tonle Sap Lake has been affected by water levels from the tributaries and rainfall in the surrounding sub-catchments and ***considered normal***.

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



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

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

| Month | Average Volume (97-21) [MCM]                            | Max Volume [MCM] | Min Volume [MCM] | Volume 2018 [MCM] | Volume 2019 [MCM] | Volume 2020 [MCM] | Volume 2021 [MCM] | Volume 2022 [MCM] | Percentage of Volume in 2021 [%] |
|-------|---|------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------------------|
| Jan   | 15523.23  | 26357.53         | 5906.80          | 13633.41          | 10285.31          | 5906.80           | 9923.80           | 11214.32          | 72.24                            |
| Feb   | 8837.89   | 15596.22         | 4198.60          | 7729.72           | 6019.30           | 4264.19           | 5832.97           | 6558.79           | 74.21                            |
| Mar   | 5654.18   | 9438.24          | 3347.07          | 5037.06           | 4354.62           | 3553.99           | 4264.88           | 4736.52           | 83.77                            |
| Apr   | 4346.65   | 8009.14          | 2866.91          | 3956.47           | 3667.47           | 2992.61           | 3556.68           | 4288.31           | 98.66                            |
| May   | 4030.23   | 9176.93          | 2417.81          | 3864.00           | 3266.43           | 2594.92           | 3240.78           | 4556.83           | 113.07                           |
| Jun   | 5708.30   | 13635.01         | 2468.70          | 5919.18           | 3517.06           | 2641.88           | 3798.29           | 7444.93           | 130.42                           |
| Jul   | 11493.25  | 28599.56         | 2925.86          | 12024.96          | 4001.99           | 2925.86           | 5346.73           |                   |                                  |
| Aug   | 24666.69  | 39015.12         | 4433.46          | 22399.65          | 7622.71           | 5941.07           | 10547.80          |                   |                                  |
| Sep   | 39634.03  | 65632.35         | 12105.31         | 53639.54          | 24194.19          | 12105.31          | 16382.34          |                   |                                  |
| Oct   | 46873.44  | 73757.23         | 19705.50         | 48193.08          | 30358.38          | 20799.13          | 27318.21          |                   |                                  |
| Nov   | 37823.16  | 60367.33         | 18534.61         | 31036.07          | 19112.65          | 27546.80          | 28982.93          |                   |                                  |
| Dec   | 25126.11  | 38888.95         | 10563.49         | 18469.21          | 10577.29          | 18251.65          | 20170.76          |                   |                                  |
|       | Critical situation, compared with historical Min values |                  |                  |                   |                   |                   |                   |                   |                                  |
|       | Normal condition, compared with LTA (Long term average) |                  |                  |                   |                   |                   |                   |                   |                                  |
|       | Low volume situation, compared with LTA values          |                  |                  |                   |                   |                   |                   |                   |                                  |


Unit: Million Cubic Meter (1 MCM= 0.001 Km<sup>3</sup>)

## 4 Flash Flood in the Lower Mekong Basin


From June 21 to 28, the LMB was affected by three weather factors including (i) low-pressure cell which covered upper Viet Nam during the first half of the weekend, (ii) southerly and south-easterly winds prevailed over the north-eastern, central and eastern parts during weekend, and (iii) the southwest monsoon which prevailed over the Gulf of Thailand then strengthened during the second half of the week. These conditions caused small and moderate rainfall in some areas from the upper to the lower part of the LMB.

According to the MRC-Flash Flood Guidance System (MRC-FFGS) and analysis, flash flood events were detected during the reporting period in several areas in northwest Cambodia and Viet Nam ranging from low to high risk level on 28 June, as shown in [Figure 14](#) and [Table 2](#).

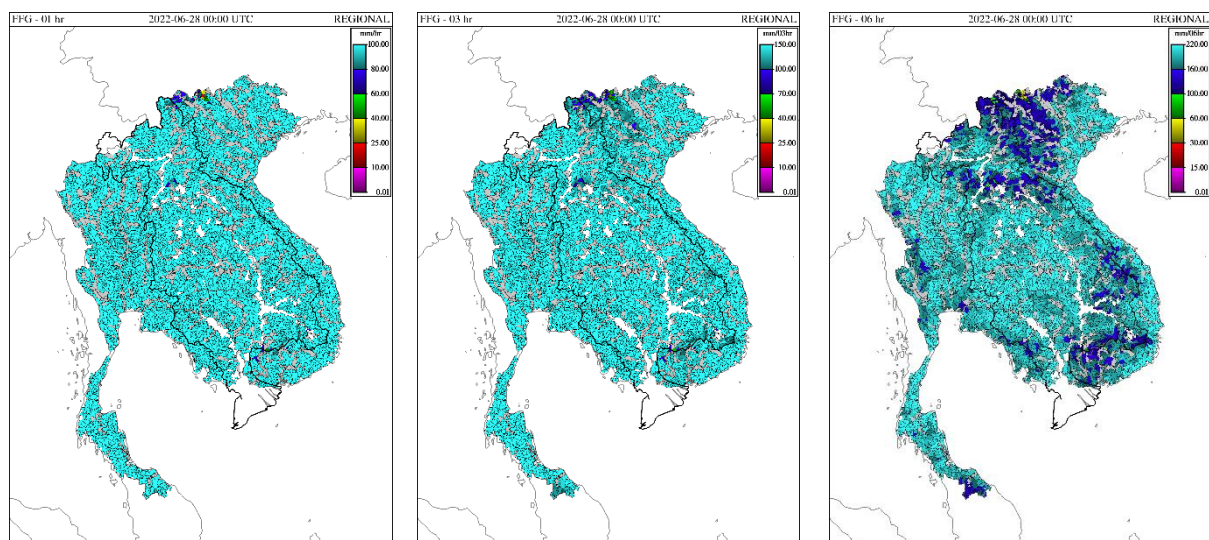
**Table 2.** Detected flash flood in Viet Nam on June 28.

|  <b>Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Cambodia</b> |           |              |                 |                                       |              |           |              |                                       |            |              |           |              |                 |            |
|--|-----------|--------------|-----------------|---------------------------------------|--------------|-----------|--------------|---------------------------------------|------------|--------------|-----------|--------------|-----------------|------------|
| Date of FFG products 28/06/2022 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 |
| Tboung Khmum   | Memot     | Chamkar Thmi | Central Lowland | Low-Risk                              | Tboung Khmur | Memot     | Chamkar Thmi | Central Lowland                       | Low-Risk   | Tboung Khmur | Memot     | Chamkar Thmi | Central Lowland | Low-Risk   |

|  <b>Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Viet Nam</b> |           |           |             |  |           |           |               |  |            |           |               |
|--|-----------|-----------|-------------|--|-----------|-----------|---------------|--|------------|-----------|---------------|
| Date of FFG products 28/06/2022 00:00 UTC time   |           |           |             |  |           |           |               |  |            |           |               |
| 01-Hour Flash Flood Risk and Location  |           |           |             | 3-Hour Flash Flood Risk and Location in Viet Nam |           |           |               | 6-Hour Flash Flood Risk and Location in Viet Nam |            |           |               |
| Provinces  | Districts | Region    | Level Risks | Provinces  | Districts | Region    | Level Risks   | Provinces  | Districts  | Region    | Level Risks   |
| Lao Cai  | Sa Pa     | Northwest | Low-Risk    | Lao Cai  | Sa Pa     | Northwest | Low-Risk      | Binh Phuoc                                       | Phuoc Long | Southeast | Low-Risk      |
| Lao Cai  | Bat Xat   | Northwest | High-Risk   | Lao Cai  | Bat Xat   | Northwest | Moderate-Risk | Lao Cai  | Sa Pa      | Northwest | Low-Risk      |
|  |           |           |             |  |           |           |               | Lao Cai  | Than Uyen  | Northwest | Low-Risk      |
|  |           |           |             |  |           |           |               | Lai Chau   | Phong Tho  | Northwest | Low-Risk      |
|  |           |           |             |  |           |           |               | Lai Chau   | Sin Ho     | Northwest | Low-Risk      |
|  |           |           |             |  |           |           |               | Lao Cai  | Bat Xat    | Northwest | Moderate-Risk |
|  |           |           |             |  |           |           |               | Lai Chau   | Muong Te   | Northwest | Low-Risk      |

**Figure 14.** Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on June 28.



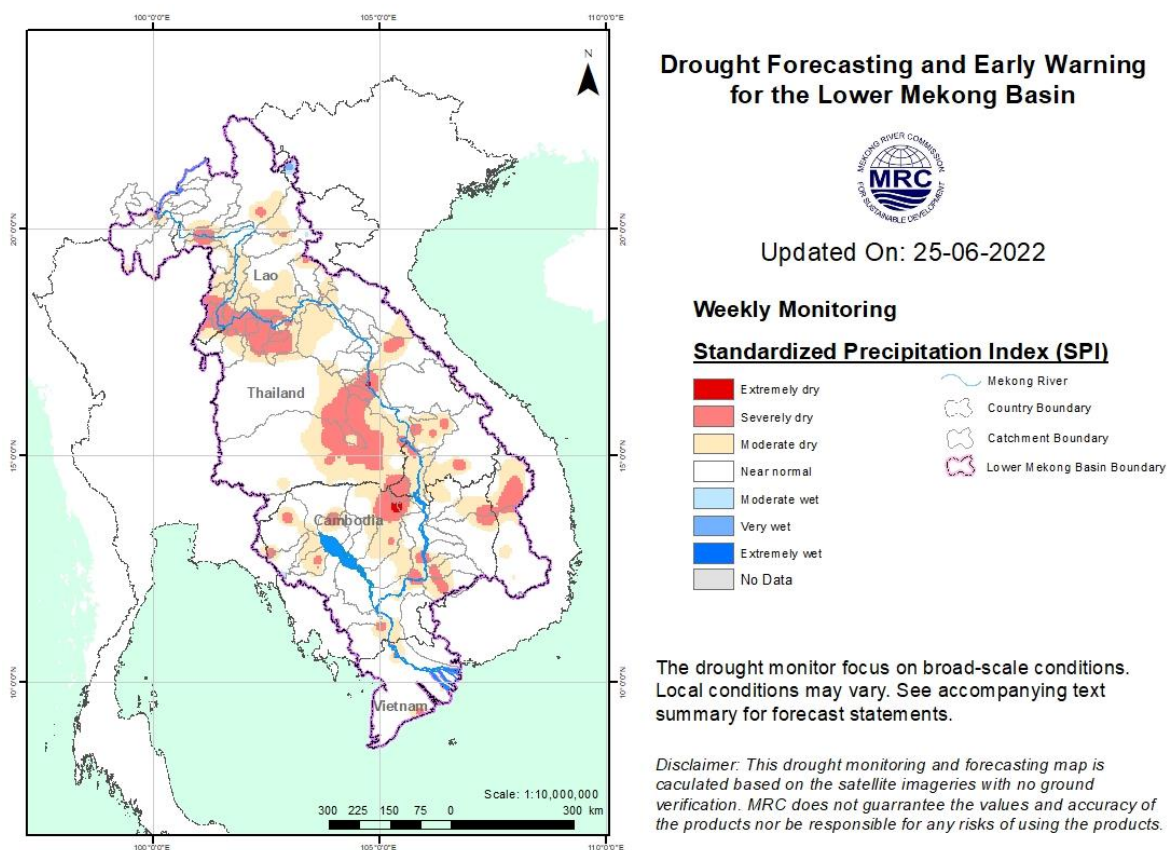
## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from 19 to 25 June 2022

Drought monitoring data for 2022 are available from Sunday to Saturday every week; thus, the reporting period is normally delayed by three days compared to Flood and Flash Flood reports. We adopt the Index of Soil Water Fraction (ISWF) data obtained from FFGS to represent soil moisture of agricultural indicator for both dry and wet seasons.

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

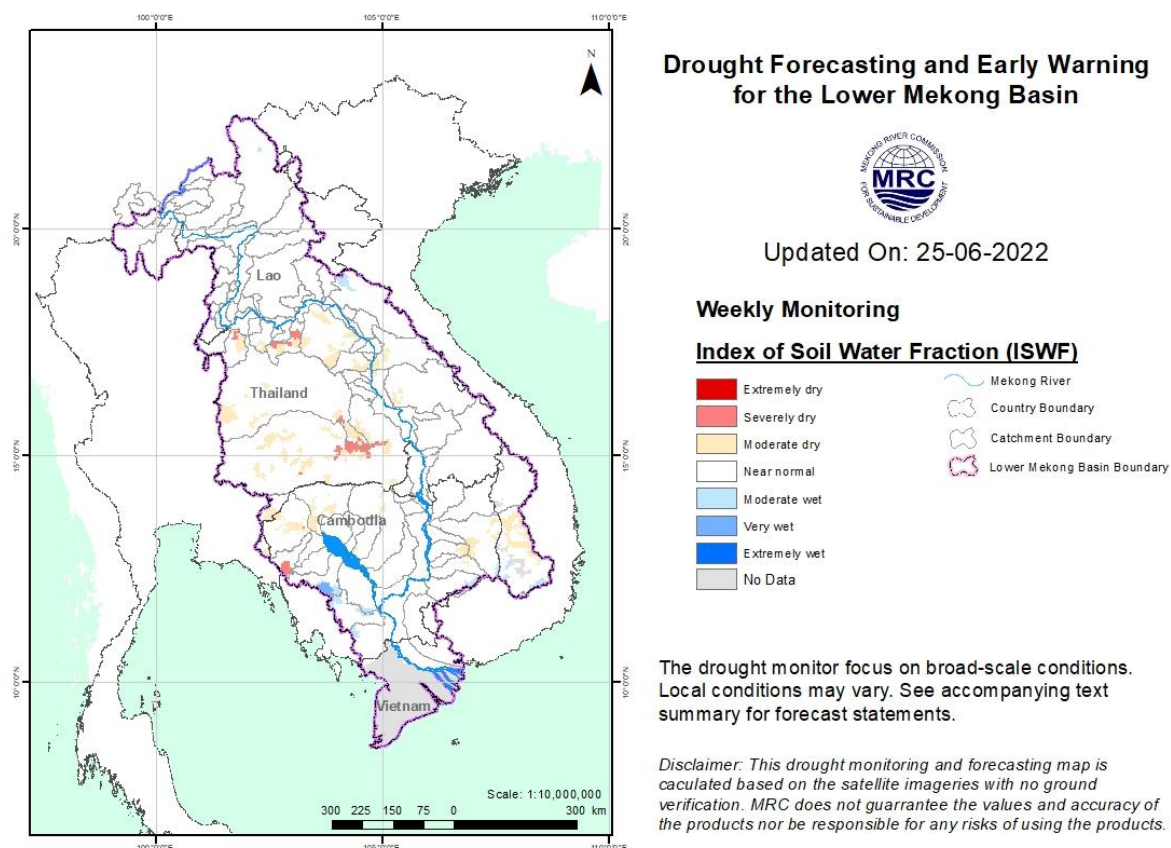
The meteorological drought indicator of SPI from June 19 to 25, as displayed in [Figure 15](#), shows **moderate and severe drought took place from the north to the south of the LMB**. In the north drought occurred in **Oudomxay, Xayaburi, Vientiane, Luang Prabang, Xiengkhuang, Xaysomboun, Borikhamxay, Nong Khai, Loei, Nong Bua Lamphu, Udon Thani, and Sakon Nakhon**. In the middle part, meteorological droughts were found in **Khaummuane, Kalasin, Mukdahan, Roi Et, Yasothon Amnat Charoen, Surin, Si Saket, Ubon Ratchathani, Saravane, Champasack, Attapeu, and Kon Tum**. And finally in the southern part it covered **Gia Lai, Ratana Kiri, Preah Vihea, Kampong Thom, Kratie, Kampong Cham, Siem Reap, Banteay Meanchey, Battambang, Pailin, Kandal, An Giang, and Dong Thap**. Around 40% of the LMB was covered by moderate and severe meteorological droughts during the monitoring week; however, it was just the first week meaning short-term drought.



**Figure 15.** Weekly standardized precipitation index from 19 to 25 June 2022.

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

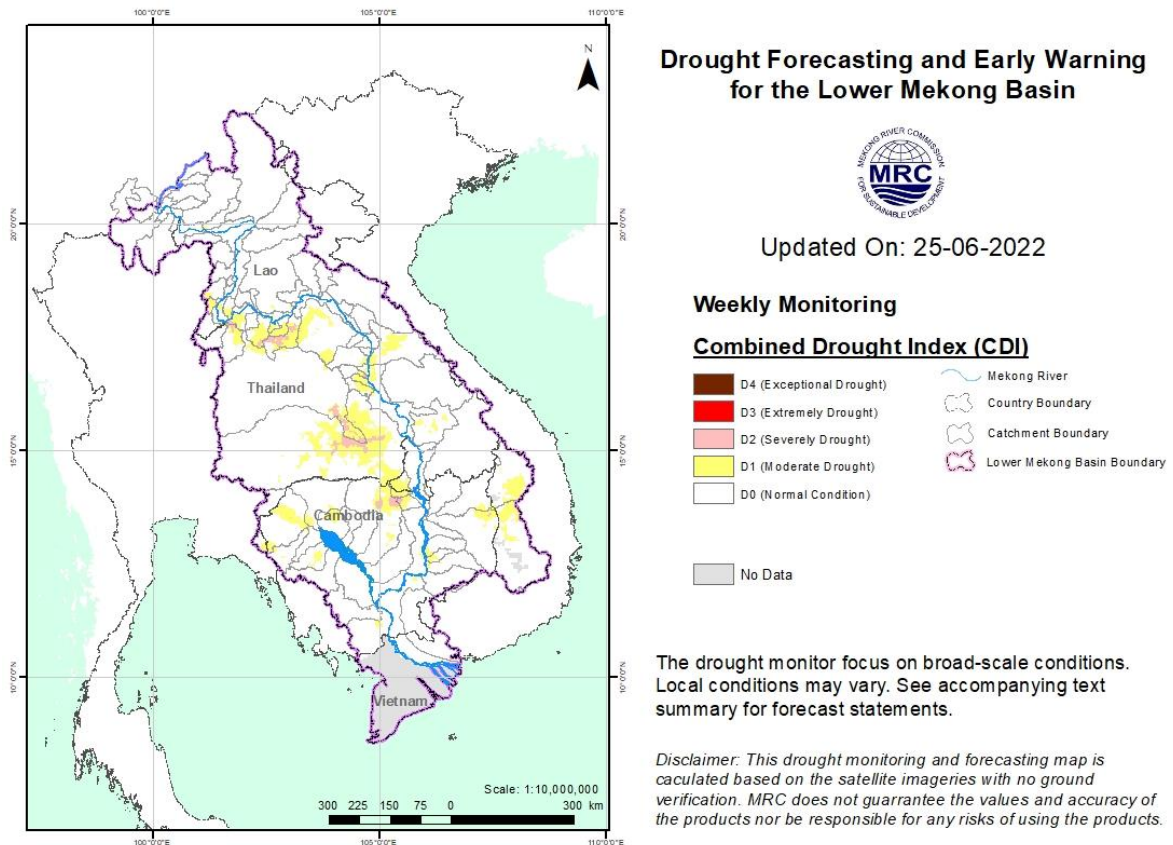
Unlike SPI, the soil water fraction from June 19 to 25, as displayed in [Figure 16](#), shows normal condition in most parts of the LMB except some moderate dry soil moisture in the middle areas of **Loei, Udon Thani, Si saket, Ubo Ratchathani, Battambang, Mondul Kiri, Gia Lai, and Dak Lak**. However, the conditions were not serious.



**Figure 16.** Index of Soil Water Fraction from 19 to 25 June 2022.

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

With such serious meteorological droughts, the combined drought indicator, as displayed in [Figure 17](#), shows some moderate and severe droughts during June 19-15 mainly in the middle part of the region. They covered **Loei, Nong Bua Lamphu, Udon Thani, Mukdahan, Khammuane, Roi Et, Yasothon, Amnat Charoen, Ubon Ratchathani, Si Saket, Surin, Preah Vihea, Siem Reap, Banteay Meanchey, Ratana Kiri, and Gia Lai**. Being short-term droughts, they do not post any serious threat yet to the local communities.



**Figure 17.** Weekly Combined Drought Index from 19 to 25 June 2022.

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



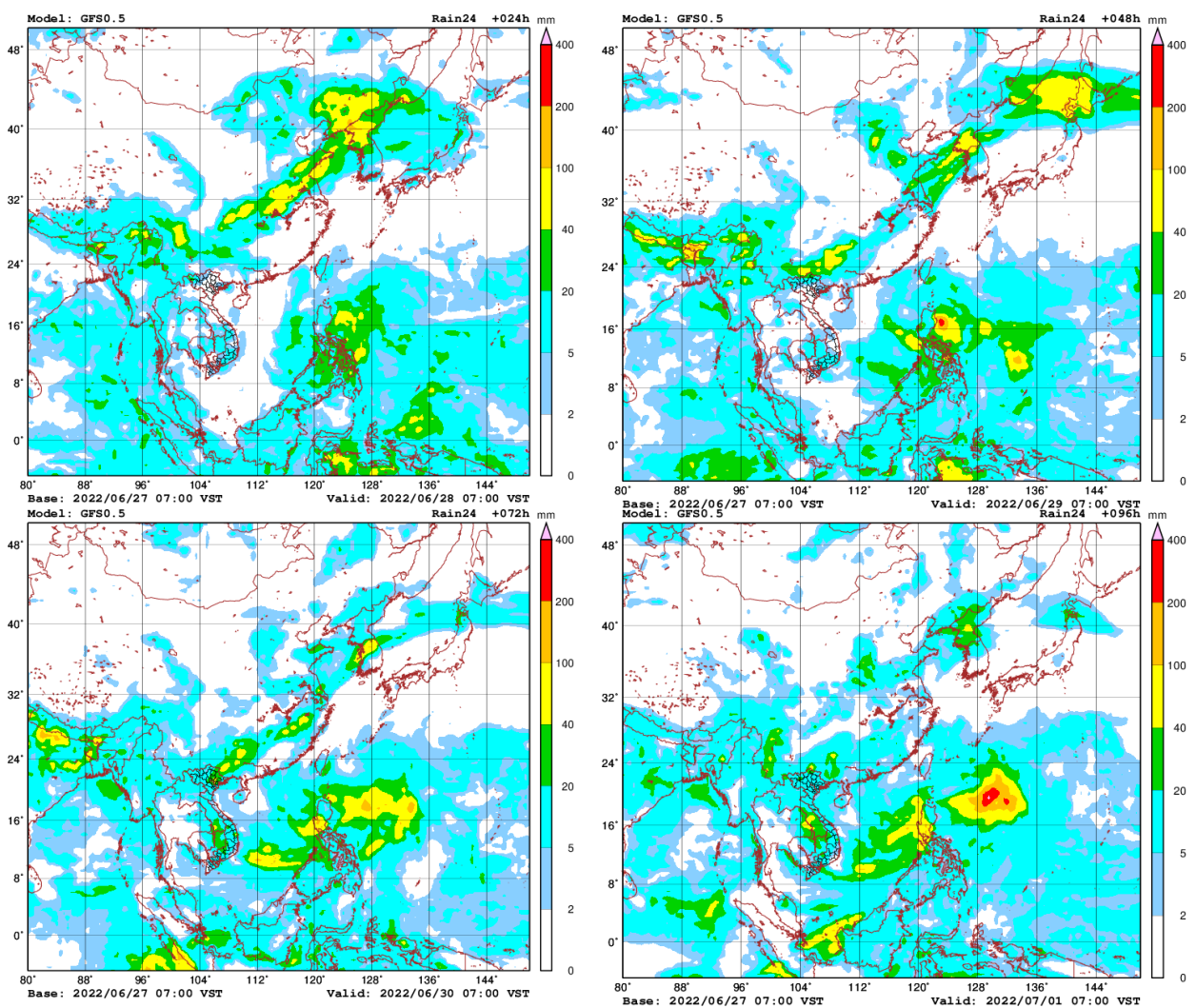
## 6 Weather and Water Level Forecast and Flash Flood Information

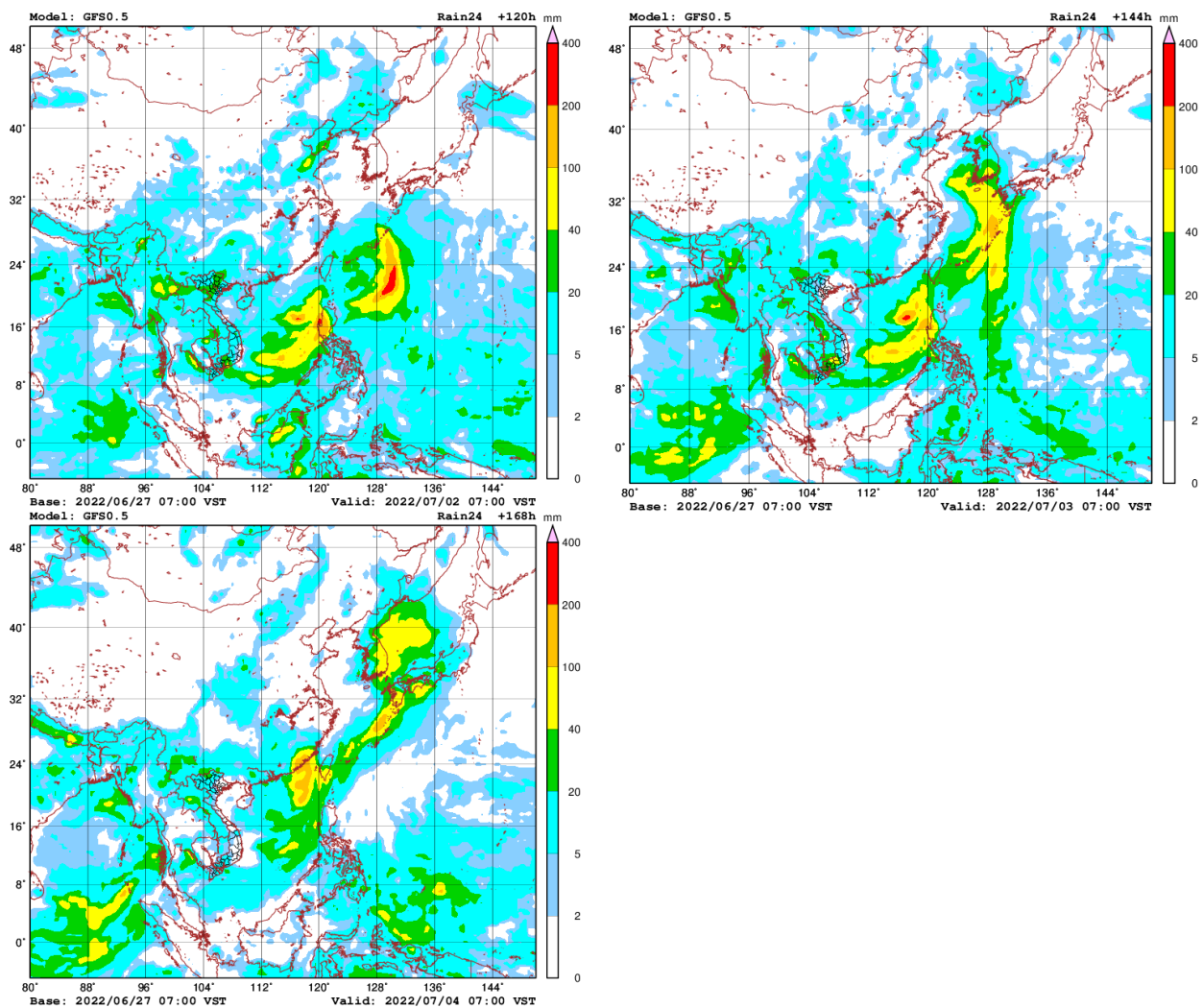
### 6.1 Weather and rainfall forecast

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

In general, from June 28 to July 4, small (5 -20 mm/24h) amount of rainfall will likely occur over the LMB. However, from July 1 to 2 moderate (20-50 mm/24h) will likely occur in some areas of the middle part of LMB.

[Figure 18](#) shows accumulated rainfall forecast (24 h) of the GFS model from June 28 to July 4.





**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 27's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 3.62 m to 3.89 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 decrease from 10.30 m to 9.70 m during the next five days. The current water level is higher than its LTA. Precipitation is forecasted for the area between Chiang Saen and Luang Prabang next week.

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

The water level at Chiang Khan in Thailand is forecasted to go down approximately 0.12 m, while water level at Vientiane in Lao PDR will also increase about 0.09 m. Furthermore, from Nong Khai in Thailand, the water level will increase also about 0.07 m over the next five days;

at Paksane in Lao PDR water level will increase about 0.14 m due to less forecasted rainfall in the upper catchments. Rainfall is forecasted for the area of Paksane next week.

The water levels at these stations are remaining lower than their LTA.

### **Nakhon Phanom to Pakse**

The water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR are forecasted to go down between 0.20 m and 0.30 m over the next five days. Water level at these stations will stay lower than their LTA level. Rainfall is forecasted for the area next week.

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

From Stung Treng to Kompong Cham along the Mekong River in Cambodia, the water levels will go up between 0.10 m to 0.20 m over the next five days. Precipitation is forecasted for the area between Stung Treng and Kompong Cham during next week.

The water levels of the Tonle Sap Lake at Prek Kdam and Phnom Penh Port as well as at Phnom Penh's Chaktomuk on the Bassac River will decrease about 0.10 m over the next five days.

Water levels at most of the stations will continue to go down and stay lower than their LTA value, particularly in the middle and lower parts of the region from the Nakhon Phanom to Pakse and from the Bassac at Phnom Penh, Koh Khel as well as from Tonle Sap at Prek Kdam to Phnom Penh Port, including the Tonle Sap Lake. Precipitation is forecasted for the low-lying area of Cambodia next week.

### **Tidal stations at Tan Chau and Chau Doc**

For Viet Nam's Tan Chau on the Mekong River and Chau Doc on the Bassac River, the water levels will be fluctuating above their LTA level, following daily tidal effects from the sea. Rainfall is forecasted for the Delta area next week.

The performance of the weekly flood forecast, with an accuracy and data input evaluation from 15 to 20 June 2022, is presented in **Annex 1**.

[Table 2](#) shows the daily flood forecasting Bulletin issued on 27 June 2022. 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 and moderate rainfall forecasted for next week, flash floods with high level are not expected to take place in the LMB. However local heavy rain in a short period of time is possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice a day at: <http://ffw.mrcmekong.org/ffg.php>.

Detailed information on Flash Flood Warning Information as well as its explanation is available for download [here](#).

### 6.4 Drought forecast

There are several climate-prediction models with different scenarios on the upcoming months until November 2022. The MRC’s DFEWS adopts an ensemble model called the North America Multi-Model Ensemble (NMME), which averages all scenarios.

The global scale of rainfall prediction is used to see how the rain distribution looks like for the coming months. [Figure 18](#) shows the ensemble mean of daily average precipitation (mm/day) each month from July to November 2022 produced by the NMME.

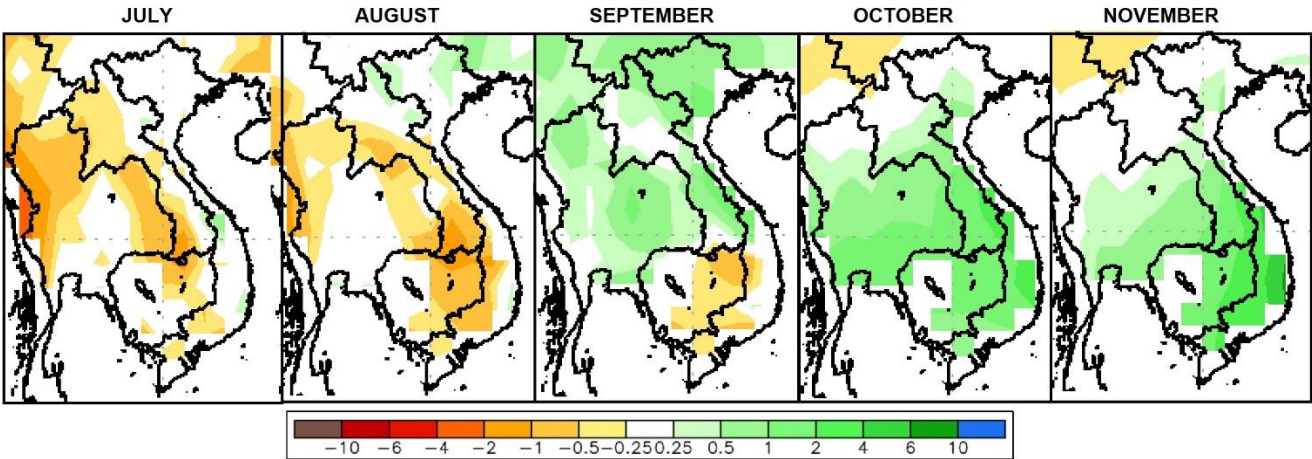


Figure 19. Daily average of monthly rainfall anomaly forecast from July to November 2022.

The ensemble prediction model based on the initial conditions in June 2022 reveals that the LMB is likely to receive below-average rainfall **in July and August** with equivalent from **moderate to severe meteorological droughts**. Below-average rainfall is also forecasted for the lower part of the region covering **Cambodia and Viet Nam during this coming September with moderate drought**. While in October and November the LMB is likely to receive more than average rainfall, meaning no drought threat is predicted for the LMB.

The 2021 dry season is relatively wetter than that of 2020 and the monsoon rain in 2022 might come on time or even earlier than normal year.



## 7 Summary and Possible Implications

### 7.1 Rainfall and its forecast

Rain was observed from Chiang Saen in Thailand to Tan Chau and Chau Doc in Viet Nam during June 21-27, including the lower part in Lao PDR and Cambodia, varying from 0.30 mm to 146.30 mm due to low-pressure dominating the LMB. However, this week rainfall was considered low in the middle and lower parts of the LMB compared with last week rainfall.

Based on the forecasted satellite data, rainfall is forecasted for some areas of the LMB with the value range from 30 mm to 100 mm for the next seven days. The forecasting model using GFS data, moreover, shows that no significant rainfall (<100 mm) is likely to take place in the Mekong region from 28 June to 03 July 2022.

### 7.2 Water level and its forecast

According to MRC's observed water level at Jinghong, it showed significantly decreased WLs from 536.64 m and 535.60 m from 21 to 27 June 2022 (recorded on 7:00 am), staying about 0.74 m lower than its Long-Term-Average (LTA: 2015-2021) value. The outflow at Jinghong station decreased from 1,790.00 m<sup>3</sup>/s to 1,050.00 m<sup>3</sup>/s from 21 to 27 June 2022.

Regardless the decreased outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand increased about 0.10 m from 21 to 27 June 2022. However, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels decreased about 0.25 m during June 21-27 due to influence of dam operation. Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR, moreover, were also decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kompong Cham in Cambodia were also decreasing about 0.10 m, due to less contributed rainfall from the upstream part (at Pakse and 3S area in Viet Nam).

Over the next five days, the water levels from Stung Treng to the lower part at key stations in Cambodia are expected to go down between 0.05 m and 0.25 m.

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

From Stung Treng to Kratie, the water levels will continue staying higher than their LTA value. The water levels – at Neak Luong on the Mekong River, from Prek Kdam to Phnom Penh Port on the Tonle Sap, and from Chaktomuk to Koh Khel on the Bassac – are forecasted to continue staying higher than their LTA.

The situation in Tan Chau on the Mekong River and Chau Doc on the Bassac River is expected to remain unchanged.

Since the second week of June 2022, water levels across most monitoring stations in the LMB have significantly dropped to the level lower than their LTA (from middle to lower stretches within the LMB). The preliminary analysis of the hydrological conditions in the LMB over July–December 2020 and November 2020 to May 2021 was done as [Situation Report](#), which can be used as reference for the trend of water level and flows of the Mekong River Basin.

The contribution to the Mekong River’s flow from the UMB in China (Yunnan component) is about 16% by the time the river discharges through the Mekong Delta into the Sea. By far the major contribution comes from the two major ‘left-bank’ (Eastern) tributaries between Vientiane – Nakhon Phanom and Pakse – Stung Treng, which together contribute more than 40% of the flows.

### 7.3 Flash flood and its trends

With the predicted amount of rainfall for the coming week as mentioned earlier in [section 6.1](#), the major flash floods are not expected in the LMB during next week. However local heavy rain in a short period of time is possible with unexpected short flash floods.

### 7.4 Drought condition and its forecast

During June 19-25, the LMB was facing some moderate and severe meteorological droughts across the region from the north to the south. The combined drought index of both meteorological and agricultural indicators shows some short-term moderate and severe droughts taking place in **Loei, Nong Bua Lamphu, Udon Thani, Mukdahan, Khammuane, Roi Et, Yasothon, Amnat Charoen, Ubon Ratchathani, Si Saket, Surin, Preah Vihea, Siem Reap, Banteay Meanchey, Ratana Kiri, and Gia Lai**. Being short-term droughts, they do not pose any serious threat yet to the local communities.

For the upcoming three months’ forecasts, the LMB is likely to receive below-average rainfall **in July and August** with equivalent from **moderate to severe meteorological droughts**. Below-average rainfall is also forecasted for the lower part of the region covering **Cambodia and Viet Nam during this coming September with moderate drought**. While in October and November the LMB is likely to receive more than average rainfall, meaning no drought threat is predicted for the LMB.

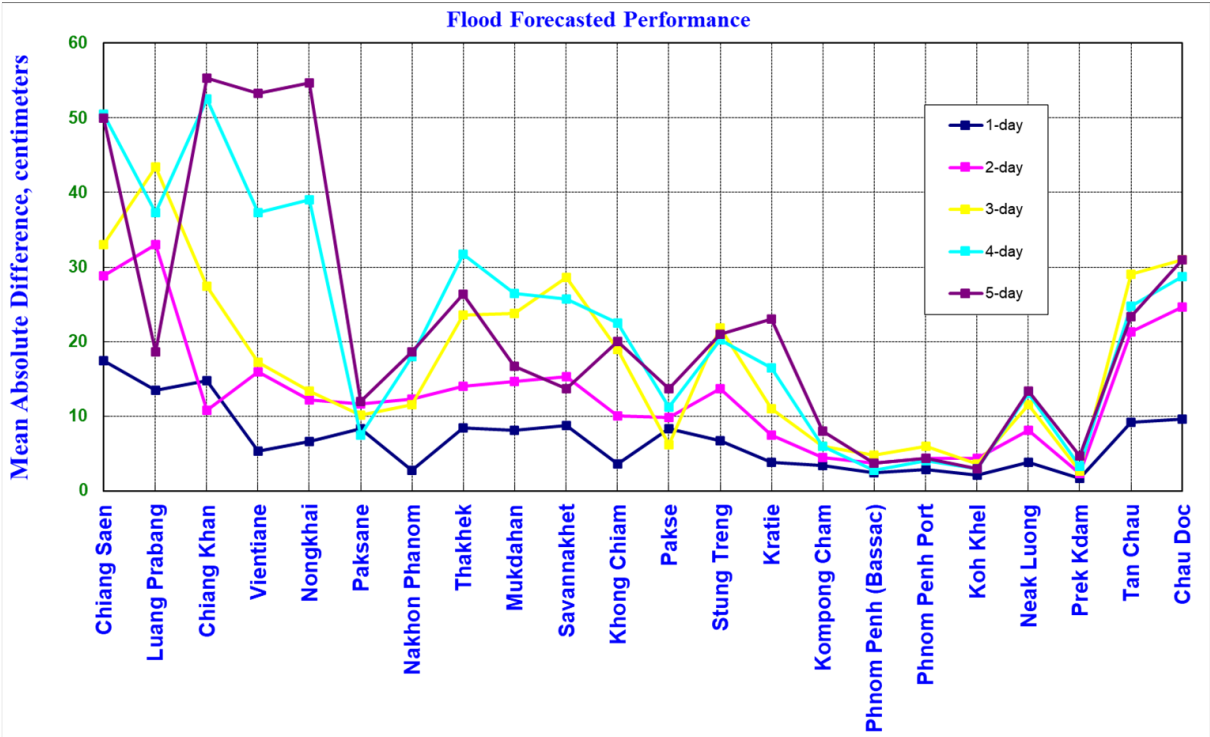
# Annex 1: Performance of the weekly flood forecasting

## 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 21-27 June 2022.

The forecasting values from 21-27 June 2022 show that the overall accuracy is fair for a one-day to five-day forecast in lead time at stations in the lower parts of the Mekong River from Luang Prabang to Paksane in Lao PDR due to some effect of rainfall and dams' operation in this area during the report period.



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

- Missing rainfall in Cambodia (DOM) data and data input are not sufficient to be used for inputting into the flood forecasting model system.
- Luang Prabang to Chiang Khan and Stung Treng to Kratie have been effluent by hydropower operations upstream, tributaries inflows.
- The influence of heavy rainfall caused by storms and hydropower operations from upstream, tributaries inflows and the lower part of the Mekong floodplain, including



the 3S (Stung Treng and Kratie).

- Khong Chaim, Pakse, Stung Treng and Kratie stations have been affected by heavy rainfall from Viet Nam and some hydropower operations on Sekong, Sesan and Sre Pok (water retention and release). Rainfall always accumulates at this spot, which could be causing rapidly high-water levels.
- Fluctuations of the water levels at Tan Chau and Chau Doc stations were due to daily tidal effects of the sea in the Mekong Delta.
- Satellite rainfall data were not representative of the actual rainfall at ground stations in some areas of the Mekong region.

### Performance based on data from the Member Countries

Flood forecasting performance is based on the hydro-met data received from the Member Countries. The flood forecasting achievement indicated in (%) and (cm) from 1 day to 5 days at each key station, against with Old Benchmark are presented in Table B1 and Table B2.

The evaluation of performance indicators, missing data and completion time for flood forecasting are presented in Table B3 and Figures B4, B5 and B6, respectively from 21 to 27, June 2022.

**Table B1:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 21 to 27 June, 2022 in cm

| Lead-time Forecasted | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane | Nongkhai  | Paksane   | Nakhon Phanom | Thakhek   | Mukdahan  | Savannakhet | Khong Chiam | Pakse     | Stung Treng | Kratie    | Kompong Cham | Phnom Penh (Bassac) | Phnom Penh Port | Koh Khel | Neak Luong | Prek Kdam | Tan Chau  | Chau Doc  |
|----------------------|-------------|---------------|-------------|-----------|-----------|-----------|---------------|-----------|-----------|-------------|-------------|-----------|-------------|-----------|--------------|---------------------|-----------------|----------|------------|-----------|-----------|-----------|
| 1-day                | 18          | 16            | 15          | 3         | 8         | 7         | 2             | 5         | 5         | 5           | 16          | 9         | 4           | 6         | 5            | 3                   | 5               | 3        | 5          | 6         | 11        | 16        |
| 2-day                | <u>32</u>   | <u>31</u>     | <u>31</u>   | 17        | 16        | 11        | 11            | 11        | 8         | 8           | 15          | 14        | 7           | 13        | 8            | 4                   | 7               | 7        | 10         | 8         | <u>24</u> | <u>32</u> |
| 3-day                | <u>48</u>   | 52            | <u>45</u>   | <u>39</u> | <u>35</u> | <u>20</u> | 18            | 20        | 17        | 16          | 17          | 19        | 14          | <u>22</u> | 9            | 5                   | 8               | 10       | 14         | 6         | <u>33</u> | <u>44</u> |
| 4-day                | <u>30</u>   | 58            | 57          | 58        | 59        | <u>43</u> | <u>31</u>     | <u>34</u> | <u>27</u> | <u>29</u>   | <u>33</u>   | <u>32</u> | <u>21</u>   | <u>41</u> | 15           | 7                   | 9               | 12       | 17         | 9         | <u>30</u> | <u>36</u> |
| 5-day                | <u>29</u>   | 68            | 67          | 64        | 66        | 56        | 55            | 60        | <u>45</u> | <u>42</u>   | 52          | <u>49</u> | <u>46</u>   | 66        | <u>26</u>    | 8                   | 13              | 9        | <u>20</u>  | 13        | <u>30</u> | <u>33</u> |

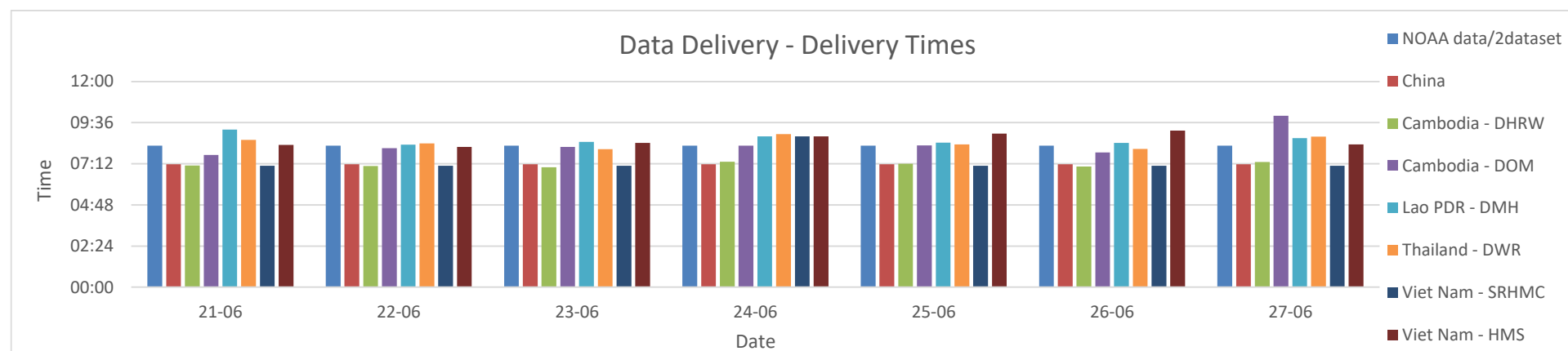
**Table B2:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 21 to 27 June, 2022 in %

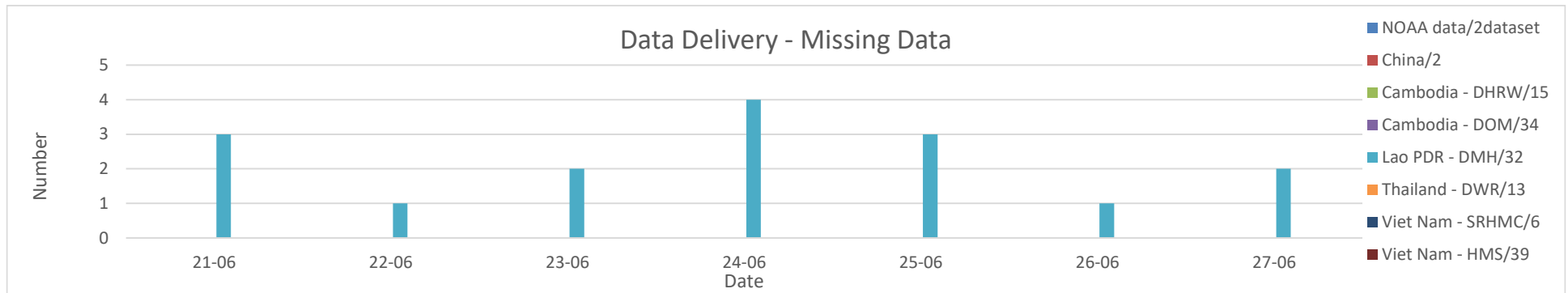
| Lead-time Forecasted | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane   | Nongkhai    | Paksane     | Nakhon Phanom | Thakhek     | Mukdahan    | Savannakhet | Khong Chiam | Pakse       | Stung Treng | Kratie      | Kompong Cham | Phnom Penh (Bassac) | Phnom Penh Port | Koh Khel    | Neak Luong  | Prek Kdam | Tan Chau    | Chau Doc    | Average     |      |
|----------------------|-------------|---------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|---------------------|-----------------|-------------|-------------|-----------|-------------|-------------|-------------|------|
| 1-day                | 57.1        | 71.4          | <u>42.9</u> | <u>42.9</u> | <u>42.9</u> | 57.1        | <u>42.9</u>   | <u>42.9</u> | 57.1        | 57.1        | <u>42.9</u> | 57.1        | 57.1        | <u>42.9</u> | 71.4         | <u>42.9</u>         | 57.1            | 71.4        | <u>42.9</u> | 57.1      | 71.4        | 71.4        | 71.4        | 54.5 |
| 2-day                | <u>33.3</u> | <u>33.3</u>   | 83.3        | 66.7        | 66.7        | 66.7        | <u>50.0</u>   | <u>50.0</u> | <u>50.0</u> | 66.7        | 66.7        | <u>50.0</u> | <u>50.0</u> | <u>50.0</u> | <u>50.0</u>  | <u>50.0</u>         | <u>50.0</u>     | 66.7        | <u>50.0</u> | 66.7      | <u>33.3</u> | <u>50.0</u> | 54.5        |      |
| 3-day                | 80.0        | <u>20.0</u>   | 80.0        | 80.0        | 60.0        | 60.0        | 60.0          | 60.0        | 60.0        | 60.0        | <u>40.0</u> | 60.0        | 60.0        | <u>40.0</u> | 60.0         | <u>20.0</u>         | 80.0            | <u>40.0</u> | <u>40.0</u> | 80.0      | 60.0        | <u>40.0</u> | 56.4        |      |
| 4-day                | <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>   | 75.0        | <u>50.0</u> | <u>50.0</u> | <u>50.0</u> | 75.0        | <u>50.0</u> | <u>50.0</u> | 75.0         | <u>50.0</u>         | 75.0            | <u>50.0</u> | <u>25.0</u> | 75.0      | <u>50.0</u> | 75.0        | <u>50.0</u> | 56.8 |
| 5-day                | <u>33.3</u> | 66.7          | 66.7        | 66.7        | <u>33.3</u> | <u>33.3</u> | 66.7          | <u>33.3</u> | 66.7        | 66.7        | 66.7        | 66.7        | <u>33.3</u> | 66.7        | 66.7         | 66.7                | <u>33.3</u>     | 66.7        | <u>33.3</u> | 66.7      | <u>33.3</u> | <u>33.3</u> | <u>33.3</u> | 53.0 |

**Table B3: Overview of performance indicators for the past 7 days from 21-27 June, 2022**

|             | FF time sent                 |                           |                               |                               | Arrival time of input data |       |                 |                |               |                |                  |                | Missing data (number-mainstream and trib.st.) |         |                    |                   |                  |                   |                    |                   |
|-------------|------------------------------|---------------------------|-------------------------------|-------------------------------|----------------------------|-------|-----------------|----------------|---------------|----------------|------------------|----------------|---|---------|--------------------|-------------------|------------------|-------------------|--------------------|-------------------|
|             | FF completed and sent (time) | Stations without forecast | FF2 completed and sent (time) | Weather data available (time) | NOAA data                  | China | Cambodia - DHRW | Cambodia - DOM | Lao PDR - DMH | Thailand - DWR | Viet Nam - SRHMC | Viet Nam - HMS | NOAA data/2dataset                            | China/2 | Cambodia - DHRW/15 | Cambodia - DOM/34 | Lao PDR - DMH/32 | Thailand - DWR/13 | Viet Nam - SRHMC/6 | Viet Nam - HMS/39 |
| <b>2022</b> |                              |                           |                               |                               |                            |       |                 |                |               |                |                  |                |   |         |                    |                   |                  |                   |                    |                   |
| week        | 10:21                        | #DIV/0!                   | -                             | -                             | 08:15                      | 07:10 | 07:08           | 08:20          | 08:37         | 08:27          | 07:19            | 08:35          | 0   | 0       | 0                  | 0                 | 16               | 0                 | 0                  | 0                 |
| month       | 10:27                        | #DIV/0!                   | -                             | -                             | 08:15                      | 07:10 | 07:17           | 08:01          | 08:34         | 08:24          | 07:16            | 08:38          | 0   | 0       | 0                  | 34                | 0                | 0                 | 0                  | 2                 |

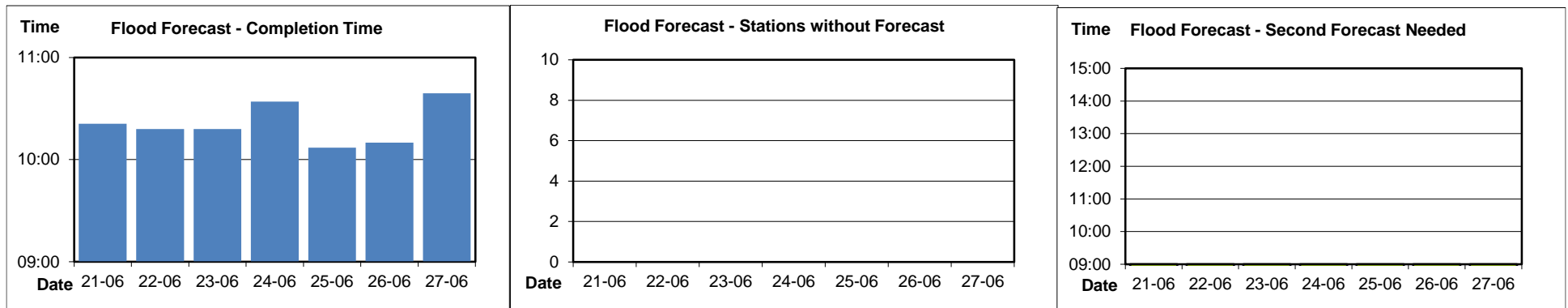
**Fig. B4: Data delivery times for the past 7 days from 21 to 27 June, 2022**





**Fig. B5: Missing data for the past 7 days from 21 to 27 June, 2022**

**Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 21 to 27 June, 2022**





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