



Mekong River Commission

Weekly Wet Season Situation Report in the Lower Mekong River Basin 13-19 October 2020

Prepared by
The Regional Flood and Drought Management Centre
20 October 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 **13 - 19 October 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 refers to a 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.

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

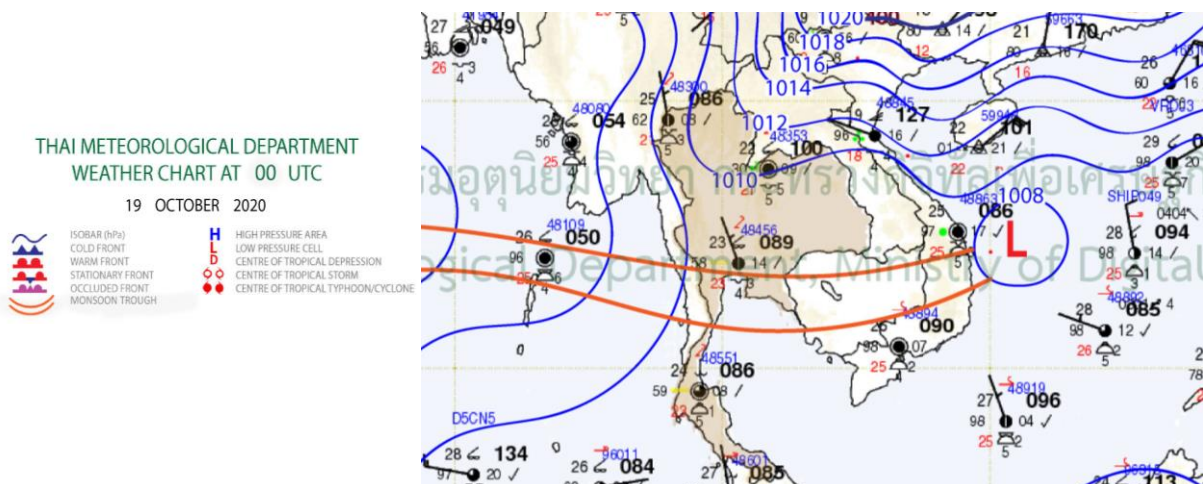
Flash flood information is accessible at: <http://ffw.mrcmekong.org/ffg.php>

2 General Weather Patterns

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

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

[Figure 1](#) presents the weather map of 19 October 2020, showing two lines of low pressure of the Monsoon Trough crossing the lower Mekong region which can continue to bring heavy rainfall over the next few days.



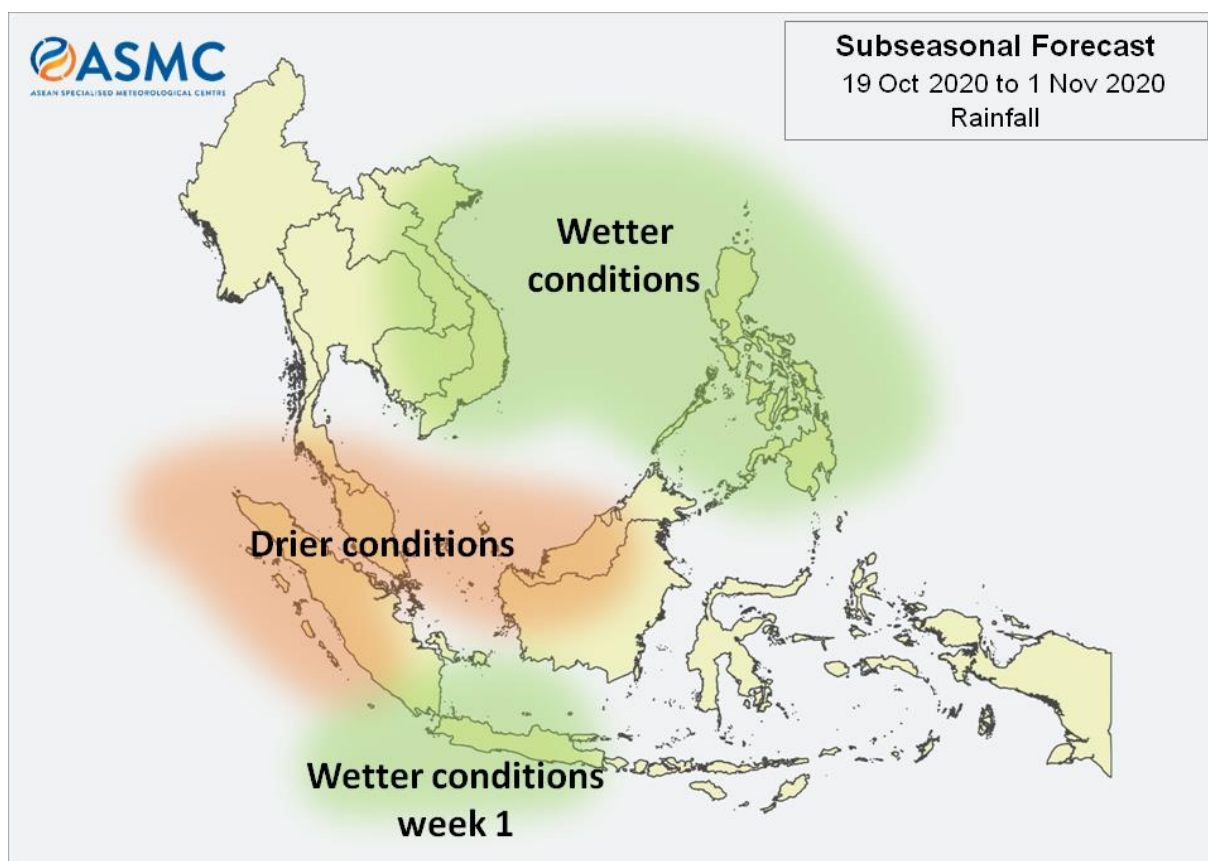


Figure 2: Outlook of rainfall over the Asian countries by ASMC.

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

There was a low pressure hitting the LMB during 13-19 October 2020. This caused heavy rainfall in the lower part of the basin from Savannakhet in the upper part to Pakse in Lao PDR and from Stung Treng in Cambodia to the lower part, as well as in the 3S area (Se Kong, Se San and Sre Pok) and the Mekong Delta in Viet Nam. Up to October 19, there were still two lines of low pressure moving across Thailand, Cambodia and Viet Nam. Additionally, on October 19, Tropical Depression *Nineteen*, which originated at the Sea, was moving towards the upper part of Viet Nam.

[Figure 3](#) shows the track of Tropical Depression *Nineteen*, which is moving from the Sea across Viet Nam to the north-eastern part of the Mekong region. The storm is moving towards the middle part of the basin from Thailand's Nakhon Phanom to Lao PDR's Pakse, including the 3S area.

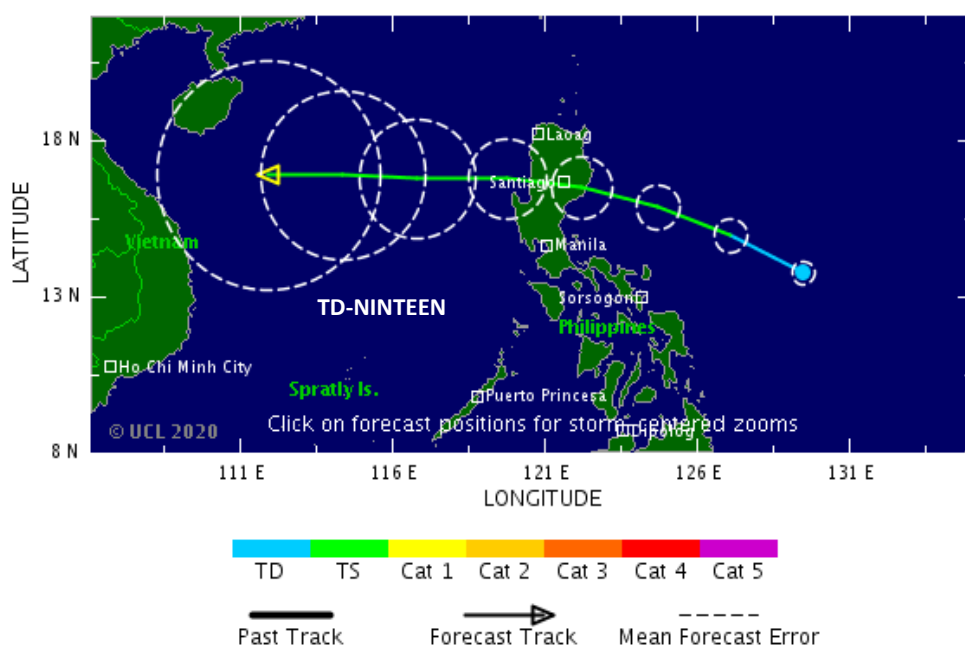


Figure 3: The moving of Tropical Depression of Nineteen toward the Mekong region.

Rainfall patterns over the LMB

This week's rainfall is considered above average, varying from 0.2 mm to 149 mm at different stations along the LMB from Chiang Saen in Thailand to Tan Chau and Chau Doc in Viet Nam. Unlike the situation last week, rainfall during this reporting week concentrated in the middle part of the basin starting from Thailand's Mukdahan to Lao PDR's Pakse and the lower part from Cambodia's Stung Treng to Viet Nam's Tan Chau and Chau Doc, ranging from 46 mm to 149 mm. But the upper part from Chiang Saen to Nakhon Phanom of Thailand in the LMB received less amount of rainfall compared to other areas. The total observed rainfall of the week at those selected stations is shown in [Figure 4](#).

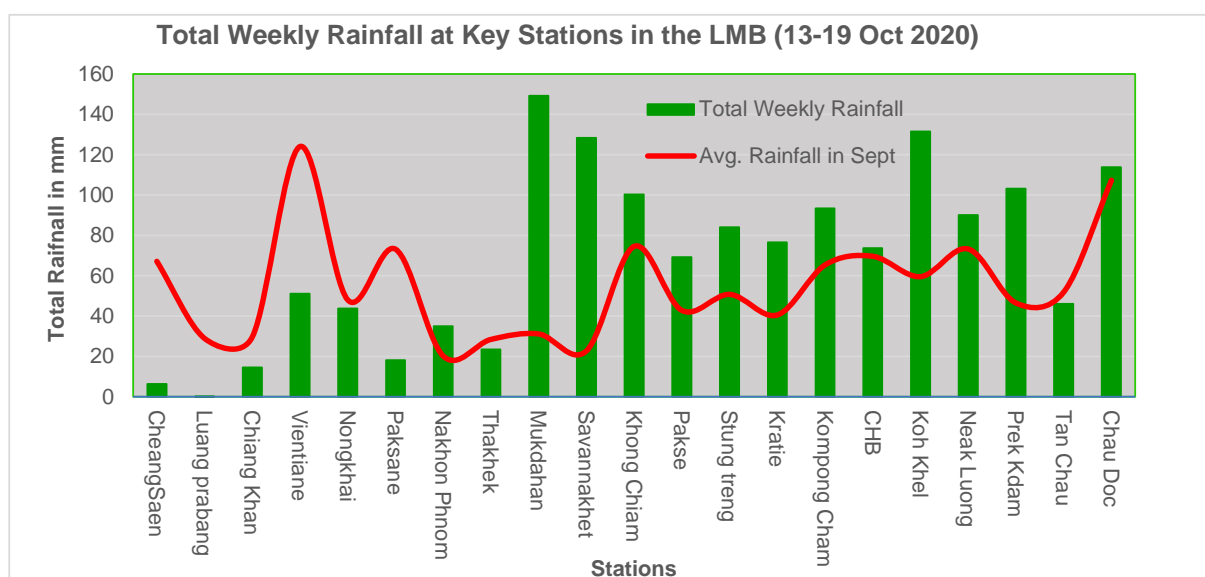


Figure 4: Weekly total rainfall at key stations in the LMB.

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 13 to 19 October 2020.

The amount of rainfall this week – from 0.4 mm to 149 mm – is considered higher than average in the lower part of the basin from Thailand’s Mukdahan to the Cambodia’s Stung Treng and Viet Nam’s Tan Chau and Chau Doc, but was lower than average in the upper part from Thailand’s Chiang Saen to Nakhon Phanom.

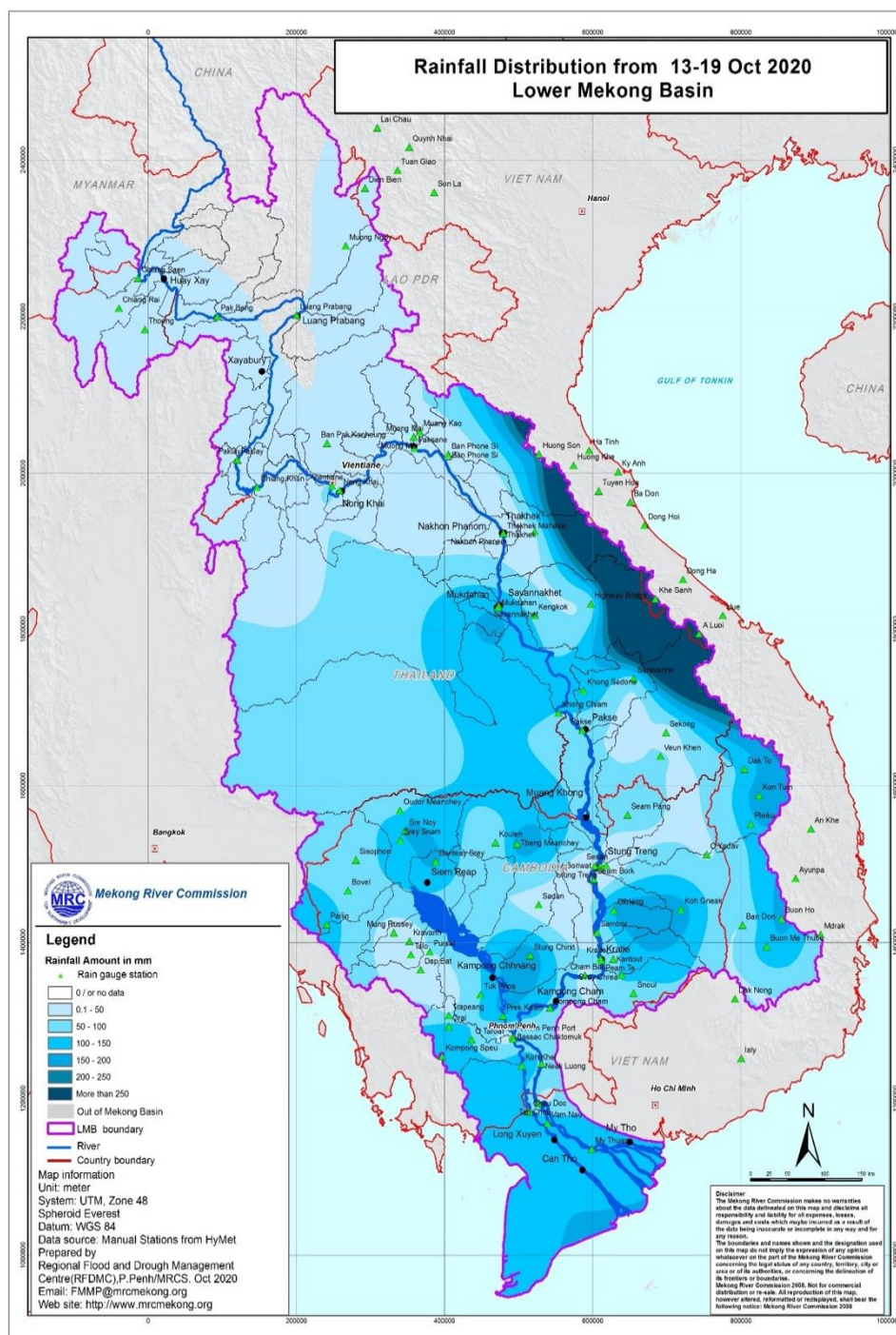


Figure 5: Weekly rainfall distribution over the LMB.

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>.

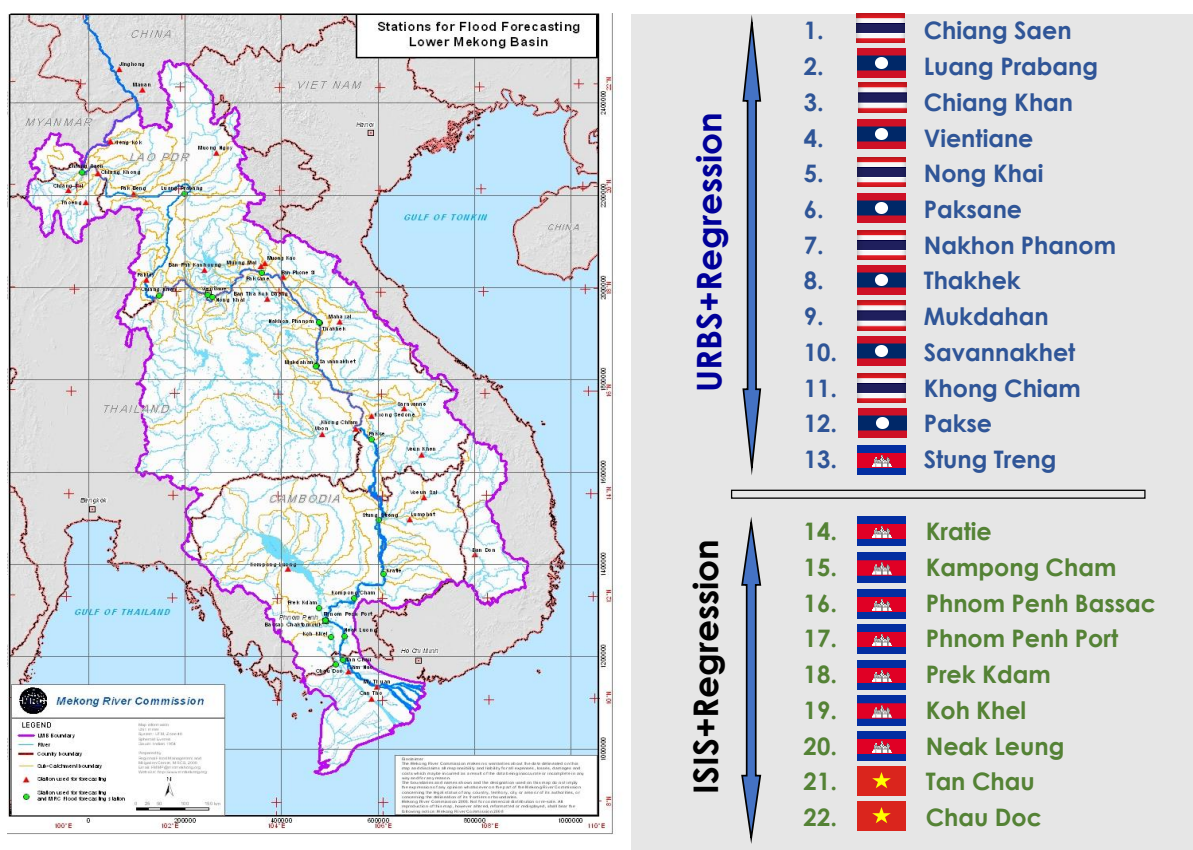


Figure 6: Key stations and model application for River Monitoring and Flood Forecasting.

Chiang Saen and Luang Prabang

Water level during October 13-19 at Thailand's Chiang Saen decreased from 2.73 metres to 2.52 metres. The main causes of such a phenomenon were believed to be a less quantity of inflow volume from the upstream stemming from Lao PDR, Myanmar and Lancang (Mekong) in China, and low contributing inflows from catchment which were due to continued low

rainfall over the recent weeks. When comparing to last week, this week's water level is relatively lower.

Water level at Luang Prabang station in Lao PDR was also decreasing from 9.18 metres to 8.88 metres during the reporting period. Compared to last week, the figure shows a decreasing number between -0.18 metres and -0.04 metres. This level is higher than that of 2019 but 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 was decreasing from 6.63 metres to 6.16 metres during this week, showing 2.54 metres below its LTA value. **The level is at minimum record and is lower than the record in 1992, one of the lowest-flow years in the Mekong history.**

Downstream water levels from Vientiane to Paksane in Lao PDR followed the same direction of the Chiang Khan's one. The decreased values varied between 0.03 and 0.46 metres. Less water contribution from upstream inflows and rainfall from sub-catchments are likely the main reason. **Compared to this time last year, the current water levels at these stations are about three meters higher.**

Nakhon Phanom to Pakse

Similarly, water levels from Nakhon Phanom in Thailand to Thakhet in Lao PDR were slightly decreasing during the reporting period, ranging from -0.25 to 0.06 metres. Below-average rainfall in upstream and its adjacent catchments are likely the cause of these increasing water levels. **On the contrary, with heavy rainfall at tributaries of Nam Phao and Se Bang Fai in Lao PDR since October 8, water levels at Khong Chiam in Thailand and Pakse in Lao PDR have gone up to over 2 metres above their LTAs, as shown in [Figure 7](#).**

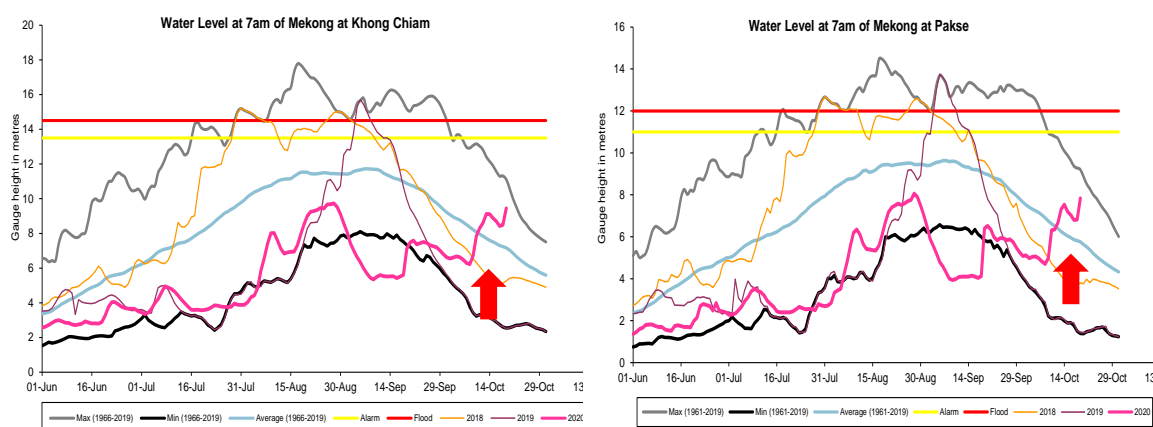


Figure 7: Water levels at Khong Chiam of Thailand and Pakse of Lao PDR.

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

Like many upstream stations, heavy rainfall from the upper part of the Mekong River and the 3S river (Sekong, Se San and Sre Pok) have made water levels at Stung Treng, Kratie, and Kampong Cham significantly increase. The water rose by about 0.50 metres and was just 2.5 metres below their maximum levels. Similarly, water levels at Chaktomuk, Koh Khel, Phnom Penh Port, and Prek Kdam stations in Cambodia were also affected by heavy rain in the area, rising up about 0.35 metres. **During this week, water levels at Stung Treng and Kratie were higher than their LTA levels, as shown in Figure 8. However, from Phnom Penh to Neak Luong, the levels were still lower than their LTAs.**

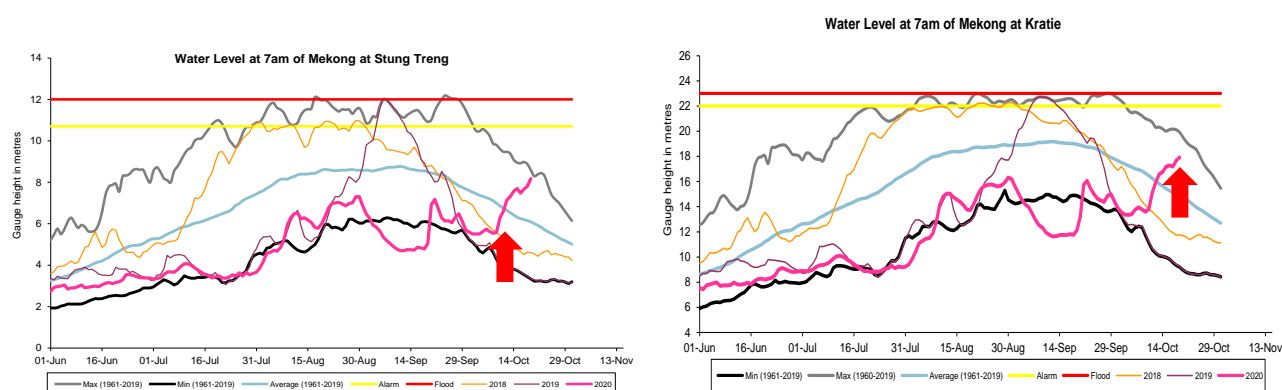


Figure 8: Water levels at Stung Treng and Kratie on Mekong River.

Tidal stations at Tan Chau and Chau Doc

Like last week, this week from October 13 to 19, 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.**

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 October 19 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. Due to the heavy rain in some of the provinces

around the Tonle Sap Lake in recent weeks, the inflows to TSL this week showed a significant increase.

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 October 19 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 October (up to 19 October) 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, August and September 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 since 2019.

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.

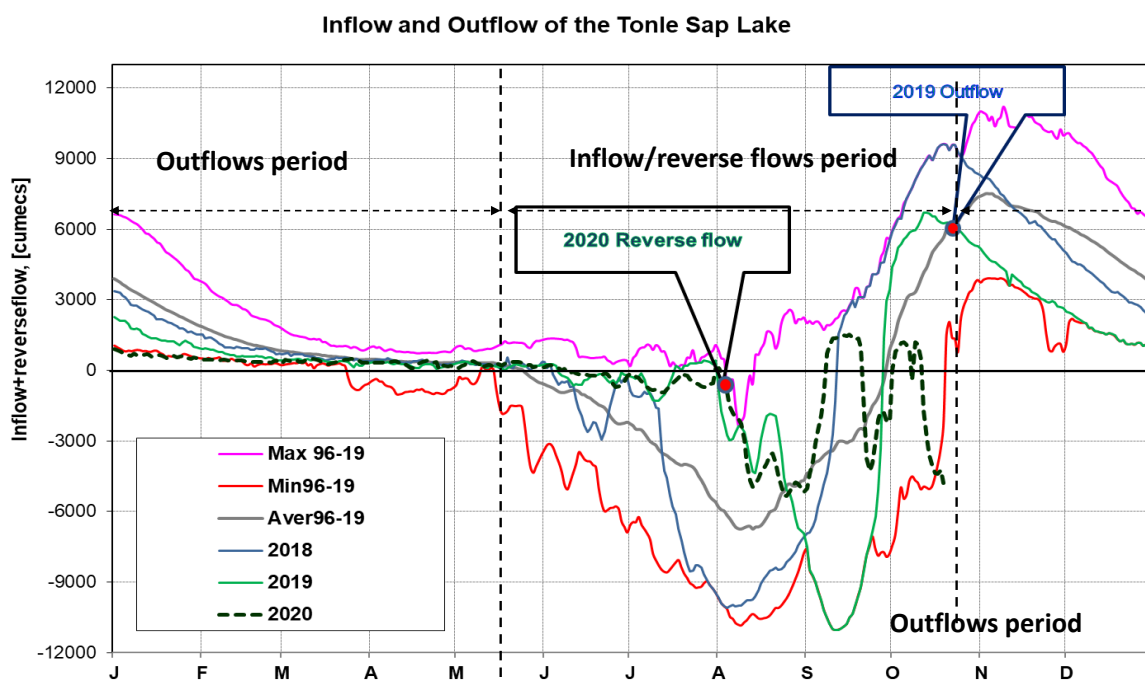


Figure 9: Seasonal change of inflows and outflows of Tonle Sap Lake.

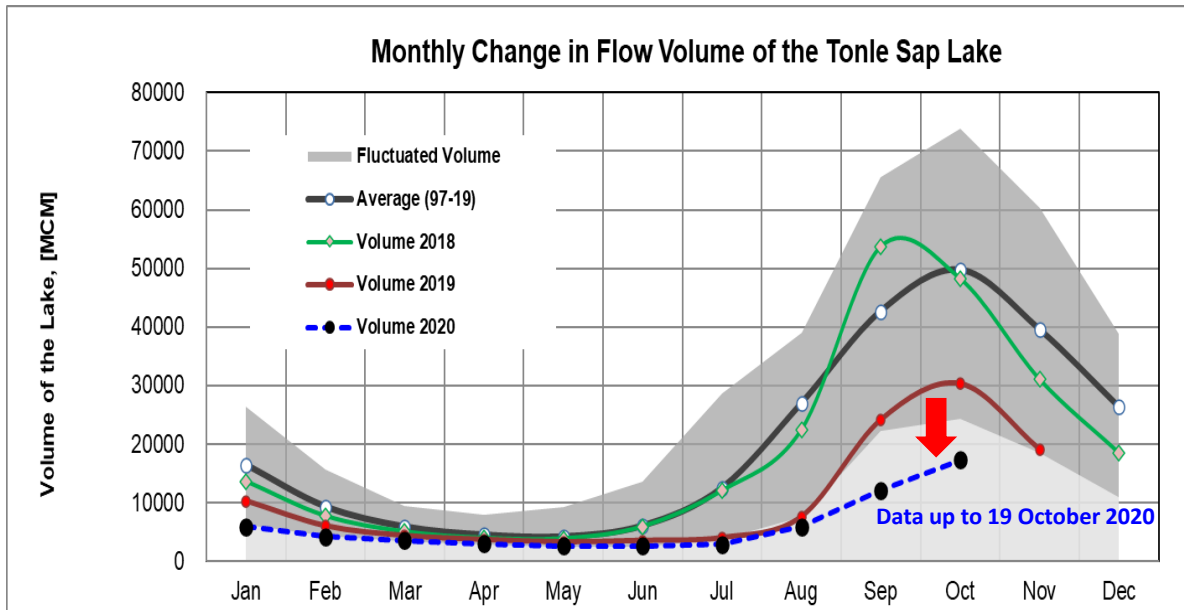


Figure 10: The seasonal change in monthly flow volume of Tonle Sap Lake.

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 | 12105.31 | 28.39 |
| Oct | 49698.19 | 73757.23 | 24276.79 | 48193.08 | 30358.38 | 17303.45 | |
| Nov | 39542.58 | 60367.33 | 18576.01 | 31036.07 | 19112.65 | | |
| Dec | 26325.13 | 38888.95 | 10869.43 | 18469.21 | 10577.29 | | |
| | Critical situation, comapred with historical Min values | | | | | | |
| | Normal condition, compared with LTA (Long term average) | | | | | | |
| | Low volume situation, comapred with LTA values | | | | | | |
| Unit: Million Cubic Meter (1 MCM= 0.001 Km ³) | | | | | | | |

4 Flash Flood in the Lower Mekong Basin

During October 13-19, the southwest monsoon was strongly developing in the Gulf of Thailand and the Tropical Depression (TD) from the Sea was also transforming to be a typical *Nangka* typhoon hitting Thanh Hoa province in northern Viet Nam on October 14. This Typhoon circulation brought heavy to very heavy rainfall (>100 mm/24hrs) to the north-central of Viet Nam and caused moderate to heavy rainfall in the middle part of the LMB, including Viet Nam, Lao PDR, and Thailand. According to the MRC-Flash Flood Guidance System (FFGS) and analysis, flash flood events were detected in some areas of Viet Nam and Lao PDR with the impacts ranging from low to high level, as shown in [Figure 11](#) and , and [Table 2](#) and [Table 3](#).

The figure and table also show Flash Flood Guidance (FFG) results for the next one, three, and six hours produced on October 17 at 00:00 UTC (07:00 AM local time).

Table 2: Detected flash flood in Viet Nam on Oct 17.

| 01-Hour Flash Flood Risk and location in Viet Nam | | | | 3-Hour Flash Flood Risk and location in Viet Nam | | | | 6-Hour Flash Flood Risk and location in Viet Nam | | | |
|---|------------|---------------------|---------------|--|------------|---------------------|---------------|--|------------|---------------------|---------------|
| Provinces | Districts | Region | Level Risks | Provinces | Districts | Region | Level Risks | Provinces | Districts | Region | Level Risks |
| Quang Tri | Huong Hoa | North Central | Moderate-Risk | Quang Tri | Huong Hoa | North Central | Moderate-Risk | Quang Tri | Huong Hoa | North Central | Moderate-Risk |
| Thua Thien Hue | A Luoi | North Central | Low-Risk | Quang Binh | Minh Hoa | North Central | Low-Risk | Quang Binh | Minh Hoa | North Central | Low-Risk |
| Quang Nam | Hien | South Central Coast | Low-Risk | Quang Nam | Hien | South Central Coast | Moderate-Risk | Quang Nam | Hien | South Central Coast | Moderate-Risk |
| Quang Nam | Nam Giang | South Central Coast | Moderate-Risk | Quang Nam | Nam Giang | South Central Coast | Moderate-Risk | Quang Nam | Nam Giang | South Central Coast | Moderate-Risk |
| Quang Binh | Le Thuy | North Central | Low-Risk | Quang Binh | Bo Trach | North Central | Low-Risk | Quang Binh | Bo Trach | North Central | Low-Risk |
| Quang Tri | Da Krong | North Central | Moderate-Risk | Quang Binh | Quang Ninh | North Central | Low-Risk | Quang Binh | Quang Ninh | North Central | Low-Risk |
| Thua Thien Hue | Phong Dien | North Central | Moderate-Risk | Quang Binh | Bo Trach | North Central | Low-Risk | Quang Binh | Bo Trach | North Central | Low-Risk |
| Quang Nam | Hien | South Central Coast | Low-Risk | Quang Binh | Le Thuy | North Central | Moderate-Risk | Quang Binh | Le Thuy | North Central | Moderate-Risk |
| Da Nang | Hoa Vang | South Central Coast | Low-Risk | Quang Tri | Da Krong | North Central | Moderate-Risk | Quang Tri | Da Krong | North Central | Moderate-Risk |
| Quang Nam | Phuoc Son | South Central Coast | Low-Risk | Thua Thien Hue | Phong Dien | North Central | Moderate-Risk | Thua Thien Hue | Phong Dien | North Central | Moderate-Risk |
| Quang Nam | Tra My | South Central Coast | Moderate-Risk | Thua Thien Hue | A Luoi | North Central | Moderate-Risk | Thua Thien Hue | A Luoi | North Central | High-Risk |
| Quang Nam | Que Son | South Central Coast | Moderate-Risk | Quang Nam | Hien | South Central Coast | Moderate-Risk | Quang Nam | Hien | South Central Coast | Moderate-Risk |
| Phu Yen | Tuy Hoa | South Central Coast | Moderate-Risk | Thua Thien Hue | Nam Dong | North Central | Low-Risk | Thua Thien Hue | Nam Dong | North Central | Low-Risk |
| | | | | Da Nang | Hoa Vang | South Central Coast | Moderate-Risk | Da Nang | Hoa Vang | South Central Coast | Moderate-Risk |
| | | | | Quang Nam | Dai Loc | South Central Coast | Low-Risk | Quang Nam | Dai Loc | South Central Coast | Low-Risk |
| | | | | Kon Tum | Dak Glei | Central Highlands | Moderate-Risk | Kon Tum | Dak Glei | Central Highlands | Moderate-Risk |
| | | | | Quang Nam | Que Son | South Central Coast | Low-Risk | Quang Nam | Que Son | South Central Coast | Low-Risk |
| | | | | Quang Nam | Phuoc Son | South Central Coast | Moderate-Risk | Quang Nam | Phuoc Son | South Central Coast | Moderate-Risk |
| | | | | Quang Ngai | Tra Bong | South Central Coast | Low-Risk | Quang Ngai | Tra Bong | South Central Coast | Low-Risk |
| | | | | Quang Nam | Tra My | South Central Coast | Moderate-Risk | Quang Nam | Tra My | South Central Coast | Moderate-Risk |
| | | | | Quang Nam | Que Son | South Central Coast | Moderate-Risk | Quang Nam | Que Son | South Central Coast | High-Risk |
| | | | | Quang Ngai | Son Tay | South Central Coast | Low-Risk | Quang Ngai | Son Tay | South Central Coast | Low-Risk |
| | | | | Phu Yen | Tuy Hoa | South Central Coast | Moderate-Risk | Phu Yen | Tuy Hoa | South Central Coast | Moderate-Risk |
| | | | | Khanh Hoa | Van Ninh | South Central Coast | Moderate-Risk | Khanh Hoa | Van Ninh | South Central Coast | Moderate-Risk |
| | | | | Khanh Hoa | Ninh Hoa | South Central Coast | Low-Risk | Khanh Hoa | Ninh Hoa | South Central Coast | Low-Risk |

Table 3: Detected flash flood in Lao PDR on Oct 17.

| 01-Hour Flash Flood Risk and location in Lao PDR | | | | | 03-Hour Flash Flood Risk and location in Lao PDR | | | | | 06-Hour Flash Flood Risk and location in Lao PDR | | | | |
|--|-----------|--------------|-----------|---------------|--|-----------|--------------|-----------|---------------|--|-----------|--------------|-----------|---------------|
| Provinces | Districts | Villages | Region | Level Risk | Provinces | Districts | Villages | Region | Level Risk | Provinces | Districts | Villages | Region | Level Risk |
| Savannakhet | Nong | LAGNENG KHOK | Southern | Low-Risk | Savannakhet | Nong | LAGNENG KHOK | Southern | Moderate-Risk | Savannakhet | Nong | LAGNENG KHOK | Southern | Moderate-Risk |
| Saravane | Ta oi | PHOR SANH | South | Moderate-Risk | Saravane | Ta oi | PHOR SANH | South | High-Risk | Saravane | Ta oi | PHOR SANH | South | High-Risk |
| Sekong | Kaleum | PRO | Southeast | Low-Risk | Savannakhet | Phine | PHAY | Southern | Low-Risk | Savannakhet | Phine | PHAY | Southern | Low-Risk |
| Sekong | Kaleum | AR-PEUANG | Southeast | Low-Risk | Sekong | Kaleum | PRO | Southeast | Moderate-Risk | Sekong | Kaleum | PRO | Southeast | Moderate-Risk |
| Sekong | Kaleum | PALAENG | Southeast | Low-Risk | Sekong | Kaleum | KA-OUANG | Southeast | Moderate-Risk | Sekong | Kaleum | KA-OUANG | Southeast | Moderate-Risk |
| Sekong | Kaleum | STHORN | Southeast | Low-Risk | Sekong | Kaleum | AR-PEUANG | Southeast | Moderate-Risk | Sekong | Kaleum | AR-PEUANG | Southeast | Moderate-Risk |
| Sekong | Lamarm | KANONG MAI | Southeast | Moderate-Risk | Sekong | Kaleum | PALAENG | Southeast | Moderate-Risk | Sekong | Kaleum | PALAENG | Southeast | Moderate-Risk |
| Sekong | Dakcheung | DAKVANG | Southeast | Low-Risk | Sekong | Kaleum | VAK TAI | Southeast | Low-Risk | Sekong | Kaleum | VAK TAI | Southeast | Low-Risk |
| | | | | | Sekong | Kaleum | TIN | Southeast | Moderate-Risk | Sekong | Kaleum | TIN | Southeast | Moderate-Risk |
| | | | | | Sekong | Kaleum | STHORN | Southeast | Moderate-Risk | Sekong | Kaleum | STHORN | Southeast | Moderate-Risk |
| | | | | | Sekong | Lamarm | KANONG MAI | Southeast | Moderate-Risk | Sekong | Lamarm | KANONG MAI | Southeast | Moderate-Risk |
| | | | | | Sekong | Dakcheung | DAKVANG | Southeast | Moderate-Risk | Sekong | Dakcheung | DAKVANG | Southeast | Moderate-Risk |

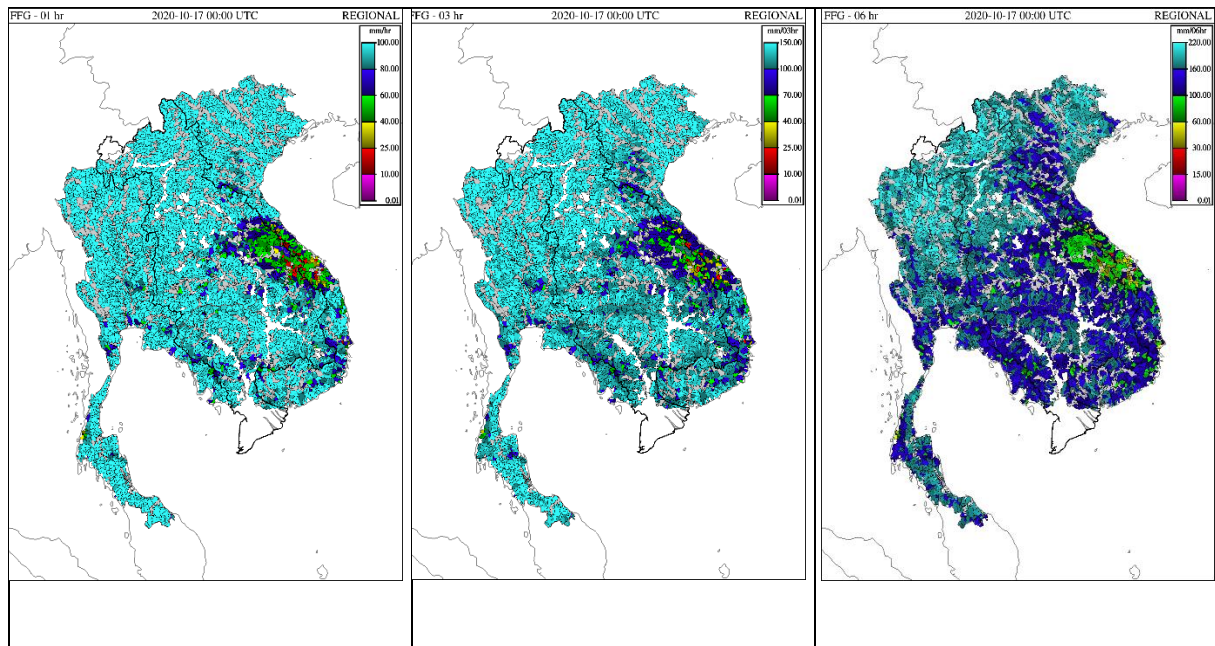


Figure 11: Flash Flood Guidance for the next 1 hour, 3 hours and 6 hours on Oct 17.

5 Drought Monitoring in the Lower Mekong Basin

Weekly drought monitoring from October 8-14

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 October 8 to 14, as shown in [Figure 12](#), was very wet in the east and south of the LMB. Northern part had a similar condition compared to last week (October 1-7) which was at a normal condition.

Meteorological indicator of SPI shows that the LMB received average rainfall in the upper and central parts, above average rainfall in the east and lower parts which cover Lao PDR and Cambodia, and average rainfall in the lower part of the LMB covering Mekong Delta of Viet Nam.

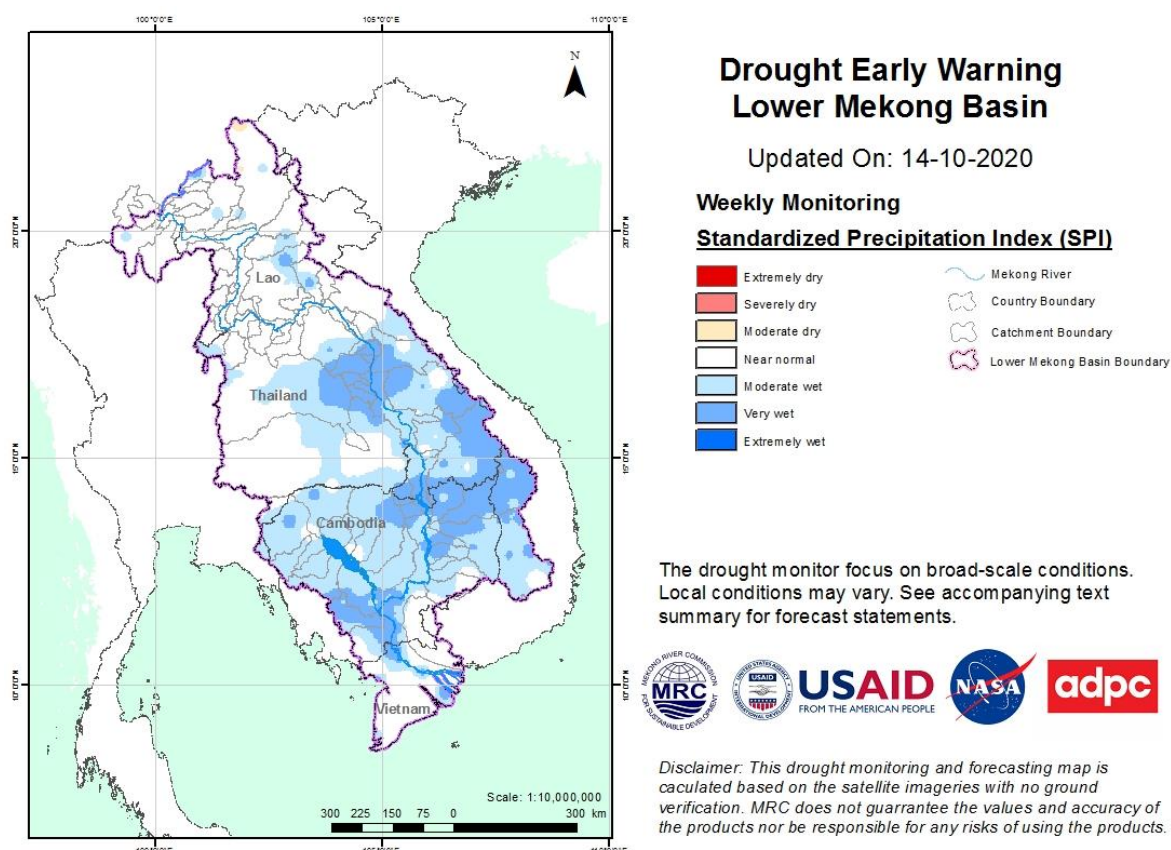


Figure 12: Weekly standardised precipitation index from Oct 8-14.

•. Weekly Soil Moisture Anomaly (SMA)

The excessive rainfall in eastern and lower parts of the region during the monitoring week from October 8 to 14 has made soil moisture ultimately saturated in east and southwest areas of the LMB, which cover southern provinces of Lao PDR and western provinces of Cambodia. Nevertheless, some provinces in the northern part of the region were still dry. The soil moisture anomaly, as displayed in [Figure 13](#), shows moderate and severe dryness in some areas of Thailand's Chiang Mai, Chiang Rai and Payao, and Lao PDR's Bokeo, Luang Namtha, Xayaburi, and southern Luang Prabang. But the situation was very much better than last week.

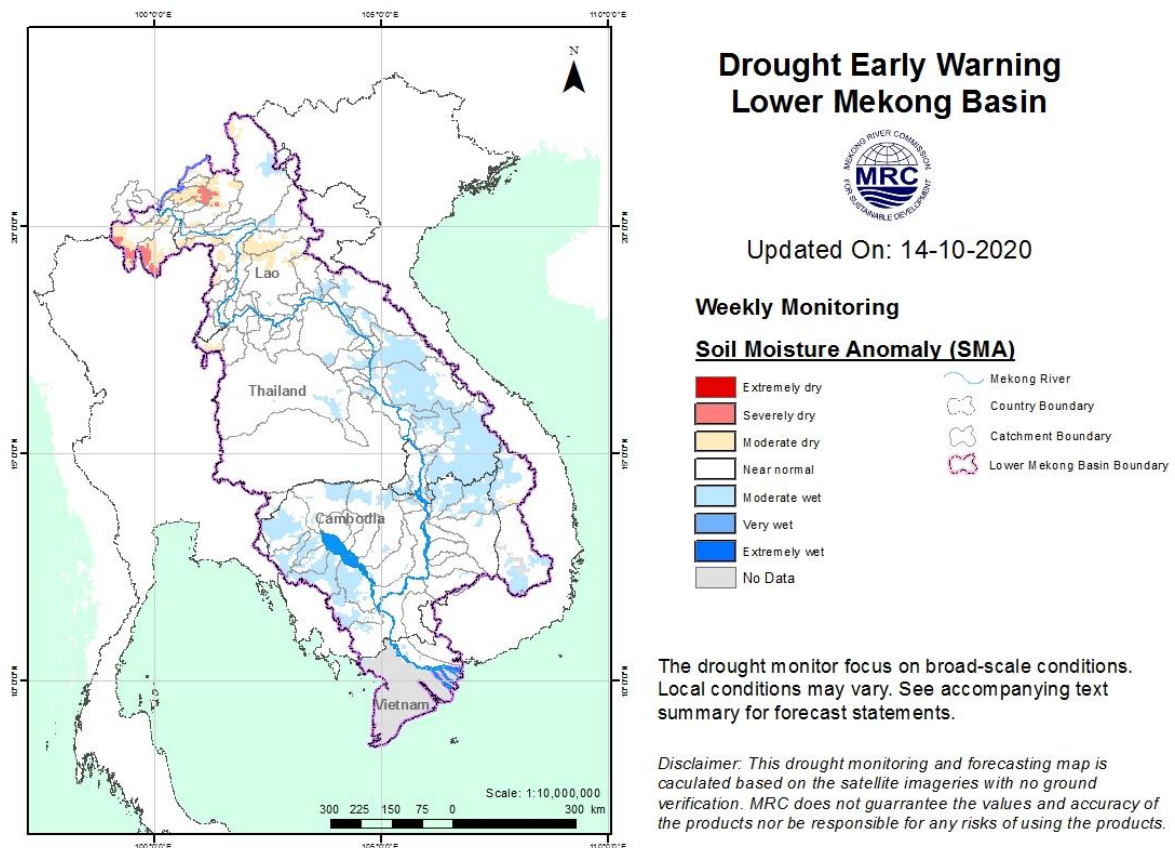


Figure 13: Weekly Soil Moisture Anomaly from Oct 8-14.

•. Weekly Combined Drought Index (CDI)

With a better soil moisture this week (October 8-14), the overall drought condition through combined drought index, as presented in [Figure 14](#), shows no drought threat over the region. The only moderate dry condition was found in northern part of the region covering small area of Chiang Mai, Chiang Rai, and Phayao of Thailand.

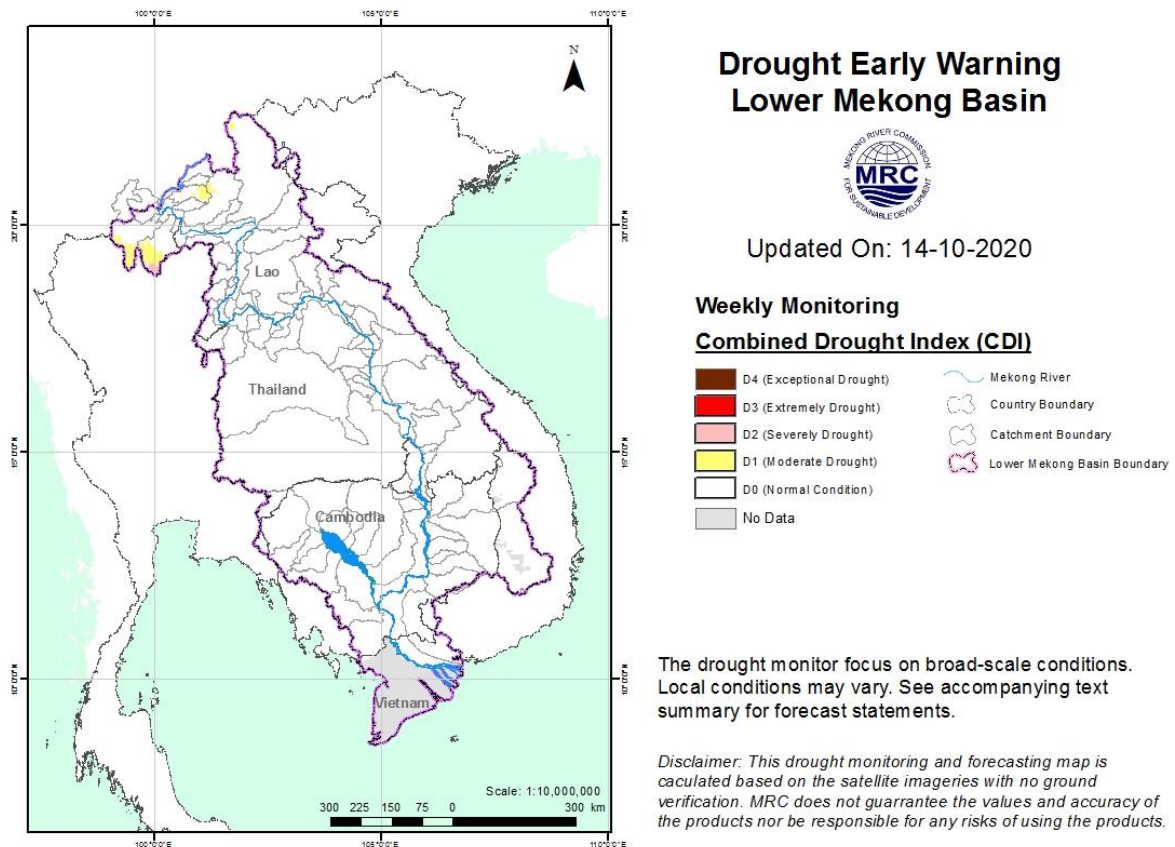


Figure 14: Weekly Combined Drought Index during Oct 8-14.

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

The Tropical Depression 19W (*Nineteen*) have been forming in the Sea and is likely to become a storm in a few days' time. Based on the forecasting results of the Joint Typhoon Warning Center (JTWC), indicated in [Figure 15](#), the TD is likely to move northwest towards the North-Central region of Viet Nam. It may hit the area on October 25-26.

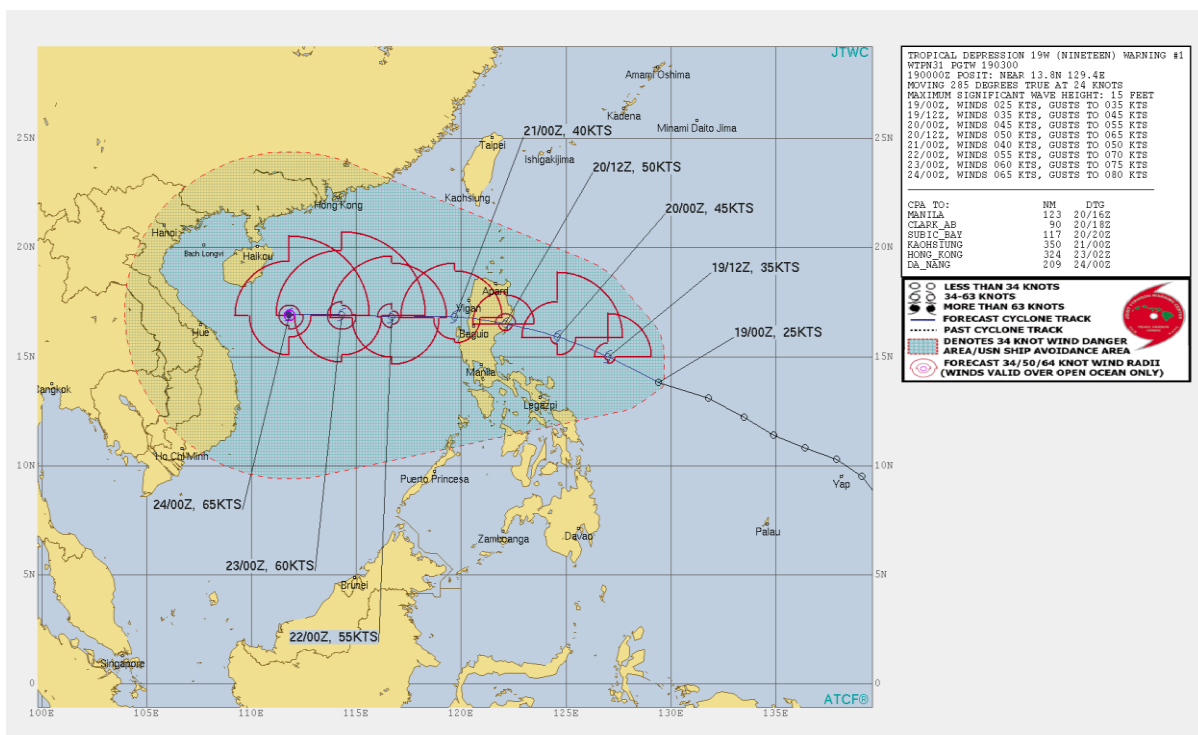
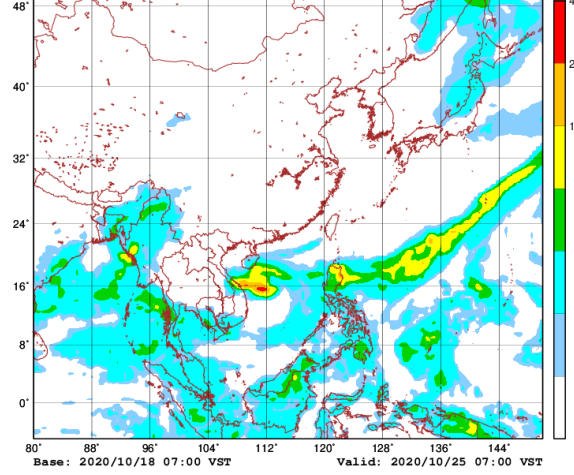
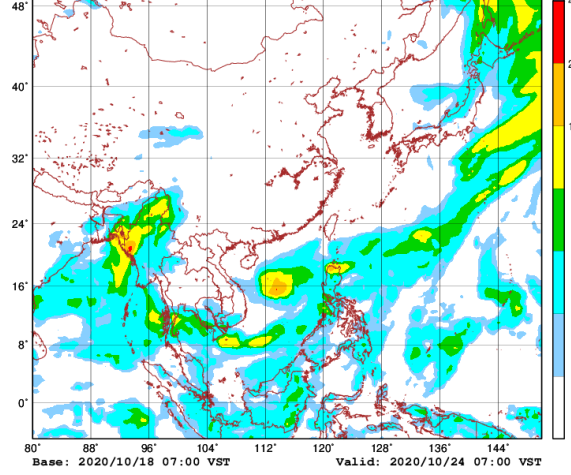
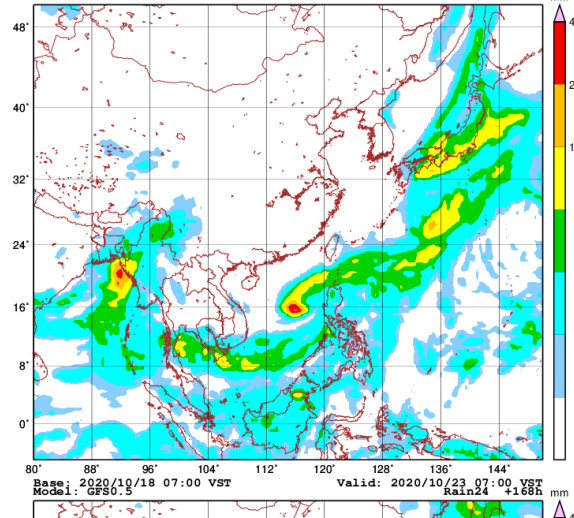
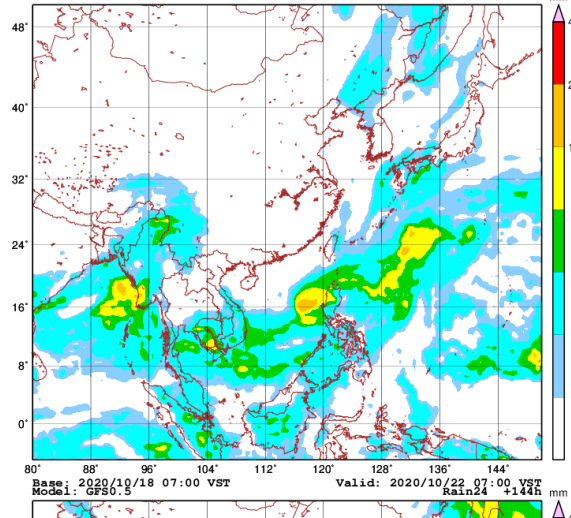
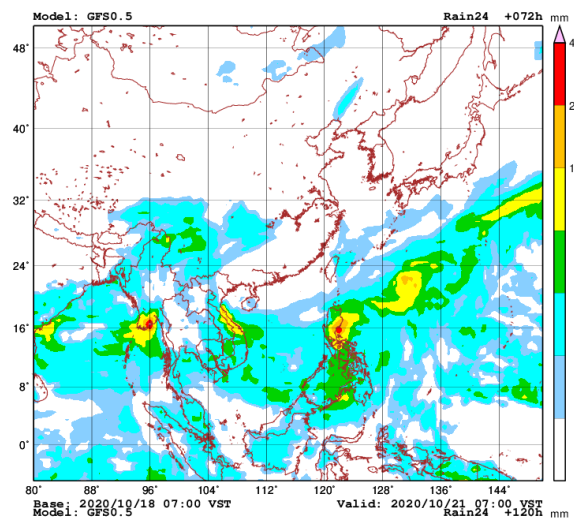
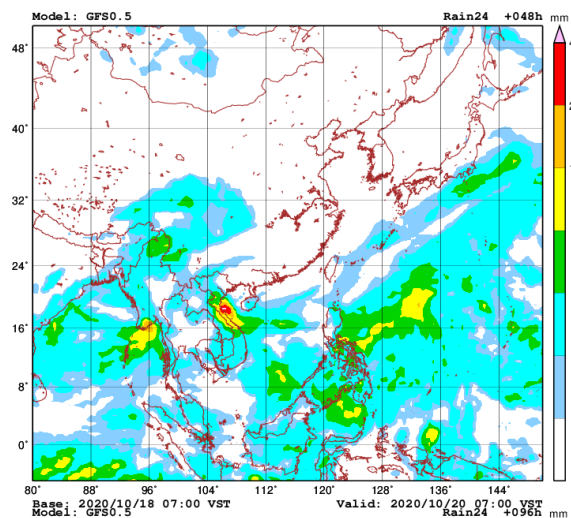


Figure 15: Track forecast of Tropical Depression. Source: JTWC

Based on the analysis of synoptic meteorological information and result from the Global Forecast System (GFS) model, in the coming week, there might be three factors affecting the LMB, much like what has happened over the past weeks. They include (i) TD's circulation, (ii) Monsoon Trough moving from the upstream part, and (iii) the on-going prevailing southwest monsoon from the Gulf of Thailand to the lower part of the LMB. During that period, moderate (20-50mm/24hrs) to heavy rain (50-100mm/24hrs) may occur in some areas from the middle to the lower parts of the LMB.

[Figure 16](#) shows accumulated rainfall forecast (24hrs) of the GFS model from October 20 through October 26.



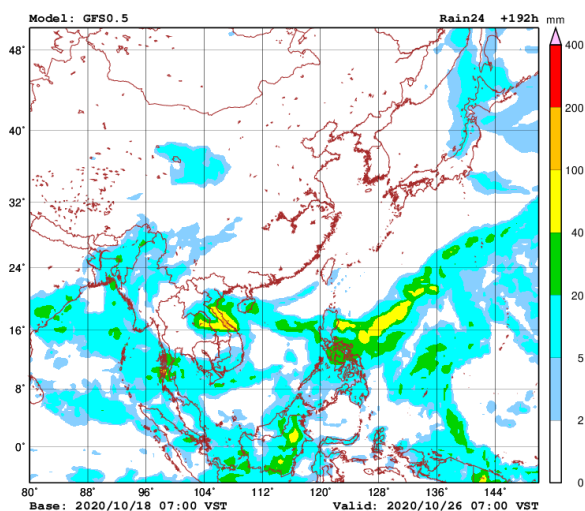


Figure 16: Accumulated rainfall forecast (24 hrs) of model GFS.

6.2 Water level forecast

Chiang Saen and Luang Prabang

Based on October 19's daily flood bulletin, the daily forecast water level at Chiang Saen in Thailand is expected to slightly increase from 2.52 to 2.78 metres in the next five days.

For Luang Prabang in Lao PDR, the water level will also increase from around 8.88 to 8.93 metres during the same period.

Despite the highs and lows, 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 down slightly from 3.64 to 3.36 metres. At Paksane in Lao PDR, the level will also decrease slightly from 4.45 to 4.10 metres in the next five days. Average quantity of precipitation is forecasted in the area. The water levels here will remain lower than their LTAs.

Nakhon Phanom to Pakse

Water levels from Nakhon Phanom in Thailand and Takhet in Lao PDR will slightly increase by about 0.06 metres in the next five days. From Khong Chaim in Thailand to Pakse in Lao PDR the water will also increase by about 0.70 metres because of the tropical depression which could possibly bring heavy rainfall to their inflow tributaries such as Nam Phao and Se Bang Fai in Lao PDR.

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

From Stung Treng to Neak Luong along the Mekong River in Cambodia, water levels will increase by about 0.60 meters in the next five days due to the influence of heavy rainfall in the 3S (Sekong, Se San and Sre Pok) and other local rainfall.

Water levels of the Tonle Sap Lake at Prek Kdam and Phnom Penh Port, as well as at Phnom Penh, Chaktomuk, and Koh Khel on the Bassac River, will increase by about 0.36 metres over the next five days.

Eventhough rain is anticipated in the coming week for the areas, the water levels at these stations will continue staying just above their minimum levels, particularly from Bassac Phnom Penh 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 4](#) shows the River Flood Forecasting Bulletin issued on October 19. Results of the daily flood forecasting bulletin are also available at http://ffw.mrcmekong.org/bulletin_wet.php.

The performance of the weekly flood forecast, with an accuracy and data input evaluation from 13 to 19 October, is presented in [Annex 1](#).

6.3 Flash Flood Information

With some potential rainfall forecasted for next week, flash flood events are likely to happen from the middle to the lower parts of the LMB. Moreover, local heavy rain in a short period of time is also possible with unexpected short flash floods. The information on flash flood guidance for the next one, three, and six hours is updated twice daily at <http://ffw.mrcmekong.org/ffg.php>.

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 October 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 17](#) of the monthly anomaly maps shows daily average of each month in mm/day from October to December 2020 produced by the NMME.

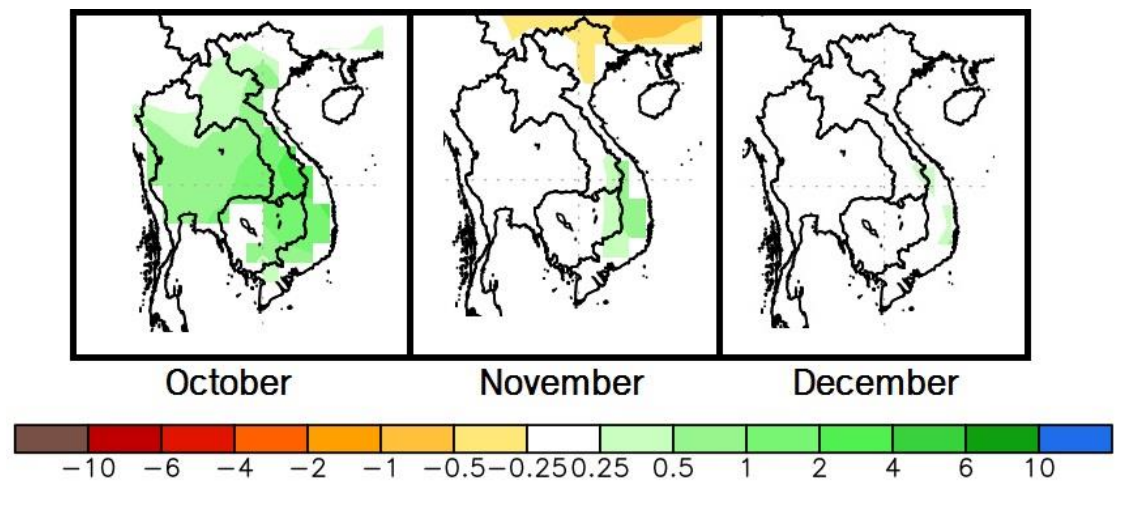


Figure 17: Daily average monthly rainfall forecast from Oct to Dec 2020.

From the ensemble prediction model, the LMB is likely to receive above average rainfall in October, average rainfall in November, and the least rainfall amount in December 2020. Among the upcoming three months, October is likely wet in all over the LMB, while November is likely wet in the southeast and a bit dry in the upper north.

Table 4. 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: 20 - 24 October 2020

Date: 19 October 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 | | | | | |
|---------------------|---|---------------------------------------|---|--------------------|-----------------------|--|--------|-----------------------------|--------|--------|--------|--------|--------|---|----|----|----|----|----|
| | | 18-Oct | | | | 19-Oct | 18-Oct | 19-Oct | 20-Oct | 21-Oct | 22-Oct | 23-Oct | 24-Oct | 19 | 20 | 21 | 22 | 23 | 24 |
| Jinghong |  | 0.0 | | | | 535.64 | 535.91 | | | | | | | ↑ | × | × | × | × | × |
| Chiang Saen |  | 5.8 | 357.110 | 12.80 | 11.50 | 2.55 | 2.52 | 2.50 | 2.61 | 2.70 | | | | ↑ | | | | ★ | ★ |
| Luang Prabang |  | 0.0 | 267.195 | 18.00 | 17.50 | 8.92 | 8.88 | 8.78 | 8.75 | 8.72 | 8.83 | 8.93 | | | | | | ↑ | |
| Chiang Khan |  | 7.7 | 194.118 | 16.00 | 14.50 | 6.42 | 6.16 | 6.07 | 6.02 | 6.00 | | | | ↓ | | | | ★ | ★ |
| Vientiane |  | 3.5 | 158.040 | 12.50 | 11.50 | 3.64 | 3.64 | 3.50 | 3.44 | 3.40 | 3.38 | 3.36 | | ↓ | | | | | |
| Nongkhai |  | 4.0 | 153.648 | 12.20 | 11.40 | 3.52 | 3.52 | 3.38 | 3.32 | 3.27 | | | | ↓ | | | | ★ | ★ |
| Paksane |  | 2.6 | 142.125 | 14.50 | 13.50 | 4.56 | 4.45 | 4.38 | 4.25 | 4.20 | 4.15 | 4.10 | | ↓ | | ↓ | | | |
| Nakhon Phanom |  | 11.8 | 130.961 | 12.00 | 11.50 | 3.45 | 3.51 | 3.58 | 3.63 | 3.68 | | | | | | | | ★ | ★ |
| Thakhek |  | 11.4 | 129.629 | 14.00 | 13.00 | 4.70 | 4.76 | 4.83 | 4.89 | 4.95 | 4.91 | 4.86 | | | | | | | |
| Mukdahan |  | 11.5 | 124.219 | 12.50 | 12.00 | 4.08 | 4.39 | 4.62 | 4.85 | 5.03 | | | | ↑ | ↑ | ↑ | ↑ | ★ | ★ |
| Savannakhet |  | nr | 125.410 | 13.00 | 12.00 | 3.09 | 3.08 | 3.26 | 3.48 | 3.65 | 3.77 | 3.75 | | ↑ | ↑ | ↑ | ↑ | ↑ | |
| Khong Chiam |  | 51.0 | 89.030 | 14.50 | 13.50 | 8.49 | 9.45 | 10.50 | 11.15 | 11.45 | | | | ↑ | ↑ | ↑ | ↑ | ★ | ★ |
| Pakse |  | 37.0 | 86.490 | 12.00 | 11.00 | 6.82 | 7.84 | 8.71 | 9.30 | 9.52 | 9.72 | 9.88 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Stung Treng |  | 12.0 | 36.790 | 12.00 | 10.70 | 7.81 | 8.18 | 8.76 | 9.26 | 9.53 | 9.66 | 9.77 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Kratie |  | 1.8 | -0.101 | 23.00 | 22.00 | 17.68 | 17.92 | 18.40 | 19.03 | 19.62 | 19.96 | 20.15 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Kompong Cham |  | 37.5 | -0.930 | 16.20 | 15.20 | 11.28 | 11.68 | 11.97 | 12.49 | 13.15 | 13.77 | 14.12 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Phnom Penh (Bassac) |  | 6.4 | -1.020 | 12.00 | 10.50 | 6.92 | 7.12 | 7.26 | 7.51 | 7.85 | 8.16 | 8.32 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Phnom Penh Port |  | nr | 0.070 | 11.00 | 9.50 | 5.94 | 6.14 | 6.28 | 6.53 | 6.87 | 7.18 | 7.35 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Koh Khel (Bassac) |  | 24.0 | -1.000 | 7.90 | 7.40 | 6.25 | 6.29 | 6.45 | 6.65 | 6.91 | 7.16 | 7.25 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Neak Luong |  | 9.4 | -0.330 | 8.00 | 7.50 | 5.03 | 5.20 | 5.41 | 5.56 | 5.79 | 6.13 | 6.46 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Prek Kdam |  | 17.2 | 0.080 | 10.00 | 9.50 | 5.89 | 6.07 | 6.29 | 6.56 | 6.92 | 7.25 | 7.42 | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Tan Chau |  | 0.0 | 0.000 | 4.50 | 3.50 | 2.58 | 2.51 | 2.43 | 2.32 | 2.22 | 2.12 | 2.03 | | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Chau Doc |  | 0.0 | 0.000 | 4.00 | 3.00 | 2.49 | 2.35 | 2.25 | 2.11 | 2.00 | 1.89 | 1.80 | | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |

REMARKS:

nr: not available.

nr: no rain.

| LEGEND | |
|---|---|
| rising water level | ↑ |
| stable water level | → |
| falling water level | ↓ |
| alarm stage | ↑ |
| alarm situation | ↑ |
| flood stage | ↑ |
| no data available | × |
| as suggested by Thailand, forecasted values are not displayed pending further improvement of the system | ★ |

Note: Stable water level is defined as a daily change of less than 10cm from Chiang Saen to Savannakhet; less than 5cm at Pakse and Stung Treng; and no more than 3cm cm from Kratie downstream.
Flood stage is when the flood level exceeds. A flood level is determined by each Member Country.
Alarm stage is when the water level ranges between alarm and flood levels.
Alarm situation is when the water level is forecasted to reach the flood stage within the next three days.

River Flood Forecaster

KHEM Sothea

NOTE: Discharge at Luang Prabang may be influenced by hydropower operations (at both upstream and downstream).
For more info, please refer to this link:
<http://www.mrcmekong.org/>; http://ffw.mrcmekong.org/bulletin_wet.php; <http://ffw.mrcmekong.org/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 (0.4 to 149 mm). However, rainfall in the upper part was considered lower than average, varying from 0.2 mm to 50 mm at different stations along the LMB from Chiang Saen to Nakhon Phanom in Thailand. The highest concentration was from Mukdahan in Thailand to Viet Nam's Tan Chau and Chau Doc area (up to 149 mm). Compared with last week's amount, the rainfall this week was considered higher in the middle and downstream part.

There was a low pressure hitting the LMB during October 8-19, causing heavy rainfall in some parts of the region. The two lines of Monsoon Trough low pressure, which has continued from the previous weeks, will still bring some more rainfall to the LMB. Also, the Tropical Depression *Nineteen* is developing from the Sea during October 19-24, which will continue to bring heavy rain in the middle and lower parts of the Mekong region.

Based on the forecasted rainfall from satellite using GFS data, rainfall is likely to take place in the areas from Paksane to Pakse in Lao PDR to the low area of Cambodia and the Central Highland of Viet Nam, varying from 50 mm to 170 mm during October 19-24. This will increase the chance of rainfall concentration over the LMB in the upcoming week (average rainfall expected).

7.2 Water level and its forecast

Water levels in the lower part of the monitoring locations in the LMB during this reporting week were increasing from Khong Chiam in Thailand to Stung Treng and Kratie in Cambodia. However, water levels at Kampong Cham to Neak Luong were still lower than their LTA levels. The rising level was due to the low-pressure weather, which brought heavy rainfall to the lower part of the region from October 8-19. Generally, this week's water levels were relatively higher than those of last week in the upper part but higher in the lower part of the LMB.

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 monitoring stations in the LMB are expected to continue slightly increasing, ranging from 0.05 to 0.55 metres. Even so, most stations' water levels are expected to remain below their LTAs, except Khong Chiam, Pakse, Stung Treng, Kratie and Kampong Cham.

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 LMB 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 the predicted moderate and heavy amounts of rainfall for the coming week as mentioned earlier in [section 6.1](#), major flash floods are likely to happen in some areas from the middle to lower parts of the LMB on 20-26 October 2020.

7.4 Drought condition and its forecast

Drought condition of the LMB from October 8 to 14 was even better than last week (October 1-7). The region only showed some moderate dry soil moisture in the north and no meteorological drought in the whole LMB. In general, drought condition was getting much better - with no potential threat - over the region.

For the upcoming three-month forecast, the LMB is likely to receive above average rainfall in October, average rainfall in November, and the least rainfall amount in December 2020. October is likely wet in all over the LMB, while November is likely wet in the southeast and a bit dry in the upper north.

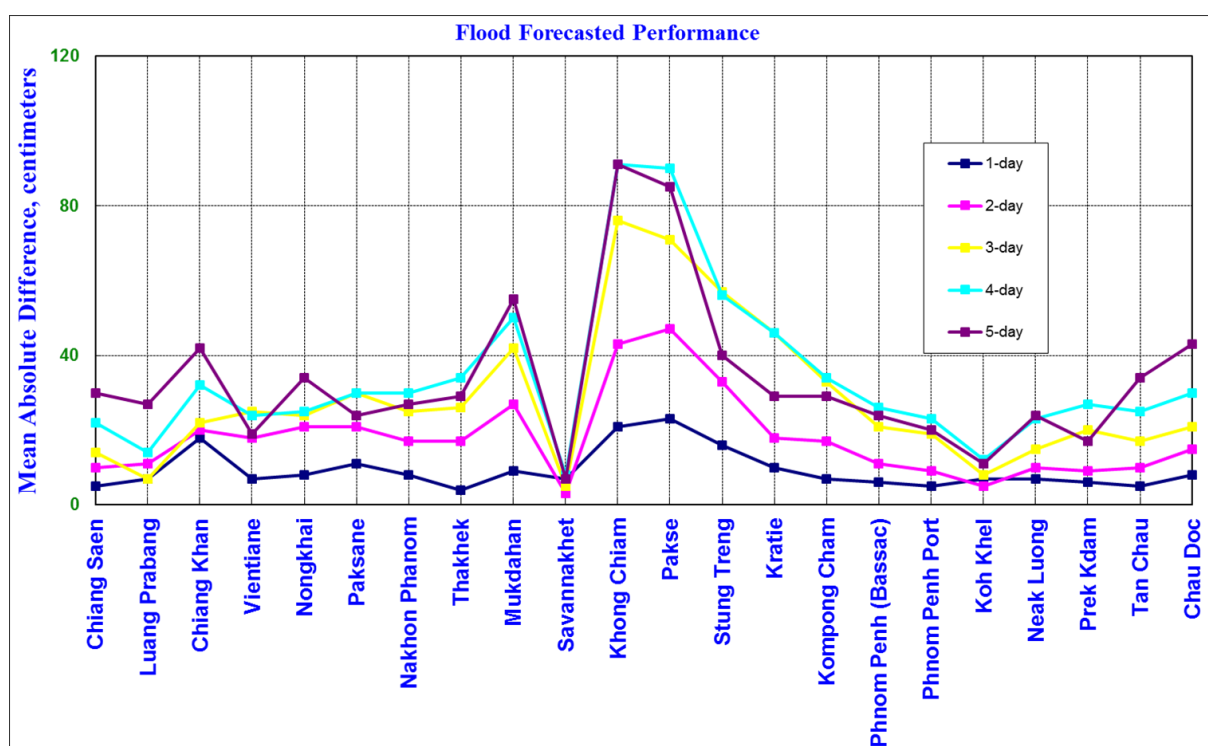
Annex 1: Performance of the weekly flood forecasting

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 13-19 October 2020.

The forecasting values from 13-19 October 2020 show that the overall accuracy is fair for a one-day to three-day forecast in lead time at stations in the middle to the lower parts of the Mekong River from Khong Chaim to Pakse due to the effect of heavy rain in this area during the report period.



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

- Missing data and data input are not sufficient to be used for inputting into the flood forecasting model system.
- The influence of heavy rainfall caused by storms and hydropower operations from upstream (Xayaburi), tributaries inflows and the lower part of the Mekong floodplain.

- 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 13-19 October 2020.

Table B1: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 12-19 October 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 | 5 | 7 | 18 | 7 | 8 | 11 | 8 | 4 | 9 | 7 | <u>21</u> | <u>23</u> | 16 | 10 | 7 | 6 | 5 | 7 | 7 | 6 | 5 | 8 |
| 2-day | 10 | 11 | <u>20</u> | 18 | <u>21</u> | <u>21</u> | 17 | 17 | <u>27</u> | 3 | <u>43</u> | <u>47</u> | <u>33</u> | 18 | 17 | 11 | 9 | 5 | 10 | 9 | 10 | 15 |
| 3-day | 14 | 7 | <u>22</u> | <u>25</u> | <u>24</u> | <u>30</u> | <u>25</u> | <u>26</u> | <u>42</u> | 5 | 76 | 71 | 57 | <u>46</u> | <u>33</u> | <u>21</u> | 19 | 8 | 15 | <u>20</u> | 17 | <u>21</u> |
| 4-day | <u>22</u> | 14 | <u>32</u> | <u>24</u> | <u>25</u> | <u>30</u> | <u>30</u> | <u>34</u> | <u>50</u> | 8 | 91 | 90 | 56 | <u>46</u> | <u>34</u> | <u>26</u> | <u>23</u> | 12 | <u>23</u> | <u>27</u> | <u>25</u> | <u>30</u> |
| 5-day | <u>30</u> | <u>27</u> | <u>42</u> | 19 | <u>34</u> | <u>24</u> | <u>27</u> | <u>29</u> | 55 | 7 | 91 | 85 | <u>40</u> | <u>29</u> | <u>29</u> | <u>24</u> | <u>20</u> | 11 | <u>24</u> | 17 | <u>34</u> | <u>43</u> |

Table B2: The Mean Absolute Difference (Error) of Flood Forecasting base on old defined Benchmark from 12-19 October 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 | 57.1 | 57.1 | <u>42.9</u> | 71.4 | 71.4 | 57.1 | 71.4 | 85.7 | <u>28.6</u> | 85.7 | 71.4 | 57.1 | 57.1 | 57.1 | 57.1 | 71.4 | 71.4 | 57.1 | 85.7 | 57.1 | 57.1 | 71.4 | 63.6 |
| 2-day | 66.7 | 66.7 | 66.7 | <u>50.0</u> | <u>50.0</u> | <u>50.0</u> | 66.7 | 83.3 | <u>33.3</u> | <u>50.0</u> | 66.7 | 66.7 | <u>50.0</u> | 66.7 | <u>50.0</u> | 83.3 | 66.7 | 66.7 | <u>50.0</u> | 66.7 | <u>50.0</u> | 66.7 | 60.6 |
| 3-day | <u>40.0</u> | 80.0 | 60.0 | <u>40.0</u> | <u>40.0</u> | <u>40.0</u> | 60.0 | 60.0 | 60.0 | <u>40.0</u> | 60.0 | 60.0 | 80.0 | 60.0 | 60.0 | <u>40.0</u> | <u>40.0</u> | 60.0 | <u>40.0</u> | <u>40.0</u> | 60.0 | <u>40.0</u> | 52.7 |
| 4-day | <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>25.0</u> | <u>50.0</u> | 75.0 | <u>50.0</u> | <u>50.0</u> | 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> | 75.0 | 75.0 | 52.3 |
| 5-day | 66.7 | <u>33.3</u> | 66.7 | 66.7 | 66.7 | <u>33.3</u> | 66.7 | <u>33.3</u> | 66.7 | 66.7 | <u>33.3</u> | 66.7 | <u>33.3</u> | <u>33.3</u> | 66.7 | 66.7 | 66.7 | <u>33.3</u> | <u>33.3</u> | <u>33.3</u> | 66.7 | 66.7 | 53.0 |

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

Table B3: Overview of performance indicators for the past 7 days from 13-19 October 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 | 10:32 | 00:00 | - | - | 08:15 | 07:10 | 07:05 | 08:06 | 08:45 | 08:22 | 07:01 | 08:15 | 0 | 0 | 0 | 0 | 68 | 14 | 0 | 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 |

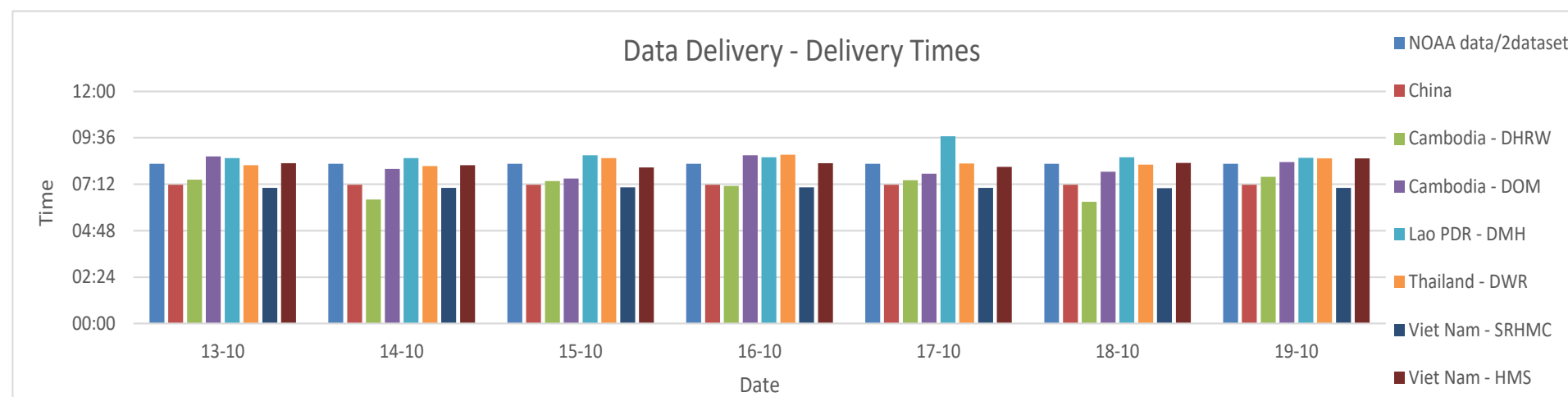


Fig. B4: Data delivery times for the past 7 days from 13-19 October 2020

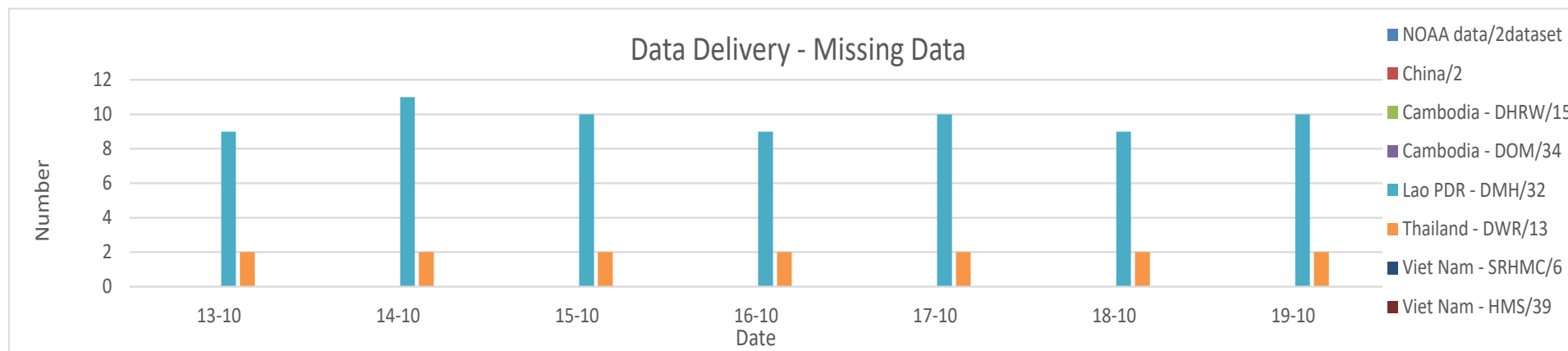


Fig. B5: Missing data for the past 7 days from 13-19 October 2020

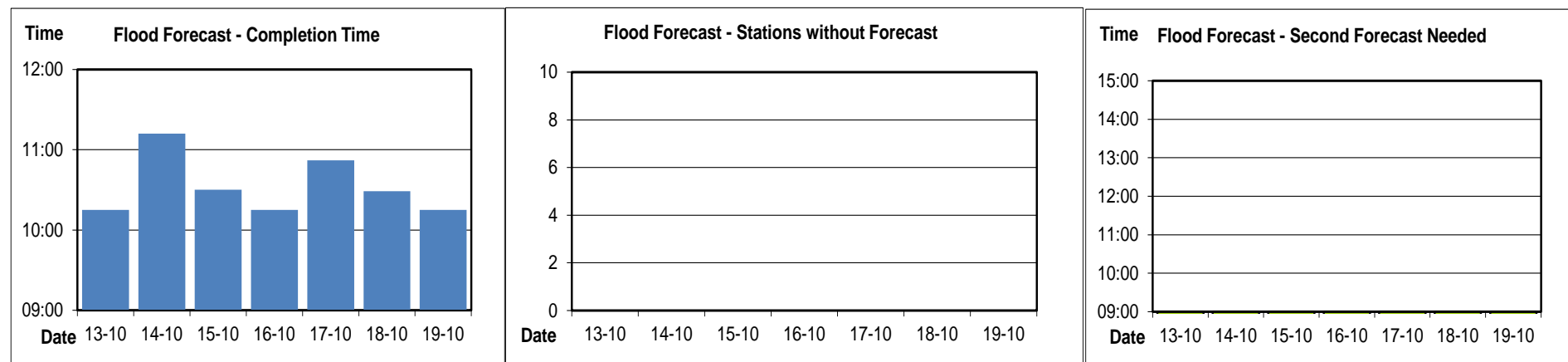


Fig. B6: Flood forecast completion time, stations without forecasts, and second forecasts need from 13-19 October 2020



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