



**Mekong River Commission**

**Weekly Wet Season Situation Report  
in the Lower Mekong River Basin  
15 – 21 September 2020**

Prepared by  
The Regional Flood and Drought Management Centre  
22 September 2020

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# 1 Introduction

This Weekly Wet Season Situation Report presents a preliminary analysis of the weekly hydrological situation in the Lower Mekong River Basin (LMB) from **15 - 21 September 2020**. The trend and outlook for water levels are also presented.

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

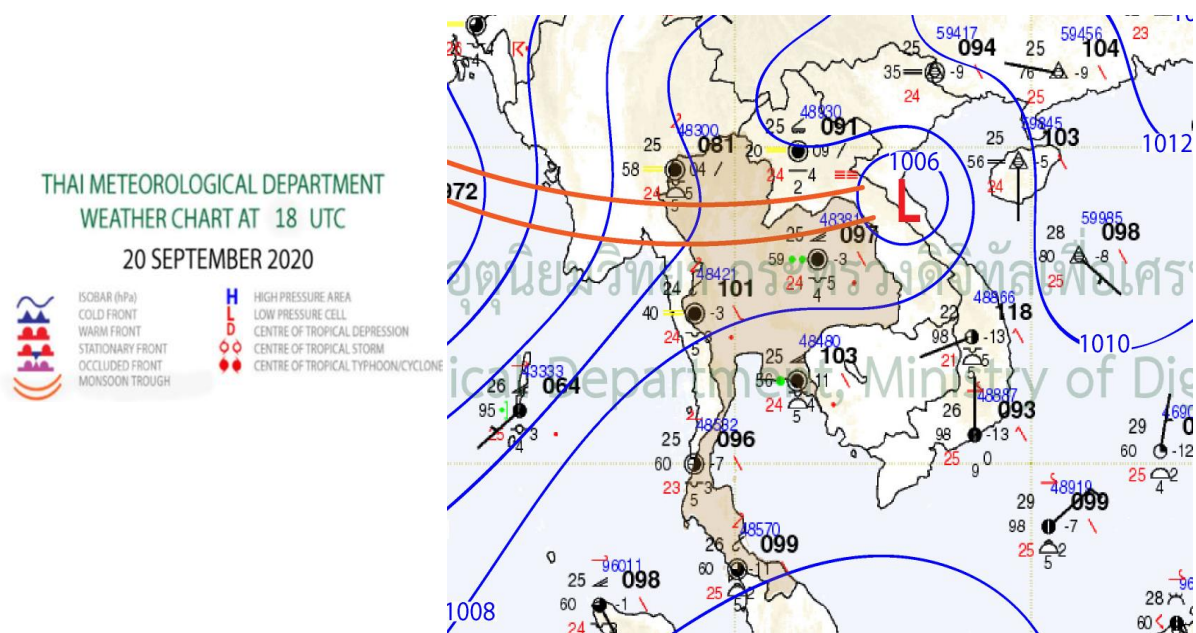
Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

## 2 General Weather Patterns

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

Since early September 2020, below and moderate-normal rainfall has been observed in the LMB, with the amount gradually decreasing from the fourth week of August. The data from the TMD predict that instances of low pressure and tropical cyclones may continue moving closer to the Mekong region in September, when heavy rainfall often occurs in the Mekong region. The TMD also predicts that scattered thundershowers throughout September will continue in the north-eastern part of Thailand (within the Mekong region).

[Figure 1](#) presents the weather map of 20 September 2020, showing two lines of low pressure of the Monsoon Trough crossing the upper Mekong region which can bring some rainfall over the next few days.



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

According to the Asian Specialised Meteorological Centre (ASMC), increased shower rainfall over the Mekong sub-region, above-normal rainfall, and hotspot activities are likely to occur in September, October and November. In the southern ASEAN region, rainfall over most parts of the equatorial region is predicted to be above normal in September.

Subsequently, from September to October, there is an increasing chance of moderate to above average rainfall for most Asian countries, especially in the Mekong region. [Figure 2](#) shows the predicted rainfall in September, October and November 2020 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).



## SON 2020 Rainfall (tercile summary), NCEP

Initial conditions 6 Aug 2020 - 15 Aug 2020

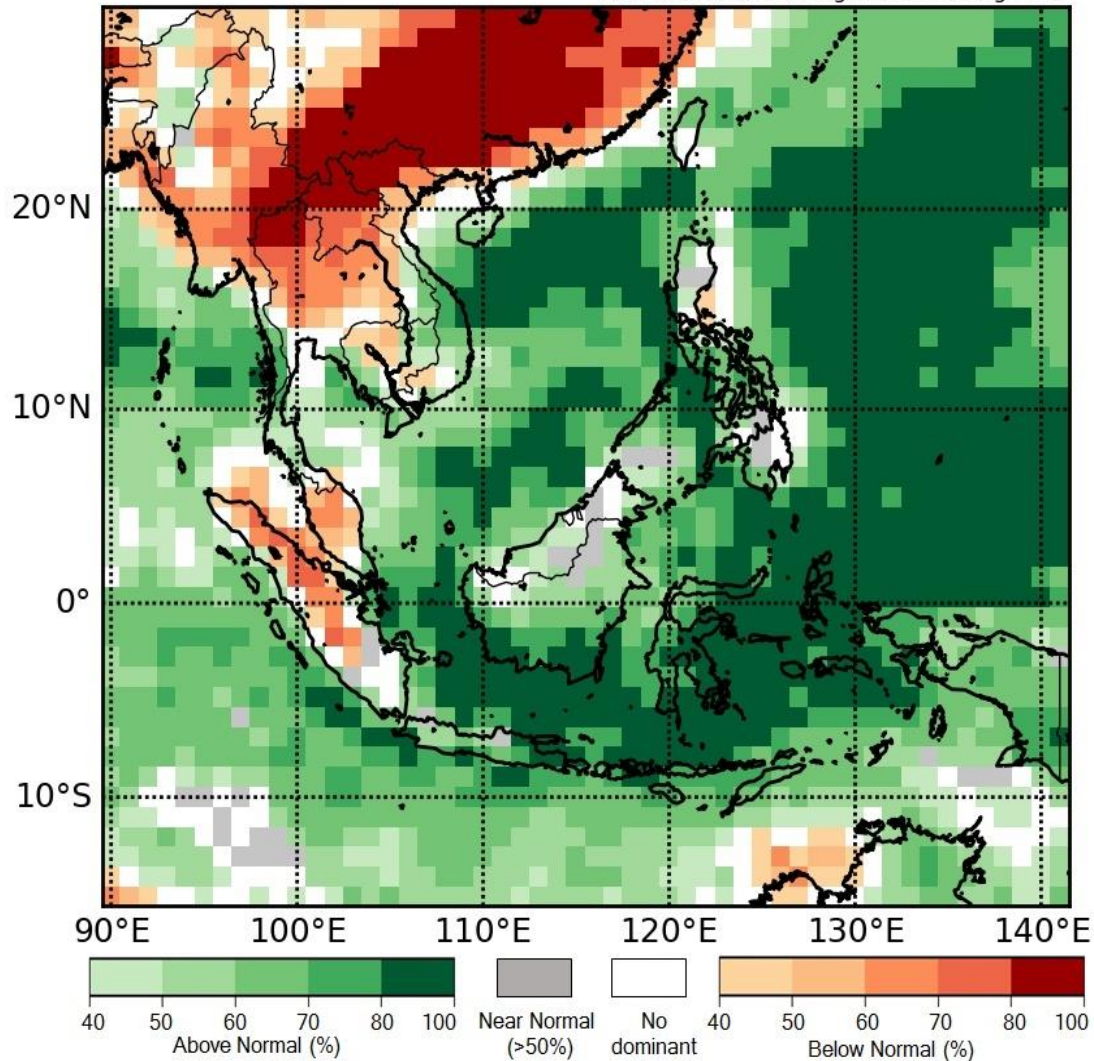


Figure 2: Predicted rainfall over the Asian Countries by ASMC

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

There was a tropical storm NOUL hitting the LMB during this reporting week from 17 to 18 September 2020, causing flash floods in the middle part of Khong Cham in Cambodia and Pakse in Lao PDR; and also the 3S area (Se Kong, Se San and Sre Pok). According to the National Center for Hydro-meteorological Forecasting (NCHMF) in Viet Nam, the Storm Noul hit Viet Nam from 17-18 September killing at least 5 people and leaving 112 injured with some missing. Up to 21 September, there are still two lines of low pressure moving across the upper part of the Mekong Region which could bring some rain in northern part of the LMB.



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 September 15 to 21.

The amount of rainfall this week - from 26 mm to 256 mm was considered higher than average in the middle part of the basin from Cambodia's Khong Cham to Viet Nam's Tan Chau and Chau Doc, but was lower than average in the upper part from Thailand's Chiang Saen to Lao PDR's Vientiane.

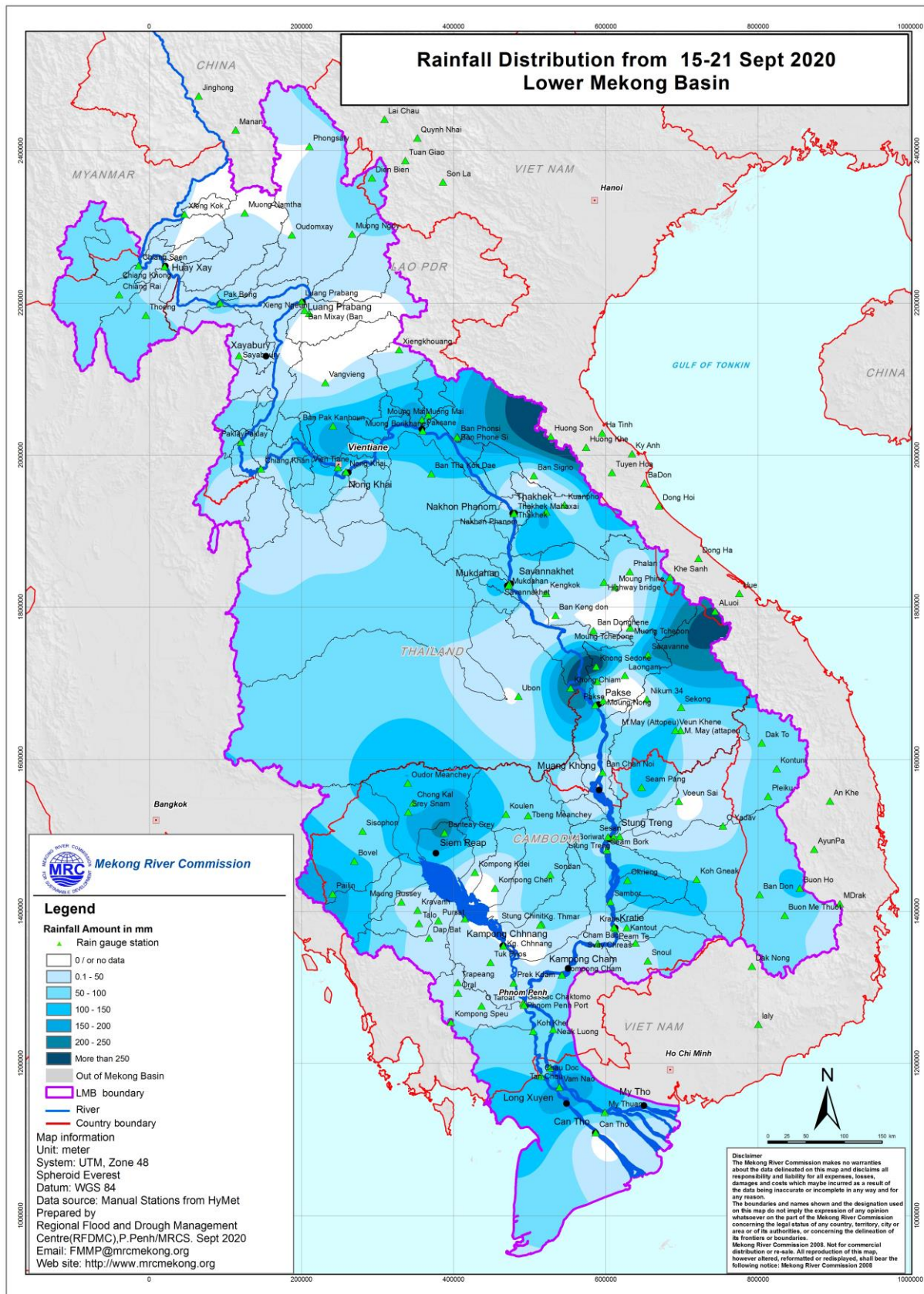


Figure 5: The weekly rainfall distribution over the LMB

### 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 to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane to present flows generated by climate conditions in the upper part of the LMB; at Pakse 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>.

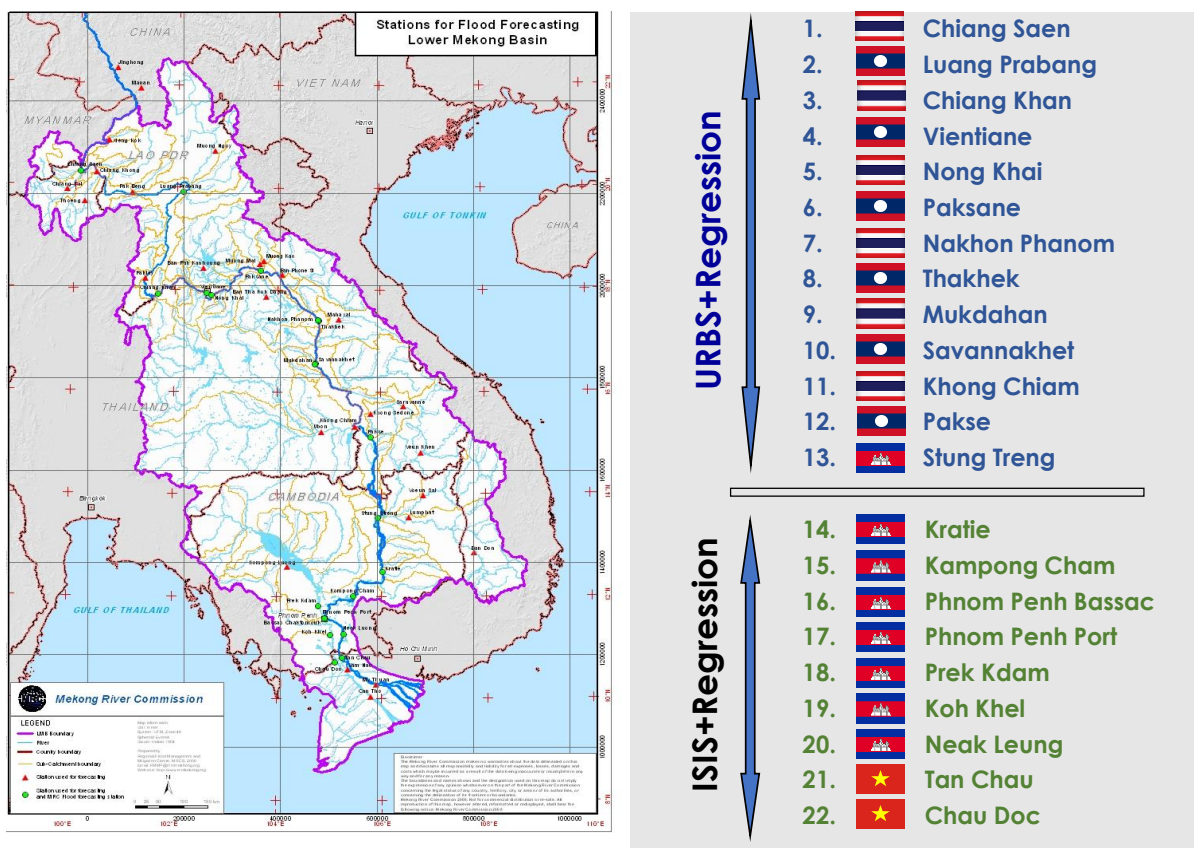


Figure 6: Key stations and model application for River Monitoring and Flood Forecasting

#### Chiang Saen and Luang Prabang

Water level during September 15-21 at Chiang Saen station in Thailand was fluctuating between -0.14 metres and 0.16 metres during this reporting week. The main causes of such a phenomenon are believed to be a less quantity of inflow volume from the upstream, stemming from Lao PDR, Myanmar and Lancang (Mekong) in China, and continued lower rainfall over recent weeks contributed by catchment inflows. When comparing to last week, this week’s water level is relatively lower.

Water level at Luang Prabang monitoring station in Lao PDR was also slightly fluctuating, between -0.16 metres and 0.31 metres, during the reporting period. Compared to last week, the figure shows an increasing number, from 9.92 metres to 10.32 metres. While this level is higher than that of 2019, it remains lower than its long-term average (LTA).

Being situated between the upstream (Nam Beng, Nam Ou, Nam Suong, and Nam Khan) and downstream (Xayaburi) hydropower dams, 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 wet season.**

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

Water level at Chiang Khan in Thailand increased from 7.88 metres last week to 8.50 metres this week, standing 2.15 metres lower than its LTA value. The level is at minimum record and is as low as the record in 2019. Operation of the Xayaburi dam upstream is believed to be the main cause.

Downstream water levels from Vientiane to Paksane in Lao PDR followed the same direction of the Chiang Khan's one. The fluctuation varied between -0.14 and 0.56 metres. Less water contribution from upstream inflows and sub-catchments is likely the main reason. **Compared to this time last year, water levels at these stations are more than 2 meters higher.**

### Nakhon Phanom to Pakse

Due to the storm NOUL, water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR were increasing during the reporting period, from -0.18 to 0.56 metres. Heavy rainfall in upstream and its adjacent catchments is likely the cause of these increasing water levels. [Figure 7](#) shows that water levels at these two stations were rising above their historical minimum levels. **During this week, water levels at the two stations were higher than their historical minimum values, when last week they were lower and considered critical.**

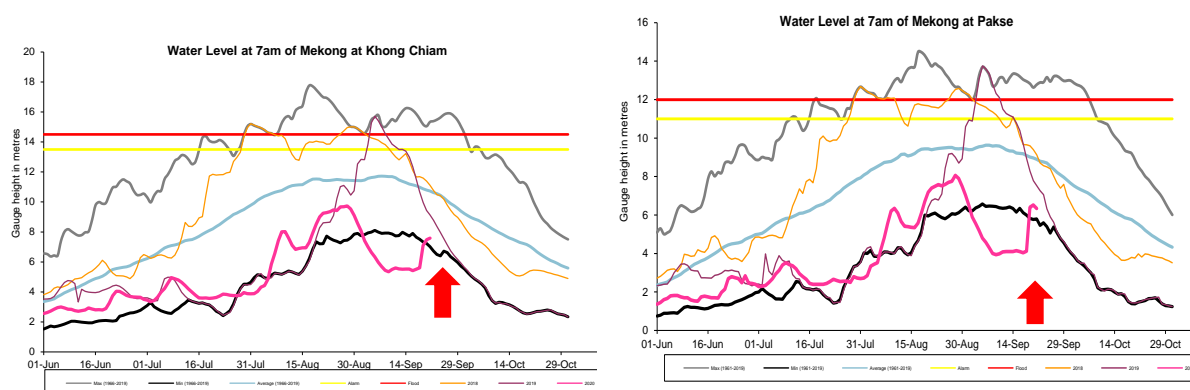
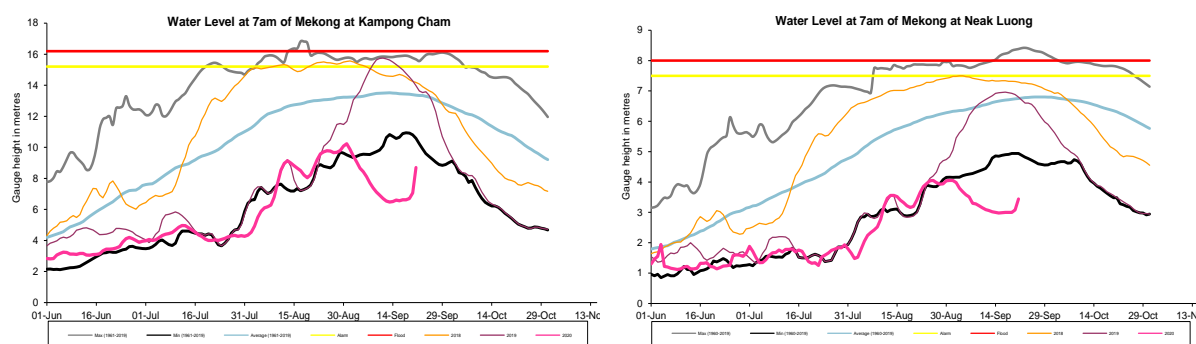


Figure 7: Water levels at Nakhon Phanom of Thailand and Pakse of Lao PDR

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

Like many of the upstream stations, water levels at Stung Treng, Kratie, Kampong Cham, Chaktomuk, Koh Khel, Phnom Penh Port, and Prek Kdam stations in Cambodia increased rapidly, rising more than 1 metre higher than last week situation. **This week's water levels, Figure 8, are still considered critical from Kampong Cham to Neak Luong in Cambodia.**



**Figure 8: Water levels at Kratie on Mekong River and Prek Kdam on Tonle Sap River**

## Tidal stations at Tan Chau and Chau Doc

Like last week, water levels at the two tidal stations of Viet Nam's Tan Chau and Chau Doc were fluctuating below their LTAs and minimum level due to daily tidal effects from the sea. **The figures are considered as critical condition.**

## 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 (TSL). This phenomenon normally takes place from mid-May to mid-October.

[Figure 9](#) shows the seasonal changes of the inflow/reverse flow and the outflow of the TSL at Prek Kdam in comparison with the flows of 2018 and 2019, and their LTA level (1997-2019). Up to September 21 of this reporting period, **it is observed that the main reverse flow into the TSL has started since August 4. There were also two extremely small instances of the reverse flow in July, but they were not significant.** The recorded incident matches the record on reverse flow into TSL by the PMFM's (Procedures for the Maintenance of Flows on the Mainstream) tool on Article 6B (monitoring area). The delay of the reverse flow was due to the low water levels on the Mekong mainstream which were caused by deficit rainfall in upper sub-catchment areas, among other factors.

Although the reverse flows have started since August 4, water volume of the Lake up to this point has been considered critical as it is still lower than its minimum level. [Figure 10](#) shows seasonal changes in monthly flow volume up to September 21 for the TSL compared with the volumes in 2018 and 2019 and their LTA and the fluctuating levels (1997-2019). It shows that in July, August, and September (up to 21) water volume of the Lake was **at a very critical level,**

compared with last year (2019) figure and historical minimum levels at the same period. Table 1 shows the monthly change in flow volume of the TSL and the critical flow volume of the TLS in July and August 2020 compared to its historical minimum value and volumes of 2018 and 2019. This reveals that the TSL is still affected by low inflows from the Mekong River and insufficient rainfall in the surrounding sub-catchments.

The low inflows (inflows from the Mekong River and from tributaries) in the early wet season of 2020 has resulted in a very critical situation of the TSL. This demonstrates the influence of the relationships between the reverse flows, water levels of the Mekong River, and the flow direction in the complex hydraulic environment of the TSL during this wet season. The data show that more than half of the annual inflow volume into the lake originates from the Mekong mainstream. Thus, flow alterations in the mainstream could have direct impacts on the Tonle Sap Lake water levels and on hydrology.

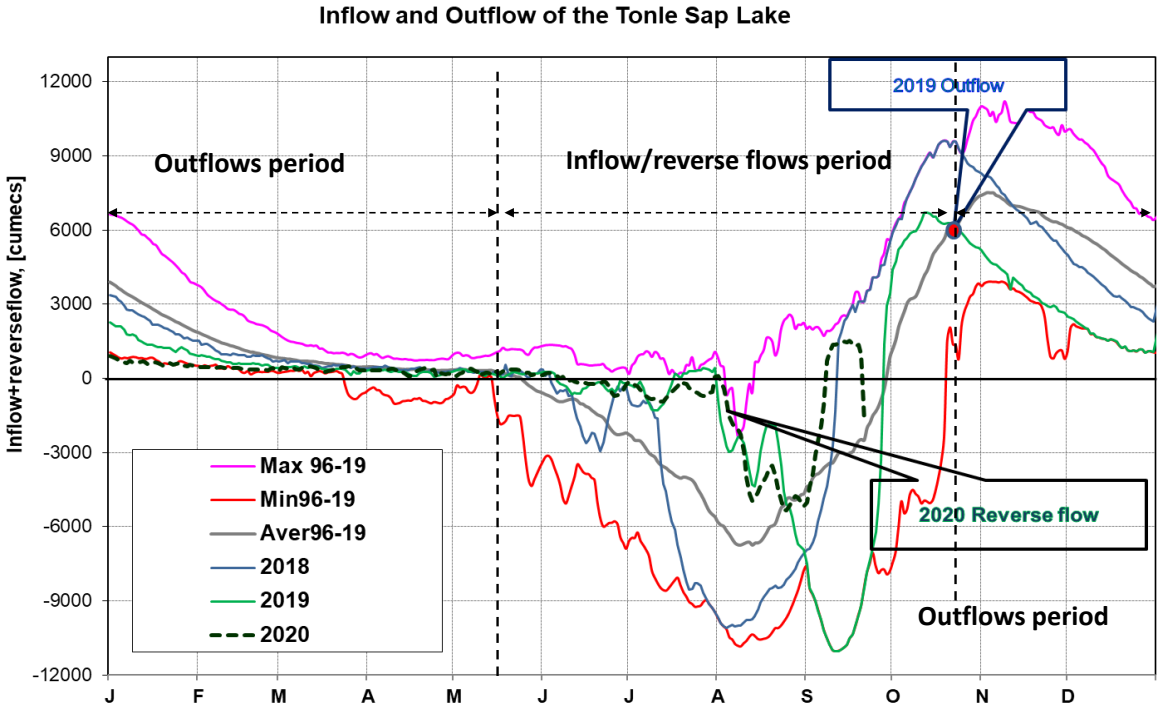


Figure 9: The seasonal change of inflows and outflows of Tonle Sap Lake



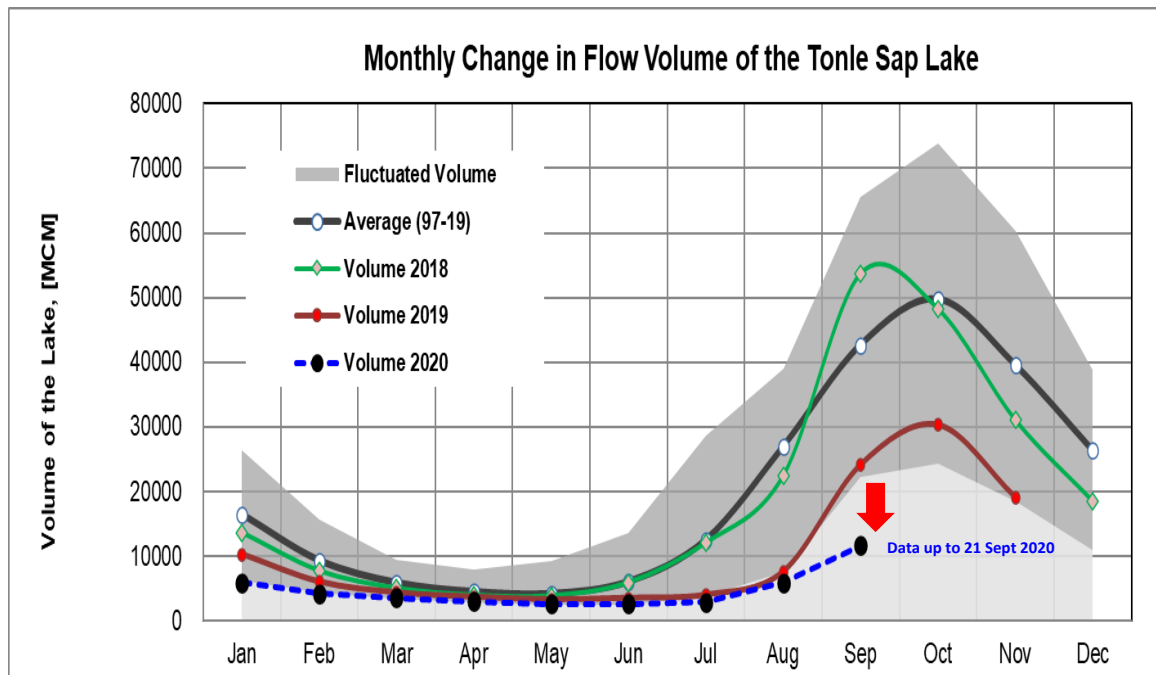


Figure 10: The seasonal change in monthly flow volume of Tonle Sap Lake

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]	Percentage of Volume in 2020 [%]
Jan	16452.95	26357.53	6272.01	13633.41	10285.31	5906.80	35.90
Feb	9312.36	15596.22	4281.41	7729.72	6019.30	4264.19	45.79
Mar	5868.92	9438.24	3350.92	5037.06	4354.62	3553.99	60.56
Apr	4474.98	8009.14	2875.42	3956.47	3667.47	2992.61	66.87
May	4166.07	9176.93	2417.81	3864.00	3266.43	2594.92	62.29
Jun	6034.10	13635.01	2470.54	5919.18	3517.06	2641.88	43.78
Jul	12502.58	28599.56	3832.51	12024.96	4001.99	2925.86	23.40
Aug	26934.35	39015.12	7554.93	22399.65	7622.71	5941.07	22.06
Sep	42644.05	65632.35	22180.73	53639.54	24194.19	11627.16	
Oct	49698.19	73757.23	24276.79	48193.08	30358.38		
Nov	39542.58	60367.33	18576.01	31036.07	19112.65		
Dec	26325.13	38888.95	10869.43	18469.21	10577.29		
	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> )							

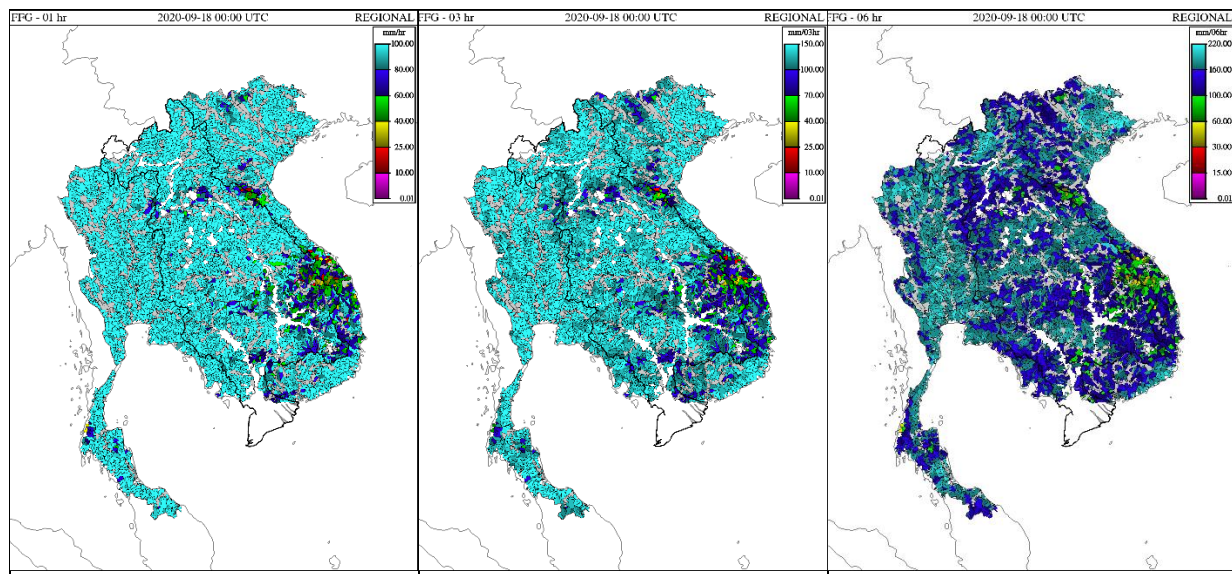
## 4 Flash Flood in the Lower Mekong Basin

During September 15-21, influence of the Tropical Depression named “NOUL” which occurred on 18 and 19 September caused heavy rain in some areas of middle part of the LMB covering Lao PDR and Thailand. According to the MRC-Flash Flood Guidance System (FFGS) and analysis, Figure 11 and Table 2, flash flood events were detected in some areas of Viet Nam and Lao PDR with the impacts ranging from low to high level.

Figure 11 and Table 2 show Flash Flood Guidance (FFG) results for the next one, three and six hours produced on 18 September 2020 at 00:00 UTC (07:00 AM local time).

**Table 2: Detected flash flood in Viet Nam and Lao PDR on 18 September 2020**

01-Hour Flash Flood Risk and Location				3-Hour Flash Flood Risk and Location in Vietnam				6-Hour Flash Flood Risk and Location in Vietnam						
Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks	Provinces	Districts	Region	Level Risks			
Nghe An	Con Cuong	North Central	Low-Risk	Nghe An	Con Cuong	North Central	Moderate-Risk	Nghe An	Con Cuong	North Central	Moderate-Risk			
Thua Thien Hue	A Luoi	North Central	Low-Risk	Nghe An	Thanh Chuong	North Central	Moderate-Risk	Nghe An	Thanh Chuong	North Central	Moderate-Risk			
Quang Nam	Hien	South Central Coast	Moderate-Risk	Kon Tum	Dak Glei	Central Highlands	Low-Risk	Thua Thien Hue	A Luoi	North Central	Moderate-Risk			
Da Nang	Hoa vang	South Central Coast	Moderate-Risk	Thua Thien Hue	A Luoi	North Central	Moderate-Risk	Quang Nam	Hien	South Central Coast	Moderate-Risk			
Quang Nam	Dai Loc	South Central Coast	Moderate-Risk	Quang Nam	Hien	South Central Coast	Moderate-Risk	Da Nang	Hoa Vang	South Central Coast	Moderate-Risk			
Kon Tum	Dak Glei	Central Highlands	Low-Risk	Da Nang	Hoa vang	South Central Coast	Moderate-Risk	Quang Nam	Hien	South Central Coast	Low-Risk			
Quang Ngai	Tra Bong	South Central Coast	Moderate-Risk	Quang Nam	Dai Loc	South Central Coast	Moderate-Risk	Quang Nam	Dai Loc	South Central Coast	Moderate-Risk			
Phu Yen	Dong Xuan	South Central Coast	Moderate-Risk	Kon Tum	Dak Glei	Central Highlands	Moderate-Risk	Kon Tum	Dak Glei	Central Highlands	Moderate-Risk			
Nghe An	Anh Son	North Central	Moderate-Risk	Kon Tum	Dak To	Central Highlands	Moderate-Risk	Kon Tum	Dak To	Central Highlands	Moderate-Risk			
				Quang Nam	Tra My	South Central Coast	Low-Risk	Quang Nam	Tra My	South Central Coast	Low-Risk			
				Quang Ngai	Tra Bong	South Central Coast	Moderate-Risk	Quang Ngai	Tra Bong	South Central Coast	Moderate-Risk			
				Quang Ngai	Son Tay	South Central Coast	Low-Risk	Quang Ngai	Son Tay	South Central Coast	Low-Risk			
				Kon Tum	Kon Plong	Central Highlands	Low-Risk	Kon Tum	Kon Plong	Central Highlands	Low-Risk			
				Quang Ngai	Minh Long	South Central Coast	Low-Risk	Quang Ngai	Minh Long	South Central Coast	Low-Risk			
				Gia Lai	Kbang	Central Highlands	Low-Risk	Gia Lai	Kbang	Central Highlands	Low-Risk			
				Phu Yen	Dong Xuan	South Central Coast	Moderate-Risk	Phu Yen	Dong Xuan	South Central Coast	Moderate-Risk			
				Kon Tum	Dak Glei	Central Highlands	Low-Risk	Ha Tinh	Huong Son	North Central	Low-Risk			
				Kon Tum	Ngoc Hoi	Central Highlands	Low-Risk	Nghe An	Anh Son	North Central	Moderate-Risk			
				Ha Tinh	Huong Son	North Central	Low-Risk							
				Nghe An	Anh Son	North Central	Moderate-Risk							
01-Hour Flash Flood Risk and Location Lao PDR				03-Hour Flash Flood Risk and Location in Lao DPR				06-Hour Flash Flood Risk and Location Lao DPR						
Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk	Provinces	Districts	Villages	Region	Level Risk
Sekong	Dakcheung	DAKVANG	Southeast	Moderate-Risk	Sekong	Kaleum	TIN	Southeast	Low-Risk	Sekong	Kaleum	TIN	Southeast	Low-Risk
					Sekong	Lamarm	KANONG MAI	Southeast	Moderate-Risk	Sekong	Lamarm	KANONG MAI	Southeast	Moderate-Risk
					Sekong	Dakcheung	DAKDEN	Southeast	Moderate-Risk	Sekong	Dakcheung	DAKDEN	Southeast	Moderate-Risk
					Sekong	Dakcheung	DAKVANG	Southeast	High-Risk	Sekong	Dakcheung	DAKVANG	Southeast	High-Risk



**Figure 11: Flash Flood Guidance (FFG) for the next 1, 3 and 6 hours on September 18 at 00:00 UTC**

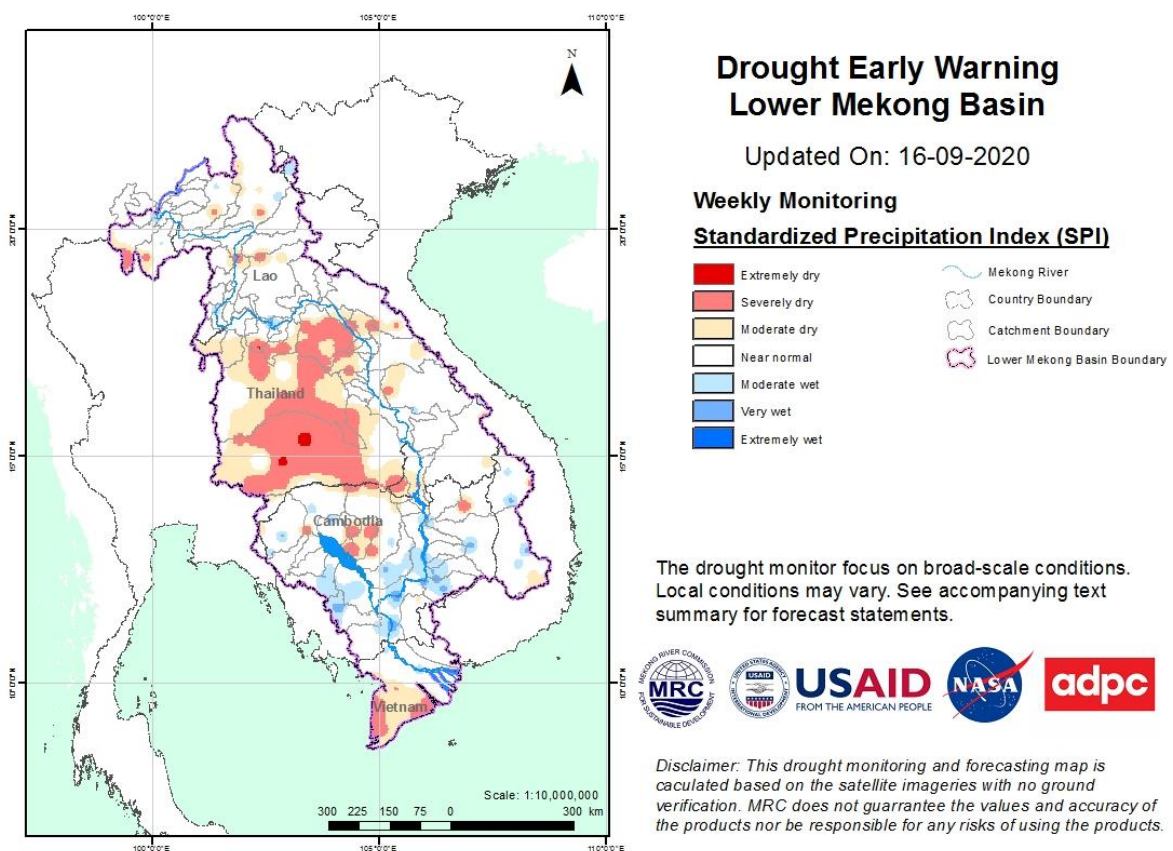
## 5 Drought Monitoring in the Lower Mekong Basin

### Weekly drought monitoring from September 10-16

Drought monitoring data are available from Thursday to Wednesday every week; thus, the reporting period is normally delayed for one week compared to Flood and Flash Flood reports.

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

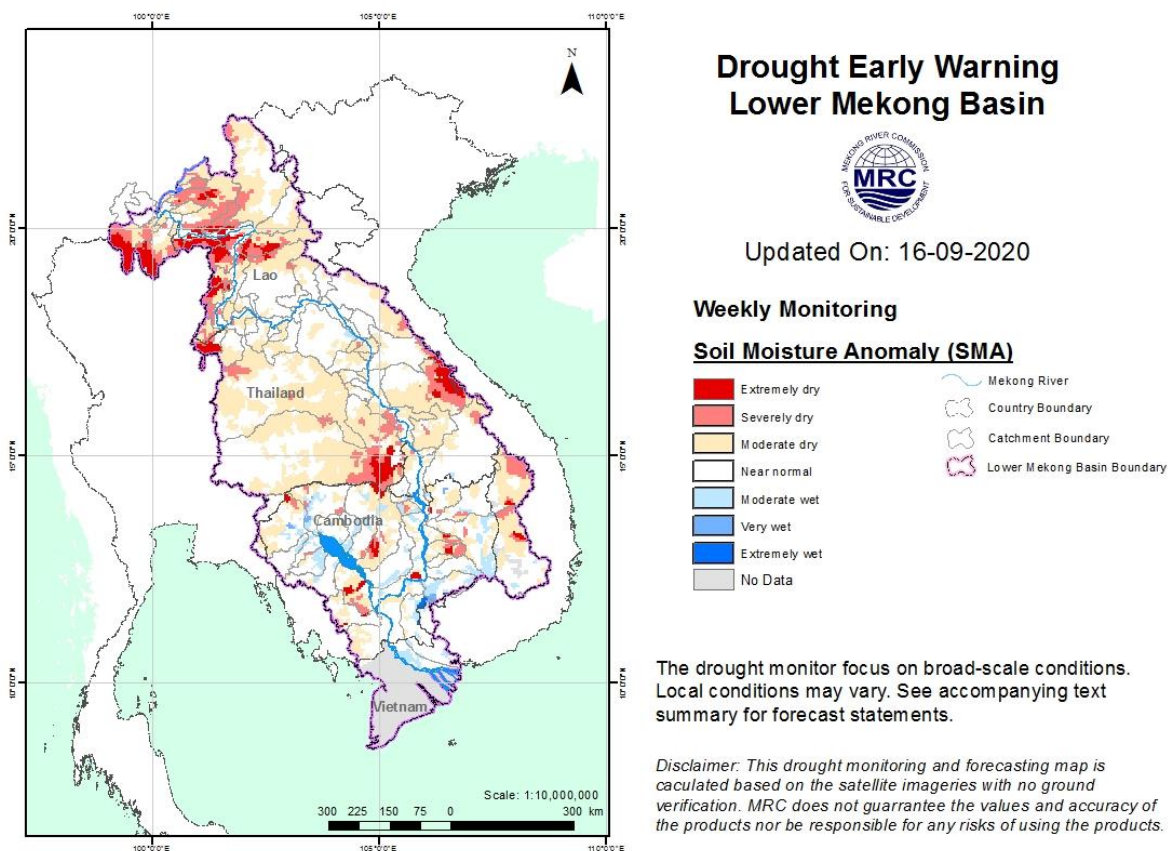
Drought condition of the LMB from September 10-16, as shown in Figure 12, did not change much comparing to the previous week. Meteorological indicator of SPI shows severe dry in most parts of north-eastern Thailand and Mekong Delta of Viet Nam which cover Buriram, Surin, Si Saket, southern and western Ubon Ratchathani, northern and southern Nakhon Ratchasima, southern Khon Kaen, Maha Sarakham, Roi Et, Yasothon, western Amnat Charoen, Kalasin, Nong Bua Lamphu, Udon Thani, Sakon Nakhon, Nakhon Phanom, and southern Nong Khai of Thailand, Ca Mau, eastern Bac Lieu, Soc Trang, and south-western Kien Giang of Viet Nam's Mekong Delta. Additionally, western Chiang Rai and Phayao of Thailand were also at severe drought. Some severe dry condition also took place in Cambodia including southern Siem Reap and Preh Vihea, Kampong Thom, and western Ratanak Kiri. In Lao PDR, the severe dry took place in north-western Champassack, some part of Savannakhet, northern Khamuane, and bordering Vientiane and Luang Prabang in the northern part of Lao PDR.



**Figure 12: Weekly standardised precipitation index from September 10-16**

• **Weekly Soil Moisture Anomaly (SMA)**

During the week from September 10-16, the agricultural indicator through soil moisture anomaly index of the LMB did not change much from the previous week (September 3-9). As shown in [Figure 13](#), the driest soil moisture condition is found in northern LMB including Thailand’s Chiang Mai, Chiang Rai, and Phayao; and Lao PDR’s Xayaburi, Luang Prabang, Luang Namtha, and Oudomxay ranging from moderate to extreme dry. North-west of Loei in Thailand, east of Savanaket in Lao PDR, west of Quang Tri in Viet Nam, and Ubon Ratchathani in Thailand were also at severely dry condition. Besides the areas above, a severe dry condition also hit the lower part of the LMB covering Cambodia and Viet Nam including some parts of Kampong Thom, Kampong Chhnang, Kampong Speu, and Mondul Kiri in Cambodia and Dak Lak, Gia Lai, and Kon Tum in Viet Nam. Most parts of north-eastern Thailand were at moderate dry from September 10-16.



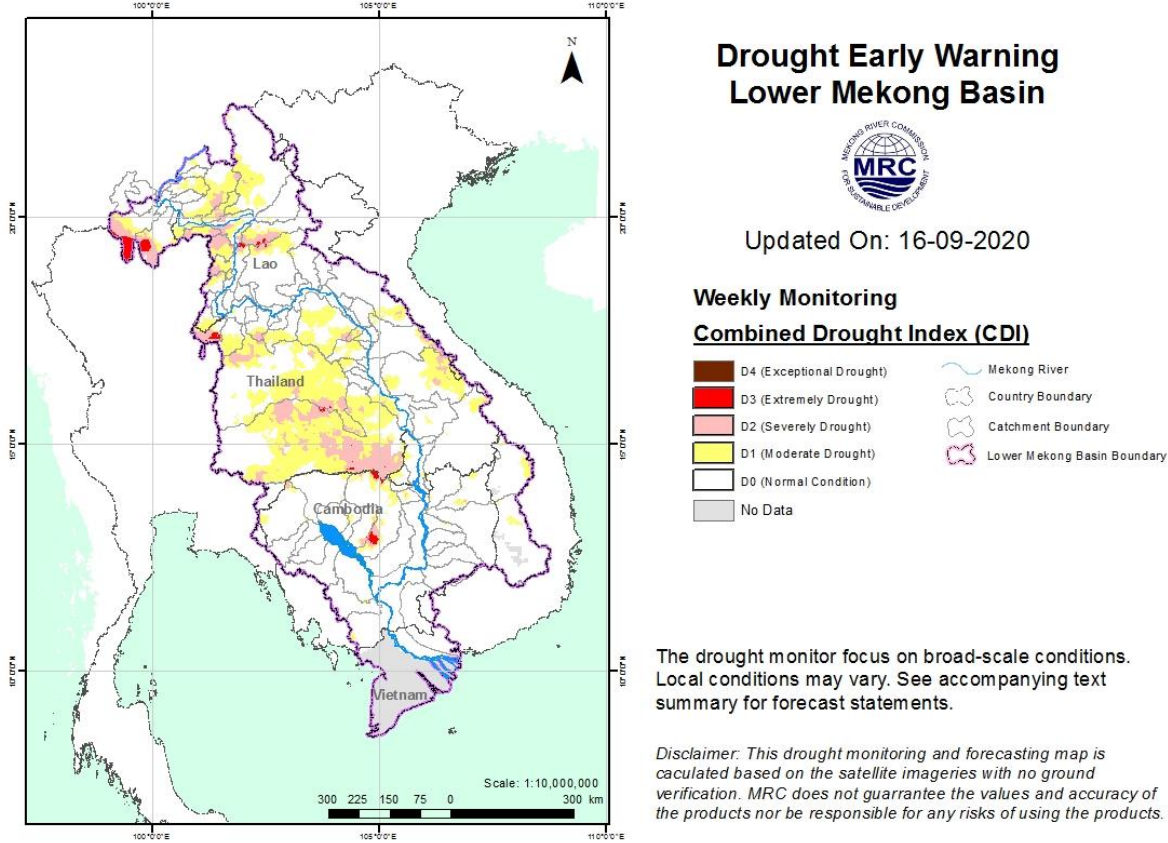
**Figure 13: Weekly Soil Moisture Anomaly from September 10-16**

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

The overall drought condition through combined drought index, as shown in [Figure 14](#), shows the driest areas in the north and central part of the LMB during the reporting week from September 10-16. In northern part, severe dry took place in some areas of Thailand’s Chiang Mai, Chiang Rai, Phayao, and Loei; and Lao PDR’s Xayaburi, Luang Prabang, Oudomxay and Luang Namtha. In central part, a severe dry condition took place in northern Buriram, Surin, Si Saket, Ubon Ratchathani, Yasothon, Roi Et, Maha Sarakham, southern Khon Kaen, Nong Bua Lamphu, and eastern Sakon Nakhon of Thailand. A

small part of Kampong Thom in Cambodia was also at severe dry. Besides that, central and southern Lao PDR, Cambodia and Viet Nam were at normal condition, except east of Lao PDR's Savannakhet and west of Viet Nam's Quan Tri which were at moderate dry during the monitoring week.

CDI values show that drought condition is very much similar to the condition last week (September 3-9), upper and central parts of the LMB are the driest areas.



**Figure 14: Weekly Combined Drought Index from September 10-16**

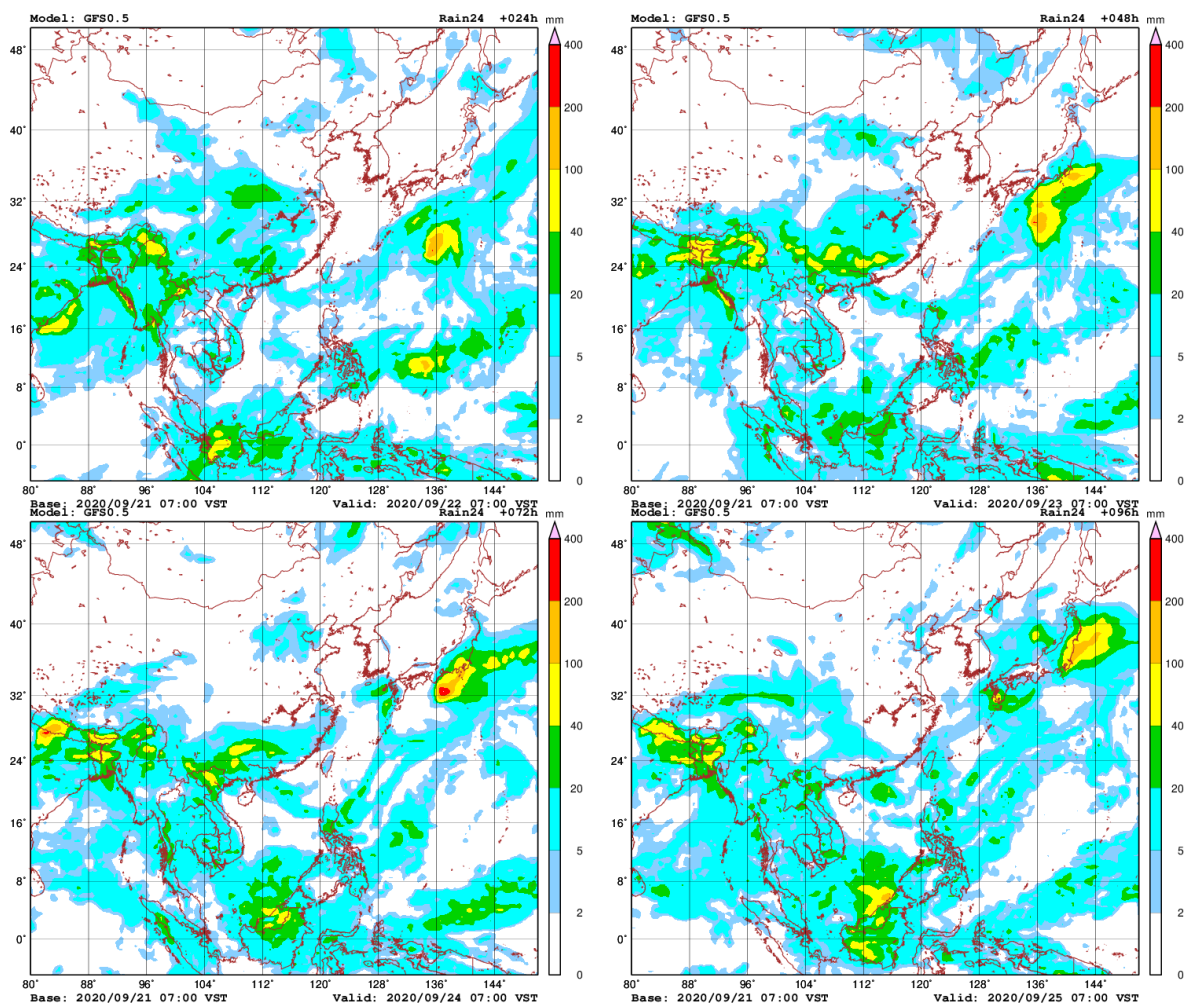
More information on Drought Early Warning and Forecasting as well as the explanation is available here: <http://droughtforecast.mrcmekong.org/templates/view/our-product>

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

### 6.1 Weather and rainfall forecast

Based on the analysis of synoptic meteorological, in the coming week, there might be three factors affecting the LMB region. They include (i) Low Pressure (L) going through the upper to the middle parts, (ii) Inter Tropical Convergence Zone (ITCZ), and (iii) Southwest Monsoon. According to the accumulated rainfall forecast (24 hrs) of the Global Forecast System (GFS) model, small (10 – 20 mm/24hrs) and moderate rainfall (20 – 40 mm/24hrs) will possibly occur in the coming week over the LMB

Figure 15 shows the accumulated rainfall forecast (24hrs) of the GFS model from September 22 through 28.



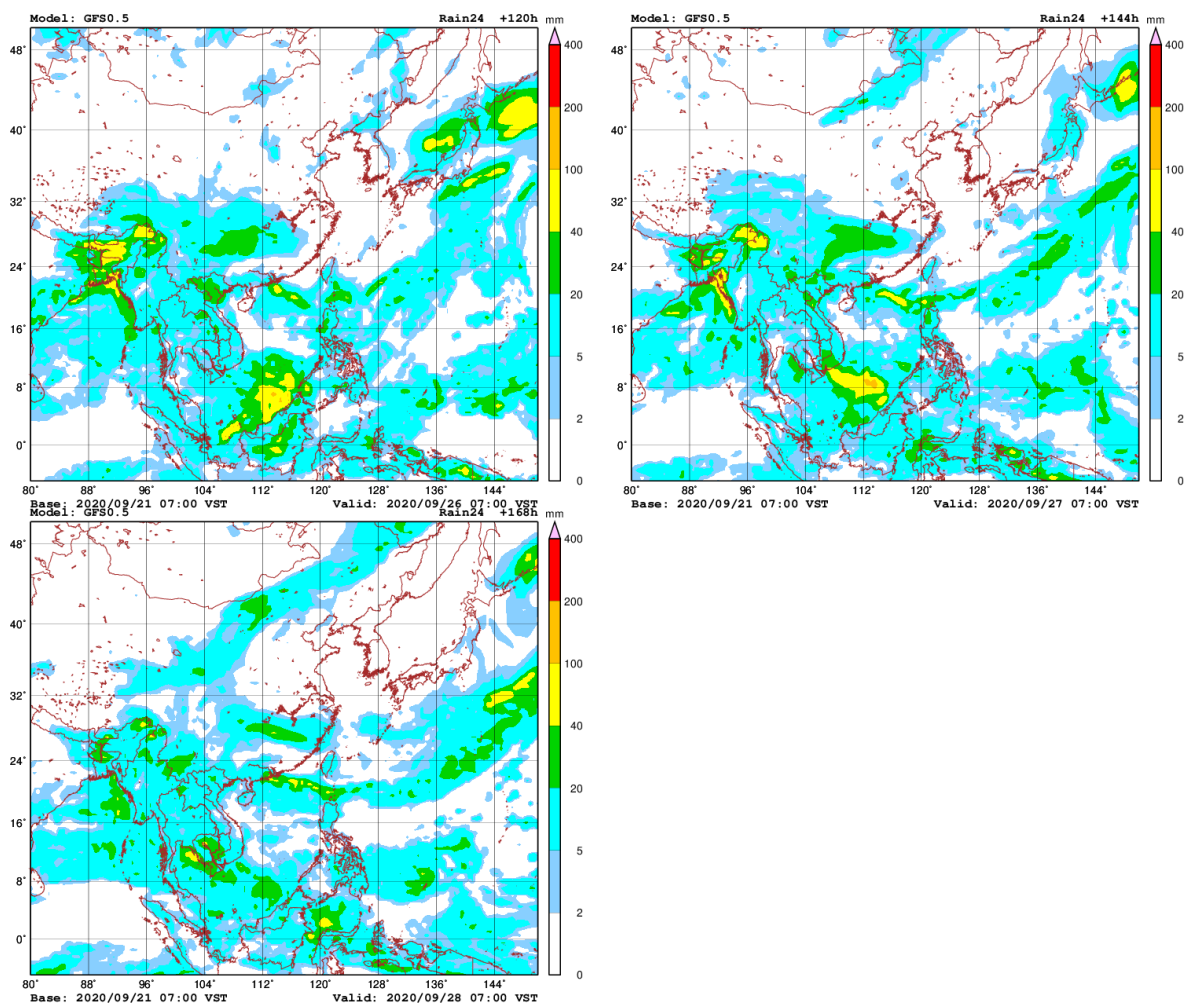


Figure 15: Accumulated rainfall forecast (24 hrs) of model GFS<sup>1</sup>

## 6.2 Water level forecast

### Chiang Saen and Luang Prabang

Based on September 21's daily flood bulletin, the daily forecast water level at Chiang Saen in Thailand is expected to slightly increase from 3.45 to 3.81 metres in the next five days.

For Luang Prabang in Lao PDR, the water level will also increase from around 9.92 to 10.62 metres during the same period.

Despite this increase, the trend of water levels at these stations will continue staying below their LTAs.

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

Water level at Vientiane station in Lao PDR is forecasted to go up from 5.30 to 6.36 metres. At Paksane in Lao PDR, the level will also increase slightly from 6.81 to 7.78 metres in the next

five days. Average quantity of precipitation is forecasted in the area. Despite that, the water levels here will still be lower than their LTAs.

### **Nakhon Phanom to Pakse**

Water levels from Nakhon Phanom in Thailand to Pakse in Lao PDR will continue to increase between 0.06 to 0.37 metres in the next five days.

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

For Cambodia's stations from Stung Treng to Neak Luong along the Mekong River, water levels will continue to increase from 0.05 to 0.85 metres in the next five days.

Water levels of the Tonle Sap Lake at Prek Kdam and Phnom Penh Port will also increase by about 1 metre over the next five days. Water levels at Phnom Penh, Chaktomuk, and Koh Khel on the Bassac River will increase about 1 metre during the same period.

Despite this increase, the water levels at these stations will continue staying below their minimum levels from Kampong Cham to Neak Luong.

### **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, water levels will be moving up and down below their LTAs, following daily tidal effects from the sea.

[Table 3](#) shows the River Flood Forecasting Bulletin issued on September 21. Results of the daily flood forecasting bulletin are also available at [http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php).

The performance of the weekly flood forecast, with an accuracy and data input evaluation from September 15-21, is presented in [Annex 1](#).

## **6.3 Flash Flood Information**

With some potential rainfall forecasted for next week, flash flood event is likely not to happen next week in the Lower Mekong Basin. However, the local heavy rains in a short period of time are also possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice daily at <http://ffw.mrcmekong.org/ffg.php>.

Further detailed information on Flash Flood Information Warnings, as well as on its explanation, is available for download [here](#).

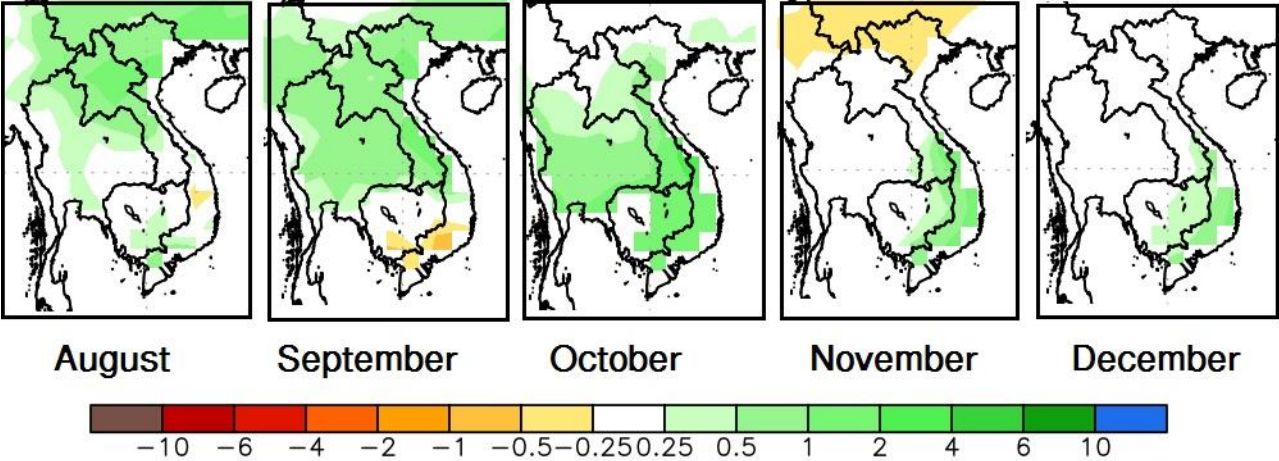
## **6.4 Drought forecast**

There are several climate-prediction models with different scenarios on the upcoming months until December 2020. The MRC's Drought Forecasting and Early Warning System (DFEWS) adopts an ensemble model, which averages all scenarios called the North America Multi-



Model Ensemble (NMME). The system is updating the data resolution from 25 km to 5 km and is expected to be ready by the end of September for the MRC DFEWS.

Temporarily, the global scale of rainfall prediction is used to see how the rain distribution looks like for the coming months. [Figure 16](#) of the monthly anomaly maps shows daily average of each month in mm/day from August to December 2020 produced by the NMME.



**Figure 16: Daily average monthly rainfall forecast from Aug to Dec 2020**

From the ensemble prediction model, the LMB is likely to receive more rain starting from August until the end of the rainy season in November 2020. Among the upcoming five months, September is likely to receive the least rain especially in southern part of the LMB covering south of Cambodia and the Mekong Delta as well as the Central Highland of Viet Nam. October is predicted to be relatively wet while November to receive average rainfall in Thailand and Lao PDR, and an excessive amount of rainfall in southeast of the LMB.

Table 3. River Flood Forecasting Bulletin



### Mekong Bulletin

Mekong River Commission Secretariat (MRCS)  
 Regional Flood and Drought Management Centre (RFDMC)  
 P.O. Box 623 #576, National Road #2, Chak Angre Krom, Meanchey, Phnom Penh, Cambodia  
 Tel: (855-23) 425353, Fax: (855-23) 425363, Email: floodforecast@mrcmekong.org  
**River Flood Forecast: 22 - 26 September 2020**

Date: 21 September 2020

Location	Country	24-hr Observed Rainfall (mm)	Zero gauge above M.S.L (m)	Flood level (m)	Alarm level (m)	Observed W. level against zero gauge (m)		Forecasted Water Levels (m)					There is currently no flood warning in place at monitoring sites on the Mekong											
						20-Sep	21-Sep	22-Sep	23-Sep	24-Sep	25-Sep	26-Sep	21	22	23	24	25	26						
Jinghong		17.0				535.94	535.91												X	X	X	X	X	
Chiang Saen		19.3	357.110	12.80	11.50	3.32	3.26	3.45	3.61	3.70									↑	↑			★	★
Luang Prabang		16.2	267.195	18.00	17.50	10.00	9.92	10.16	10.25	10.45	10.55	10.62							↑	↑	↑	↑		
Chiang Khan		4.5	194.118	16.00	14.50	7.94	8.50	8.70	8.82	8.90									↑	↑	↑		★	★
Vientiane		3.5	158.040	12.50	11.50	4.88	5.30	5.80	6.02	6.16	6.25	6.36							↑	↑	↑	↑		↑
Nongkhai		1.4	153.648	12.20	11.40	5.08	5.47	5.93	6.40	6.61									↑	↑	↑	↑	★	★
Paksane		10.1	142.125	14.50	13.50	6.22	6.81	7.05	7.33	7.58	7.69	7.78							↑	↑	↑	↑	↑	
Nakhon Phanom		1.9	130.961	12.00	11.50	5.08	5.38	5.65	5.76	5.90									↑	↑	↑	↑	★	★
Thakhek		0.5	129.629	14.00	13.00	6.25	6.81	7.15	7.30	7.47	7.61	7.67							↑	↑	↑	↑	↑	
Mukdahan		4.3	124.219	12.50	12.00	5.02	5.20	5.47	5.63	5.72									↑	↑	↑		★	★
Savannakhet		5.2	125.410	13.00	12.00	3.48	3.62	3.85	3.97	4.03	4.10	4.13							↑	↑	↑			
Khong Chiam		1.0	89.030	14.50	13.50	7.48	7.59	7.83	8.20	8.40									↑	↑	↑	↑	★	★
Pakse		nr	86.490	12.00	11.00	6.52	6.34	6.51	6.77	6.89	6.97	7.06							↓	↑	↑	↑	↑	↑
Stung Treng		2.0	36.790	12.00	10.70	6.91	7.18	7.26	7.37	7.55	7.63	7.68							↑	↑	↑	↑	↑	
Kratie		2.6	-0.101	23.00	22.00	13.19	15.75	16.07	16.19	16.33	16.53	16.63							↑	↑	↑	↑	↑	↑
Kompong Cham		9.2	-0.930	16.20	15.20	7.06	8.70	11.05	11.38	11.51	11.66	11.87							↑	↑	↑	↑	↑	↑
Phnom Penh (Bassac)		nr	-1.020	12.00	10.50	4.31	4.81	5.96	6.13	6.20	6.29	6.40							↑	↑	↑	↑	↑	↑
Phnom Penh Port		nr	0.070	11.00	9.50	3.33	3.83	5.00	5.18	5.25	5.35	5.47							↑	↑	↑	↑	↑	↑
Koh Khel		0.3	-1.000	7.90	7.40	4.06	4.44	5.29	5.45	5.50	5.57	5.65							↑	↑	↑	↑	↑	↑
Neak Luong		0.0	-0.330	8.00	7.50	3.08	3.44	4.27	5.35	5.50	5.56	5.63							↑	↑	↑	↑	↑	↑
Prek Kdam		nr	0.080	10.00	9.50	3.32	3.85	5.02	5.18	5.25	5.35	5.46							↑	↑	↑	↑	↑	↑
Tan Chau		0.0	0.000	4.50	3.50	1.15	1.22	1.31	1.35	1.43	1.52	1.62							↑	↑	↑	↑	↑	↑
Chau Doc		0.0	0.000	4.00	3.00	1.17	1.08	1.03	1.07	1.15	1.22	1.30							↓	↓	↑	↑	↑	↑

REMARKS:

-: not available.  
 nr: no rain.

LEGEND		
rising water level	↑	<p>Note: Stable water level is defined as a daily change of less than 10cm from Chiang Saen to Savannakhet; less than 5cm at Pakse and Stung Treng; and no more than 3cm from Kratie downstream.</p> <p><b>Flood stage</b> is when the flood level exceeds. A flood level is determined by each Member Country.</p> <p><b>Alarm stage</b> is when the water level ranges between alarm and flood levels.</p> <p><b>Alarm situation</b> is when the water level is forecasted to reach the flood stage within the next three days.</p>
stable water level	↔	
falling water level	↓	
alarm stage	🟡	
alarm situation	🟠	
flood stage	🔴	
no data available	X	
as suggested by Thailand, forecasted values are not displayed pending further improvement of the system	★	

River Flood Forecaster

*K. Sothea*  
 KHEM Sothea

NOTE: Discharge at Luang Prabang may be influenced by hydropower operations (at both upstream and downstream).  
 For more info, please refer to this link:  
<http://www.mrcmekong.org/>; [http://ffw.mrcmekong.org/bulletin\\_wet.php](http://ffw.mrcmekong.org/bulletin_wet.php); <http://ffw.mrcmekong.org/reportflood.php>

## 7 Summary and Possible Implications

### 7.1 Rainfall and its forecast

Rainfall during this reporting week was considered above average in the middle and lower parts of the LMB (46 to 256 mm). However, at the upper part it was considered average, varying from 26 mm to 100 mm at different stations along the LMB from Chiang Saen in Thailand to Vientiane in Lao PDR. The highest concentration was in the middle and lower parts of the LMB from Khong Cham in Cambodia to Viet Nam's Tan Chau and Chau Doc area (up to 256 mm). Compared with last week's amount, it was considered higher at the downstream part.

There was a tropical storm (NOUL) in the LMB from 17 to 19 September during this reporting week. On September 21, continuing from recent weeks there were two lines of low pressure of the Monsoon Trough, crossing the northern and eastern parts of the Mekong region. This situation may still bring some rainfall to these areas over the next few days.

Based on the forecasted rainfall from satellite using GFS data, rainfall is likely to take place in areas between Lao PDR's Paksane and the Central Highland of Viet Nam, varying from 20 mm to 85 mm in September 26. This will increase the chance of rainfall concentration over the LMB in the upcoming week (near average rainfall expected).

### 7.2 Water level and its forecast

Water levels at the middle to the lower parts of the monitoring locations in the LMB during this reporting week were rising higher than their historical minimum levels. The rising level was due to the Storm NOUL which brought heavy rain to middle part of the region from 17 to 19 September. Generally, this week's water levels were relatively higher than last week's ones.

The starting date of the reverse flow from the Mekong River into the Tonle Sap Lake took place on August 4, slightly late compared to a normal event. However, two extremely small and brief instances happened in July. Due to late reverse flows this year, the water volume of the Lake at this reporting point remains extremely small and less than its minimum volume (even than the 2019's) and is considered at critical level.

**Over the next few days, water levels across most of the stations in the LMB are expected to continue increasing**, ranging from 0.05 and 0.85 metres. Even so, all the stations' water levels are expected to remain below their LTAs.

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

Below average precipitation during the past months is believed to be one of the main factors causing low water levels at most of the stations along the Mekong mainstream.

Since the beginning of this year (2020), water levels in the Lower Mekong River have been lower than their LTAs for all monitoring stations (from upper to lower stretches within the LMB). Like many parts of the world, the Mekong region has been affected by the prolonged El Nino event, the phenomenon that usually causes extreme heat and insufficient rainfall. This climate change impact has been observed since 2019. Therefore, the main cause of low water levels in the Mekong mainstream from June to July 2020 could be the unusual low rainfall as results of the climate change affecting the Lower Mekong Region.

For a more complete preliminary analysis of the hydrological conditions in the LMB over January – July 2020, please refer to this [Situation Report](#).

The contribution to the Mekong River's flow from the Upper Mekong Basin 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 predicted small and medium amount of rainfall for the coming week as mentioned earlier in section 6.1, major flash floods are not likely to happen in the LMB. However, short flash floods in the community areas is still possible. Soil moisture condition in local communities of the region remains highly saturated due to the remaining absorbed rainwater in the ground from the previous weeks especially upper-half of the LMB including Thailand and middle-to-northern Lao PDR.

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

Drought condition of the LMB from September 10-16 was drier in northern and central parts of the LMB. Severe drought condition was found in Thailand's Chiang Mai, Chiang Rai, Phayao, and Leo; and Lao PDR's Xayaburi, Luang Prabang, Oudomxay and Luang Namtha; Thailand's Buriram, Surin, Si Saket, Ubon Ratchathani, Yasothon, Roi Et, Maha Sarakham, southern Khon Kaen, Nong Bua Lamphu, and eastern Sakon Nakhon of Thailand, and small part of Cambodia's Kampong Thom.

The upcoming three-month (September-November) forecast shows that LMB areas are likely to receive more rain compared to the previous months and its three-month long-term average. However, the southern part of the LMB including south of Cambodia, Mekong Delta, as well as Central Highland of Viet Nam is predicted to receive less rain than other areas in September 2020.

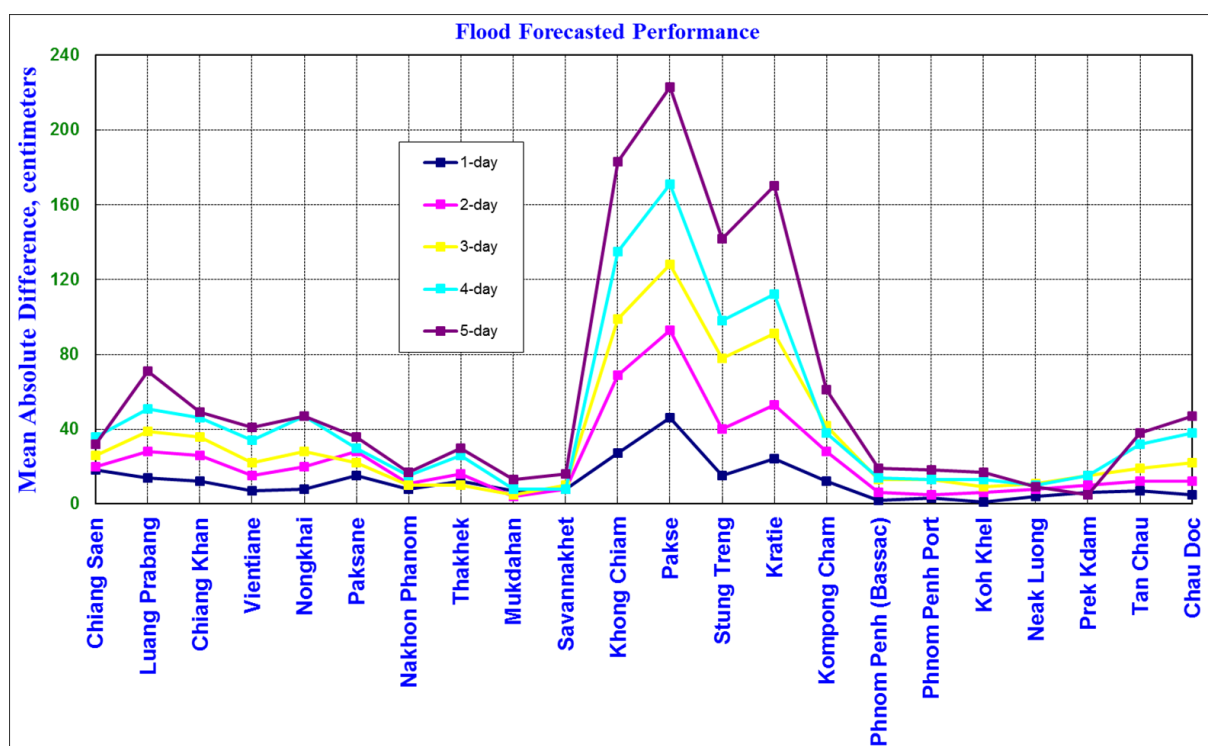
## Annex 1: Performance of the weekly flood forecasting

### 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 15 to 21 September 2020.

The forecasting values from 15 to 21 September 2020 show that the overall accuracy is fair for 1-day to 3-day forecast in lead time at stations in the middle part of the Mekong River from Khong Chiam to Kratie due to the effect of Storm NOUL effected in in this area.



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

- Missing data and data input are not sufficient to be used for inputting into the flood forecasting model system.
- The influence of heavy rainfall caused by storms and hydropower operations from upstream (Xayaburi) and tributaries inflows.
- Luang Prabang, Chiang Khan and Paksane stations have been affected by hydropower

operations of Xayaburi and Nam Nguem (water retention and release). Rainfall always accumulates at this spot, which could be causing rapid high-water levels.

- Rapid fluctuations of water levels at Tan Chau and Chau Doc stations due to daily tidal effects of the sea in the Mekong Delta.
- Satellite rainfall data was not representative of the actual rainfall at ground stations in some areas of the Mekong region.

### **Performance based on data from the Member Countries**

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

The evaluation of performance indicators, missing data and completion time for flood forecasting are presented in Table B3 and Figures B4, B5 and B6, respectively from 15 – 21 September 2020.

**Table B1:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 15 to 21 September 2020 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	14	12	7	8	15	8	12	7	8	27	46	15	24	12	2	3	1	4	6	7	5
2-day	20	28	26	15	20	28	11	16	4	8	69	93	40	53	28	6	5	6	8	10	12	12
3-day	26	39	36	22	28	22	10	10	5	10	99	128	78	91	42	13	13	9	11	15	19	22
4-day	36	51	46	34	47	30	15	26	8	8	135	171	98	112	38	14	13	13	10	15	32	38
5-day	32	71	49	41	47	36	17	30	13	16	183	223	142	170	61	19	18	17	9	5	38	47

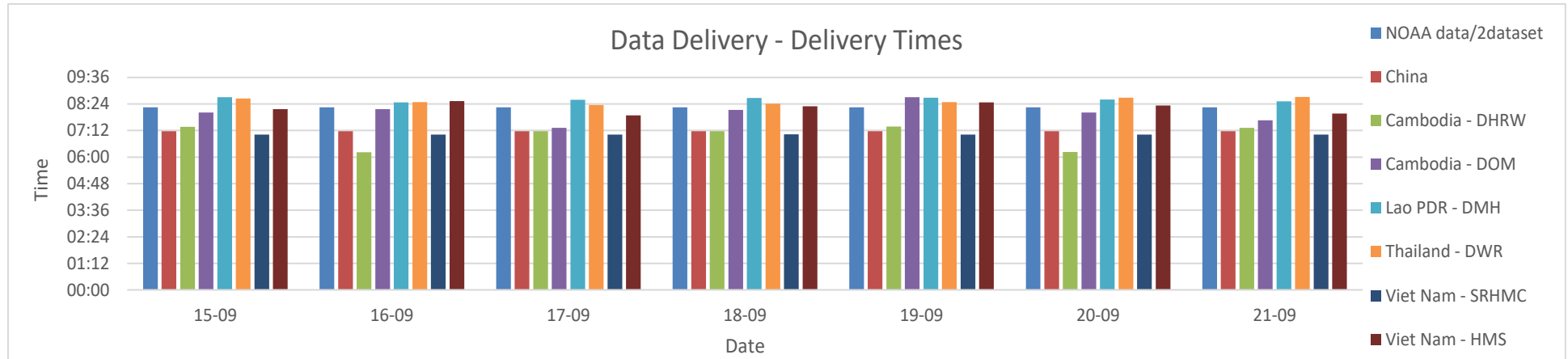
**Table B2:** The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 15 to 21 September 2020 in %

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	28.6	42.9	57.1	57.1	57.1	71.4	85.7	85.7	71.4	57.1	71.4	71.4	71.4	57.1	85.7	71.4	71.4	71.4	85.7	57.1	57.1	57.1	57.1	65.6
2-day	33.3	33.3	50.0	66.7	50.0	66.7	66.7	66.7	83.3	50.0	50.0	50.0	83.3	66.7	83.3	83.3	83.3	83.3	83.3	66.7	66.7	50.0	50.0	64.4
3-day	60.0	40.0	40.0	80.0	60.0	80.0	40.0	60.0	40.0	40.0	40.0	40.0	60.0	80.0	80.0	80.0	80.0	80.0	80.0	40.0	60.0	40.0	40.0	59.1
4-day	50.0	50.0	25.0	50.0	50.0	50.0	50.0	75.0	50.0	75.0	25.0	25.0	50.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	25.0	25.0	56.8
5-day	66.7	33.3	66.7	66.7	33.3	66.7	66.7	33.3	66.7	66.7	33.3	66.7	33.3	66.7	66.7	33.3	33.3	33.3	66.7	66.7	33.3	33.3	33.3	51.5

**Note:** Red values are not well matched with the actual values in (%) and (cm)

**Table B3: Overview of performance indicators for the past 8 days from 15 to 21 September 2020**

2020	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
week	10:09	00:00	-	-	08:15	07:10	06:58	08:00	08:36	08:32	07:01	08:14	0	0	1	0	70	2	1	0
month	10:24	00:00	-	-	08:15	07:10	07:38	08:11	08:39	08:26	07:14	08:14	0	0	37	0	464	0	2	38



**Fig. B4: Data delivery times for the past 8 days from 15 to 21 September 2020**



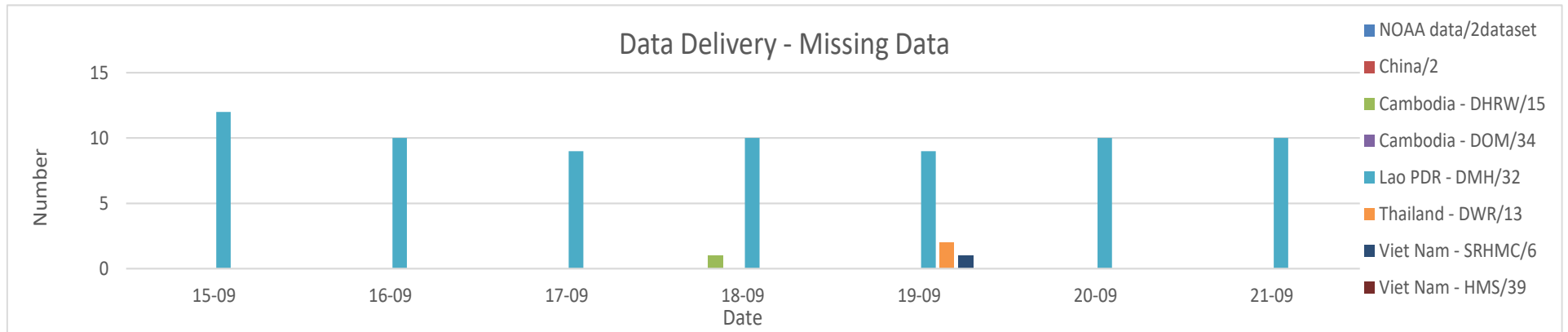


Fig. B5: Missing data for the past 7 days from 15 to 21 September 2020

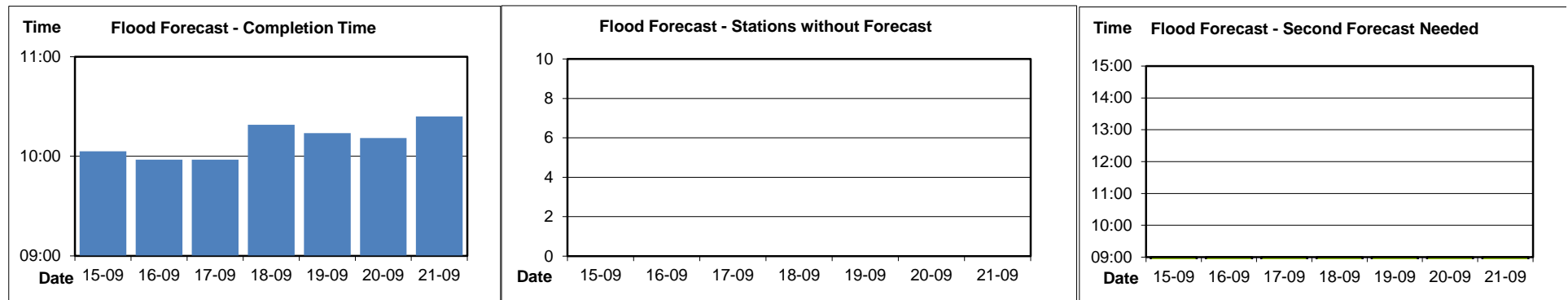


Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 15 to 21 September 2020



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