

Weekly Dry Season Situation Report for the Mekong River Basin

Prepared on: 17/12/2019, covering the week from 10th to 16th December 2019.

Weather Patterns, General Behaviors of the Mekong River and Outlook Situation

General weather patterns:

From 10 to 16 Dec 2019, there was no rainfall in the LMB. Based on the weather outlook bulletins and maps issued by the Thailand Meteorology Department (TMD) were used to verify the weather condition in the LMB. They stated that for the next 2 months from December 2019 to February 2020, the total rain of northern, northeastern, eastern and central parts including within the area of Bangkok Metropolitan and Vicinity would be reached about 30% to 40% below normal condition. They stated that some westerly wind waves from Myanmar may pass the Upper Thailand causing the area to meet thunder rain, gusty wind at some areas and possibly falling hail. **Figures 1 & 2** presented the weather map for 12 and 16 December 2019.

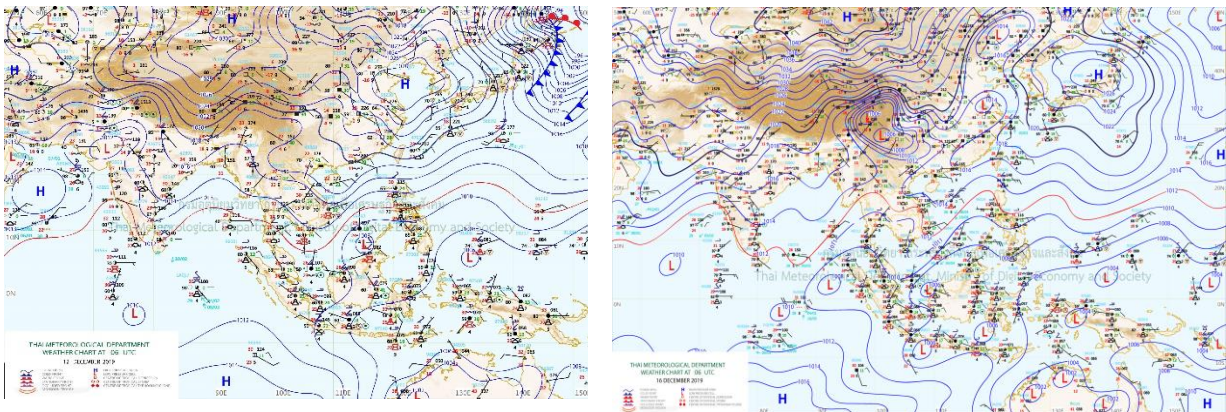


Figure 1: Summary of weather condition over the LMB from 12 and 16 Dec 2019

General behavior of the Mekong River:

This week from 10 to 16 Dec 2019, water levels from Chiang Saen were increased due to the inflow from China, varied from 0.03 m to 0.32 m which could draw water levels at this station upper than its LTA. However, water level trend at Luang Prabang and Chiang Khan are likely impacted by hydropower dam at Xayaburi, in which they fluctuated, varied from 0.02 m to 0.08 m. Water levels at stations at the middle part of LMB from Vientiane to Pakse were slightly increased but the water levels were close to their minimum levels. Follow the same trend of water levels from upstream, stations at Stung Treng, Kratie, Chaktomuk on the Bassac, Phnom Penh Port and Neak Luong were also close to their minimum levels. For the 2 tidal stations at Tan Chau and Chau Doc, water levels increased the same trends as minimum levels in December 2019. The actual water levels at most of the key station are staying below their LTAs and even Min Levels (see its hydrograph in **Annex B**).

For stations from Chiang Saen and Luang Prabang

Water levels from 10 to 16 Dec 2019 at Chiang Saen station were increased, due to the inflow from Jinghong (as observed during the wet season from June to October). At this station water levels decreased from 0.03 m to 0.32 m. However, at Luang Prabang station, water levels were fluctuated and stay close to its historical Maximum Levels. Water levels at this station sometime increased rapidly in 0.66 m, due to the reservoir operation of upstream and downstream at Xayaburi. It was observed that the Luang Prabang stations is likely nominated by hydro power dam operation

upstream (tributaries) and downstream (Xayaburi) in which water levels always fluctuated above their LTAs, during the impounding reservoir at Xayaburi from end of October 2018 to May 2019.

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

Water levels from 10 to 16 Dec 2019 at Chiang Khan station were likely also nominated by upstream hydropower dam of Xayaburi, which was noted that water levels fluctuated from 0.02 to 0.07 m. The current observed water levels at Chiang Khan, Vientiane/Nong Khai and Paksane stations are close to their historical minimum levels.

For stations from Nakhon Phanom to Pakse

Water levels from 10 to 16 Dec 2019 at Khong Chiam to Pakse stations were found slightly increased, varied from 0.02 to 0.04m. The current water levels at these stations area still below their minimum historical levels.

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

Water levels from 10 to 16 Dec 2019 at Stung Treng, Kratie and Kompong Cham were continued to slightly decrease, varied from 0.02 m to 0.04 m. The current water levels at Stung Trend, Kratie, Kompong Cham, Chaktomuk Koh Khel, Phnom Penh Port and Neak Luong were close to their historical minimum levels (1980-2018). For Prekdam on the Tonle Sap, water levels are stayed above its Minimum levels.

Tan Chau and Chau Doc

Water levels from 10 to 16 Dec 2019 at the 2 tidal stations at Tan Chau and Chau Doc were slightly increased, follows the same trends of their minimum levels due to the tidal effect from the sea. Water levels were kept the same trends as minimum levels since early December 2019 and the actual water levels are stayed below their LTAs

According to the Japan Meteorological Agency (JMA), Sea surface temperature (SST) variability in the tropics Neutral, which has no major impact.

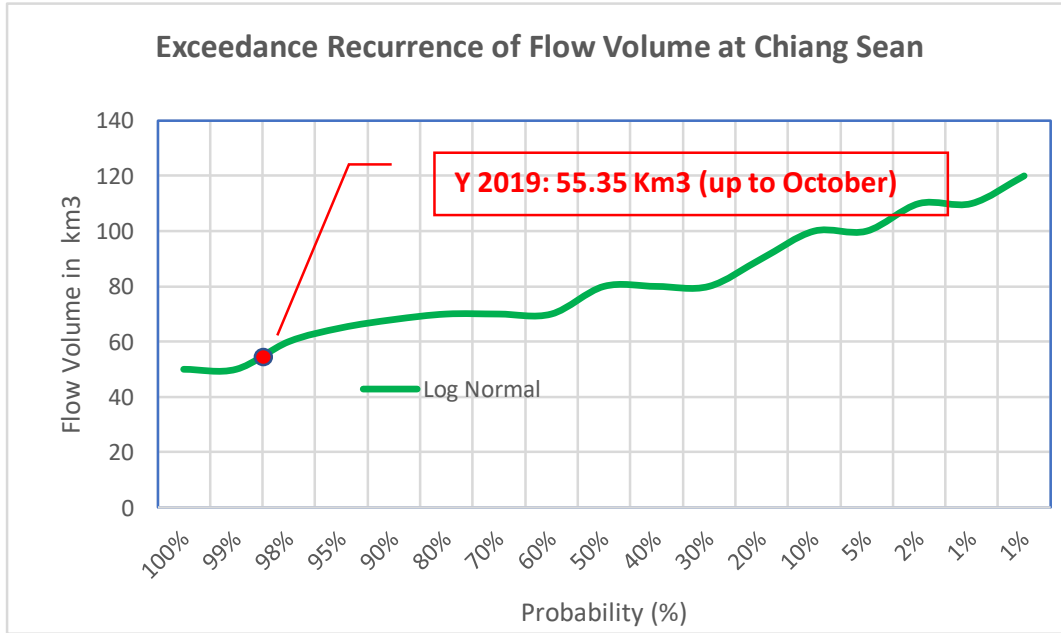
Discussion and Conclusion

From 10 to 16 Dec 2019, the trend of water levels at Chiang Sean were continued to increase due to the inflows from Jinghong and no rainfall. Water level at Chiang Sean is relied from inflow from Jinghong Hydropower Station on Lancang and its catchment rainfall. The impact could obviously see the gradually increasing water level to downstream to Vientiane/Nong Khai. Based on a hydrological phenomenon, the inflow contribution of water from the upstream of Lancang-Mekong in China to the Mekong mainstream is about 16% in total during the Dry season from Nov to May, while 24% in the Wet season (Adamson. 2010). The whole inflow of water into the lower Mekong basin is influenced more by inflow from tributaries and the direct rainfall catchment.

The low inflows from upstream and less rainfall in catchments, resulting water levels from Paksane to Pakse are drastically dropped below their minimum levels. Also, from Stung Treng, Kratie and Kompong Cham stations water levels are followed the same trend from upstream which stay below their minimum levels.

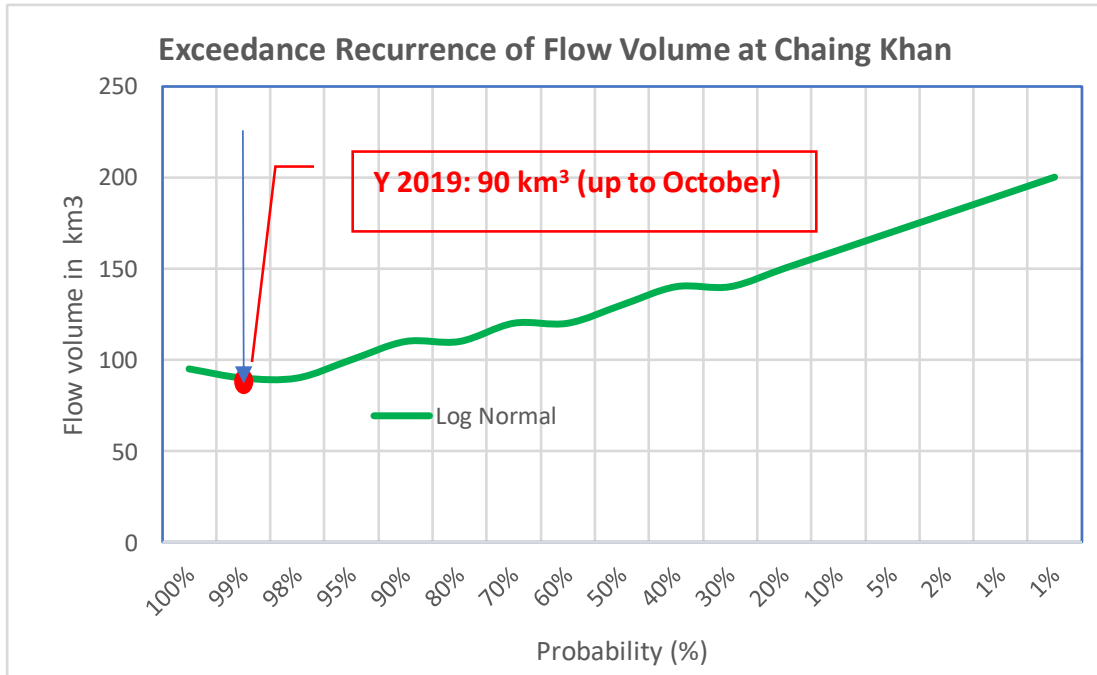
Based on the Exceedance Recurrence of the Minimum Flow Volumes at Chiang Sean, Chaing Khan and Kratie referred to historical data availability and the flows volume up to October 2019, it showed the current situation at these stations are considered as critical low flows in between ***50 to 100 year of return period of low flow condition***. **Figure 2** showed the Exceedance Recurrence Flow Volume with the table of probability condition of highlighted the low flows condition at Chiang Sean, Chiang Khan and Kratie.

A. Chaing Sean Station

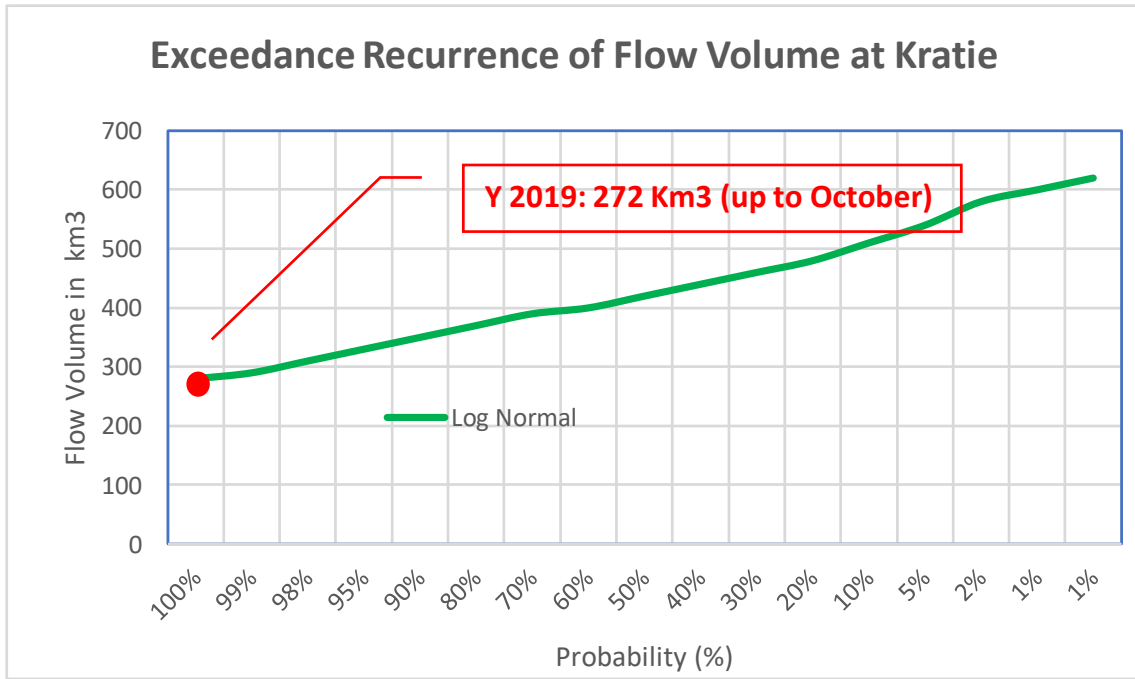


| Probability | Recurrence Year | Log Normal [km ³] | Y2019 [km3] | Conditions |
|-------------|-----------------|-------------------------------|--------------|--------------------------|
| 100% | 200 | 50 | | Critical Low Flow |
| 99% | 100 | 50 | | |
| 98% | 50 | 60 | 55.35 | Low Flow |
| 95% | 20 | 65 | | |
| 90% | 10 | 68 | | |
| 80% | 5 | 70 | | Normal Flow |
| 70% | 3 | 70 | | |
| 60% | 2 | 70 | | |
| 50% | 2 | 80 | | |
| 40% | 3 | 80 | | |
| 30% | 3 | 80 | | |
| 20% | 5 | 90 | | |
| 10% | 10 | 100 | | High Flow |
| 5% | 20 | 100 | | |
| 2% | 50 | 110 | | |
| 1% | 100 | 110 | | |
| 1% | 200 | 120 | | |

B. Chiang Khan Station



| Probability | Recurrence Year | Log Normal [km ³] | Y2019 [km ³] | Conditions |
|-------------|-----------------|-------------------------------|--------------------------|-------------------|
| 100% | 200 | 50 | | Critical Low Flow |
| 99% | 100 | 50 | | |
| 98% | 50 | 60 | 55.35 | Low Flow |
| 95% | 20 | 65 | | |
| 90% | 10 | 68 | | |
| 80% | 5 | 70 | | Normal Flow |
| 70% | 3 | 70 | | |
| 60% | 2 | 70 | | |
| 50% | 2 | 80 | | |
| 40% | 3 | 80 | | |
| 30% | 3 | 80 | | |
| 20% | 5 | 90 | | |
| 10% | 10 | 100 | | High Flow |
| 5% | 20 | 100 | | |
| 2% | 50 | 110 | | |
| 1% | 100 | 110 | | |
| 1% | 200 | 120 | | |



| Probability | Recurrence Year | Log Normal [km ³] | Y2019 [km ³] | Conditions |
|-------------|-----------------|-------------------------------|--------------------------|-------------------|
| 100% | 200 | 280 | 272 | Critical Low Flow |
| 99% | 100 | 290 | | |
| 98% | 50 | 310 | | Low Flow |
| 95% | 20 | 330 | | |
| 90% | 10 | 350 | | |
| 80% | 5 | 370 | | Normal Flow |
| 70% | 3 | 390 | | |
| 60% | 2 | 400 | | |
| 50% | 2 | 420 | | |
| 40% | 3 | 440 | | |
| 30% | 3 | 460 | | |
| 20% | 5 | 480 | | High Flow |
| 10% | 10 | 510 | | |
| 5% | 20 | 540 | | |
| 2% | 50 | 580 | | |
| 1% | 100 | 600 | | |
| 1% | 200 | 620 | | |

Flow data period: 1925-2019

Figure 2: Exceedance Recurrence Flow Volumes and Probability of Low Flow condition at Chiang Saen, Chiang Khan and Kratie

Based on the low flow analyses of the Mekong from Chiang Saen to Kratie, the upcoming **Dry Season** can be possible of facing some problem, related to the shortage of drinking water and agricultural production, fishery production, ecological systems, biodiversity, bank erosion, salinity intrusion in the Mekong Delta and waterway transport because not enough water for fish spawning and also aquatic lives ect. The reduced water flow could also affect to the expanding unsaturated soil which cause bank erosion and salinity intrusion from the sea.

The Trend of water level and its Outlook

Referred to weekly river monitoring bulletin, next week from 17 to 23 December 2019, water levels at Chiang Saen will continue to increase which will varies from 0.02 m to 0.06 m. Water level of the station at Luang Prabang and Chiang Khan will be fluctuated due to the impact of the inflow from reservoir operation upstream and downstream. Water levels at Vientiane /Nong Khai and Paksane follow the same trend as upstream inflows, which will increase from 0.02m to 0.05 m. From Nakhon Phanom to Pakse, water levels will be increased from 0.02 m to 0.06 m. The 7 days forecasted rainfall of NOAA (GFAS) of showed below-normal rainfall will continue in the next 7 days in some places mainly in the low-lying area and the Mekong Delta.

From Stung Treng, Kratie and Kompong Cham, water levels for the next 7 days forecasting 17 to 23 December 2019 will slightly decrease from 0.02 m to 0.04 m. At Chaktomuk and Phnom Penh Port, Prekdam on the Tonle Sap and Neak Luong on the Mekong will follow the same trends as upstream from Kratie and Kompong Cham.

For the tidal stations at Tan Chau and Chau Doc will be decreased and follow the same trend as their minimum levels from 17 to 23 December 2019, varied from 0.03m to 0.18 m.

For details information on water levels and rainfall at each key station, **Annex A** and **Annex B** are presented as follows:

- Tables presents observed water levels and rainfall from last week (**Annex A**)
- The water levels hydrographs showing the observed water levels for the dry season (**Annex B**)

Annex A: Graphs and Tables

Table A1: observed water levels

Unit: m

| 2019 | Jinghong | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane | Nongkhai | Paksane | Nakhon Phanom | Mukdahan | Pakse | Stung Treng | Kratie | Kompong Cham | Phnom Penh (Bassac) | Koh Khei | Neak Luong | Prek Kdam | Tan Chau | Chau Doc |
|------------|----------|-------------|---------------|-------------|-----------|----------|---------|---------------|----------|-------|-------------|--------|--------------|---------------------|----------|------------|-----------|----------|----------|
| 10/12/2019 | - | 2.57 | 8.69 | 4.25 | 1.30 | 1.44 | 2.90 | 1.05 | 1.62 | 1.07 | 2.80 | 7.34 | 3.13 | 2.39 | 2.37 | 2.20 | 1.88 | 1.38 | 1.52 |
| 11/12/2019 | - | 2.57 | 8.62 | 4.18 | 1.30 | 1.51 | 2.92 | 1.05 | 1.62 | 1.01 | 2.63 | 7.46 | 3.20 | 2.38 | 2.36 | 2.20 | 1.79 | 1.49 | 1.60 |
| 12/12/2019 | - | 2.56 | 8.80 | 4.16 | 1.25 | 1.40 | 2.94 | 1.05 | 1.65 | 1.06 | 2.71 | 7.29 | 3.28 | 2.47 | 2.45 | 2.18 | 1.84 | 1.54 | 1.64 |
| 13/12/2019 | - | 2.62 | 8.78 | 4.12 | 1.20 | 1.36 | 2.93 | 1.06 | 1.68 | 1.06 | 2.66 | 7.32 | 3.24 | 2.51 | 2.50 | 2.05 | 1.84 | 1.53 | 1.62 |
| 14/12/2019 | - | 2.78 | 8.70 | 4.33 | 1.18 | 1.34 | 2.87 | 1.08 | 1.70 | 1.04 | 2.68 | 7.36 | 3.26 | 2.54 | 2.50 | 1.94 | 1.82 | 1.45 | 1.54 |
| 15/12/2019 | - | 3.10 | 8.68 | 4.70 | 1.23 | 1.37 | 2.87 | 1.05 | 1.72 | 1.08 | 2.67 | 7.29 | 3.20 | 2.53 | 2.54 | 1.95 | 1.79 | 1.32 | 1.44 |
| 16/12/2019 | - | 3.16 | 8.62 | 4.80 | 1.46 | 1.57 | 2.79 | 1.04 | 1.70 | 1.06 | 2.56 | 7.35 | 3.18 | 2.52 | 2.56 | 1.94 | 1.86 | 1.12 | 1.26 |

Table A2: observed rainfall

Unit: mm

| 2019 | Jinghong | Chiang Saen | Luang Prabang | Chiang Khan | Vientiane | Nongkhai | Paksane | Nakhon Phanom | Mukdahan | Pakse | Stung Treng | Kratie | Kompong Cham | Phnom Penh (Bassac) | Koh Khei | Neak Luong | Prek Kdam | Tan Chau | Chau Doc | |
|------------|----------|-------------|---------------|-------------|-----------|----------|---------|---------------|----------|-------|-------------|--------|--------------|---------------------|----------|------------|-----------|----------|----------|---|
| 10/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16/12/2019 | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: No data available from China during the Dry Season

Annex B: Season Water Level Hydrographs

This Annex showed water level hydrographs of each key station. These hydrographs distributed weekly water level for River Monitoring purpose.

HYDROGRAPH AT 7 AM OF MEKONG TONLE SAP AND BASSAC AT MAINSTREAM STATIONS IN DRY SEASON UP TO 16 DECEMBER 2019

