# Mekong River Commission

## Regional Flood and Drought Management Centre

**Weekly Situation Report for the Wet Season in the Mekong River Basin**

**Prepared on: 23/06/2020, covering the week from 16 to 22 June 2020**

**Weather Patterns, General Behaviours of the Mekong River and Outlook Situation**

### General weather patterns

From 16 to 22 June 2020, there were some rainfall in the LMB. The weather outlook bulletins (3 months weather forecast: Jun-Jul-Aug) and maps issued by the Thailand Meteorology Department (TMD) were used to verify the weather condition in the LMB. They stated that the 3 months from Jun-Jul-Aug 2020, the low-pressures of air mass cells will be developed around the Mekong Region that cause some depressions and tropical cyclones, resulting summer thunderstorms and rain in this period. Moreover, coldly high-pressure air masses from China will meet hot air masses already prevailing over LMB, resulting in abnormal rainfall in June and July 2020. **Figure 1** presented the weather map on 22 June 2020.

According to the Asian Specialized Meteorological Centre (ASMC), the increased shower rainfall over the Mekong sub-region, hotspot activities in the sub-region are expected to be generally subdued for June 2020. In the southern ASEAN region, rainfall over most parts of the equatorial region is predicted to be above normal in June 2020. Hotspot activities are likely to remain generally subdued, although isolated hotspot activities may emerge from time to time.

The predicted above-normal rainfall in the Mekong region is showed in Jun-July-August 2020. Therefore, from June to August 2020, there will increasing chance from moderate to above average rainfall for most parts of the equatorial region. **Figure 2** showed the predicted 1-month rainfall in Jun 2020 in Southeast Asia, including the Mekong region will affect above-normal rainfall.

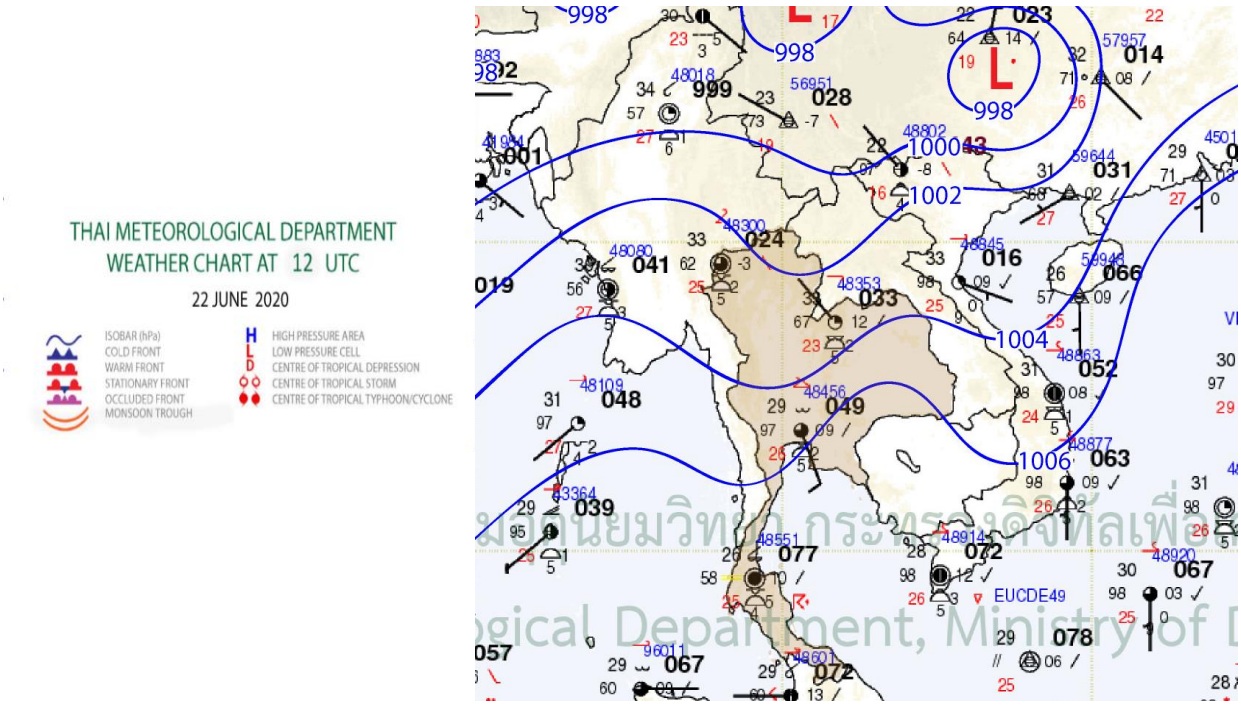



**Figure 1** Summary of weather condition over the LMB on 22 June 2020

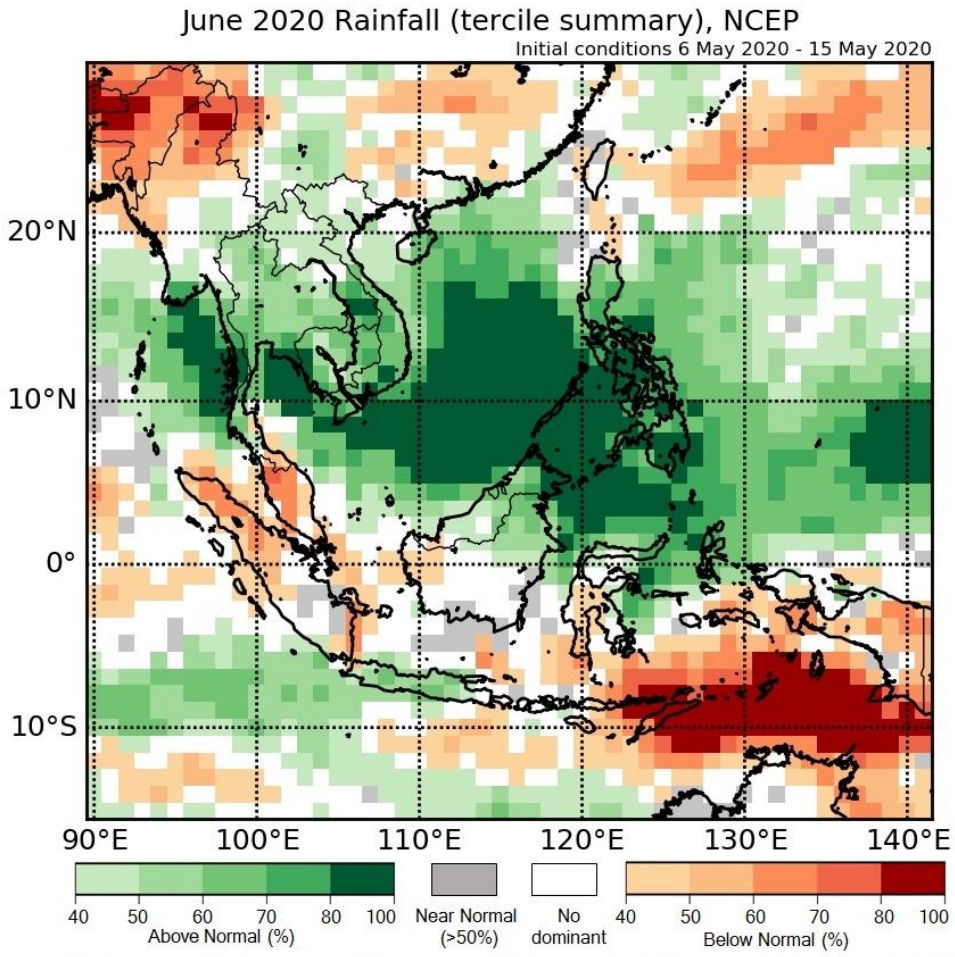



**Figure 2** The 3 months predicted rainfall over Asian Countries by ASMC

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

No Depression or tropical depression (TD), Tropical Storm (TS) or Typhoon (TY) were presented in LMB during this week.

## The rainfall pattern over the LMB

Rainfall in this week is considered moderate, varied from 0.1 mm to 100 mm in different areas of the Lower Mekong River Basin (LMRB). The weekly rainfall distribution in the Lower Mekong Basin from 15 to 22 June 2020 is showed in **Figure 3.**

It is indicated that this week rainfall was focused on Paksane area, which showed high values for more than 250 mm and the other area in the LMB varied from 0.1 mm to 150 mm.

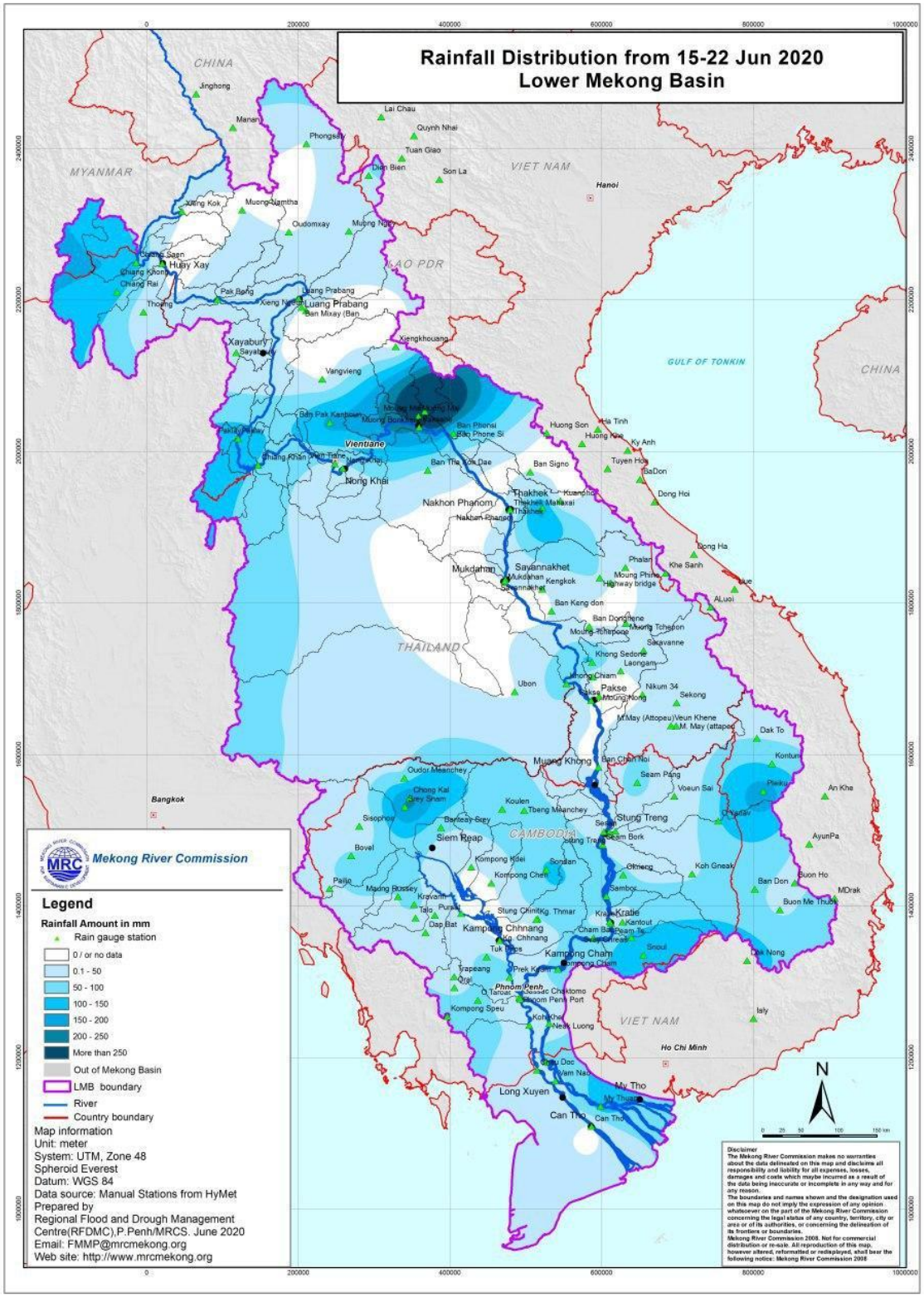



**Figure 3** The weekly rainfall distribution from 15 to 22 June 2020 over the LMB

## General Situation on water levels of the Mekong River

This week from 16 to 22 June 2020, water levels at the upper most station of Chiang Sean were fluctuated, varied from -0.25 m to 0.150 m. This fluctuated water levels at this station were due to the inflow from upstream and the average rainfall within this week.

Water levels at Luang Prabang and Chiang Khan are likely impacted by hydropower dam at Xayaburi and upstream hydropower dams. At Lung Prabang, water levels were fluctuated over their long-term average (LTA) levels, varied from -0.03 m to 0.06 m. Water levels at Chiang Khan (downstream of Xayaburi) were also fluctuated, varied from -0.16 m to 0.66 m (observed on 16th June 2020). Water levels at stations in the middle part of LMB from Lao's Vientiane to Thailand's Nakhon Phanom were followed the same trends from upstream, which currently water levels at these stations are lower than their LATs.

Further observation at Mukdahan to Pakse, water levels were also below their LTAs, followed the same trend from upstream reach from 16 to 22 June 2020.

This week water levels at stations of Stung Treng, Kratie, Kampong Cham, Neak Luong, on the Mekong, Chaktomuk and Koh Khel on the Bassac and Phnom Penh Port and Prekdam on the Tonle Sap are slightly decreased, varied from -0.2 m to -0.15 m. The current water levels at these stations are below their LTAs, although some rainfall in the area.

For the 2 stations at Tan Chau and Chau Doc, water levels are having been fluctuating below their LTAs due to the daily tidal effect from the sea. The attached hydrograph at each key station is showed in **Annex A**. **Figure 4** presented the stations for river flood forecasting for the wet season from June to October.

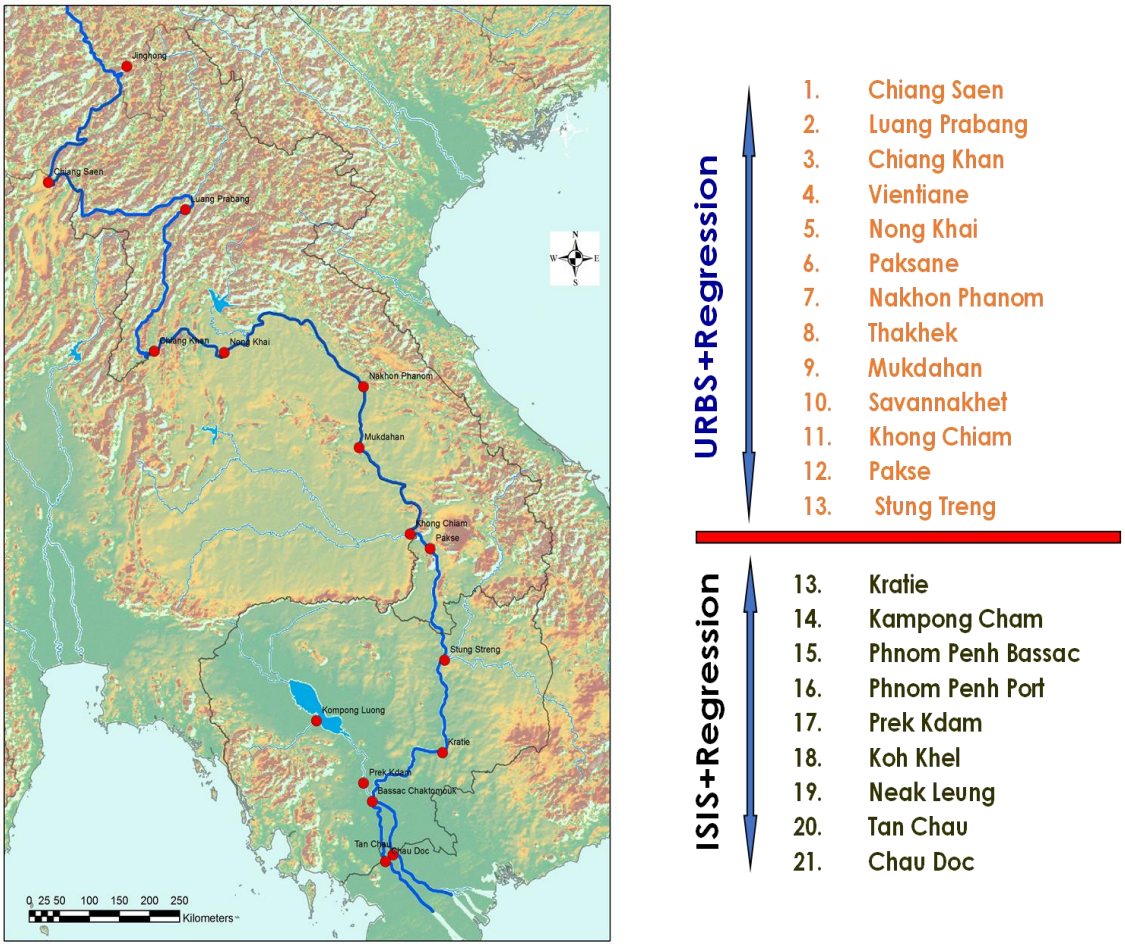



**Figure 4** Stations for River Monitoring with Models Application

***For stations from Chiang Saen and Luang Prabang***

Water levels from 16 to 22 June 2020 at Chiang Sean station were fluctuated, varied -0.25 m to 0.150 m. At Luang Prabang station, water levels were also fluctuated over its LTA levels. Water levels at this station are likely impacted by hydropower dam at Xayaburi and upstream hydropower dams.

***For stations from Chiang Khan, Vientiane-Nong Khai and Paksane***

Water levels from 16 to 22 June 2020 at Chiang Khan station were likely nominated by upstream hydropower dam of Xayaburi, which fluctuated from -0.16 m to 0.66 m (observed on 20 June 2020), that can increase inflow to downstream reach at Vientiane and Nong Khai in a next day. The current observed water levels at these stations are below their LTAs.

***For stations from Nakhon Phanom to Pakse***

Water levels from 16 to 22 June 2020 at Nakhon Phanom to Pakse stations were slightly increased, varied from 0.01 m to 0.55 m due to the inflows and rainfall from upper sub-catchments. However, this week water levels at these stations are below their LTAs.

***For stations from Stung Treng to Kampong Cham/ Phnom Penh to Koh Khel/ Neak Luong***

This week from 16 to 22 June 2020, water levels at stations of Stung Treng and Kratie Kampong Cham, Chaktomuk, Koh Khel, Phnom Penh Port and Prekdam were below their LTAs, although rainfall in this area for the last few days. As observing at Neak Luong on the Mekong, Chaktomuk on the Bassac and Koh Khel on the Bassac, their water levels were influencing by tidal from the sea due to the low water level of the Mekong from November 2019 to March 2020 (these water levels are followed the same trends of 2015-2016).

***For the tidal stations at Tan Chau and Chau Doc***

From 16 to 22 June 2020, water levels at the 2 tidal stations at Tan Chau and Chau Doc were fluctuated below their LTAs due to the daily tidal effect from the sea.

According to the Japan Meteorological Agency (JMA), the typical impact of El Niño on Southeast Asia is drier-than-average rainfall conditions, especially during the season June to August and can be extending to October 2020.

## The Tonle Sap Flow

At the end of wet season when the inflow of the Mekong is receded, the flow of the Tonle Sap Lake (TLS Lake) is being flow out. **Figure 4** showed the seasonal change of inflow/reversed flows and outflows. It was indicated that the outflows of the Tonle Sap Lake are matched to their LTAs, since early April 2020. **Table 1** showed the monthly change in volume of the Tonle Sap Lake with hydrographs comparing the flow between its LTA, 2018, 2019 and the recent year 2020 (up to 22 June). The seasonal change in monthly Volume Flows of the Tole Sap Lake showed in **Figure 5**. The low inflow from the Mekong and the less rainfall in the surrounding sub-catchments caused the outflow volume from the TLS Lake in 2020 is very low. The low outflow from the Tonle Sap Lake could affect the Mekong Delta of low water levels during the dry season, which could face of water shortage for agricultural production in that area. Since last week the outflows for the Tonle Sap Lake is returned to normal situation due to the rainfall from catchments.
The low outflow from the Tonle Sap could also affect the expanding unsaturated soil that may cause bank erosion and increase salinity intrusion from the sea in the Mekong Delta.

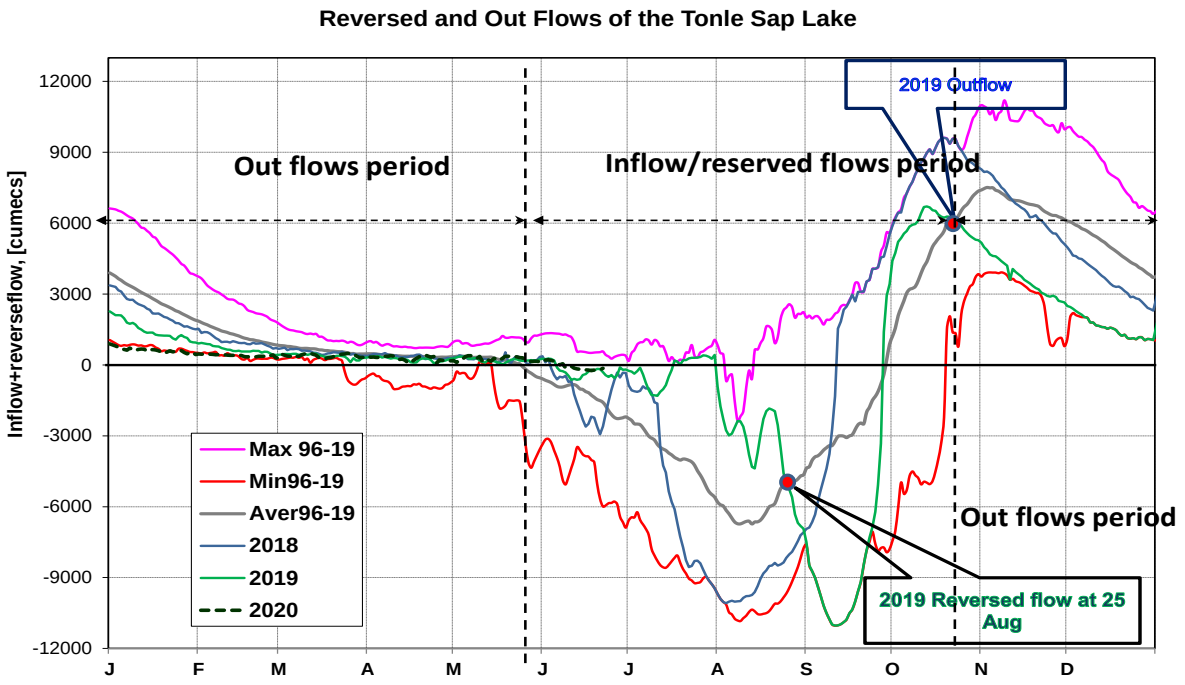



**Figure 4** The seasonal change of inflows and outflows of the Tole Sap Lake

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

| Month | Average (97-19) | Volume2018 | Volume2019 | Volume2020 | Percentage of Volume in 2020 [%] |
|---|---|---|---|---|---|
| **Jan** | 16452.95 | 13633.41 | 10285.31 | 5906.80 | 35.90 |
| **Feb** | 9312.36 | 7729.72 | 6019.30 | 4264.19 | 45.79 |
| **Mar** | 5868.92 | 5037.06 | 4387.48 | 3560.35 | 60.66 |
| **Apr** | 4474.98 | 3956.47 | 3667.47 | 2992.61 | 66.87 |
| **May** | 4166.07 | 3864.00 | 3266.43 | 2594.92 | 62.29 |
| **Jun** | 6034.10 | 5919.18 | 3517.06 | 2576.80 | 42.70 |
| **Jul** | 12502.58 | 12024.96 | 4001.99 | | |
| **Aug** | 19718.46 | 22399.65 | 5812.35 | | |
| **Sep** | 42644.05 | 53639.54 | 24194.19 | | |
| **Oct** | 49698.19 | 48193.08 | 30358.38 | | |
| **Nov** | 39542.58 | 31036.07 | 19112.65 | | |
| **Dec** | 26325.13 | 18469.21 | 10577.29 | | |
| | Low-flow condition, comapred with LTA (Long term average) | | | | |
| | Normal condition, compared with LTA (Long term average) | | | | |

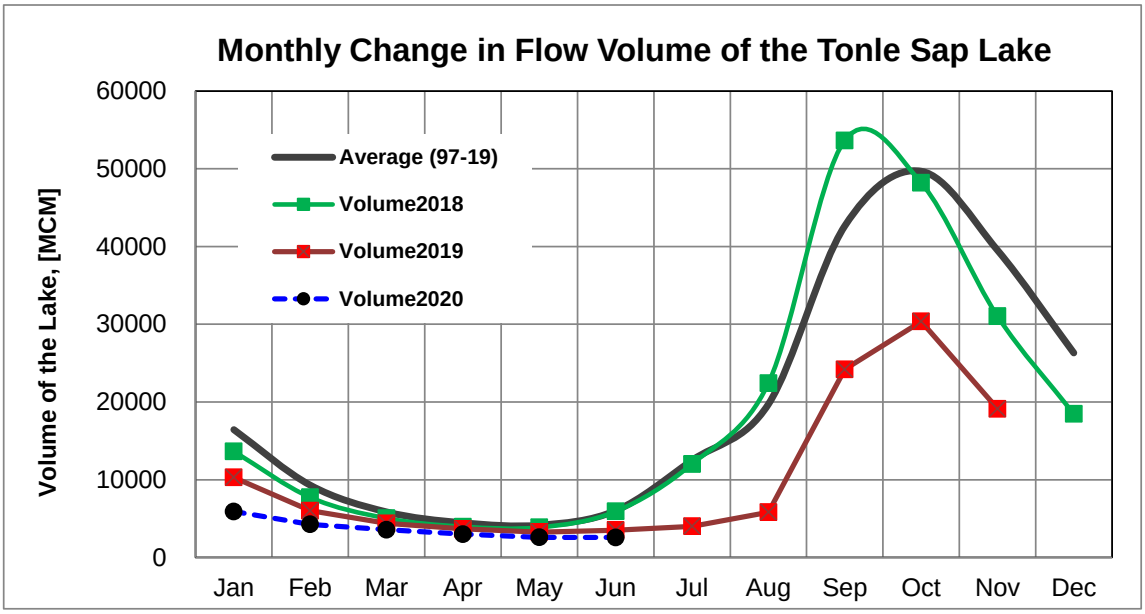



**Figure 5** The seasonal change in monthly Volume Flows of the Tole Sap Lake

## Discussion and Conclusion

From 16 to 22 June 2020, the trend of water levels at Chiang Sean were fluctuated due to the inflow from upstream and less rainfall from catchment inflows. Water level at Chiang Sean is relied from inflow at Jinghong Hydropower Station on Lancang and its catchment rainfall.

Luang Prabang stations is likely nominated by hydropower dam operation from upstream (tributaries) and downstream (Xayaburi) in which their water levels always fluctuated above their LTAs during the dry season from Nov to May. It was observed that water levels at this station have been affected, since the impounding reservoir at Xayaburi last year in October 2019.

Analysis of the Mekong River Commission's data revealed that the drop of water levels along the Mekong mainstream were resulted from less rainfall at catchments inflows and low inflows from upstream due to reservoir operation, including major tributaries inflows upstream.

Water levels at stations in the middle part of LMB from Vientiane to Pakse were increased, following the same trend of upstream. The recent water levels at these stations are below their LTAs. These low water levels indicated the low inflow from upstream and less rainfall from catchments network.

From Stung Treng, Kratie, Kampong Cham and Neak Luong on the Mekong, Phnom Penh Port to Prekdam on the Tonle Sap and Chaktomuk and Koh Khel on the Bassac showed the current water levels below their LTAs, although some rainfall in the low-lying area this week.

The Mekong river flow depends not only on the flow from the upstream, but also on the rainfall from sub-catchment inflows. 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 South China Sea. By far the major contribution comes from the two majors 'left-bank' (eastern) tributaries between Vientiane – Nakhon Phanom and Pakse – Stung Treng, which together contribute more than 40% of the flows.

Since the beginning of this year 2020, there were very low water level in the lower Mekong River, due to low rainfall in the basin in 2019. Like many parts of the world, the Mekong region has been affected by the prolonged El Nino phenomenon, the phenomenon that usually causes extreme heat and insufficient rain in 2019. The cause of below average water levels in the Mekong mainstream in Jan-Feb-Mar 2020 is likely due to unusual low rainfall in 2019 and the effected El Nino process over the Mekong region 2019.

The amount of water flowing from Jinghong dam in China could also be a potential contribution of the low flow at the upper part of the LMB (Chiang Saen-Vientiane). According to the notification from China, were

decreased about 0.76m, due to the test of equipment of hydropower dam at Jinghong from 27 Dec 2019 to 4 Jan 2020.

Another potential important reason of low flow in the mainstream (Jan-Feb-Mar) was the contribution from major tributary dams. Potentially, there were storing waters that contributed to the Mekong river basin in time of no or low rainfall. This has impacted the basin situation. However, we do not have any official data to quantify their contribution.

## The Trend of water level and its Outlook

Based on daily flood bulletin on 22 June 2020, water levels along the lower Mekong River from 23 to 27 June 2020 from Chiang Saen to Luang Prabang will expect to be increased that can be varied from 0.05 m to 0.20 m. From Chiang Khan to Vientiane/ Nong Khai and Paksane, water levels will also be increased, followed the same trend from upstream which can be varied from 0.10 m to 0.35 m. From Nakhon Phanom to Pakse, water levels will increase from 0.03 m to 0.15 m.

From Cambodia's Stung Treng to Neak Loung on the Mekong River, water will be increased varies from 0.03 m to 0.25 m. The water levels of the Tonle Sap Lake at Prekdam and Phnom Penh Port will be increased from 0.02 m to 0.12 m. Water levels at Phnom Penh at Chaktomuk and Koh Khel on the Bassac River will increase from 0.02 m to 0.12 m.

For Viet Nam's Tan Chau on the Mekong River and Chau Doc on the Bassac River, water levels will be decreased and fluctuated below their LTAs, follow the daily effect tidal from the sea.

The weekly flood forecasting performance, accuracy and data input evaluation are presented in **Annex B**.

Perhaps even more expecting based on the historical hydrology phenomenon, the abnormal rainfall can be occurred at the end June 2020, which can contribute to the flow in the Mekong River.

According to the Asian Specialized Meteorological Centre (ASMC), from July to August 2020, there will increase chance of above-normal rainfall in the Mekong-sub region. Although the Dry Season 2020 is finished, but still the scattered hotspots were detected in Cambodia and Thailand, and isolated ones were also detected in Myanmar, Lao PDR and southern Viet Nam in June 2020.

Additionally, some tropical cyclones from the Pacific Ocean or the South China Sea may feasibly move near or toward Mekong region, based the seasonal outlook of TMD.

Results of daily flood forecasting bulletin is available at http://ffw.mrcmekong.org/bulletin_wet.php.

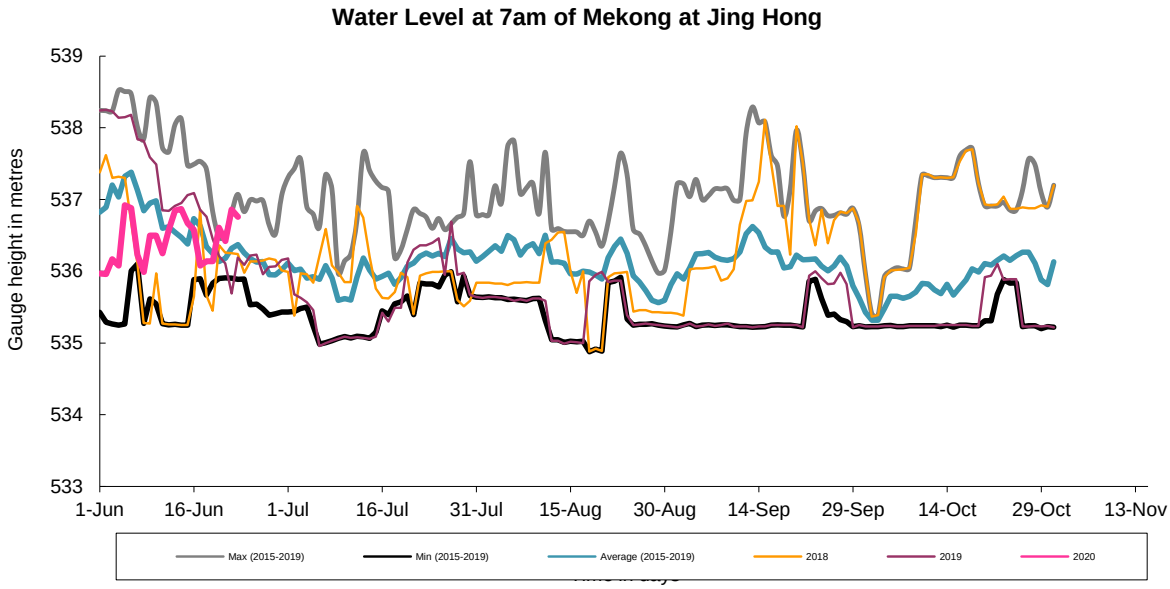
***Remark:***

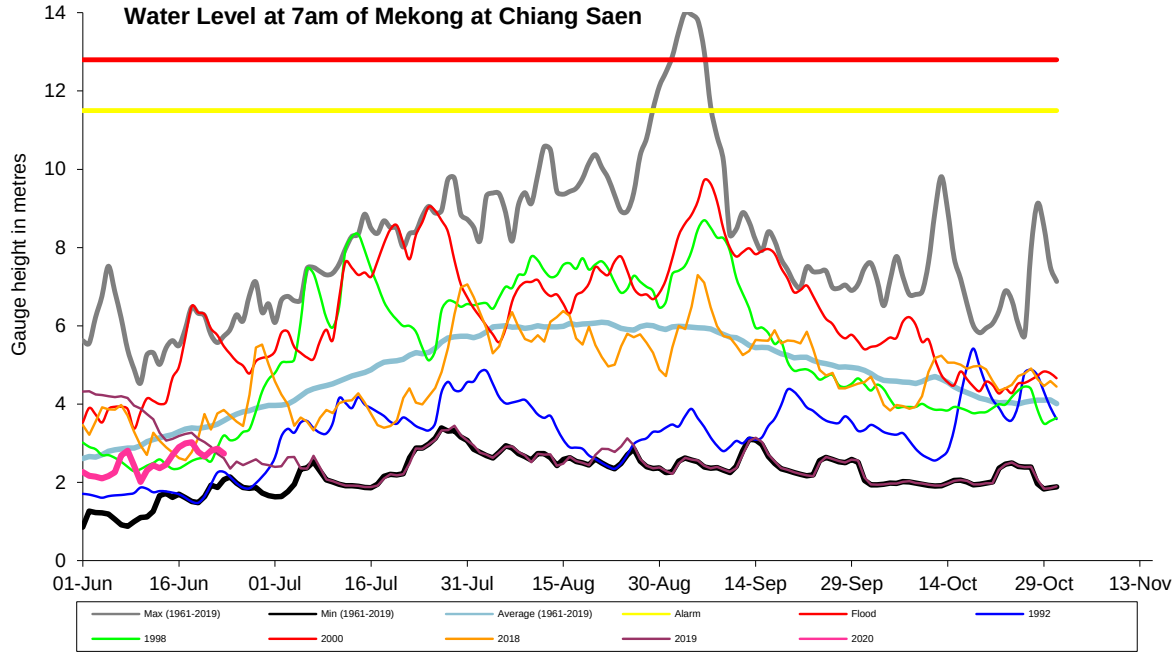
For details information on water levels and rainfall hydrographs at each key station are presented in **Annex A** and **Annex B** showed the Accuracy and performance of weekly flood forecasting activities.

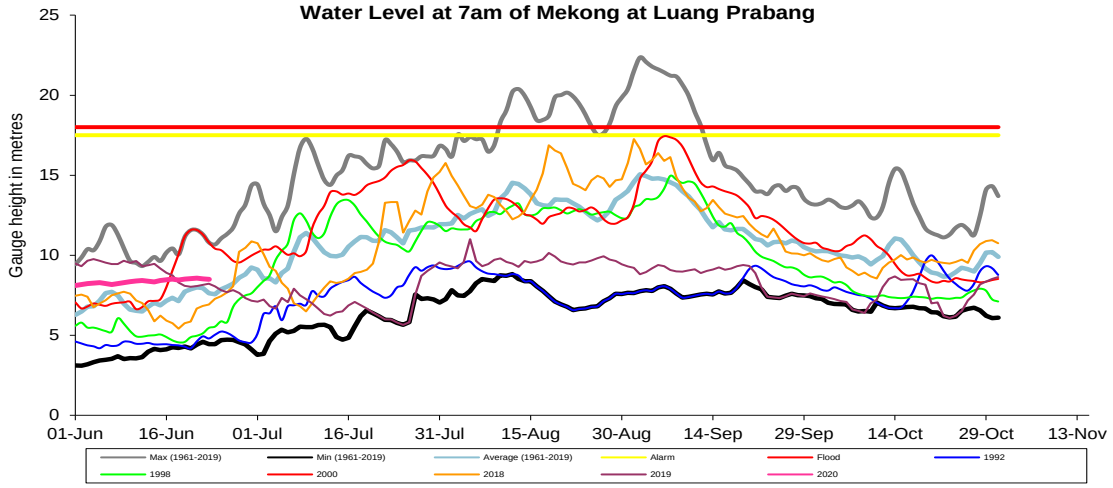
- The water levels hydrographs showing the observed water levels for the Wet Season (**Annex A**)
- Weekly Accuracy and Performance of weekly river flood forecasting (**Annex B**)

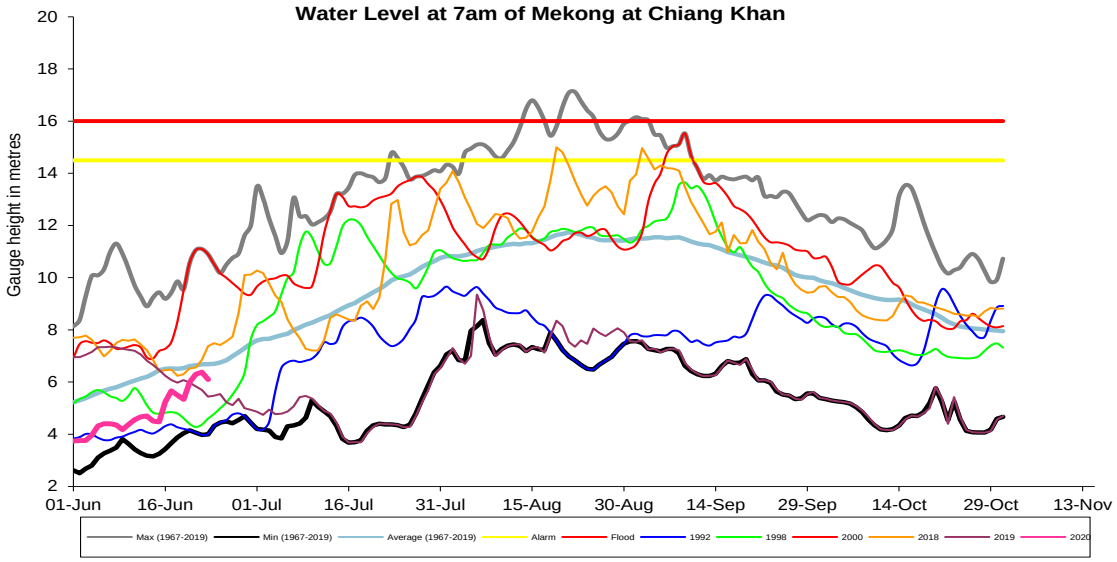
## Annex A: Weekly Water Level Hydrographs at each key station

### HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON UP TO 31 OCTOBER 2020




Water Level at 7am of Mekong at Luang Prabang
Gauge height in metres
25
20
15
10
5
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Mekong at Chiang Khan
Gauge height in metres
20
18
16
14
12
10
8
6
4
2
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1967-2019)
Min (1967-2019)
Average (1967-2019)
Alarm
Flood
1992
1998
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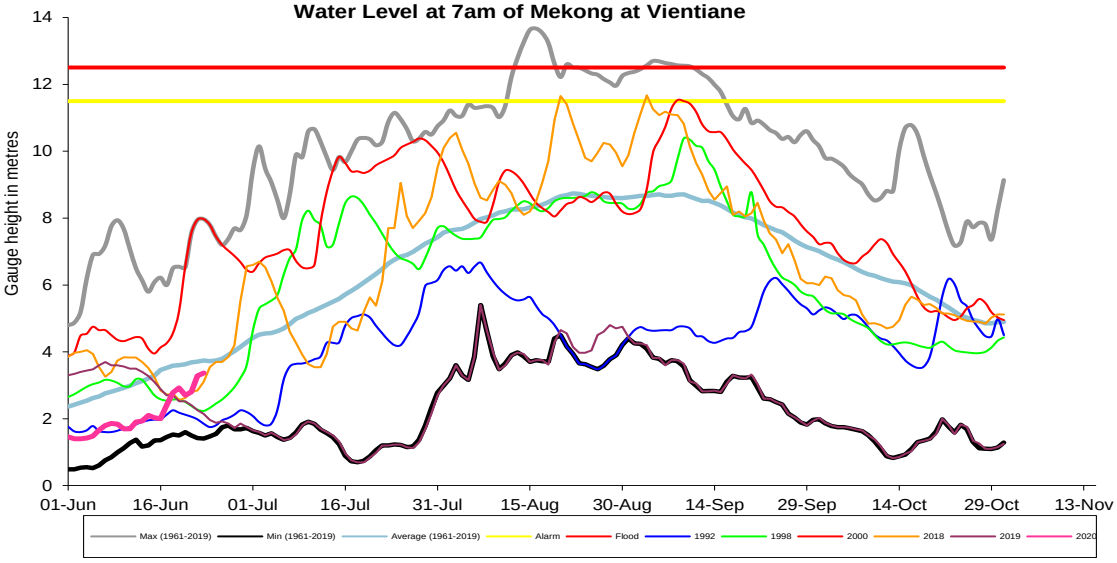
2018
2019
2020


Water Level at 7am of Mekong at Vientiane
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
1998
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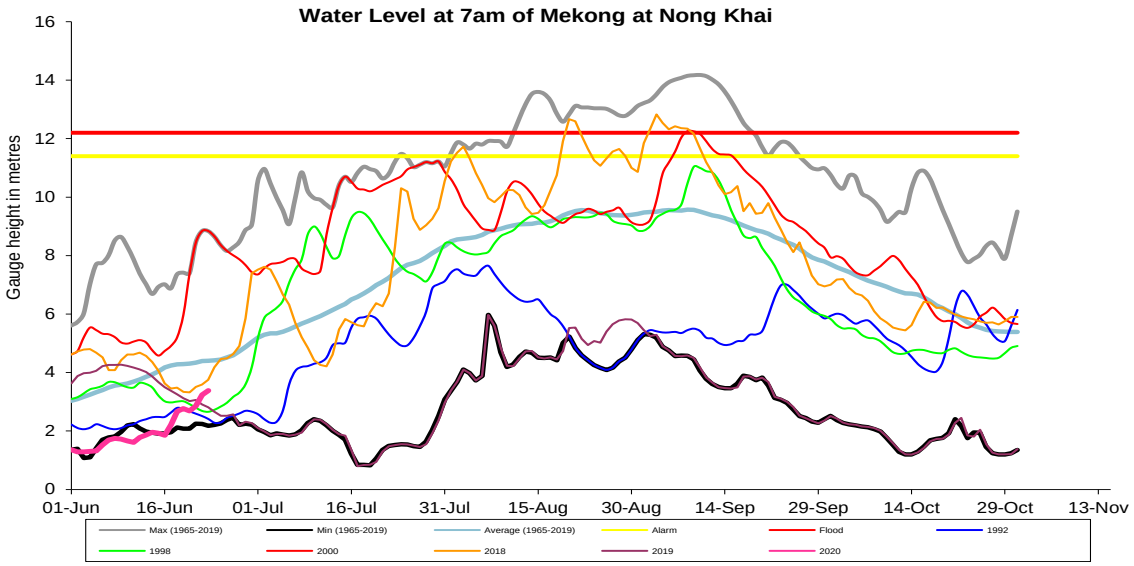
2019
2020


Water Level at 7am of Mekong at Nong Khai
Gauge height in metres
16
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1965-2019)
Min (1965-2019)
Average (1965-2019)
Alarm
Flood
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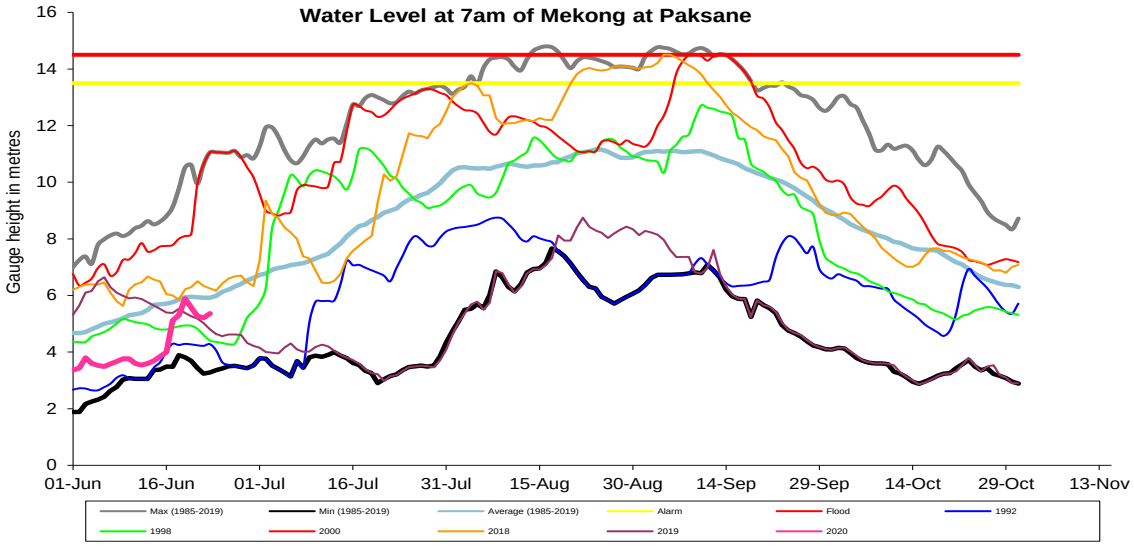
2019
2020


Water Level at 7am of Mekong at Paksane
Gauge height in metres
16
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1985-2019)
Min (1985-2019)
Average (1985-2019)
Alarm
Flood
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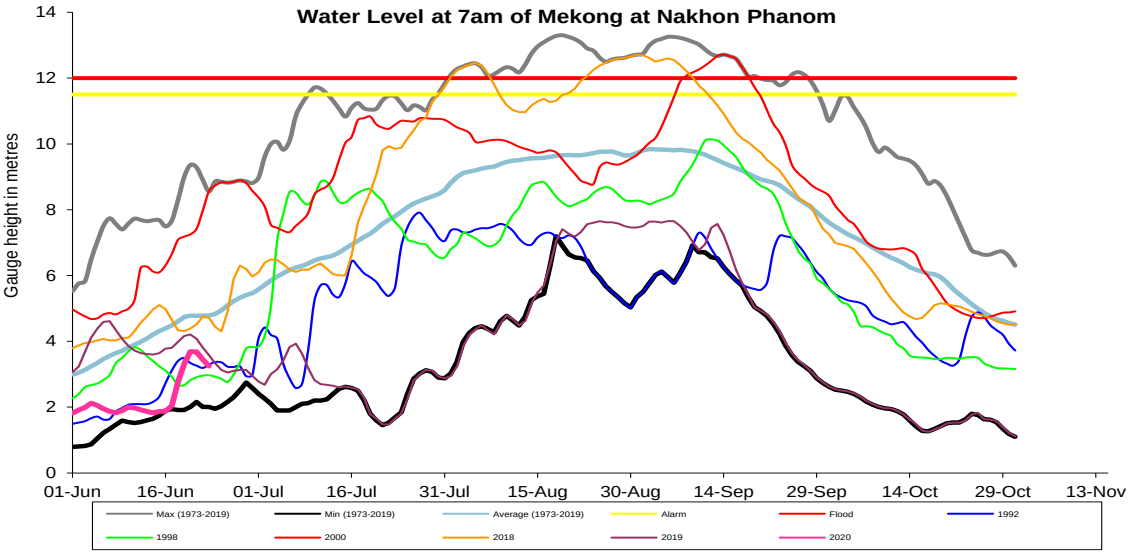
2018
2019
2020


Water Level at 7am of Mekong at Nakhon Phanom
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1973-2019)
Min (1973-2019)
Average (1973-2019)
Alarm
Flood
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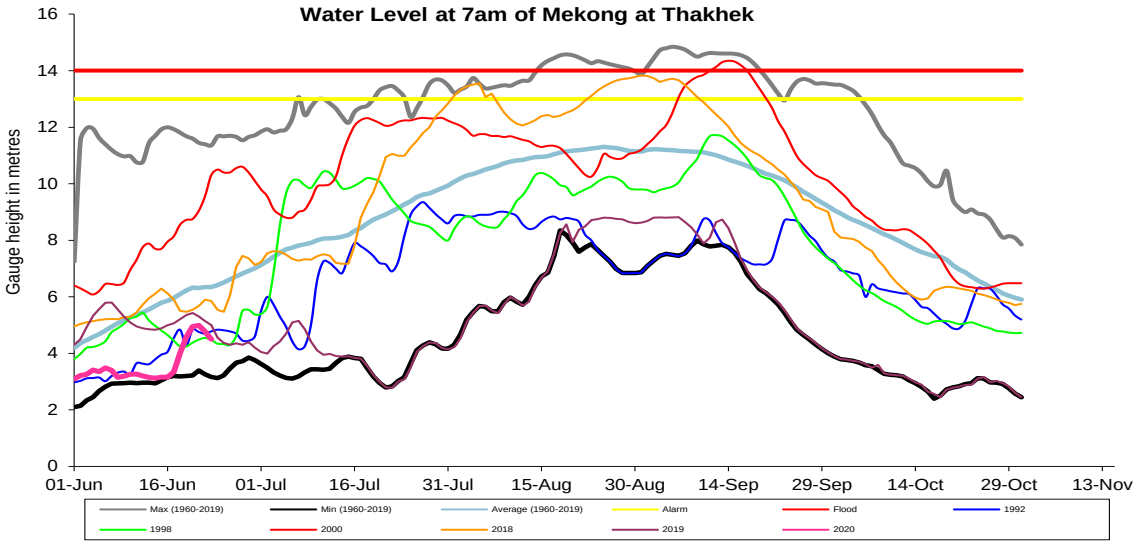
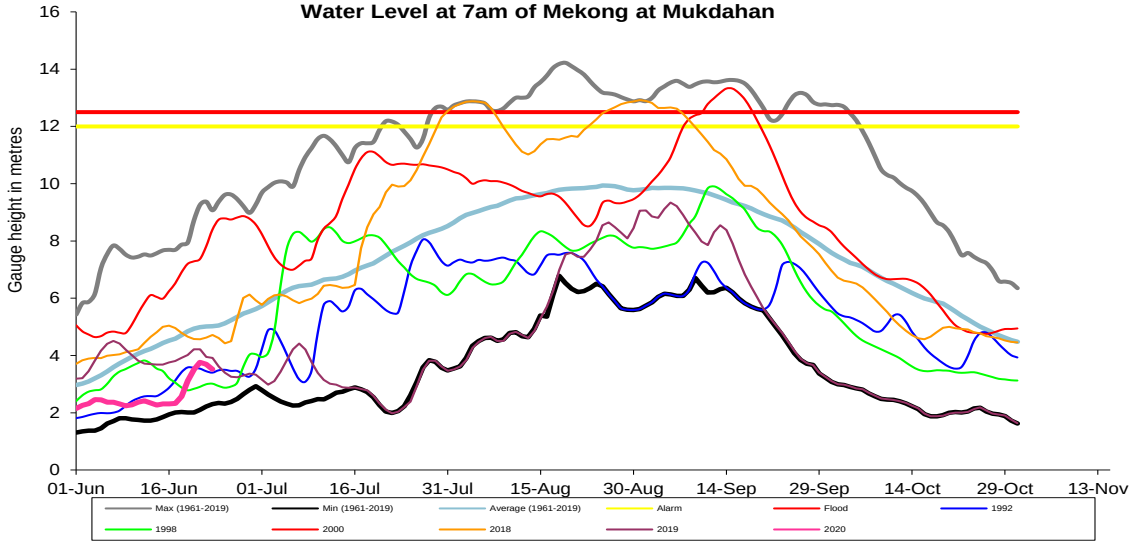
2018
2019
2020


Water Level at 7am of Mekong at Thakhek
Gauge height in metres
0
2
4
6
8
10
12
14
16
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1960-2019)
Min (1960-2019)
Average (1960-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Mekong at Mukdahan
Gauge height in metres
0
2
4
6
8
10
12
14
16
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
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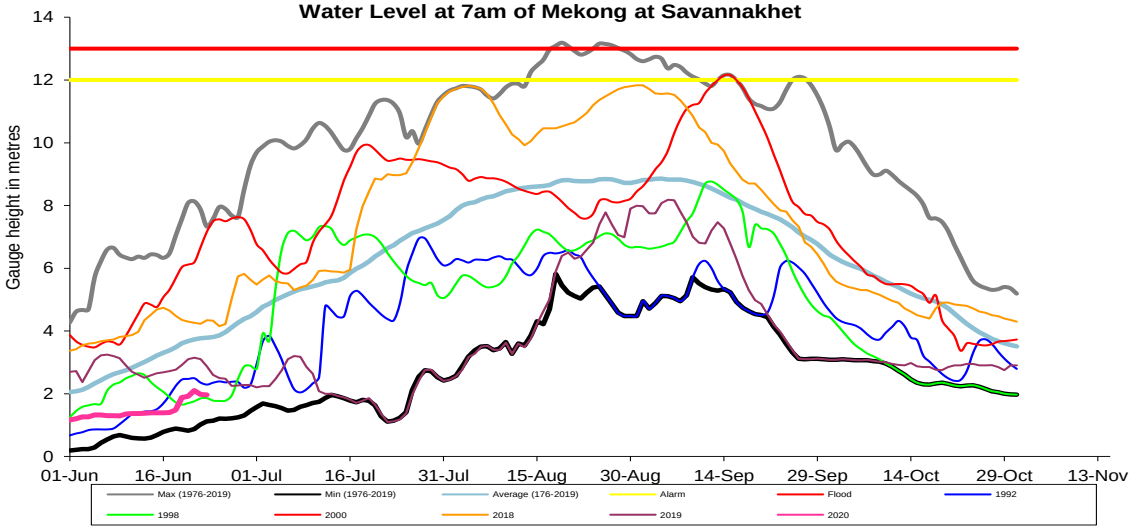
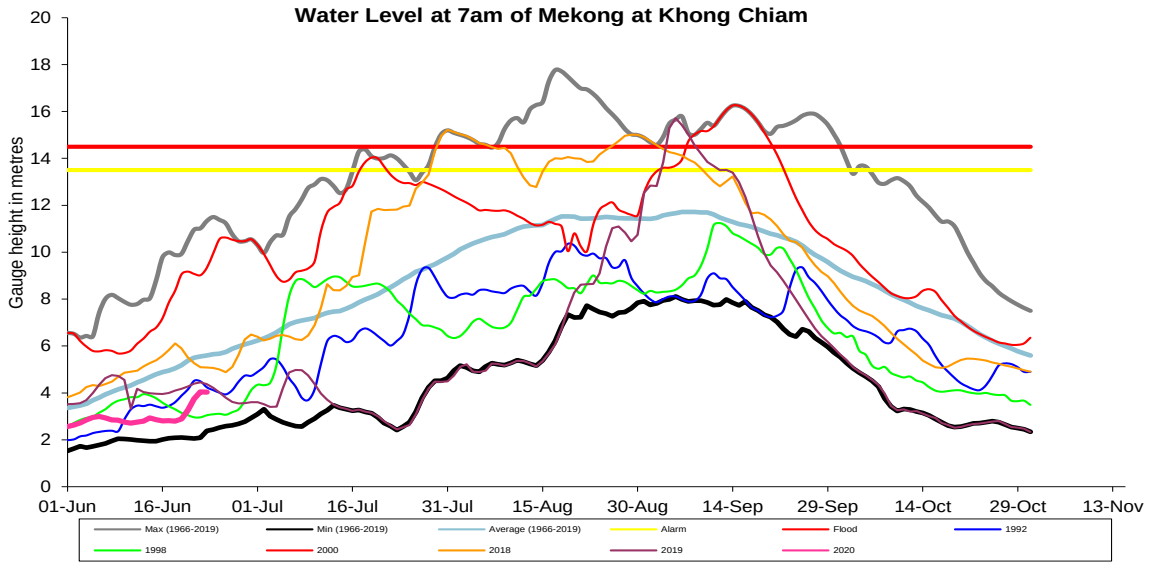
2019
2020


Water Level at 7am of Mekong at Savannakhet
Gauge height in metres
0
2
4
6
8
10
12
14
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1976-2019)
Min (1976-2019)
Average (176-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Mekong at Khong Chiam
Gauge height in metres
20
18
16
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1966-2019)
Min (1966-2019)
Average (1966-2019)
Alarm
Flood
1992
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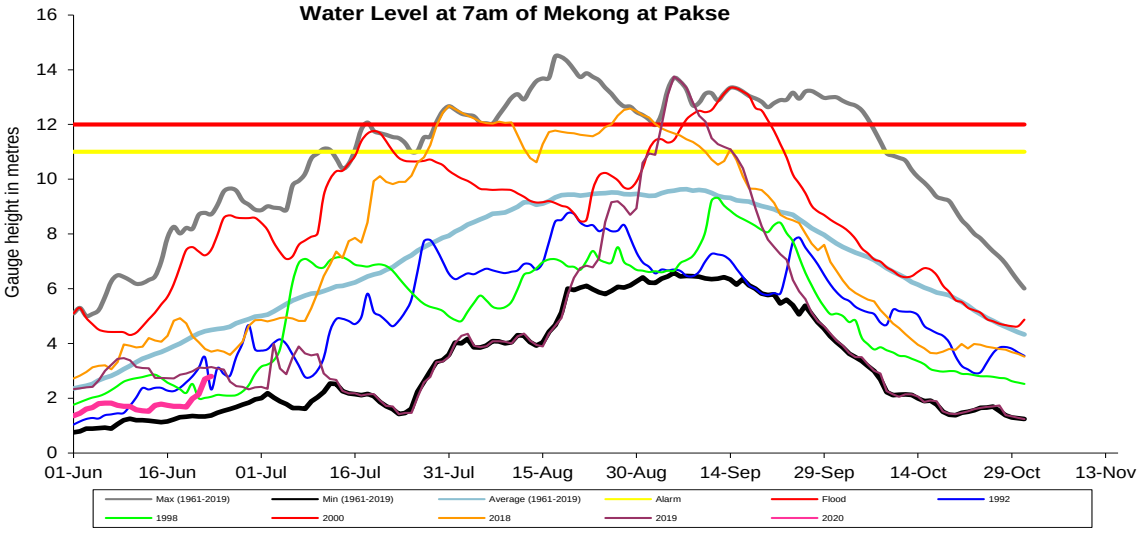
2018
2019
2020


Water Level at 7am of Mekong at Pakse
Gauge height in metres
16
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
1998
2000
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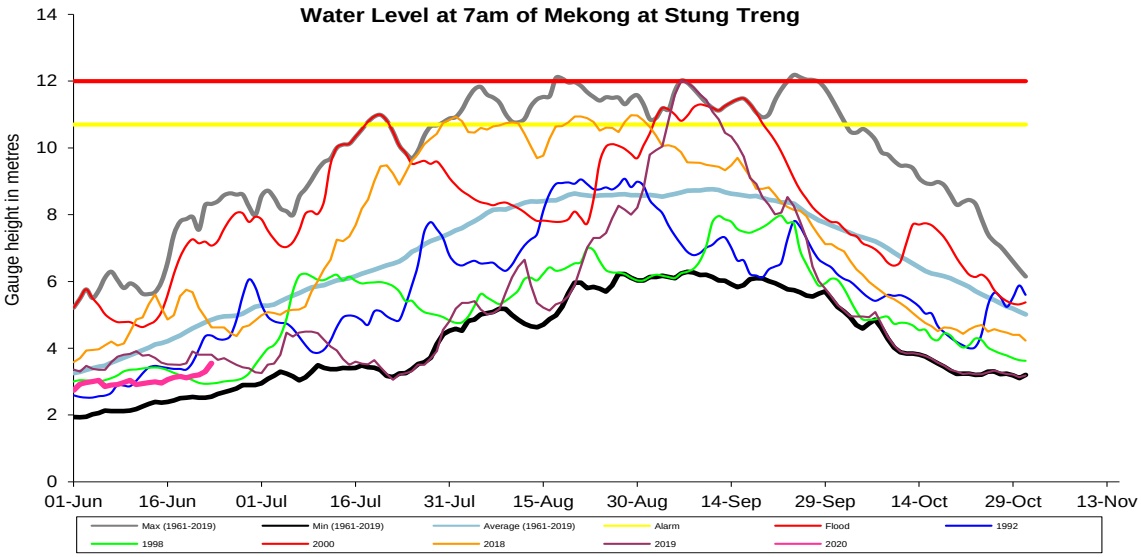
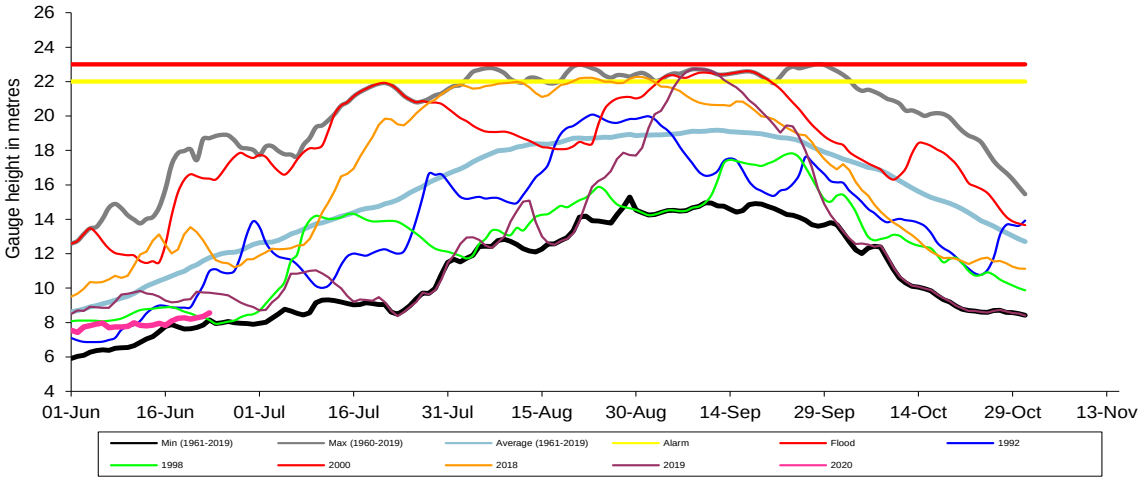
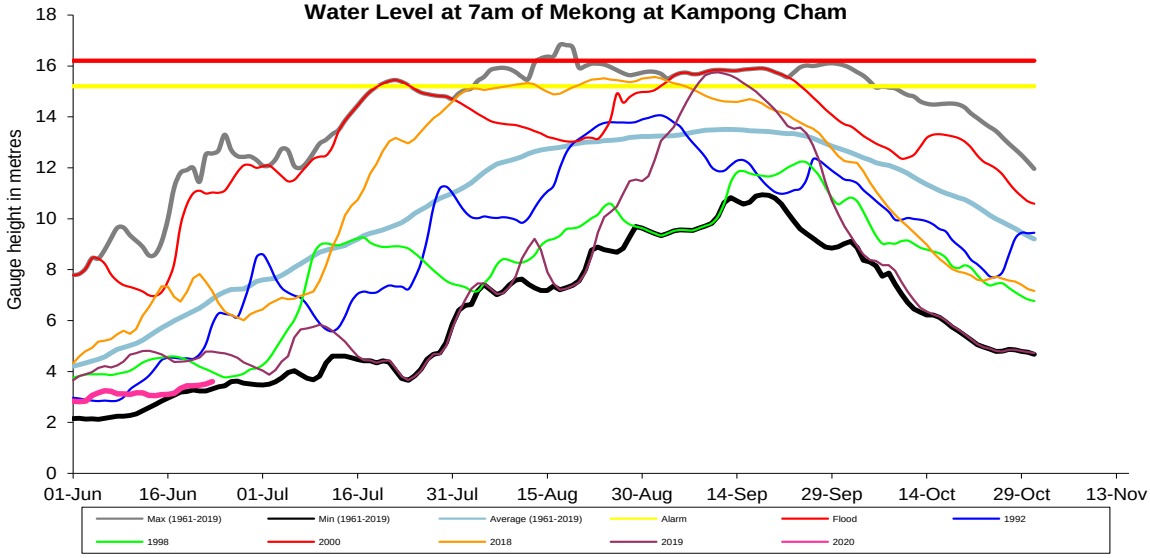
2019
2020


Water Level at 7am of Mekong at Stung Treng
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020

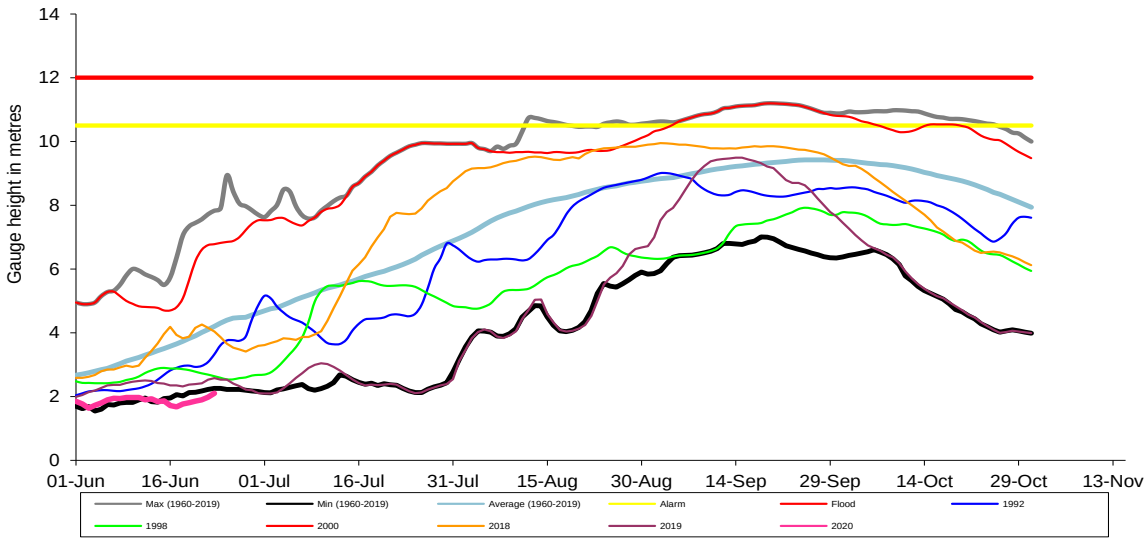
**Water Level at 7am of Mekong at Kratie**

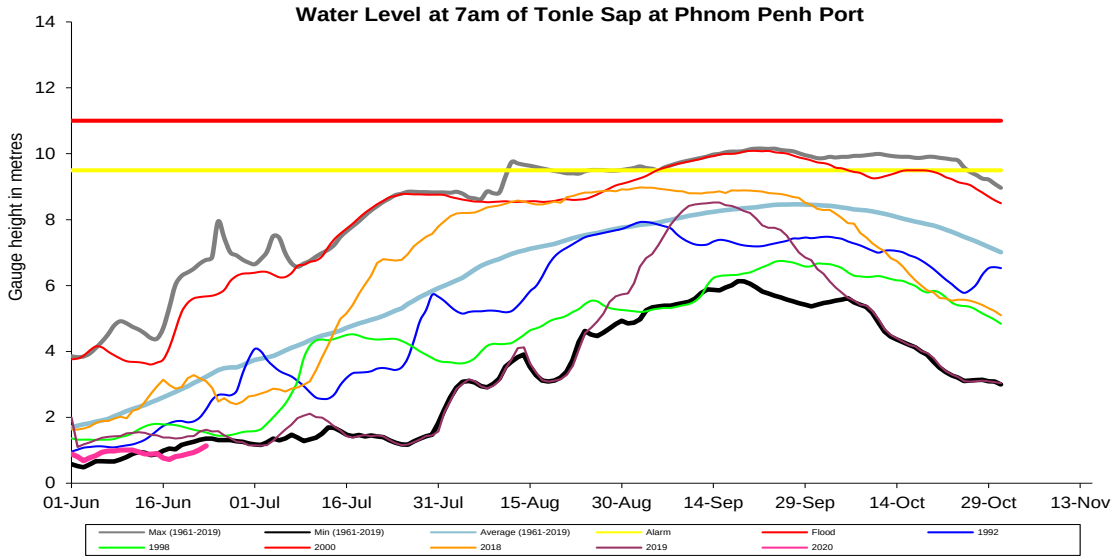


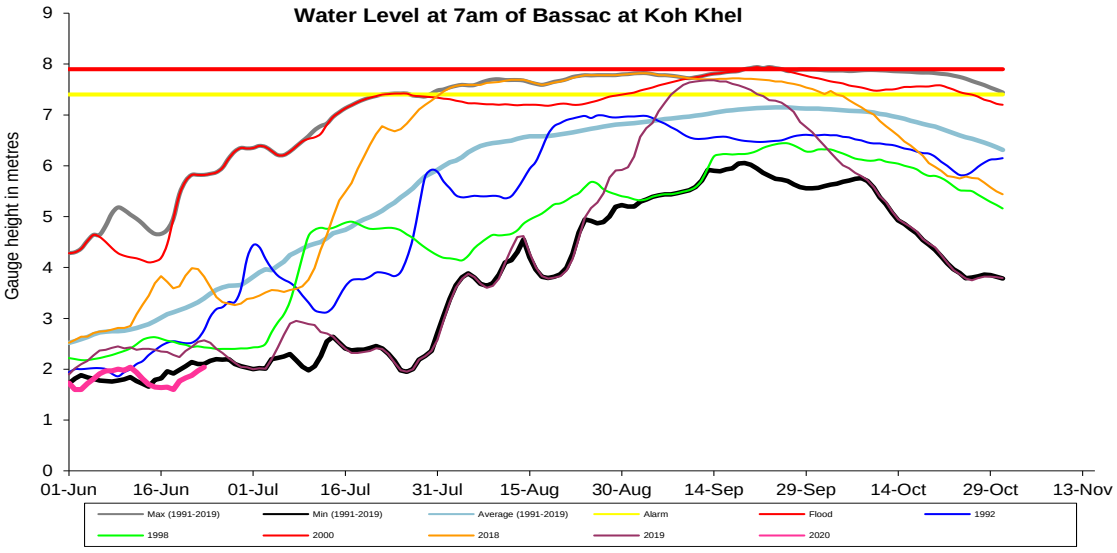

**Water Level at 7am of Mekong at Kampong Cham**

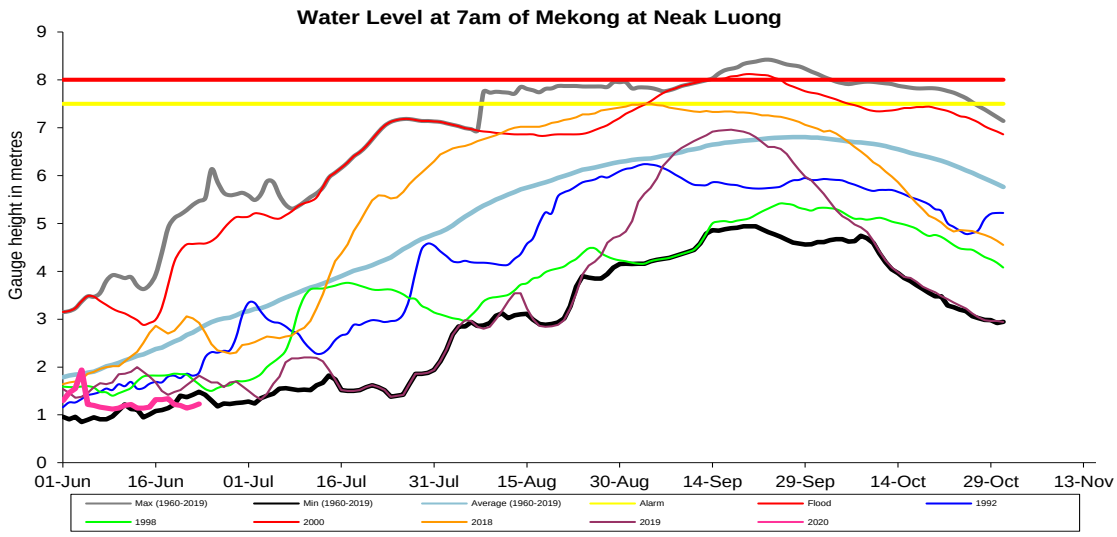


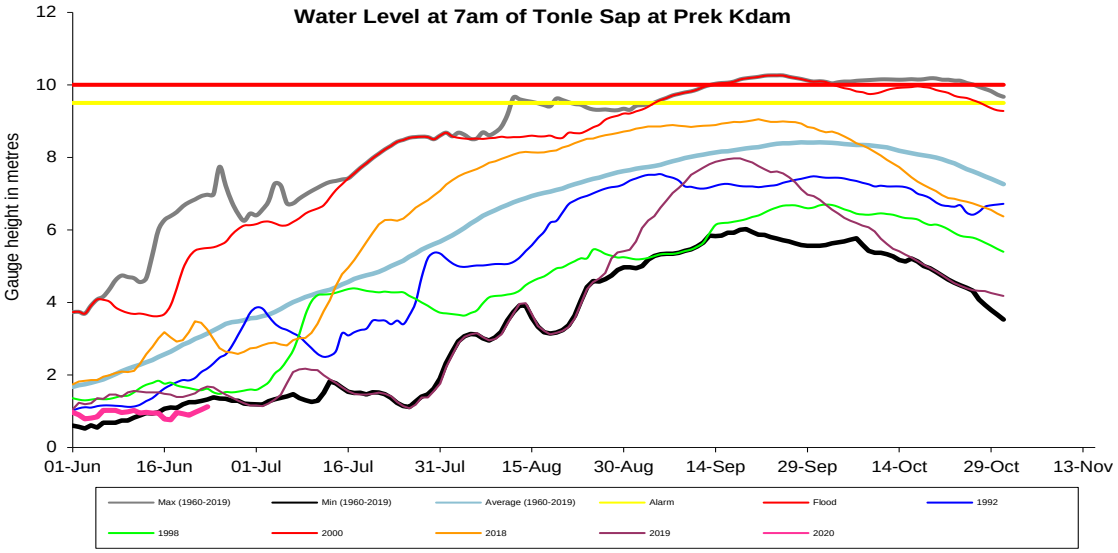

**Water Level at 7am of Mekong at Phnom Penh Chaktomuk**

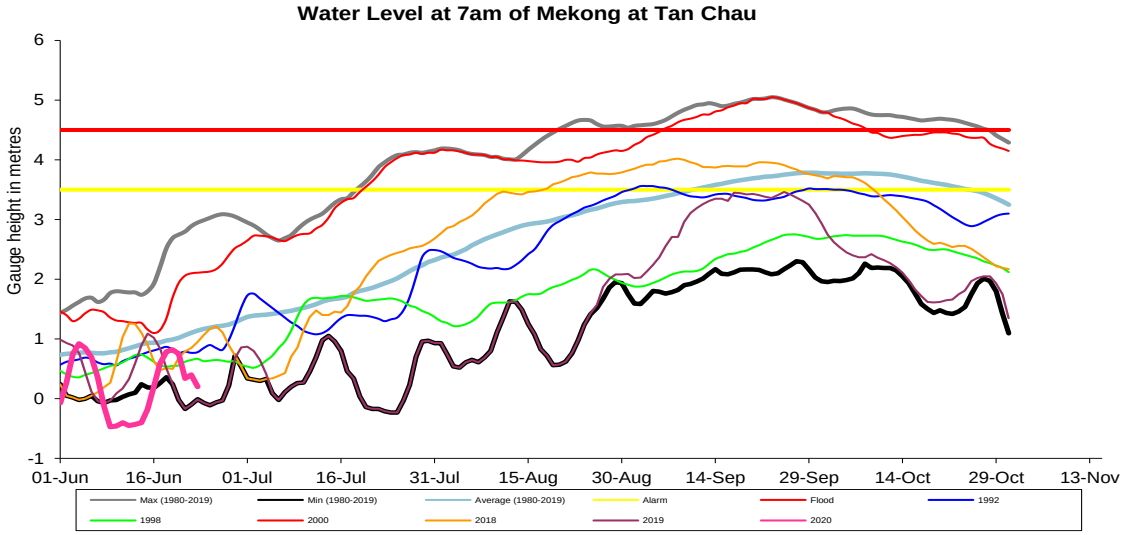


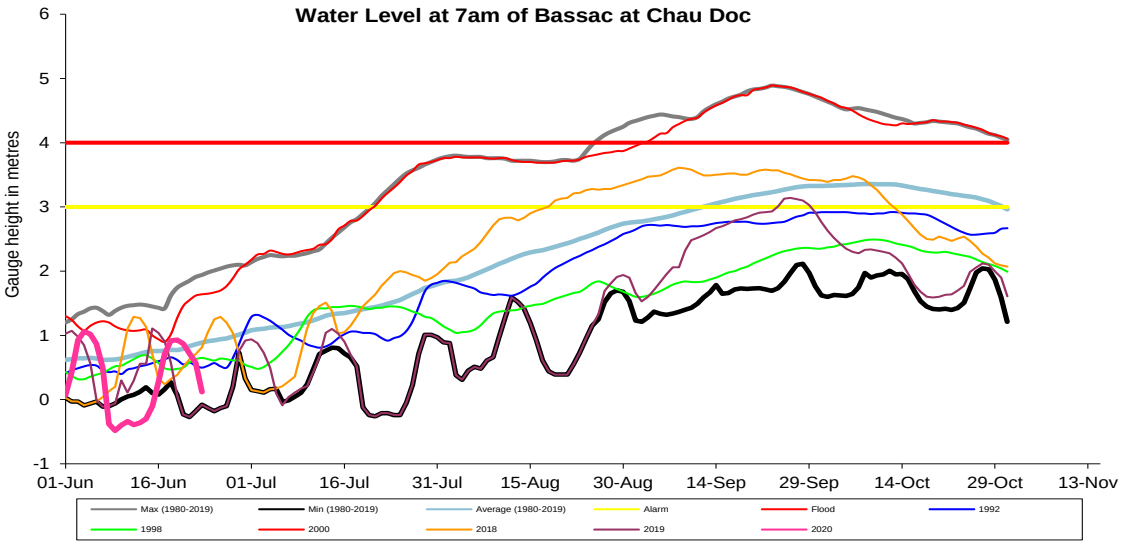

Water Level at 7am of Tonle Sap at Phnom Penh Port
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1961-2019)
Min (1961-2019)
Average (1961-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Bassac at Koh Khel
Gauge height in metres
9
8
7
6
5
4
3
2
1
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1991-2019)
Min (1991-2019)
Average (1991-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Mekong at Neak Luong
Gauge height in metres
9
8
7
6
5
4
3
2
1
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1960-2019)
Min (1960-2019)
Average (1960-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Tonle Sap at Prek Kdam
Gauge height in metres
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1960-2019)
Min (1960-2019)
Average (1960-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020


Water Level at 7am of Mekong at Tan Chau
Gauge height in metres
6
5
4
3
2
1
0
-1
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1980-2019)
Min (1980-2019)
Average (1980-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020

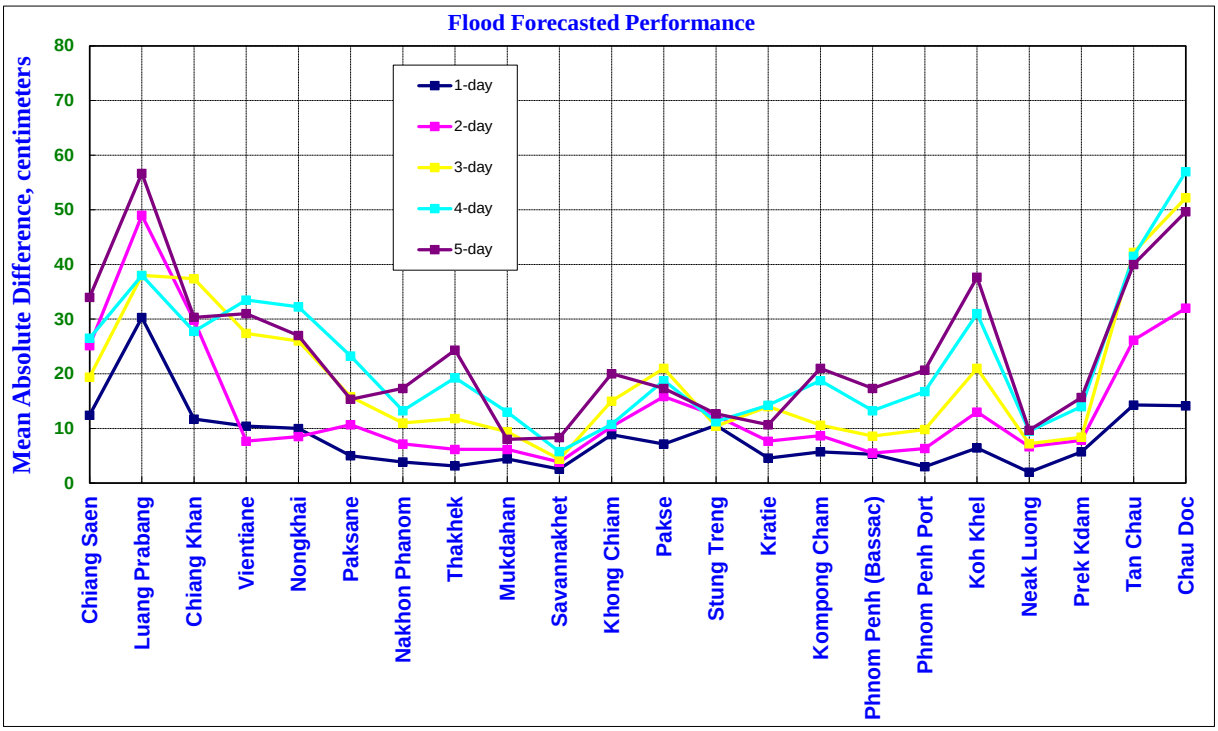

Water Level at 7am of Bassac at Chau Doc
Gauge height in metres
6
5
4
3
2
1
0
-1
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Max (1980-2019)
Min (1980-2019)
Average (1980-2019)
Alarm
Flood
1992
1998
2000
2018
2019
2020

## Annex B: Accuracy and Performance of weekly flood forecasting

### 1. Accuracy

"Accuracy" is referred to the results of the MRC Mekong Flood Forecasting System, after adjusted by forecaster and shared them in public information. The adjustment of flood forecasting outcome from the flood forecasting system, required Flood Forecasters to have strong knowledge in hydrology and statistical modelling for estimating the relationships between stations at upstream to downstream of the Mekong River Basin. The flood forecasting performance presented in a graph below showed the average flood forecasting accuracy at each key station along the Mekong mainstream from 08 to 15 June 2020.

The forecasting values from 16 to 22 June 2020 showed in overall accuracy is fair for 1-day to 3-day of forecast lead time at stations in the middle from Chiang Khan to Pakse and lower parts from Stung Treng to Neak Luong of the Mekong River. However, the accuracies at upper at Luang Prabang, and lower part at Koh Khel and the tidal stations at Tan Chau and Tan Chau and Chau Doc for 4-day to 5-day forecast were found higher than 50%.




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

1) Missing data and data input is not sufficient to be used as input into the flood forecasting model system.
2) Influence of hydropower operations from upstream and tributaries inflows.
3) Rapid up and down of water levels at stations of Tan Chau and Chau Doc due to daily tidal effect from the Sea in the Mekong Delta.
4) Rainfall from satellite was not well represented to the actual rainfall at ground stations in the Mekong region.

*Forecast Achievement*

The flood forecasting achievement indicated in (%) and (cm) from 1-day to 5-day at each key station, against with New Benchmark for a successful lead-time are presented in **Table B1** and **Table B2**.

**Table B1**: Evaluation performance forecasting (from 16 to 22 June 2020) base on New Benchmark (%).

Unit 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1-day** | 15 | 7 | 33 | 12 | 9 | 38 | 13 | 12 | 10 | 10 | 15 | 15 | 6 | 6 | 5 | 5 | 5 | 5 | 7 | 9 | 17 | 11 |
| **2-day** | 22 | 19 | 57 | 13 | 13 | 65 | 32 | 30 | 20 | 7 | 25 | 23 | 12 | 11 | 9 | 8 | 8 | 5 | 13 | 14 | 24 | 23 |
| **3-day** | 27 | 28 | 57 | 35 | 30 | 94 | 62 | 55 | 38 | 18 | 22 | 24 | 20 | 17 | 13 | 9 | 10 | 9 | 20 | 12 | 34 | 30 |
| **4-day** | 43 | 24 | 36 | 31 | 20 | 112 | 84 | 74 | 68 | 24 | 12 | 26 | 26 | 16 | 16 | 9 | 11 | 6 | 27 | 15 | 40 | 37 |
| **5-day** | 35 | 45 | 67 | 13 | 13 | 103 | 110 | 97 | 93 | 33 | 14 | 10 | 25 | 22 | 13 | 10 | 11 | 7 | 30 | 14 | 42 | 32 |

**Table B2**: Evaluation performance forecasting (from 16 to 22 June 2020) base on New Benchmark (cm). Unit 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 | *Average* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1-day** | 57.1 | 42.9 | 57.1 | 57.1 | 42.9 | 42.9 | 42.9 | 57.1 | 42.9 | 42.9 | 71.4 | 85.7 | 42.9 | 71.4 | 57.1 | 85.7 | 71.4 | 57.1 | 71.4 | 57.1 | 71.4 | 57.1 | ***58.4*** |
| **2-day** | 66.7 | 66.7 | 50.0 | 66.7 | 50.0 | 33.3 | 50.0 | 50.0 | 66.7 | 66.7 | 83.3 | 83.3 | 66.7 | 50.0 | 50.0 | 83.3 | 66.7 | 50.0 | 66.7 | 50.0 | 66.7 | 50.0 | ***60.6*** |
| **3-day** | 40.0 | 60.0 | 40.0 | 40.0 | 60.0 | 60.0 | 40.0 | 60.0 | 40.0 | 60.0 | 40.0 | 40.0 | 60.0 | 60.0 | 40.0 | 60.0 | 80.0 | 60.0 | 60.0 | 60.0 | 80.0 | 40.0 | ***53.6*** |
| **4-day** | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 75.0 | 50.0 | 50.0 | 50.0 | 50.0 | 75.0 | 50.0 | 50.0 | 50.0 | 50.0 | 75.0 | 75.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | ***54.5*** |
| **5-day** | 33.3 | 33.3 | 66.7 | 66.7 | 66.7 | 33.3 | 33.3 | 33.3 | 33.3 | 33.3 | 66.7 | 66.7 | 66.7 | 66.7 | 66.7 | 66.7 | 66.7 | 66.7 | 33.3 | 66.7 | 33.3 | 66.7 | ***53.0*** |

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

## 2. Performance based on data collection from Member Countries

Flood forecasting performance is based on hydro-met data received from Member Countries (MCs), evaluating performance indicators, missing data and completed time for flood forecasting are presented in **Table B4** and **Figure B1**, **B2** and **B3**, respectively from 08 to 16 June 2020.

**Table B4**: Overview of performance indicators for the past 8 days from 15 to 22 June 2020

| | FF time sent | | | | Arrival time of input data | | | | | | | | Missing data (number-mainstream and trib.st.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 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* | *10:25* | *00:00* | - | - | *08:15* | *07:10* | *07:14* | *08:14* | *08:45* | *08:27* | *07:00* | *08:25* | *0* | *0* | *3* | *0* | *113* | *0* | *0* | *0* |
| *month* | *10:24* | *00:00* | - | - | *08:15* | *07:10* | *07:55* | *08:09* | *08:43* | *08:24* | *07:14* | *08:27* | *0* | *0* | *35* | *0* | *0* | *0* | *0* | *38* |

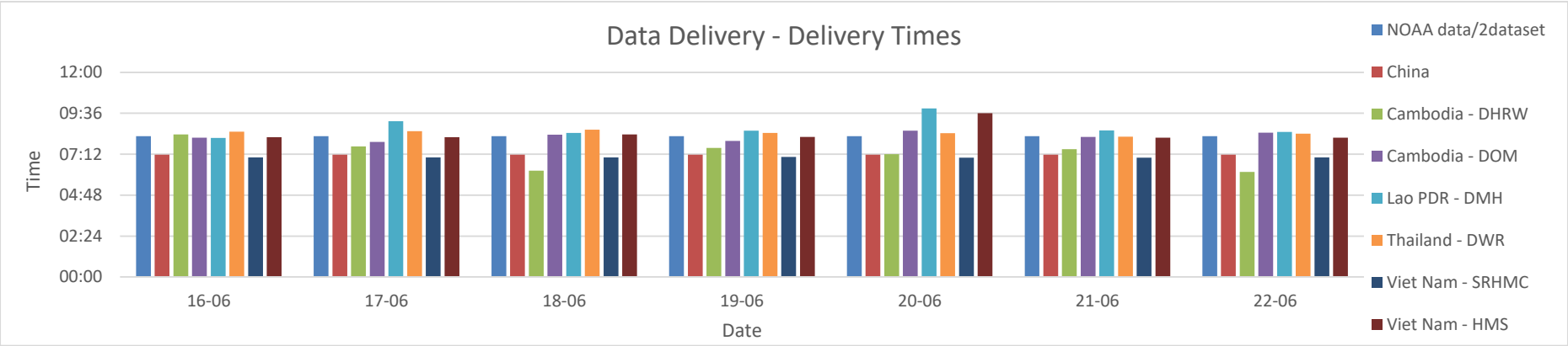



**Fig. B1**: Data delivery times for the past 8 days from 16 to 22 June 2020

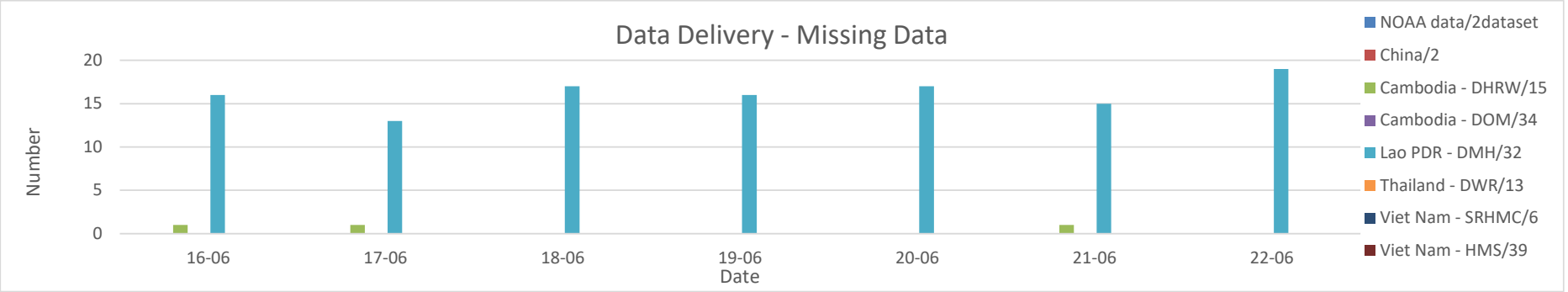



**Fig. B2**: Missing data for the past 7 days from 16 to 22 June 2020

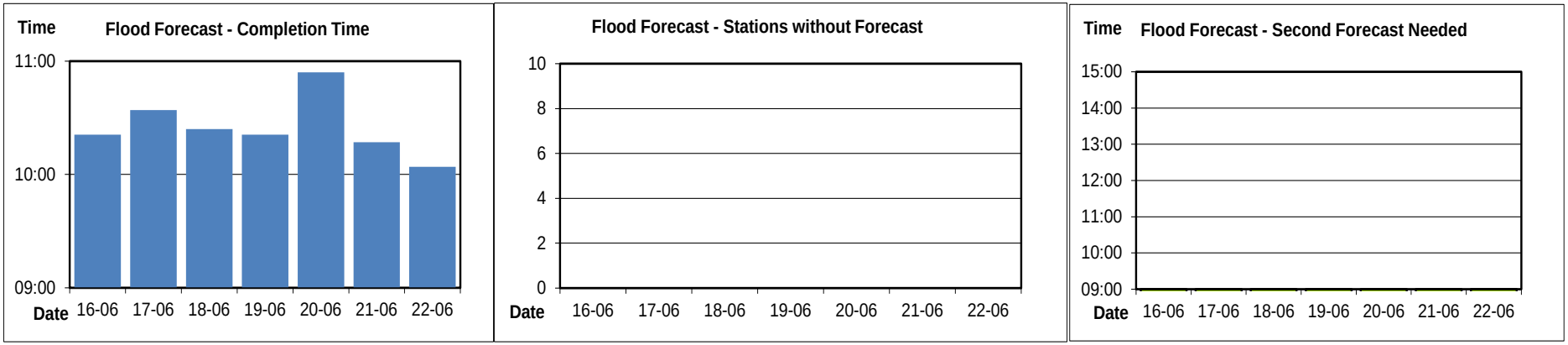



**Fig. B3**: Flood forecast completion time, stations without forecast and second forecast need from 16 to 22 June 2020