



**Mekong River Commission**

# **Weekly Wet Season Situation Report in the Lower Mekong River Basin 28 September – 04 October 2021**

Prepared by  
The Regional Flood and Drought Management Centre  
05 October 2021

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Mekong River Commission

Documentation and Learning Centre

184 Fa Ngoum Road, Unit 18, Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR

Telephone: +856-21 263 263 | E-mail: [mracs@mrcmekong.org](mailto:mracs@mrcmekong.org) | [www.mrcmekong.org](http://www.mrcmekong.org)

# Contents

- Figures..... v
- Table .....vi
- Key Messages ..... 1
- 1 Introduction ..... 3
- 2 General Weather Patterns ..... 4
  - 2.1 Tropical depressions (TD), tropical storms (TS) and typhoons (TY) ..... 5
  - 2.2 Rainfall patterns over the LMB ..... 6
- 3 Water Levels in the Lower Mekong River ..... 8
- 4 Flash Flood in the Lower Mekong Basin ..... 15
- 5 Drought Monitoring in the Lower Mekong Basin..... 17
- 6 Weather and Water Level Forecast and Flash Flood Information ..... 20
  - 6.1 Weather and rainfall forecast ..... 20
  - 6.2 Water level forecast ..... 21
  - 6.3 Flash Flood Information..... 22
  - 6.4 Drought forecast ..... 23
- 7 Summary and Possible Implications ..... 25
  - 7.1 Rainfall and its forecast ..... 25
  - 7.2 Water level and its forecast ..... 25
  - 7.3 Flash flood and its trends..... 26
  - 7.4 Drought condition and its forecast ..... 26
- Annex 1: Performance of the weekly flood forecasting ..... 27

# Figures

- Figure 1.** Summary of weather conditions over the LMB. .... 4
- Figure 2.** Outlook of wet and dry conditions over the Asian countries by ASMC. .... 5
- Figure 3.** A tropical depression risk observed on 4 October 2021. .... 5
- Figure 4.** Weekly total rainfall at key stations in the LMB during 28 Sept-4 Oct 2021..... 6
- Figure 5.** Weekly rainfall distribution over the LMB during 28 September-4 October 2021. ... 7
- Figure 6.** Key stations and model application for River Monitoring and Flood Forecasting. .... 8
- Figure 7.** Water level at the Jinghong hydrological station during 1 July-4 October 2021. .... 9
- Figure 8.** Water levels at Chiang Saen in Thailand and Luang Prabang in Lao PDR..... 10
- Figure 9.** Water levels Veintiane and Paksane in Lao PDR..... 11
- Figure 10.** Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR..... 11
- Figure 11.** Water levels at Stung Treng and Kratie on the Mekong River. .... 12
- Figure 12.** Seasonal change of inflows and outflows of Tonle Sap Lake ..... 13
- Figure 13.** The seasonal change in monthly flow volume of Tonle Sap Lake. .... 13
- Figure 14.** Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on Sep 29. .... 16
- Figure 15.** Weekly standardized precipitation index from 25 September to 01 October 2021. .... 17
- Figure 16.** Weekly Soil Moisture Anomaly from 25 September to 01 October 2021..... 18
- Figure 17.** Weekly Combined Drought Index from 25 September to 01 October 2021..... 19
- Figure 18.** Accumulated rainfall forecast (24 h) based on a GFS model..... 21
- Figure 19.** Daily average of monthly rainfall anomaly forecast from October to December 2021..... 23

## Table

<b>Table 1.</b> The monthly change in the flow volume of Tonle Sap Lake. ....	14
<b>Table 2.</b> Weekly River Monitoring Bulletin. ....	24

## 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 Pakse in Lao PDR, including the lower part in Cambodia and Viet Nam, varying from 4.40 millimetres (mm) to 112.70 mm.
- There will be average rainfalls for the next 5 days over the Mekong region from 5 to 11 October 2021 due to low-pressure dominating the Mekong region.

### Water level and its forecast

- According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 20 September to 4 October 2021. It moved from 535.22 m on 20 Sept to 535.25 on 4 Oct 2021 (recorded on 7:00 am). The outflow was up from 801 m<sup>3</sup>/s on Sept 20 to 819 m<sup>3</sup>/s on Oct 4, 2021. From September 20 to October 4, water level at this station dropped about 0.02 m and was about 0.01 m higher than its historical minimum value.
- Along with the significant low outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.55 m from 23 September to 4 October 2021. However, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels decreased about 1.55 m during 28 September-4 October 2021 due to less rainfall in the area and dam operation. Water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR were also decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia were significantly decreasing, due to low rainfall and following the same trend of the upstream flow (at Pakse and 3S area in Vietnam).
- The water volume of the Tonle Sap Lake is lower than its LTA but lower than the levels in 2019 and higher than 2020 during the same period in September.
- Over the next few days, the water levels across most monitoring stations are expected to slightly increase but remain lower than their long-term average value in most stations.

### Drought condition and its forecast

- Soil moisture conditions were anomaly dry in some areas of the upper part of the LMB. However, the combined drought indicator shows that the LMB did not face any significant drought during the monitoring week from September 25 to October 1. The entire LMB region received from average to above average rainfall.
- For the upcoming three-month forecast, the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the

wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.



# 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 **28 September - 04 October 2021**. The trend and outlook for water levels are also presented.

This analysis is based on the daily hydro-meteorological data provided by the Mekong River Commission (MRC) Member Countries (MCs) – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. All the water 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>

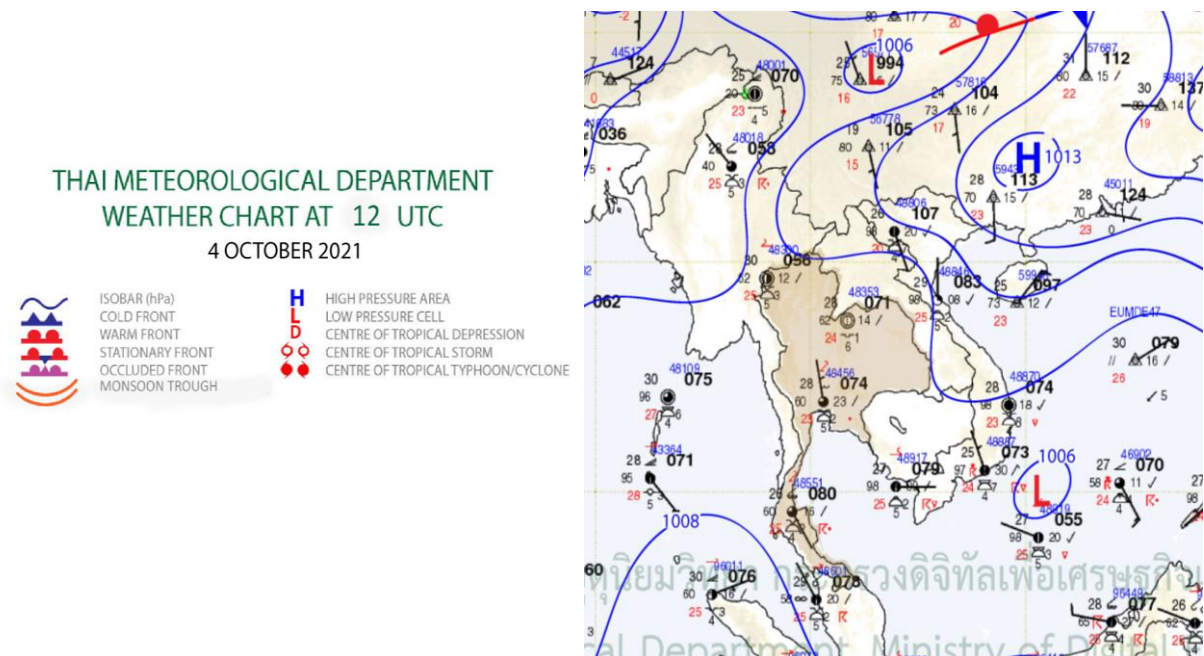
Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

## 2 General Weather Patterns

The weather outlook bulletins for three months (October, November and December) and the weather maps issued by the Thai Meteorological Department (TMD) were used to verify weather conditions in the LMB.

The TMD stated that the transition period moving from the rainy to the winter season will start from October and the below average rainfall which reduces temperature and cool weather will start from the end of this month onward. However, low pressure will move in the southern part of the LMB in Vietnam, which will bring more rainfall in October and early November.

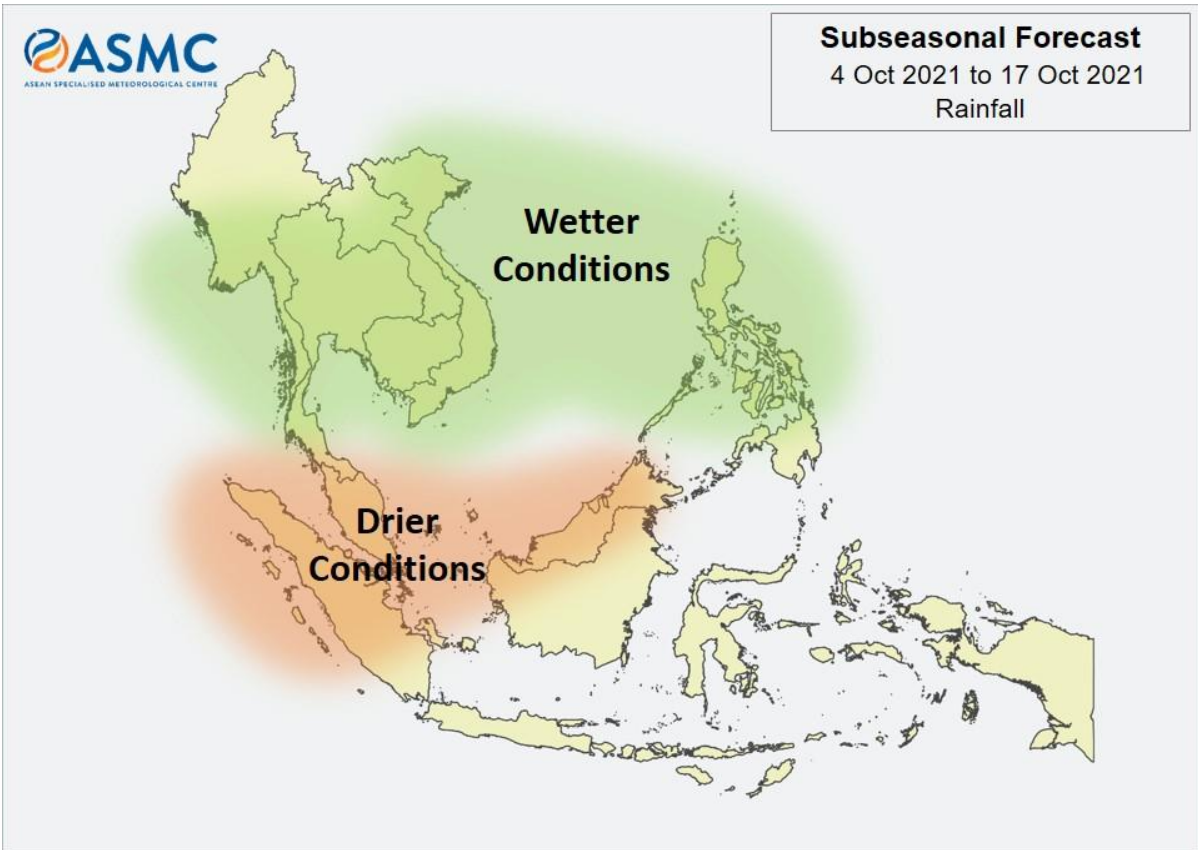
[Figure 1](#) presents the weather map on 4 October 2021, showing no low-pressure line moving over the LMB. However, rainfall can focus on the lower part of northern Thailand, Lao PDR and Viet Nam and the 3S area (Sesan, Sre Pok, and Sekong) in Cambodia and Viet Nam.



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

According to the ASEAN Specialised Meteorological Centre (ASMC), a highest probability of wetter condition is predicted over of the lower part of the Mekong region covering Lao PDR and Thailand from 4 to 17 October 2021, during the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October. Moreover, LMB is likely dominated by wetter condition, which may receive more rainfall in general (above-average rainfall) in the Lower part to the LMB.

[Figure 2](#) shows the outlook of comparative wet conditions from 4 to 17 October 2021 covering the whole LMB region, based on results from the NCEP model (National Centres for Environmental Prediction).

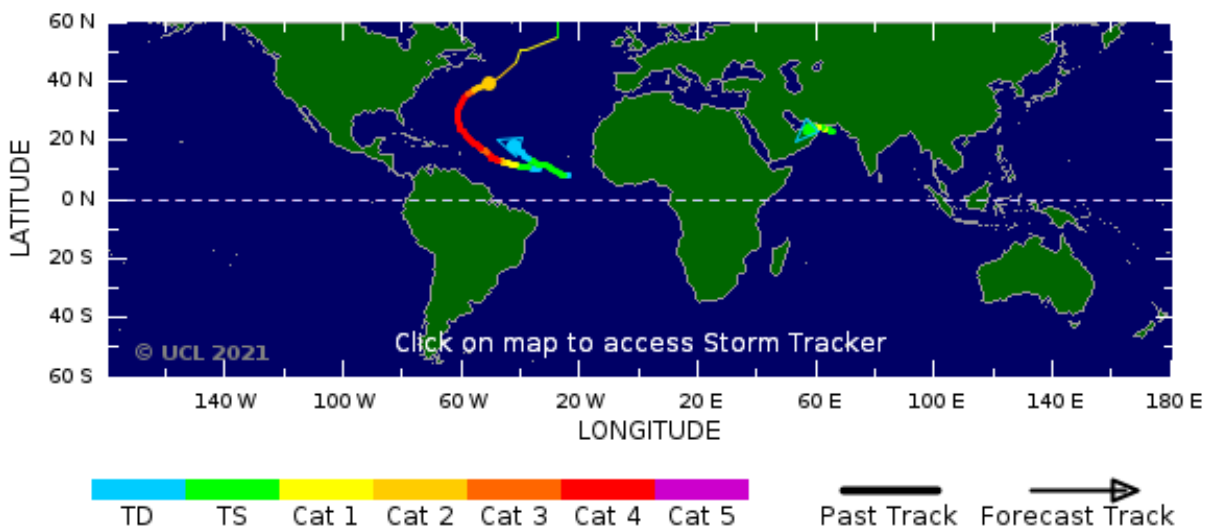


**Figure 2.** Outlook of wet and dry conditions over the Asian countries by ASMC.

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

There was no low-pressure line taking place in the lower part of the LMB on 4 October 2021, as shown in [Figure 1](#). Also, based on the Tropical Storm Risk (TSR), as displayed in [Figure 3](#), there was no sign of tropical depression moving to the Mekong region up to 4 October 2021.

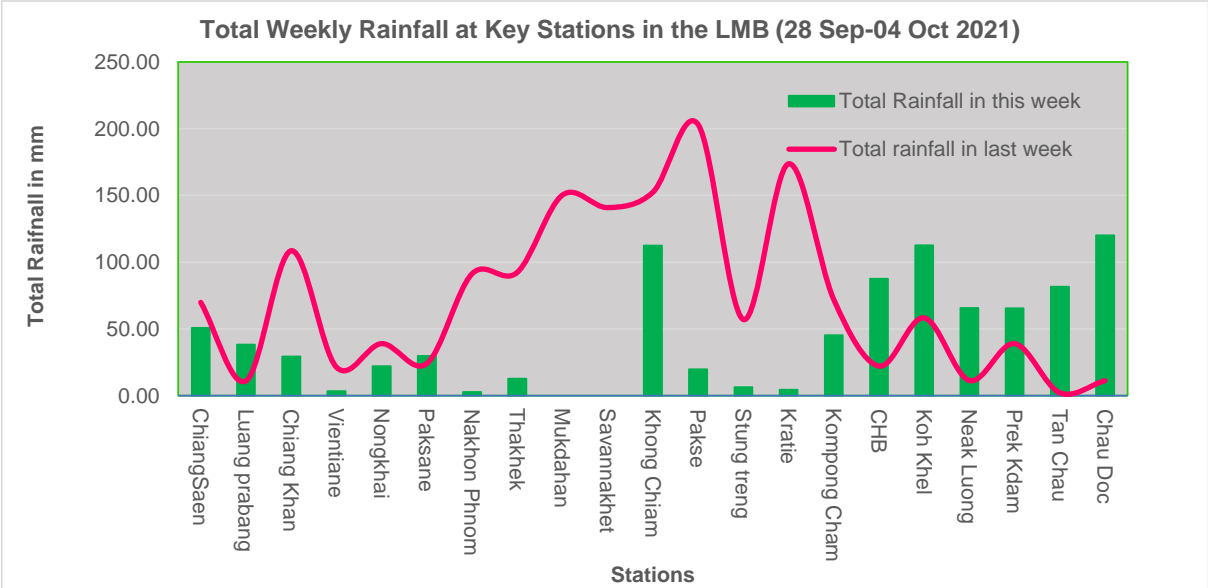
**Active system as of 04 October 2021 3:37 GMT**



**Figure 3.** A tropical depression risk observed on 4 October 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 4.40 mm to 112.70 mm. The weekly total rainfall from 28 September to 4 October 2021 in this reporting week was considered high from Khong Chiam in Thailand to Chau Doc in Vietnam. This week rainfall is lower than last week rainfall in the Upper and Middle parts of the LMB (see [Figure 4](#)).



**Figure 4.** Weekly total rainfall at key stations in the LMB during 28 Sept-4 Oct 2021.

To verify area rainfall distribution, [Figure 5](#) shows a map of the weekly accumulated rainfall based on observed data provided by the MRC MCs – Cambodia, Lao PDR, Thailand, and Viet Nam – from 28 September to 4 October 2021.

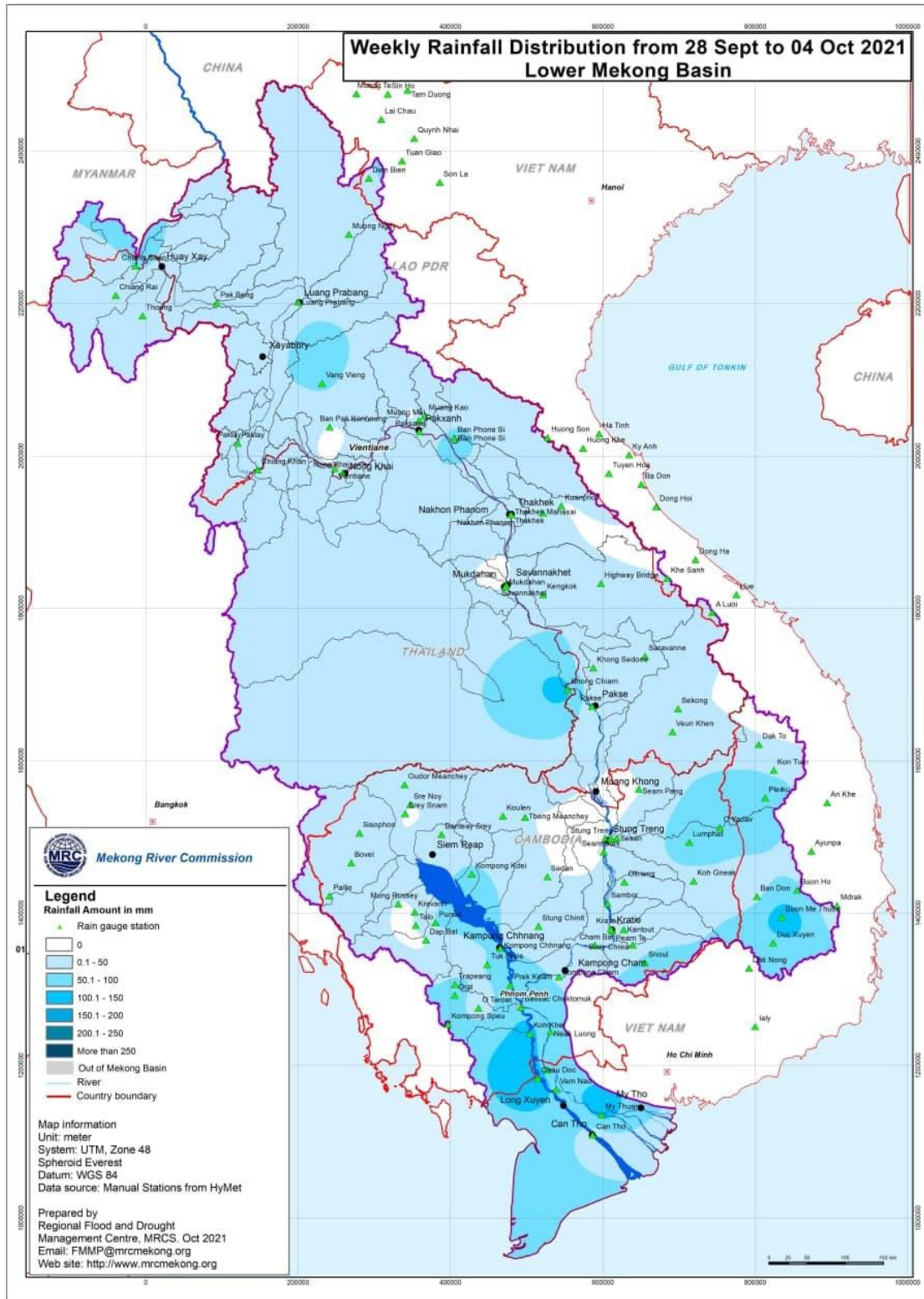
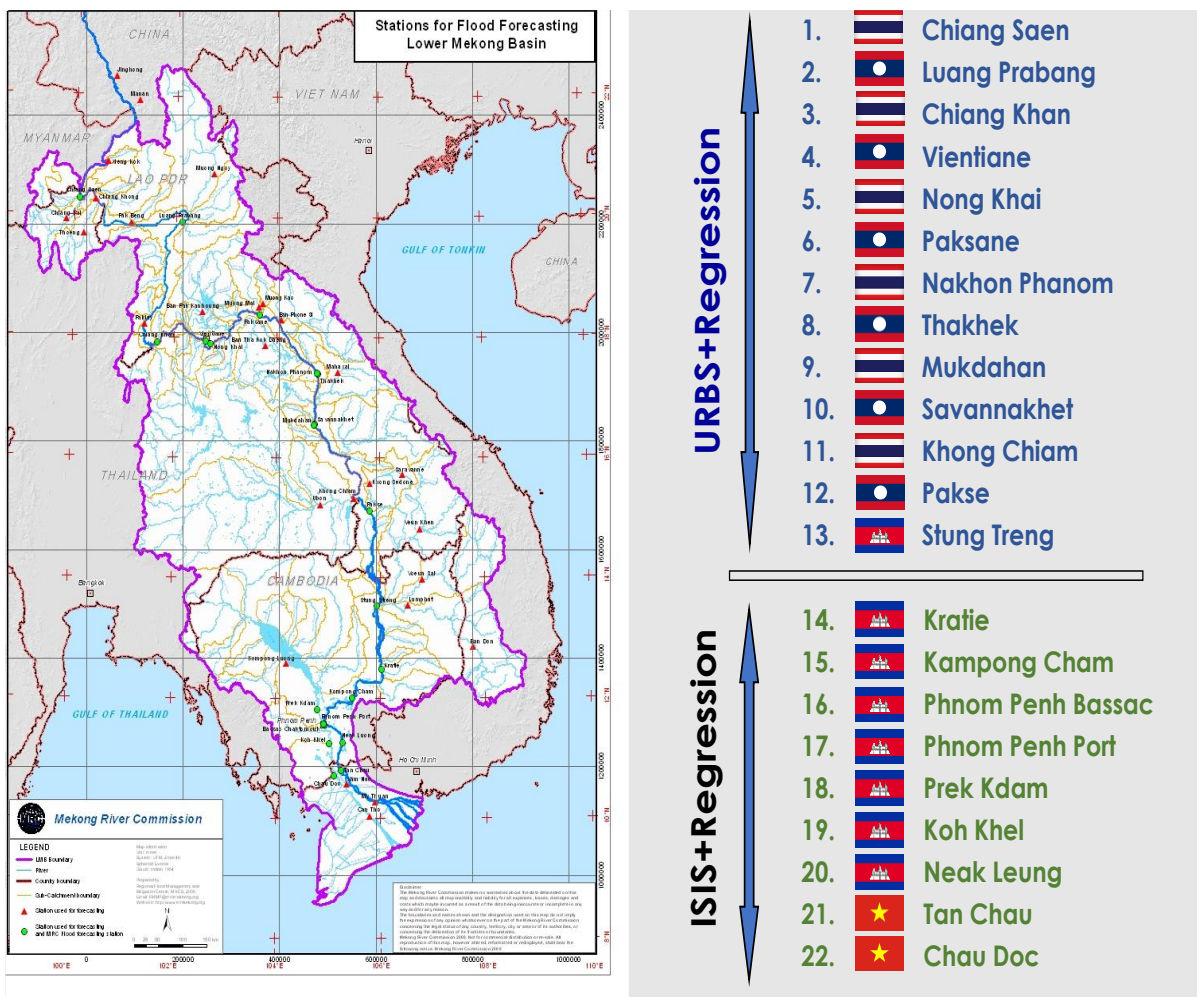


Figure 5. Weekly rainfall distribution over the LMB during 28 September-4 October 2021.

### 3 Water Levels in the Lower Mekong River

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

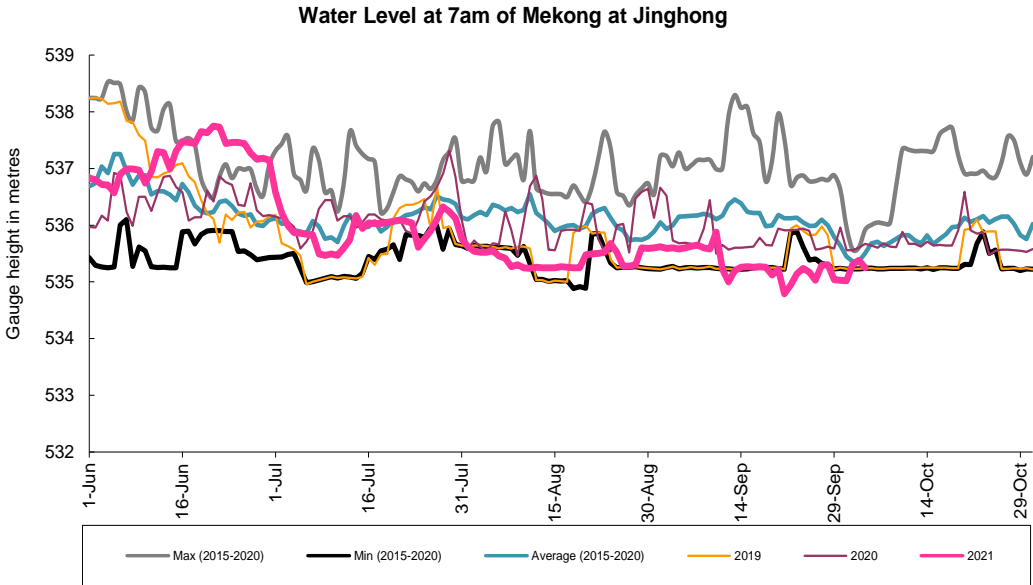
The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in [Figure 6](#). The hydrograph for each key station is available from the MRC’s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



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

According to MRC’s observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 20 September to 4 October 2021. It moved from **535.22 m on 20 Sept to 535.25 on 4 Oct 2021 (recorded on 7:00 am)**. The outflow was up from 801 m<sup>3</sup>/s on Sept 20 to 819 m<sup>3</sup>/s on Oct 4, 2021. From September 20 to October 4, water level at this station dropped about 0.02 m and was about 0.01 m higher than its historical minimum value.

[Figure 7](#) below presents water level that decreased at the Jinghong hydrological station<sup>1</sup>, indicating that the trend of fluctuating water level from 28 September to 4 October 2021 and showed about 0.01 m higher than its minimum level.



**Figure 7.** Water level at the Jinghong hydrological station during 1 July-4 October 2021.

Along with the significant low outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.55 m from 23 September to 4 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels decreased about 1.55 m during 28 September-4 October due to less rainfall in the area and influence of dam operation. Water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR were also decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia were significantly decreasing, due to low rainfall and following the same trend of the upstream flow (at Pakse and 3S area in Vietnam).

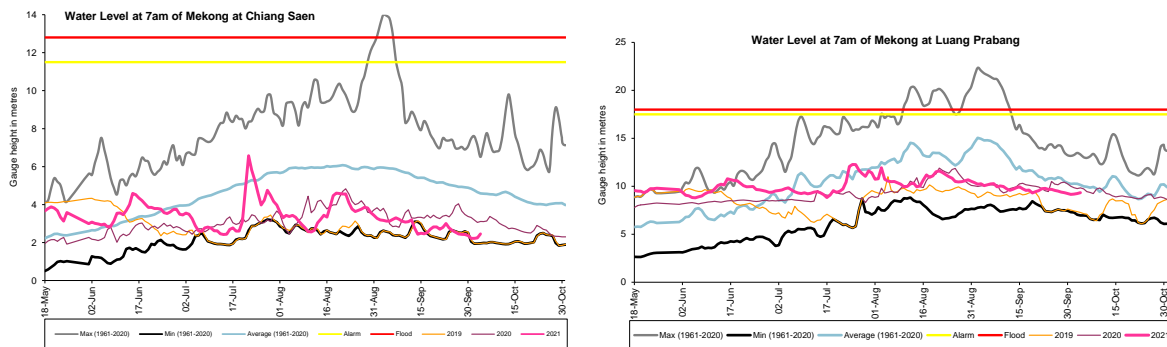
Based on hydrological phenomenon, the contribution of inflow water from the upstream of Lancang-Mekong in China to the Mekong mainstream is about 16% in total during the wet season from June to October. The whole inflow of water into the LMB is influenced by rainfall at the Mekong mainstream and its 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 28 September to 4 October 2021 at Thailand's Chiang Saen slightly increased from 2.43 m to 2.45 m, showing 0.02 m down and was about 2.13 m lower than its Long-Term-Average (LTA) value, which considered critical. The water level at Luang Prabang station in Lao PDR slightly decreased from 9.40 m to 9.34 m during the reporting period. This level shows 1.43 m lower than its long-term-average (LTA) value. The trend – sometimes higher or lower to its historical maximum and LTA values – has been observed since early 2021. 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) significantly decreased from 8.38 m to 6.62 m during the reporting week. This significant decrease showed 3.06 m lower than its Long-Term- Average (LTA). The water level downstream at Vientiane in Lao PDR followed the upstream trend. It also decreased from 5.84 m to 5.38 m and was about 2.35 m lower than its LTA during 27 September-4 October 2021. However, at Nong Khai station in Thailand, the water level also decreased during the reporting period. It was down from 5.74 m to 4.17 m, showing 2.23 m lower than its LTA. For Paksane in Lao PDR, water levels decreased about 1.11 m, dropping from 6.29 m to 5.18 m. The WL at this station was still about 3.28 m lower than its LTA. The recently decreased water levels were obviously due to the low rainfall in the sub-catchment area, amid the inflows from upstream. The water levels at Vientiane and Paksane are shown in [Figure 9](#) below.



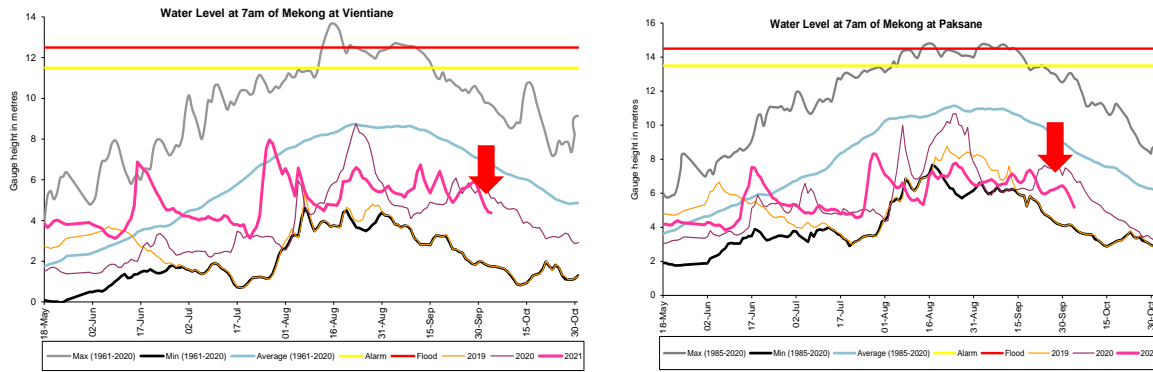


Figure 9. Water levels Veintiane and Paksane in Lao PDR.

### Nakhon Phanom to Pakse

The water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR decreased about 0.55 m due to low rainfall and less inflow from upstream. Further downstream from Khong Chiam in Thailand to Pakse in Lao PDR, water level significantly decreased dropping about 1.10 m due to low rainfall in the catchment area. **Water levels at these stations (Nakhon Phanom to Pakse) were staying below their LTA level, which were still considered critical.** [Figure 10](#) shows the water levels at Nakhon Phanom and Pakse stations.

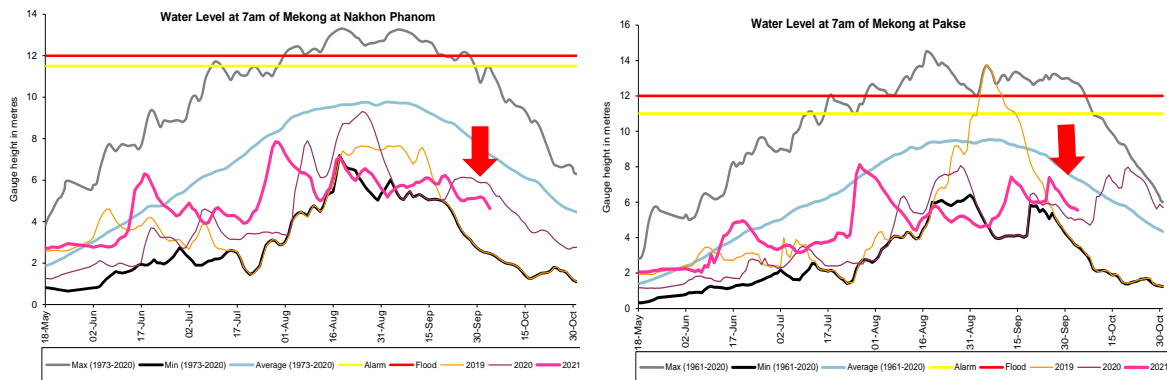
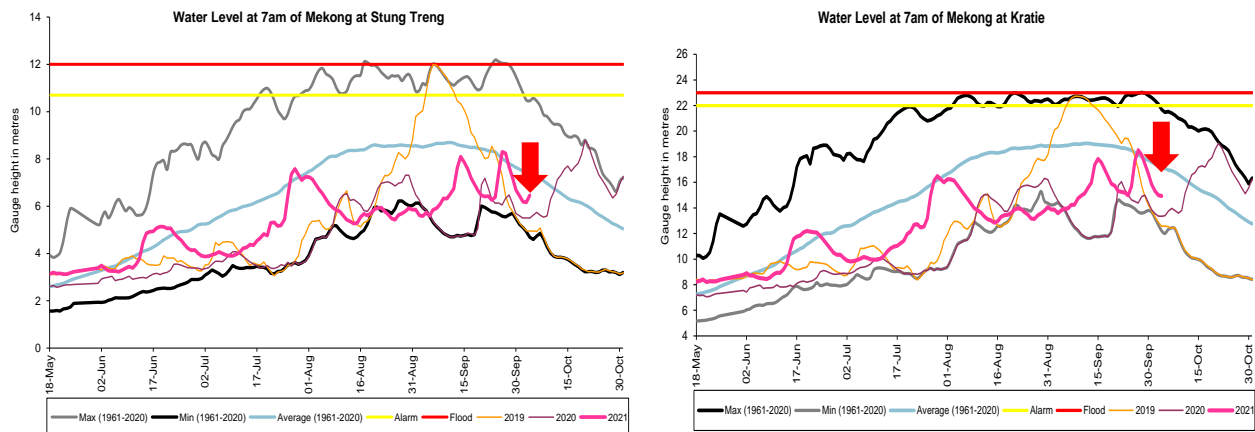


Figure 10. Weekly water levels at Nakhon Phanom in Thailand and Pakse in Lao PDR

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

Followed 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 remarkably went down during 28 September-4 October 2021. This week water level at Stung Treng and Kratie decreased about 1.22 m and 3.21 m, respectively, moving down to about 0.89 m and 2.27 m lower than their LTA (as showed in [Figure 11](#)). Also, the water level at Kompong Cham obviously decreased about 2.36 m and was still about 2.82 m lower than its LTA. **Water levels at these stations were moving down lower than their TLA levels, which considered critical.**



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

At Chaktomuk on the Bassac River, due to local rainfall in the inflow catchment, the water level decreased by about 0.73 m and stayed 2.81 m lower than its LTA value; while at Koh Khel, water level went down 0.49 m, staying 1.20 m lower than its LTA value. The water level at Prek Kdam on the Tonle Sap Lake decreased about 0.45 m and was about 2.69 m lower than its LTA value. The water level at the Tonle Sap Lake (observed at Kompong Luong) was similar to Prek Kdam station’s water level. The recent decreased water level was because of less inflow 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 Kompong Luong) followed the same trend of Prek Kdam station’s water level. **Water levels at these stations were staying lower than their LTA levels, which still considered critical.**

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

Like last week, the water levels from 28 September to 4 October 2021 at Viet Nam’s Tan Chau and Chau Doc were fluctuating due to daily tidal effects from the sea. The fluctuation levels were between 1.78 m and 2.29 m; they were in between the range of their LTA and historical minimum levels and **considered normal.**

#### **The Tonle Sap Flow**

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

[Figure 12](#) shows the seasonal changes of the outflow of the Tonle Sap Lake at Prek Kdam in comparison with the flows of 2018 and 2019, and their LTA levels (1997–2019). Up to October 4 of this reporting period, **it was observed that the main inflow/reverse flow to Tonle Sap Lake decreased due to low rainfall from upstream.** This decreased inflow of Tonle Sap Lake was most likely caused by less inflows from the catchment area. Up to September 2021, the inflow into the Tonle Sap Lake condition in 2021 was lower than 2019 and matched with 2020 inflow conditions. For next week, low rainfall is forecasted for the Tonle Sap area; thus, the inflow into the Tonle Sap Lake is likely to continue decreasing from the current level.

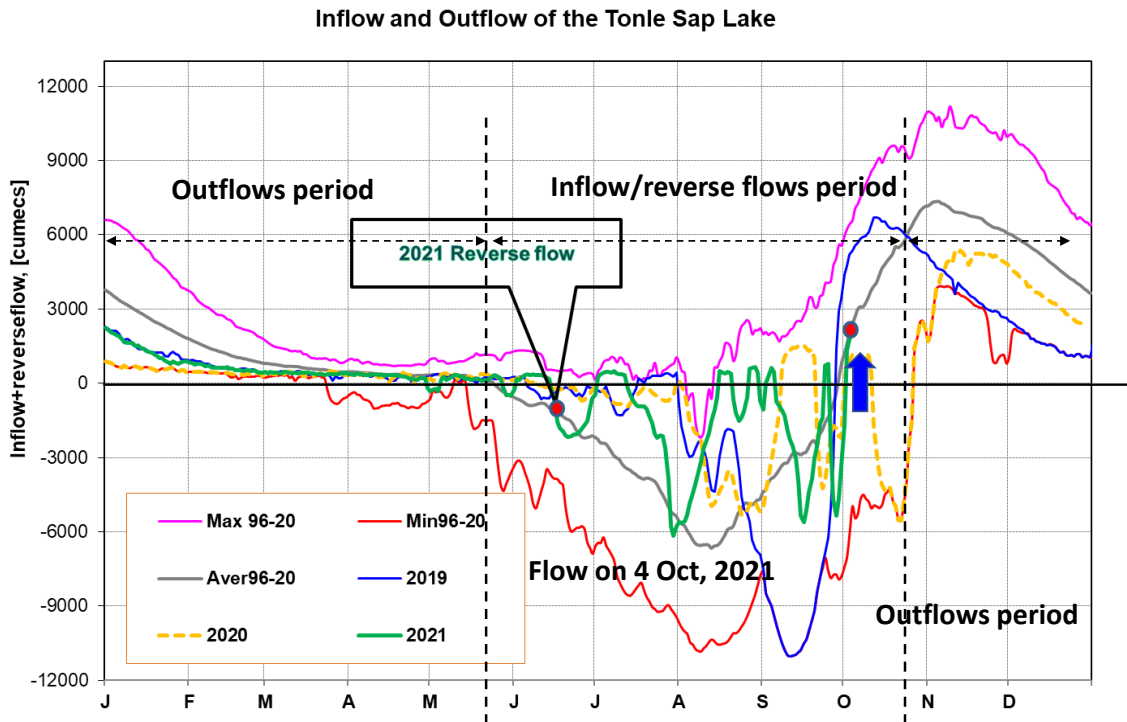


Figure 12. Seasonal change of inflows and outflows of Tonle Sap Lake

The water volume of the Tonle Sap Lake up to this point has been considered low in comparison with its 2019 and LTA levels. Figure 13 shows seasonal changes in monthly flow volumes up to October 4 for the Lake compared with the volumes in 2018, 2019 and 2020, their LTA, and the fluctuation levels (1997–2019). It shows that up to September, **the water volume of the Tonle Sap Lake is lower than its LTA but lower than the levels in 2019 and higher than 2020 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 Mekong River, the tributaries, and rainfall in the surrounding sub-catchments and *considered very critical*.

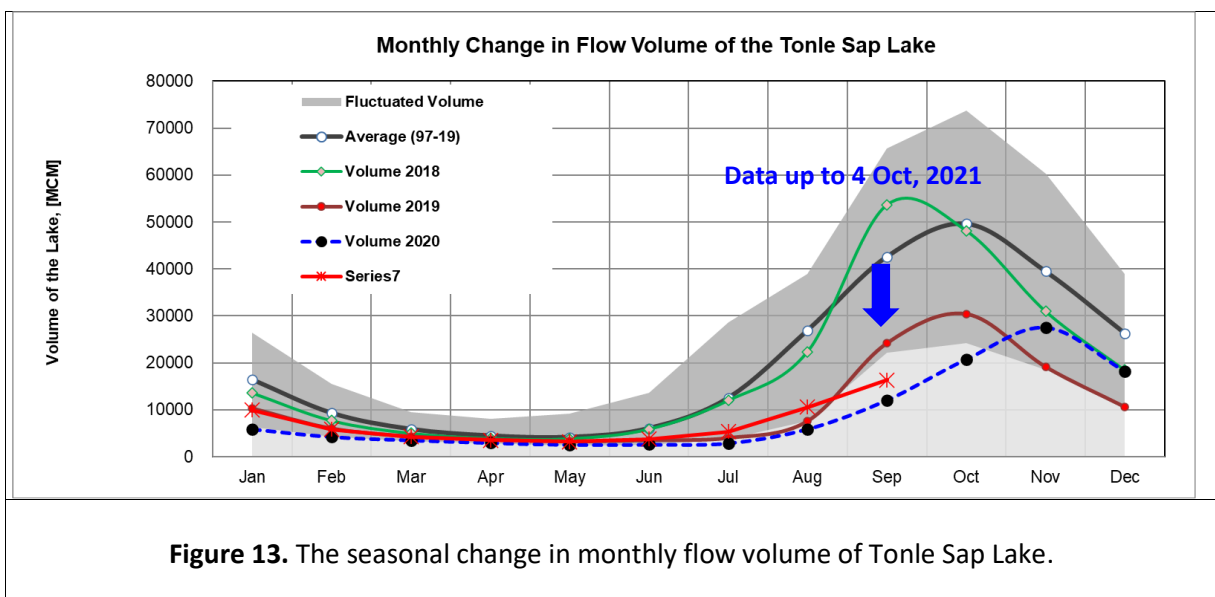


Figure 13. The seasonal change in monthly flow volume of Tonle Sap Lake.

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

Month	Average Volume (97-19) [MCM]	Max Volume [MCM]	Min Volume [MCM]	Volume 2018 [MCM]	Volume 2019 [MCM]	Volume 2020 [MCM]	Volume 2021 [MCM]
Jan	16452.95	26357.53	6272.01	13633.41	10285.31	5906.80	9923.80
Feb	9312.36	15596.22	4281.41	7729.72	6019.30	4264.19	5832.97
Mar	5868.92	9438.24	3350.92	5037.06	4354.62	3553.99	4264.88
Apr	4474.98	8009.14	2875.42	3956.47	3667.47	2992.61	3556.68
May	4166.07	9176.93	2417.81	3864.00	3266.43	2594.92	3240.78
Jun	6034.10	13635.01	2470.54	5919.18	3517.06	2641.88	3798.29
Jul	12502.58	28599.56	3832.51	12024.96	4001.99	2925.86	5346.73
Aug	26934.35	39015.12	7554.93	22399.65	7622.71	5941.07	10547.80
Sep	42644.05	65632.35	22180.73	53639.54	24194.19	12105.31	16382.34
Oct	49698.19	73757.23	24276.79	48193.08	30358.38	20799.13	
Nov	39542.58	60367.33	18576.01	31036.07	19112.65	27546.80	
Dec	26325.13	38888.95	10869.43	18469.21	10577.29	18251.65	
	Critical situation, compared with historical Min values						
	Normal condition, compared with LTA (Long term average)						
	Low volume situation, compared with LTA values						
Unit: Million Cubic Meter (1 MCM= 0.001 Km <sup>3</sup> )							


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

## 4 Flash Flood in the Lower Mekong Basin


From September 28 to October 4, the LMB was affected by three weather factors (i) the southwest monsoon which prevailed over the Gulf of Thailand was weak almost the entire week; (ii) the easterly and south-easterly wind prevailed over upper part, and (iii) the low-pressure cell covered Myanmar on the first day of the week. These conditions caused some rainfall in some areas of the middle and lower parts of the LMB.

According to the MRC-Flash Flood Guidance System (MRC-FFGS) and analysis, flash flood events were detected during the reporting period in several areas of the LMB for Cambodia, Thailand and Viet Nam with ranging low risk level; the risk wasn't detected in Lao PDR. as shown in [Figure 14](#) and [Table 2](#).


**Table 2.** Detected flash flood in Thailand, Cambodia, and Viet Nam on September 29.

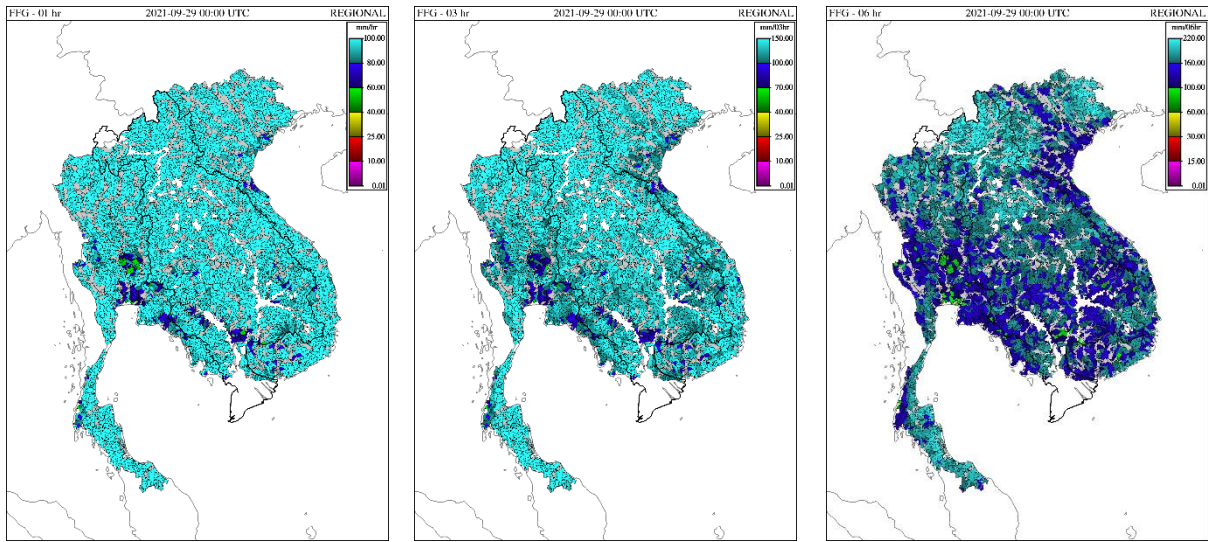
 <b>Rate-risk and location of the flash flood may occur in the next 1, 3, and 6 hours in Thailand</b>												
Date of FFG products 29/09/2021 00:00 UTC time												
01-Hour Flash Flood Risk and Location				03-Hour Flash Flood Risk and Location				06-Hour Flash Flood Risk and Location				
Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	Provinces	Districts	Region	Level Risk	
Samut Prakarn	Phra Samut Chedi		Low-Risk	Samut Prakarn	Phra Samut Chedi		Low-Risk	Chanthaburi	Khlung	Eastern	Low-Risk	
Samut Prakarn	Muang Samut Prakarn		Low-Risk	Prachinburi	Muang Prachinburi	Eastern	Low-Risk	Prachinburi	Prachantakham	Eastern	Low-Risk	
Samut Prakarn	Bang Bo		Low-Risk	Nakhon Sawan	Ta Khli	Central	Low-Risk	Buriram	Nongki	Northeastern	Low-Risk	
Prachinburi	Muang Prachinburi	Eastern	Low-Risk	Nakhon Sawan	Ta Khli	Central	Low-Risk	Buriram	Lum Phaimat	Northeastern	Low-Risk	
Nonthaburi	Bang Bua Thong	Central	Low-Risk	Lopburi	Phatthana Nikhom	Central	Low-Risk	Trad	Muang Trat	Eastern	Low-Risk	
Chainat	Sanphaya	Central	Low-Risk	Thai Island			Low-Risk	Bangkok	Bangkok	Central	Low-Risk	
Nakhon Sawan	Ta Khli	Central	Low-Risk					Samut Sakhon	Muang Samut Sakhon	Northeastern	Low-Risk	
Nakhon Sawan	Ta Khli	Central	Low-Risk					Samut Prakarn	Phra Samut Chedi		Low-Risk	
Chainat	Sanphaya	Central	Low-Risk					Samut Prakarn	Muang Samut Prakarn		Low-Risk	
Chainat	Muang Chai Nat	Central	Low-Risk					Samut Prakarn	Bang Bo		Low-Risk	
Lopburi	Ban Mi	Central	Low-Risk					Samut Prakarn	Muang Samut Prakarn		Low-Risk	
Lopburi	Ban Mi	Central	Low-Risk					Chachoengsao	Bang Pakong	Eastern	Low-Risk	
Lopburi	Kok Sumrong	Central	Low-Risk					Chachoengsao	Bang Pakong	Eastern	Low-Risk	
Lopburi	Kok Sumrong	Central	Low-Risk					Chachoengsao	Bang Pakong	Eastern	Low-Risk	
Lopburi	Sa Bot	Central	Low-Risk					Chachoengsao	Muang Chachoengsao	Eastern	Low-Risk	
Lopburi	Kok Sumrong	Central	Low-Risk					Nakhon Nayok	Pak Phli	Eastern	Low-Risk	
Lopburi	Tha Wung	Central	Low-Risk					Prachinburi	Muang Prachinburi	Eastern	Low-Risk	
Lopburi	Tha Wung	Central	Low-Risk					Chonburi	Phan Thong	Eastern	Low-Risk	

 <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 29/09/2021 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
Kampong Thom	Baray	Kokir Thum	Northwest	Low-Risk	NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOUR					Pursat	Veal Veang	Chamka Chrey Khang Toong	Western	Low-Risk
Kampong Thom	Baray	Khinhaom	Northwest	Low-Risk						Kampong Cham	Stueng Triang	Veal Preah	Central Lowland	Low-Risk
Tboung Khmum	Memot	Chamkar Thmei	Central Lowland	Low-Risk						Kampong Cham	Stueng Triang	Sampieng Kraom	Central Lowland	Low-Risk
										Kampong Thom	Baray	Kolor Thum	Northwest	Low-Risk
										Kampong Thom	Baray	Pongro Ling	Northwest	Low-Risk
										Kampong Thom	Baray	Khinhaom	Northwest	Low-Risk
										Kampong Cham	Cheung Prey	Ruessel Lor	Central Lowland	Low-Risk
										Kampong Cham	Cheung Prey	Kngaok	Central Lowland	Low-Risk
										Tboung Khmum	Memot	Karbut	Central Lowland	Low-Risk
										Tboung Khmum	Memot	Chamkar Thmei	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 29/09/2021 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	
NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 01-HOUR				NO ANY DETECTION OF FLASH FLOOD WITHIN NEXT 03-HOUR				Kon Tum	Sa Thay	Central Highlands	Low-Risk	
								Gia Lai	Kbang	Central Highlands	Low-Risk	
								Gia Lai	Kbang	Central Highlands	Low-Risk	
								Phu Yen	Tuy Hoa	South Central Coast	Low-Risk	
								Binh Thuan	Tanh Linh	South Central Coast	Low-Risk	
								Binh Thuan	Ham Thuan Nam	South Central Coast	Low-Risk	
								Dong Nai	Xuan Loc	Southeast	Low-Risk	
								Tay Ninh	Tan Bien	Southeast	Low-Risk	
								Ha Tinh	Nghi Xuan	North Central	Low-Risk	
								Ha Tinh	Huong Son	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 Sep 29.

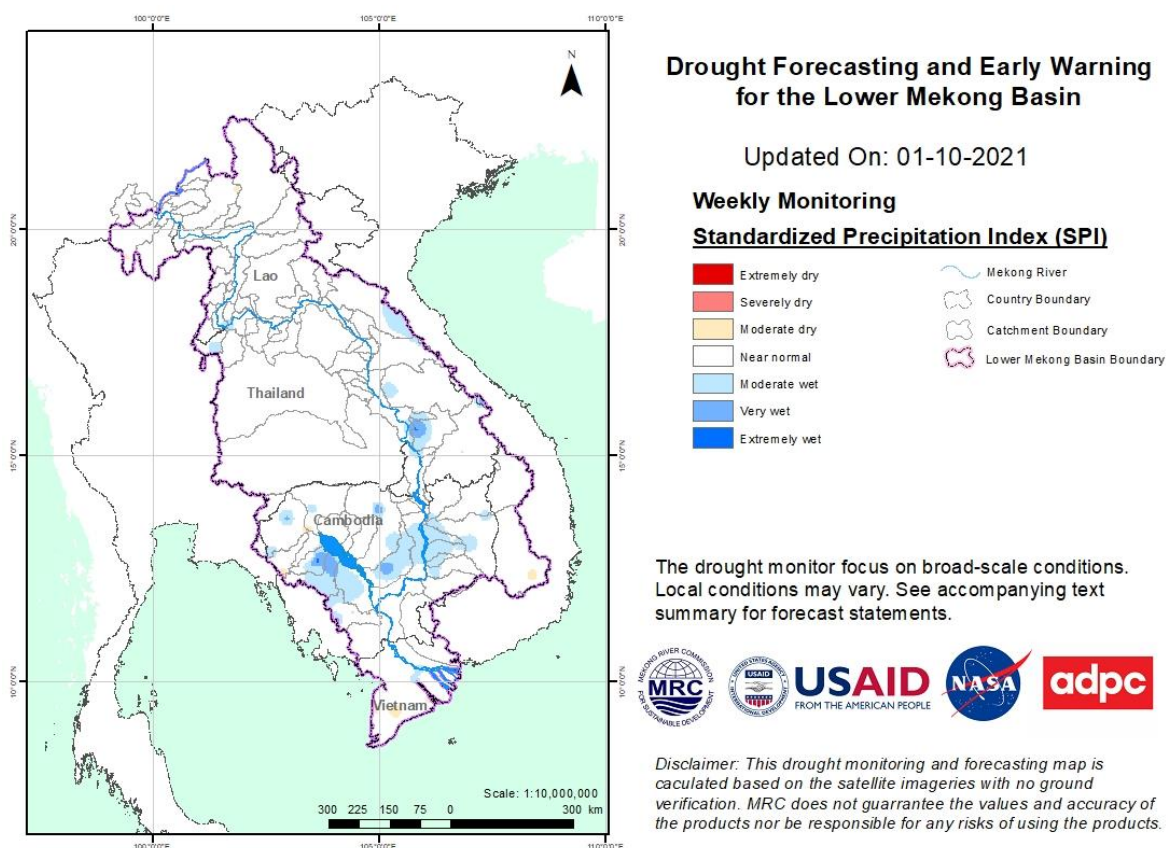
## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from 25 September to 01 October 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)**

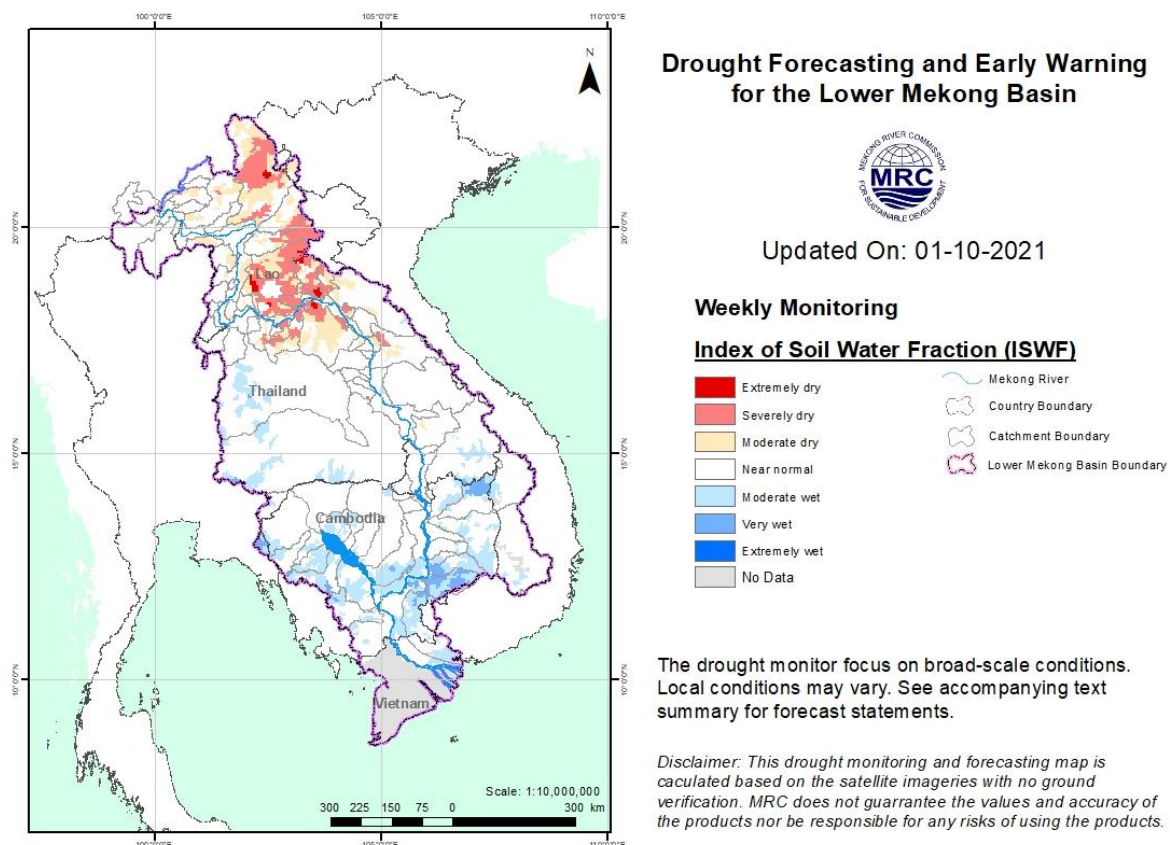
Meteorological drought indicator of SPI from September 25 to October 1, as shown in [Figure 15](#), shows that the entire LMB was either normal or wet; the region received from average to above average rainfall during the monitoring week.



**Figure 15.** Weekly standardized precipitation index from 25 September to 01 October 2021.

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

The soil water fraction from September 25 to October 1, as displayed in [Figure 16](#), shows wet condition in the middle and lower parts and dry condition in the upper part of the LMB. The anomaly dry soil moistures covered some area of Phongsaly, Oudomxay, Luang Prabang, Xiengkhuang, Vientiane, Xaysomboun, Borikhamxay, and Khammuane of Lao PDR and Nong Khai, Udon Thani, and Sakon Nakhon of Thailand. The conditions were at moderate and severely dry.

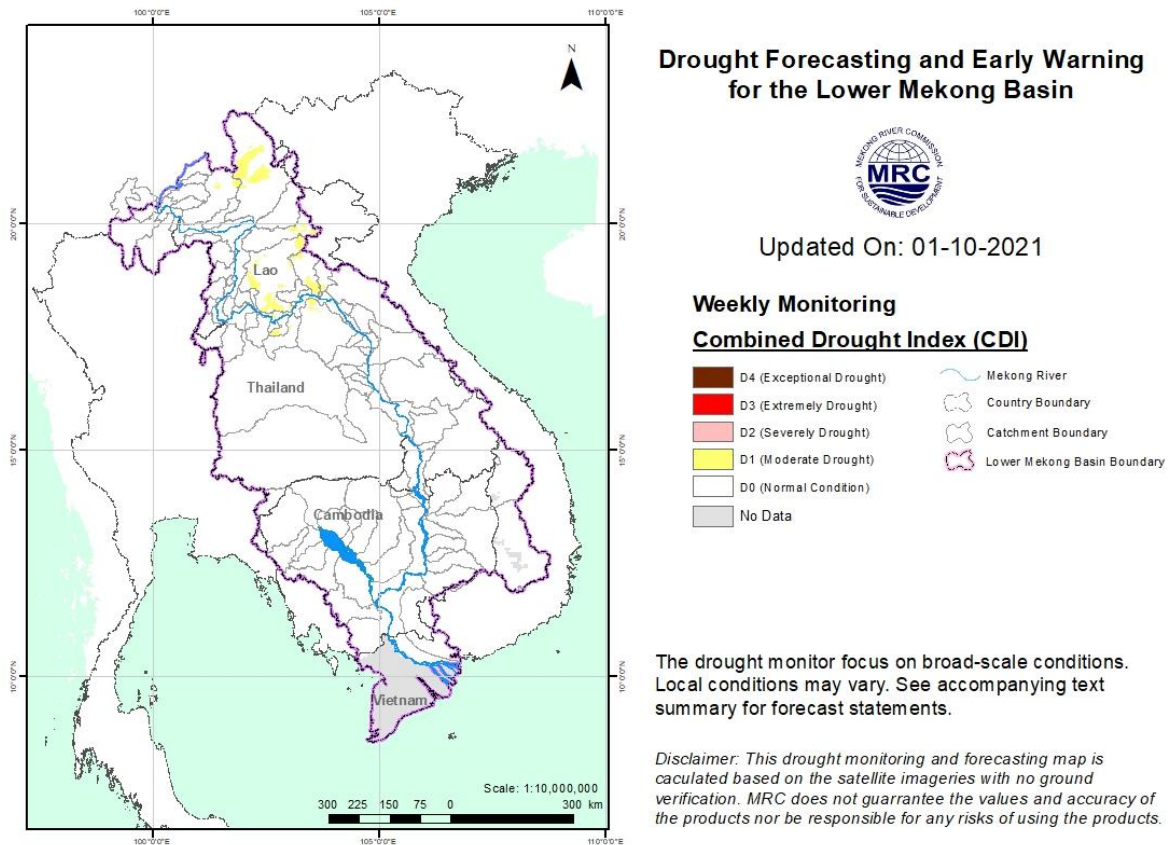


**Figure 16.** Weekly Soil Moisture Anomaly from 25 September to 01 October 2021.

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

Amid some anomaly dry soil moistures in the northern part, the LMB were generally at normal during the monitoring week, as displayed in [Figure 17](#). The combined drought indicator reveals normal conditions in most part of the region.





**Figure 17.** Weekly Combined Drought Index from 25 September to 01 October 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.

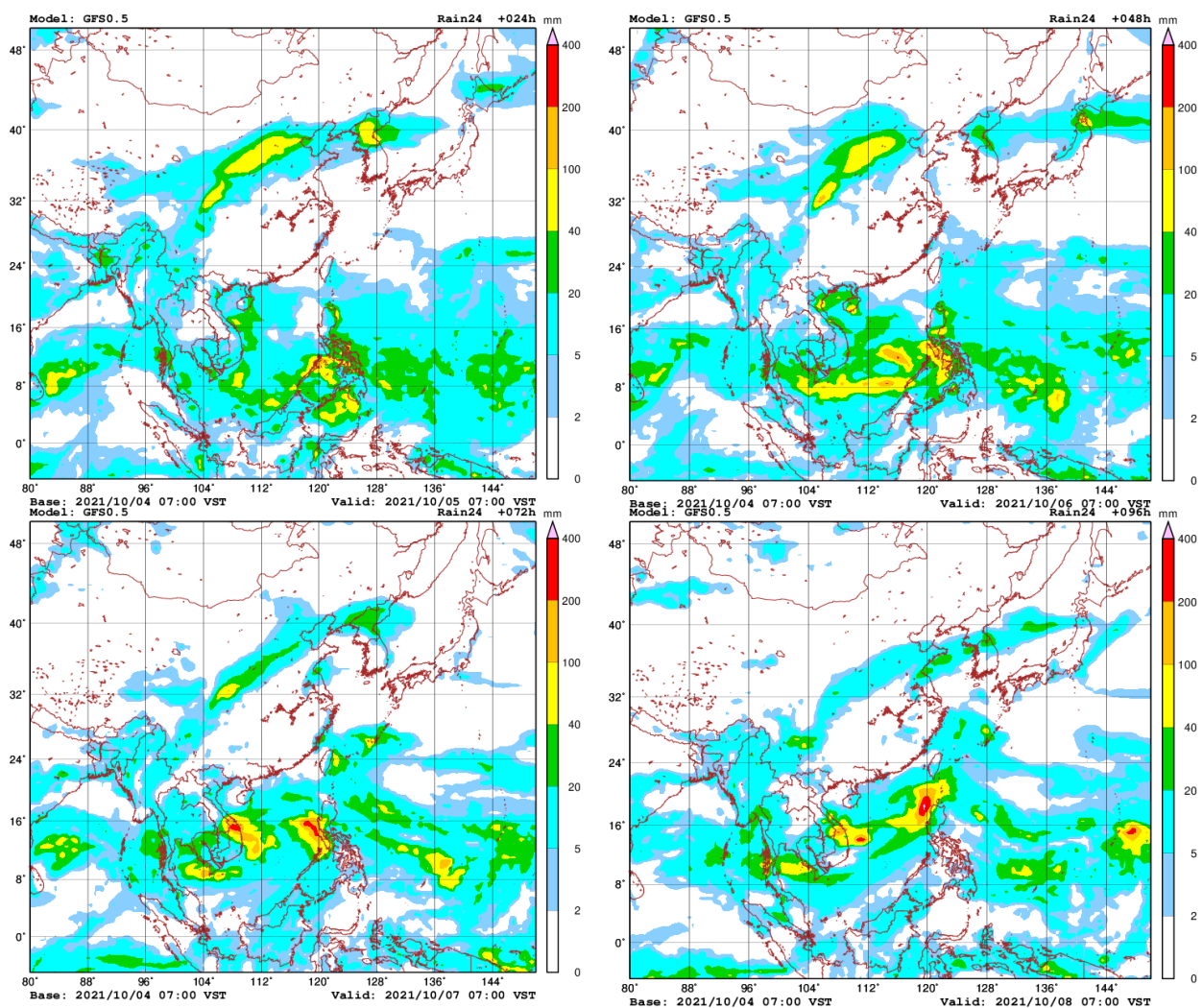
## 6 Weather and Water Level Forecast and Flash Flood Information

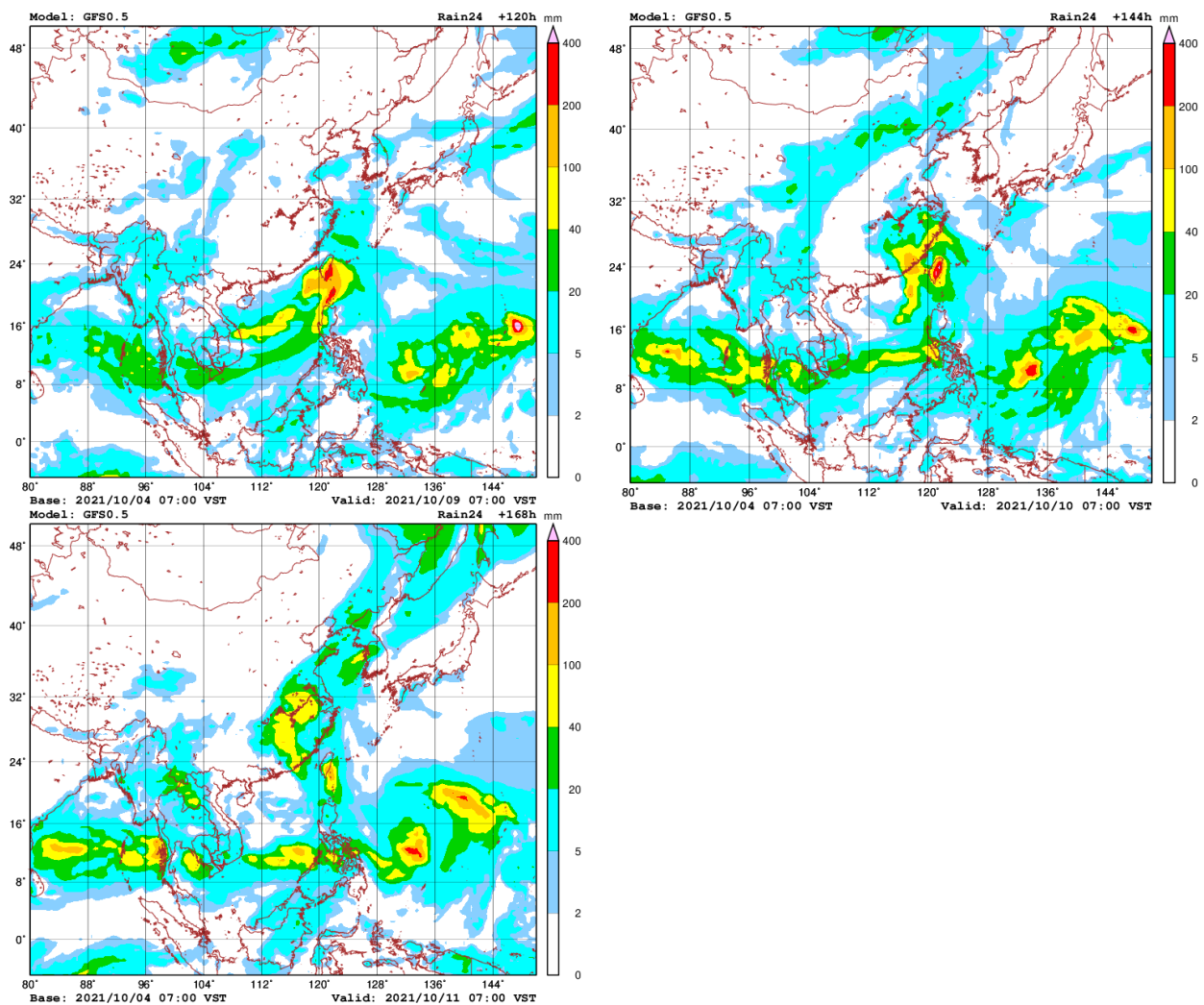
### 6.1 Weather and rainfall forecast

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

In general, from October 5 to 11, moderate rainfall (20-50 mm/24h) will likely occur over the LMB, however from October 7 to 10, heavy rainfall (>50 mm/24h) will likely occur in some areas of the middle and lower parts of the LMB.

[Figure 18](#) shows accumulated rainfall forecast (24 h) of the GFS model from October 5-11.





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

## 6.2 Water level forecast

### Chiang Saen and Luang Prabang

Based on October 4's daily flood forecasting bulletin, the daily forecasted water level at Chiang Saen in Thailand is expected to increase from 2.45 m to 2.60 m over the next five days. The trend will keep the water level at this station below its LTA.

For Luang Prabang in Lao PDR, the water level will slightly increase from 9.34 m to 9.83 m during the next five days. The current water level is lower than its LTA. Precipitation is forecasted for the area between Chiang Saen and Luang Prabang next week.

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

The water level at Chiang Khan in Thailand is forecasted to go up approximately 0.40 m, while water level at Vientiane in Lao PDR will also increase about 0.29 m. Furthermore, from Nong Khai in Thailand, the water level will slightly increase about 0.22 m over the next five days; however, at Paksane in Lao PDR water level will likely decrease about 0.33 m due to low 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 decrease between 0.45 m and 1.37 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 Kampong Cham/Phnom Penh to Koh Khel/Neak Luong**

From Stung Treng to Kampong Cham along the Mekong River in Cambodia, the water levels will go down from 0.10 m to 0.95 m over the next five days. Precipitation is forecasted for the area between Stung Treng and Kampong 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 by about 0.25 m over the next five days.

Water levels at most of the stations will continue to stay lower than their LTA value, particularly in the lower part of the region 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 above their minimum 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 28 September to October 4 2021, is presented in **Annex 1**.

[Table 2](#) shows the daily flood forecasting Bulletin issued on October 4. 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**

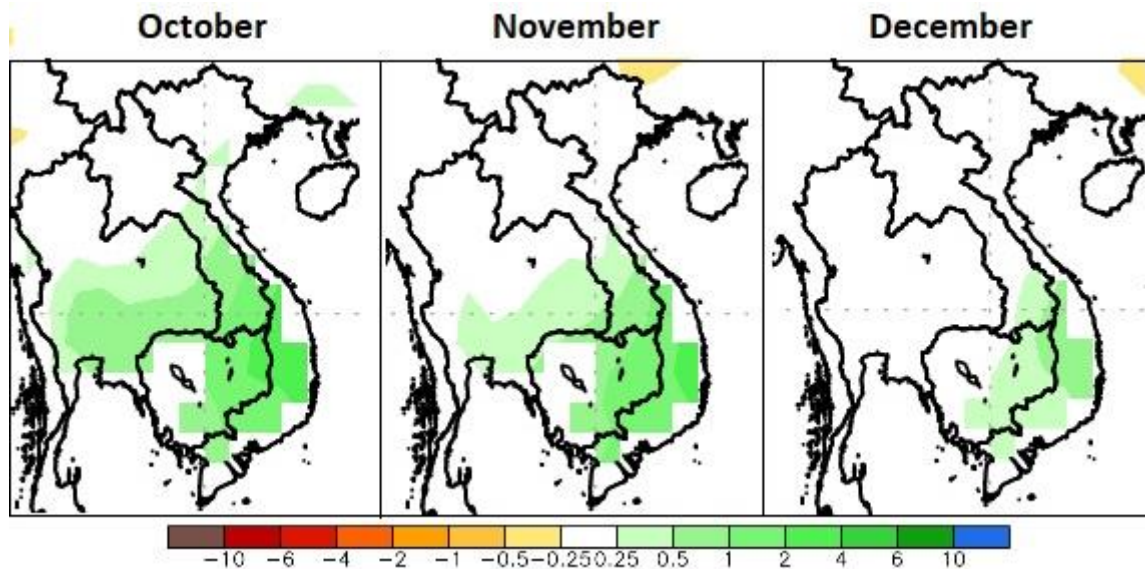
With moderate and heavy rainfall forecasted for next week, flash floods with high level are expected to take place in the LMB. And local heavy rain in a short period of time is possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice a day at: <http://ffw.mrcmekong.org/ffg.php>.

Detailed information on Flash Flood Warning Information as well as 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 November 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 October to December 2021 produced by the NMME.



**Figure 19.** Daily average of monthly rainfall anomaly forecast from October to December 2021.

The ensemble prediction model based on the initial conditions in September reveals that the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.

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



## 7 Summary and Possible Implications

### 7.1 Rainfall and its forecast

Rain was observed from Chiang Saen in Thailand to Pakse in Lao PDR during September 27-October 4, including the lower part in Cambodia and Viet Nam, varying 4.40 mm to 112.70 mm, and considered low compared with last week.

Based on the forecasted satellite data, rainfall is forecasted for some areas of the LMB with the value range from 20 mm to 100 mm for the next seven days. The forecasting model using GFS data, moreover, shows that significant rainfall (<100 mm) is likely to take place in the Mekong region from 5 to 11 October 2021.

### 7.2 Water level and its forecast

According to MRC's observed water level data, the outflows at Jinghong hydrological station showed water level changes over the monitoring period from 20 September to 4 October 2021. It moved from **535.22 m on 20 Sept to 535.25 on 4 Oct 2021 (recorded on 7:00 am)**. The outflow was up from 801 m<sup>3</sup>/s on Sept 20 to 819 m<sup>3</sup>/s on Oct 4, 2021. From September 20 to October 4, water level at this station dropped about 0.02 m and was about 0.01 m higher than its historical minimum value.

Along with the significant low outflow from Jinghong upstream, water levels of monitoring stations at Chiang Saen in Thailand also decreased about 0.55 m from 23 September to 4 October 2021. Moreover, from Chiang Khan in Thailand to Vientiane in Lao PDR, water levels decreased about 1.55 m during 28 September-4 October due to less rainfall in the area and influence from the dam operation. Water levels from Nakhon Phanom in Thailand to Savannakhet in Lao PDR were also decreasing. Water levels from the stretches of the river from Stung Treng to Kratie and at Kampong Cham in Cambodia were significantly decreasing, due to low rainfall and following the same trend of the upstream flow (at Pakse and 3S area in Vietnam).

Over the next five days, the water levels from Khong Chiam to Pakse and from Stung Treng to the lower part at key stations in Cambodia are expected to drop between 0.30 m and 1.00 m.

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

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

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

Since the fourth week of October 2021, water levels across most monitoring stations in the LMB have significantly dropped to the level lower than their LTA (from upper to lower stretches within the LMB). For a more complete preliminary analysis of the hydrological conditions in the LMB over July–December 2020 and November 2020 to May 2021 see this [Situation Report](#).

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

### **7.3 Flash flood and its trends**

With the predicted amount of rainfall for the coming week as mentioned earlier in [section 6.1](#), the major flash floods are expected in the LMB during next week. And local heavy rain in a short period of time is possible with unexpected short flash floods.

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

Soil moisture conditions were anomaly dry in some areas of the upper part of the LMB. However, the combined drought indicator shows that the LMB did not face any significant drought during the monitoring week from September 25 to October 1. The entire LMB region received from average to above average rainfall.

For the upcoming three-month forecast, the LMB is likely to receive above average rainfall in October mainly in the central and southern parts of the region. Like 2020, the forecast shows that October is likely the wettest month of the year. November is forecasted to receive from average to above average rainfall throughout the LMB; the wetter part is likely to take place in the south. Lastly, in December the forecast shows some rain which likely take place in the south of the region.



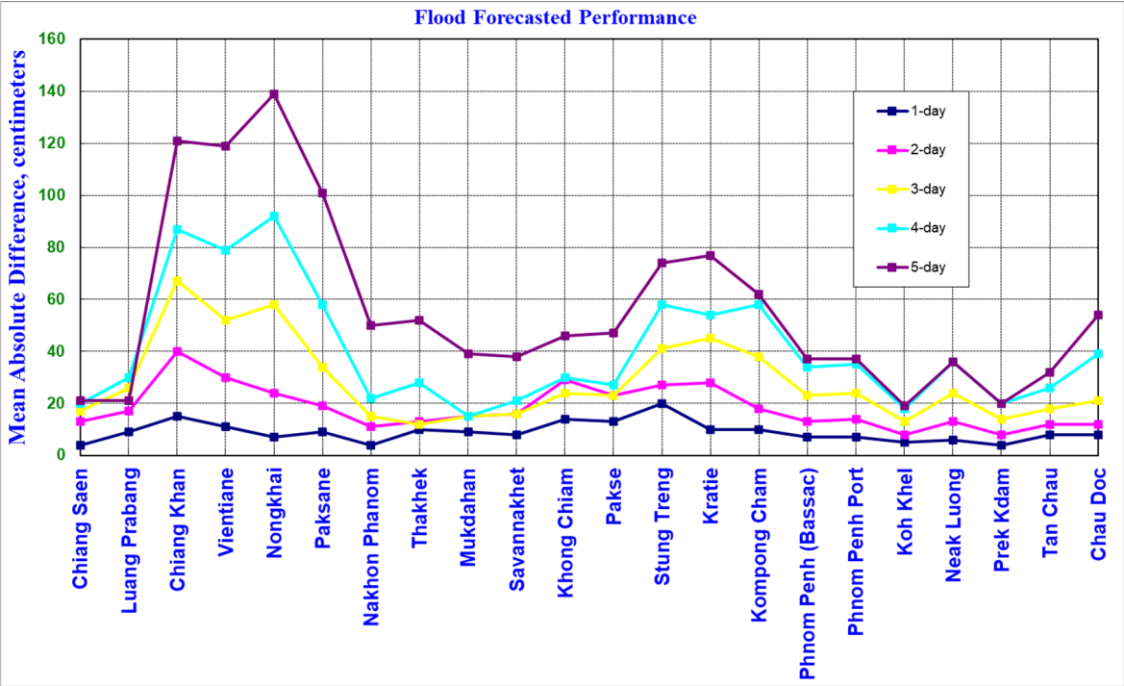
# Annex 1: Performance of the weekly flood forecasting

## 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 28 September to 4 October 2021.

The forecasting values from 28 September to 4 October show that the overall accuracy is fair for a one-day to three-day forecast in lead time at stations in the middle to the lower parts of the Mekong River from Luang Prabang to Chiang Khan due to the effect of heavy 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 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 Vietnam 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 28 September to 4 October, 2021.

**Table B1:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 28 September to 4 October, 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 Khei	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
1-day	4	9	15	11	7	9	4	10	9	8	14	13	<u>20</u>	10	10	7	7	5	6	4	8	8
2-day	13	17	<u>40</u>	<u>30</u>	<u>24</u>	19	11	13	15	16	<u>29</u>	<u>23</u>	<u>27</u>	<u>28</u>	18	13	14	8	13	8	12	12
3-day	17	<u>26</u>	67	52	58	<u>34</u>	15	12	15	16	<u>24</u>	<u>23</u>	<u>41</u>	<u>45</u>	<u>38</u>	<u>23</u>	<u>24</u>	13	<u>24</u>	14	18	<u>21</u>
4-day	<u>20</u>	<u>30</u>	87	79	92	58	<u>22</u>	<u>28</u>	15	<u>21</u>	<u>30</u>	<u>27</u>	58	54	58	<u>34</u>	<u>35</u>	18	<u>36</u>	<u>20</u>	<u>26</u>	<u>39</u>
5-day	<u>21</u>	<u>21</u>	121	119	139	101	<u>50</u>	52	<u>39</u>	<u>38</u>	<u>46</u>	<u>47</u>	74	77	62	<u>37</u>	<u>37</u>	19	<u>36</u>	<u>20</u>	<u>32</u>	54

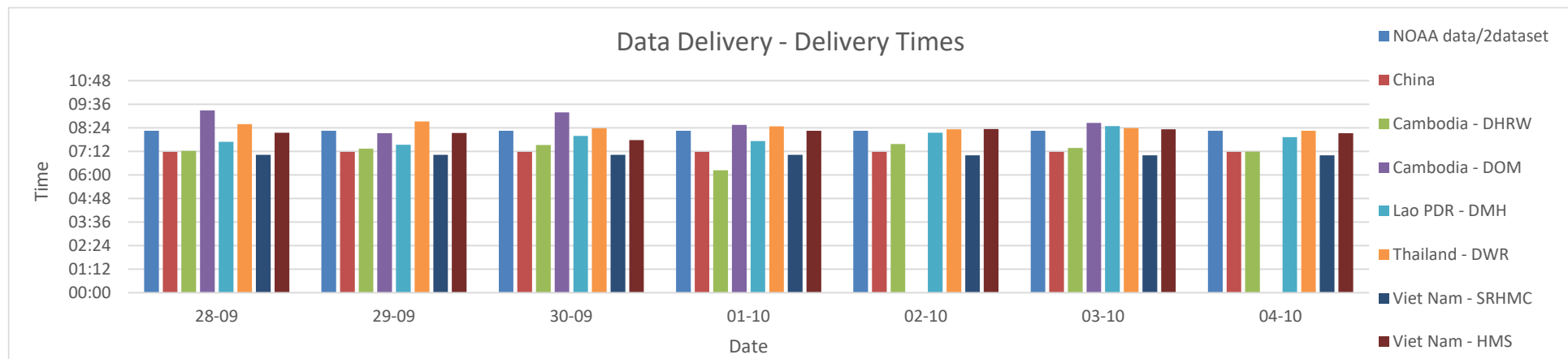
**Table B2:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 28 September to 4 October, 2021 in %

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 Khei	Neak Luong	Prek Kdam	Tan Chau	Chau Doc	Average	
1-day	<u>42.9</u>	71.4	57.1	71.4	71.4	57.1	71.4	57.1	<u>28.6</u>	57.1	71.4	85.7	<u>42.9</u>	71.4	57.1	71.4	57.1	<u>42.9</u>	57.1	71.4	57.1	57.1	57.1	<u>60.4</u>
2-day	66.7	66.7	66.7	66.7	<u>50.0</u>	66.7	66.7	66.7	<u>50.0</u>	<u>50.0</u>	66.7	66.7	<u>50.0</u>	<u>50.0</u>	<u>33.3</u>	66.7	66.7	66.7	<u>50.0</u>	<u>33.3</u>	66.7	66.7	66.7	<u>59.1</u>
3-day	<u>40.0</u>	60.0	60.0	60.0	60.0	60.0	80.0	80.0	60.0	60.0	60.0	80.0	60.0	60.0	60.0	60.0	60.0	60.0	<u>40.0</u>	<u>40.0</u>	80.0	60.0	60.0	<u>60.9</u>
4-day	75.0	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>25.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>25.0</u>	75.0	75.0	<u>50.0</u>	75.0	<u>25.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>50.0</u>	<u>51.1</u>
5-day	<u>33.3</u>	<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	<u>33.3</u>	66.7	66.7	<u>33.3</u>	66.7	<u>33.3</u>	66.7	66.7	<u>33.3</u>	<u>33.3</u>	<u>33.3</u>	<u>33.3</u>	<u>50.0</u>

**Table B3: Overview of performance indicators for the past 7 days from 28 September to 4 October 2021**

	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
	FF completed and sent (time)	Stations without forecast	FF2 completed and sent (time)	Weather data available (time)	NOAA data	China	Cambodia - DHRW	Cambodia - DOM	Lao PDR - DMH	Thailand - DWR	Viet Nam - SRHMC	Viet Nam - HMS	NOAA data/2dataset	China/2	Cambodia - DHRW/15	Cambodia - DOM/34	Lao PDR - DMH/32	Thailand - DWR/13	Viet Nam - SRHMC/6	Viet Nam - HMS/39
<b>2021</b>																				
<i>week</i>	10:23	00:00	-	-	08:15	07:10	07:12	08:45	07:55	08:26	07:00	08:09	0	0	0	68	57	14	1	0
<i>month</i>	10:30	00:00	-	-	08:15	07:10	07:21	08:36	08:26	08:14	07:17	08:09	0	0	14	272	334	48	7	38

**Fig. B4: Data delivery times for the past 7 days from 28 September to 4 October 2021**



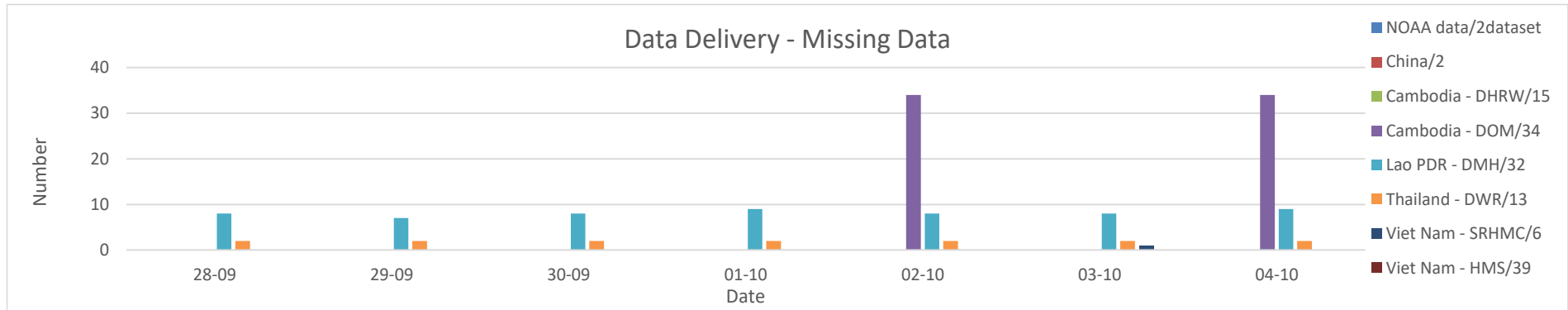
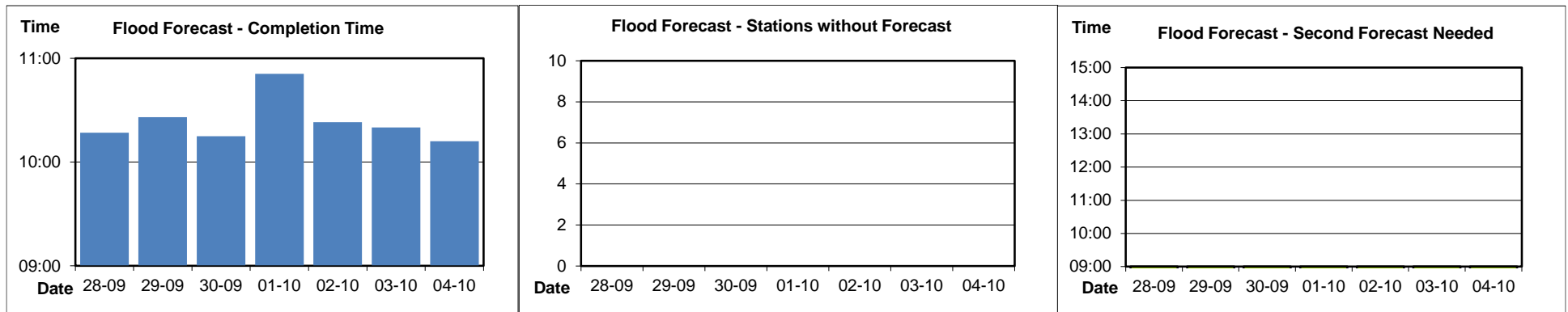


Fig. B5: Missing data for the past 7 days from 28 September to 4 October 2021

Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 28 September to 4 October 2021





## Mekong River Commission Secretariat

P. O. Box 6101, 184 Fa Ngoum Road, Unit 18 Ban Sithane Neua, Sikhottabong District, Vientiane 01000, Lao PDR  
Tel: +856 21 263 263. Fax: +856 21 263 264 [www.mrcmekong.org](http://www.mrcmekong.org)

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