Weekly Flood Situation Report for the Mekong River Basin

Prepared by RFDMC

covering the week from 13th to 19th August 2019 and potential trend next week

Weather Patterns, General Behaviour of the Mekong River and Flood Situation

General weather patterns

During the week from 13th to 19th August 2019, the weather outlook bulletins and maps issued by the Thailand Meteorology Department (TMD) were used to verify the weather condition in the LMB. The abundant rainfall often occurs at this month (August) with more rain amount than previous months. The low pressure was observed at the middle part of LMB (Chaing Khan and Vientiane/ Nong Khai), which attracted rainfall in these locations during this week. Additionally, some tropical cyclones may move closer or toward the upper portion of the northern and northeastern parts of Thailand. **Figures 1 & 2** presented the weather map for 15th and 19th August 2019.

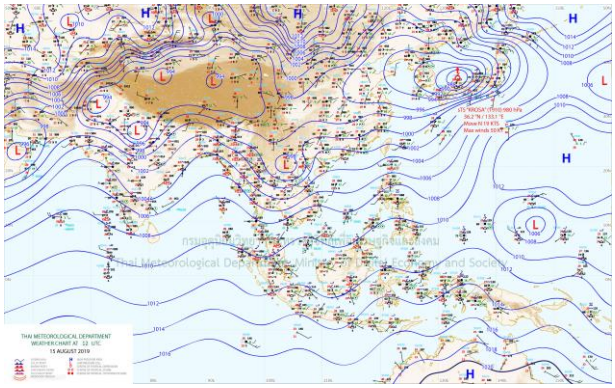


Figure 1: Weather map for 15th Aug 2019

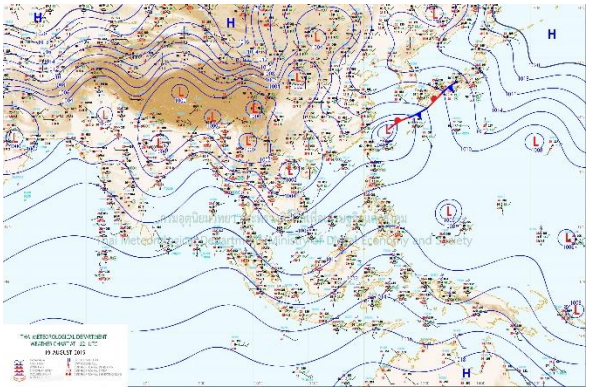


Figure 2: Weather map for 19th Aug 2019

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

No TD, TS or TY was presented in LMB during this week.

Other weather phenomena that affect the discharge

According to the Asian Specialized Meteorological Center (ASMC), climatologically, the prevailing Southwest Monsoon conditions are expected to persist till October 2019. The below-normal rainfall is predicted over the southern ASEAN region and over southern Philippines, while wetter-than-normal conditions are expected in the southern parts of Cambodia, Myanmar, Thailand and Viet Nam. In terms of temperature, warmer-than-average conditions can be expected over the equatorial ASEAN region and the inland areas of Thailand. **Figure 2** showed the rainfall outlook over southern Southeast Asia.

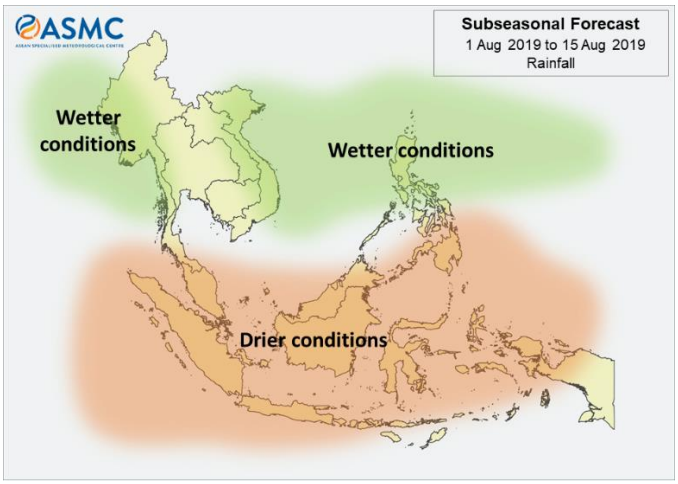


Figure 2: The predicted higher likelihood of above-normal rainfall over southern Southeast Asia in August 2019

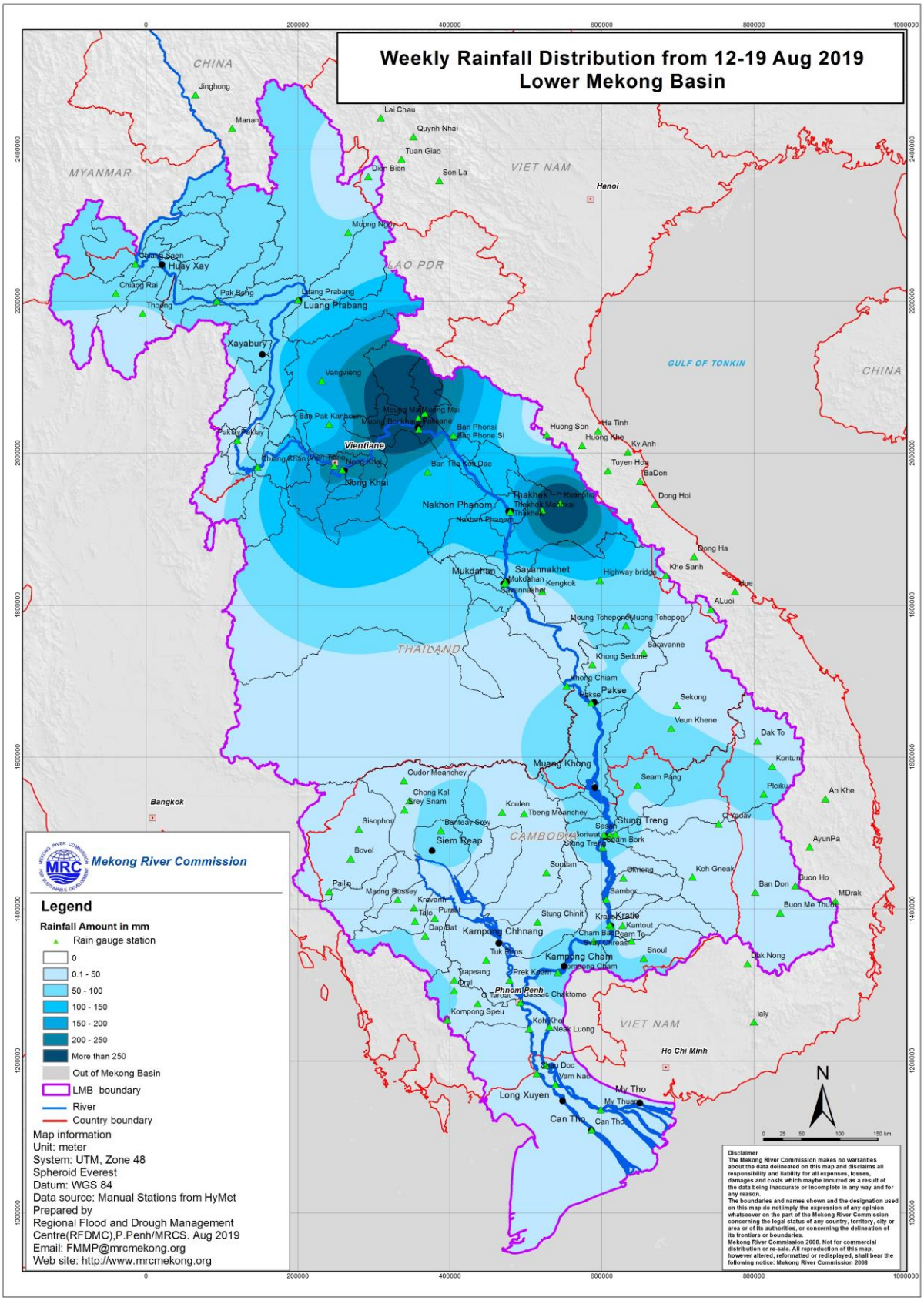
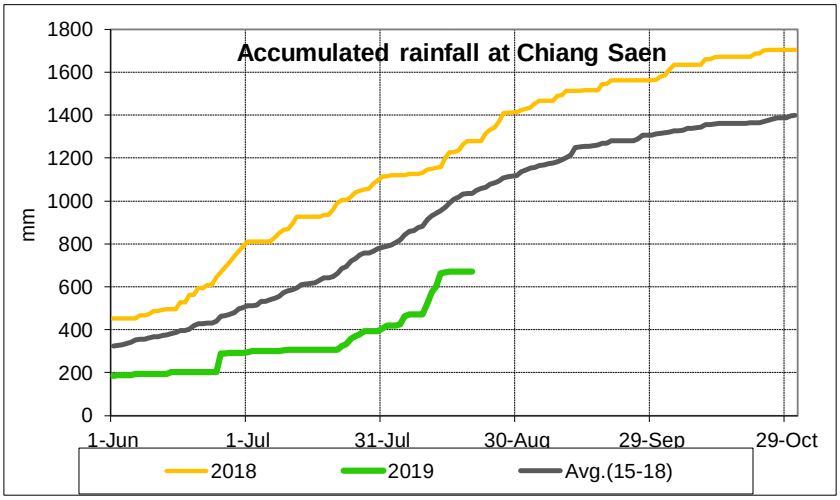
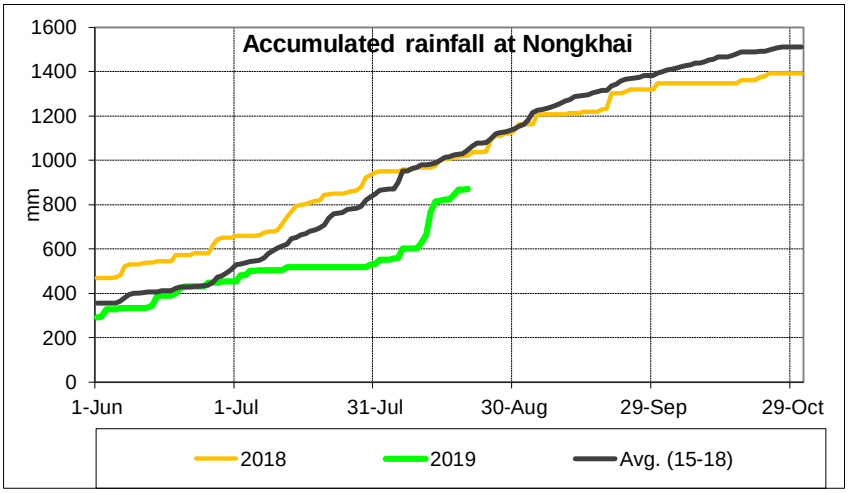


Figure 3: Weekly Rainfall Distribution over the LMB from 12th to 19th Aug 2019

Over weather situation

The weather of this week was scattered thundershowers with moderate and heavy rain of the Southwest monsoon and tropical depression. Consequently, in this week there was heavy rainfall covered from Vientiane to Thakhet varied from 100 mm to more than 200 mm. The weekly rainfall distribution in the Lower Mekong Basin from 12th to 19th Aug 2019 is showed in **Figure 3.** The accumulated rainfall in the specific location at Chiang Sean, Nong Khai, Kratie and Chau Doc up to 19th Aug 2019 are showed in **Figure 4**. It indicated the early August' s rainfall is still low in most of the stations, compared to their LTAs except at Kratie was higher than its LTA.





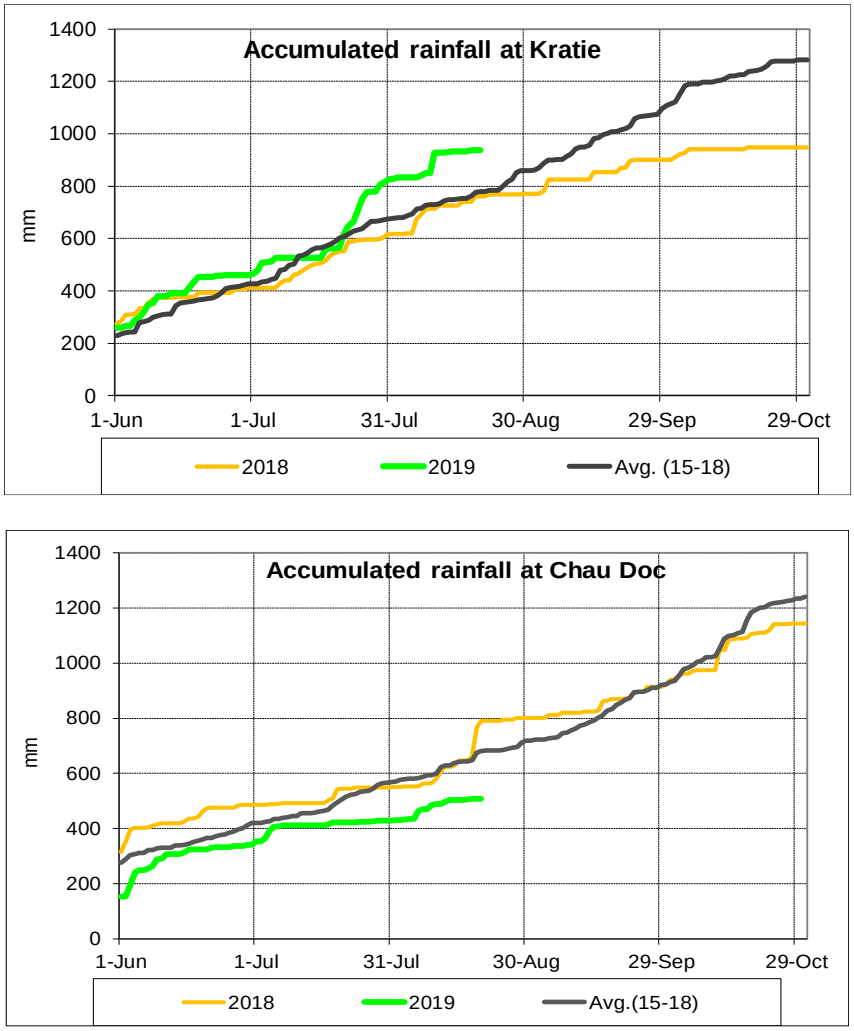


Figure 4: Accumulated Rainfall up to 19th Aug 2019 in specific stations over the LMB

General behaviour of the Mekong River

During the last week, the water levels at stations from upper to middle part of LMB has been increasing, due to some rainfall in the catchment inflows. However, water levels at those key stations are lower than their historical minimum levels from Chiang Sean down to Cambodia's Mekong River System (Bassac and Tonle Sap), except at Luang Prabang station where water level was higher than its minimum level due to the operation of upstream inflow from tributaries and the downstream at Xayaburi. The tends of water level in the entire Mekong River Basin is suggested a significant reduction in the natural groundwater contribution to these tributaries over the last months. This might arise as a response to what might be described as a hydrological low flow following on from the very deficient rainfall in early Wet Season of 2019. It may be that the ground water contributions tail off exponentially under such conditions

For stations from Chiang Saen and Luang Prabang

Water levels from 13th to 19th Aug 2019 at Chiang Sean station were slightly increased due to the decreased outflow from Jinghong from 11th to 15th August for power grid maintenance (Notification dated on 5th August 2019 to MRCS) which water levels were still staying below their historical minimum levels (1980-2018). It was decreased about 0.01 m to 0.29 m. For Luang Prabang station, water levels were increased about 0.10 to 0.40 m (18 August 2019). The current water level at this station is higher than their minimum levels but still below the LTA. 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 and Nong Khai and Paksane

Water levels from 13th to 19th Aug 2019 at these stations were also followed the same trend of upstream inflowed from Chiang Sean. It was observed that at Chiang Khan, Vientiane, Nong Khai and Paksane stations, water levels were increased about 0.30 m to 0.60 m and reached upper than their historical minimum levels (1980-2018).

For stations from Nakhon Phanom/Thakhet to Mukdaha/Sovannakhet

Water levels from 13th to 19th Aug 2019 at Nakhon Phanom/Thakhet to Mukdahan/Sovannakhet stations were also followed the same trend as upstream stations and influenced by catchment rainfall, which caused water level increased about 0.25m to 0.70 m. The current water levels at these stations are reach higher than their historical minimum levels (1980-2018).

For stations from Khong Chiam to Pakse

The same trend as upstream part, water levels from 13th to 19th Aug 2019 at Khong Chiam to Pakse stations were increased about 0.25 m to 0.82 m m. Water levels at these stations are reached close to their historical minimum levels (1980-2018).

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

Water levels from 13th to 19th Aug 2019 at Stung Treng, Kratie, Kompong Cham and Phnom Penh stations on the Mekong, Bassac and Tonle Sap were decreased from 0.02 m to 0.70 m due to the low rainfall from catchment inflows. It was found that water levels at Stung Trend, Kratie and Kompong Cham stations were reached above their historical minimum levels (1980-2018), while at Chaktomuk on the Bassac, Phnom Penh port and Prekdam on the Bassac and Neak Luong on the Mekong are still below their Minimum Levels (1980-2018).

Tan Chau and Chau Doc

Water levels from 13th to 19th Aug 2019 at these 2 tidal stations were still maintaining fluctuated over their LTAs but did not follow the same trend as previous years as indicated in **Annex B**. This might affect by the El Nino process in the South China Sea, based on the information done by Japan Meteorological Agency (JMA).

According to the Japan Meteorological Agency (JMA), Sea surface temperature (SST) variability in the tropics can significantly impact on the global climate through atmospheric circulation. El Niño event, which are identified by SST fluctuations from the central to the eastern equatorial Pacific (NINO.3), are widely known examples of this. The NINO3 index is one of several El Niño/Southern Oscillation (ENSO) indicators based on sea surface temperatures. The five-month running mean of the SST deviation for NINO.3 predicted by JMA's El Niño prediction model is presented in **Figure 5**.

According to the ASMC, the El Niño Southern Oscillation (ENSO) has been downgraded to “Neutral” status at this time. While warmer sea-surface temperature (SSTs) remain over the Nino3.4 Region.

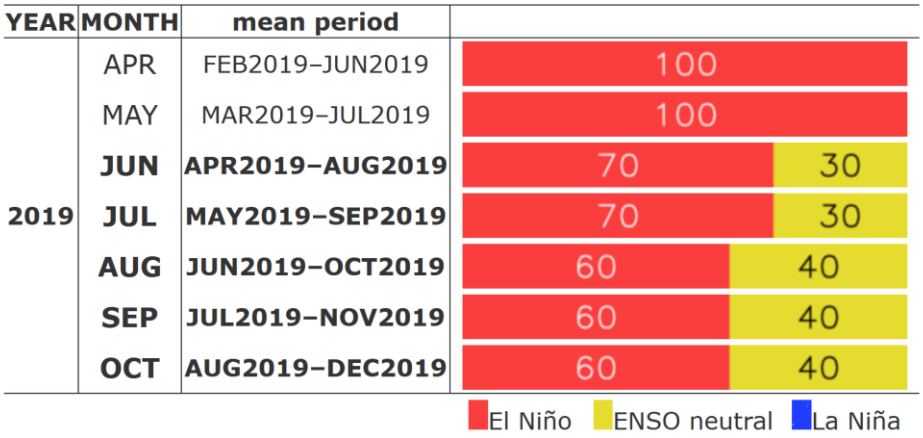


Figure 5 Five-month running mean of the SST deviation for NINO.3 predicted by JMA's El Niño prediction model (JMA/MRI-CGCM2)

Discussion and Conclusion

From 13th to 19th Aug 2019, the trend of water levels at Chiang Sean were slightly decreased to the decreased outflow from Jinghong from 11th to 15th August for power grid maintenance (Notification dated on 5th August 2019 to MRCS) and low rainfall since last week. Water flow realised from Jinghong Hydropower Station on Lancang was considered strong impact at this station. The impact could obviously see the gradually decreasing water level to downstream at 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 Wet season from June to October. The whole inflow of water into the lower Mekong basin is influenced more by tributaries and a direct from catchment rainfall distribution.

However, from Paksane to Kratie water levels were increased roughly from 0.25 m to 0.68 m which could draw water levels at these key stations above their long-term minimum levels.

The initial conclusion (for discussion) is that the regional tail off in water levels is a combined response to regional low rainfall conditions and dam operation. The decreased water levels at key stations seems associated with reduced turbined flows from the Upper Mekong reservoirs. which in turn are no doubt a reflection of the hydrological 'low-flow' and consequent low levels of reservoir storage.

On the other hand, the hydrological conditions (rainfall and flows) of the Mekong River during early Wet Season 2019 (Aug-Sep) is characterized as low flow due to the low rainfall and water storing at upstream reservoirs, which caused low inflows. The low rainfall caused low-water levels in the mainstream and catchment inflow of the Lower Mekong Basin.

In short, the low-flow condition in the Mekong River system is likely caused by the low rainfall, the impact of hydropower operation and storing water at reservoirs at upstream and tributaries.

Further work to clarify the issues, with specific attention being paid to conditions on the inflow from tributaries in the northern part in Lao PDR.

The low water level in the Mekong region is naturally occurring phenomenon caused by low rainfall, but possible effects include a dangerous shortage of water for drinking and agriculture. The reduced water flow could also affect aquatic life in the Mekong and impact food safety ect.

Note: For detail information on the current flows and water levels situation from upstream to downstream, **Annex A** showed the monthly flow hydrograph at specific stations whereas in **Annex B** presented hydrographs of water level at the 22 key stations on the Mekong River.

The Trend of water level and its Outlook

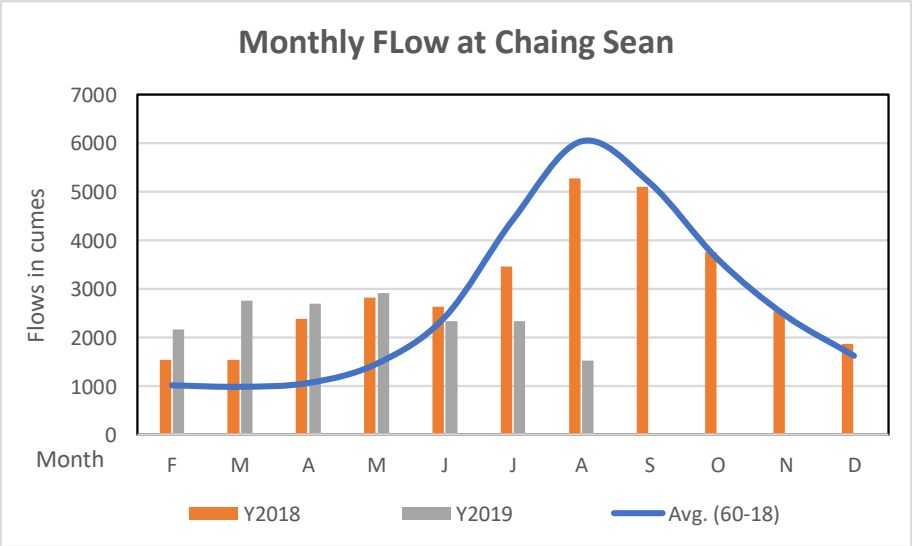
Based on of the daily river flood forecasting outcomes for next week from 21 to 25 Aug 2019, water levels at Chiang Saen will be increased from 0.05 to 0. 30 m, while the water level of the station at Luang Prabang will be fluctuated due to the impact of the inflow from reservoir operation upstream and

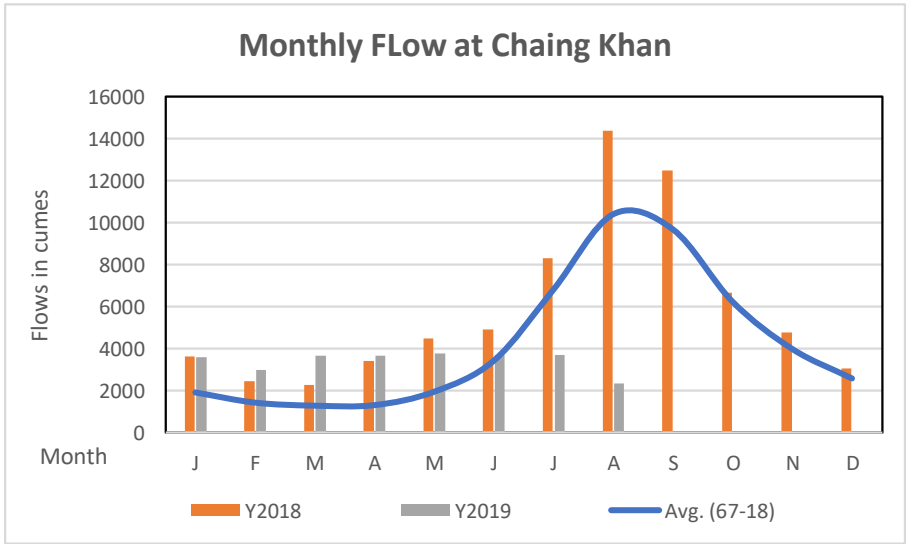
downstream of this station, which could also be impacted down to Nong Khai station. From Khong Chaim down to the Cambodia's stations at Stung Treng, Kratie, Kompaong Cham, Chaktomuk, Tole Sap at Phnom Penh Port, Prekdam on the Tonle Sap and Neak Luong on the Mekong, the 5 days forecasting from 21 to 25 August showed the increased trends of water level. Also, the 5 days forecasted rainfall of NOAA (GFAS) of showed above normal rainfall in the next 5 days.

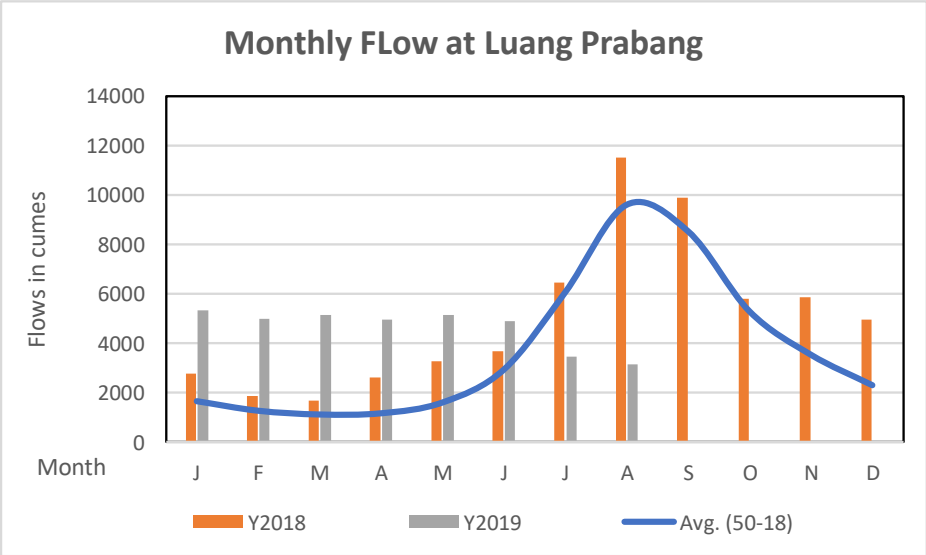
ASMC also expected that for July-August-September 2019, above-normal rainfall will be nominated the northern Southeast Asia (southern parts of Myanmar, Thailand, Laos, Cambodia and Vietnam).

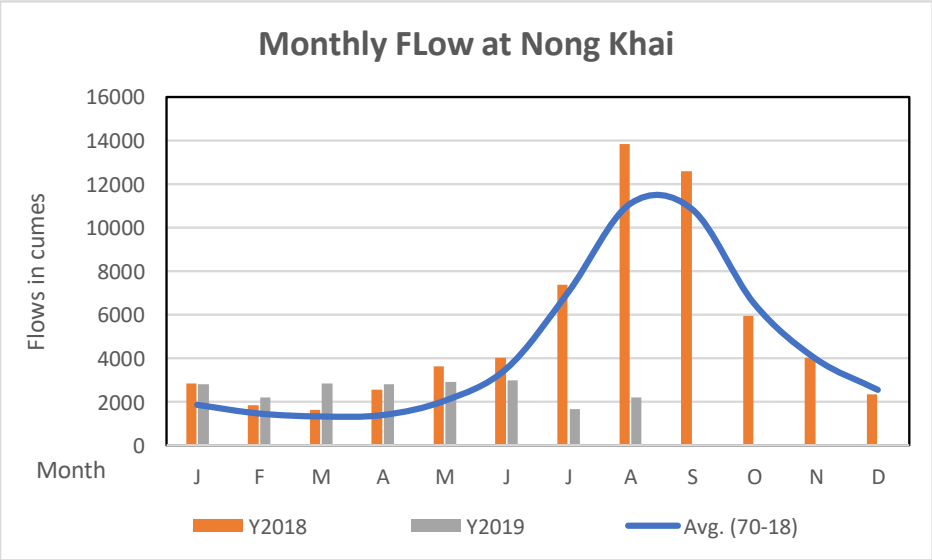
Annex A: Monthly Flow Hydrographs

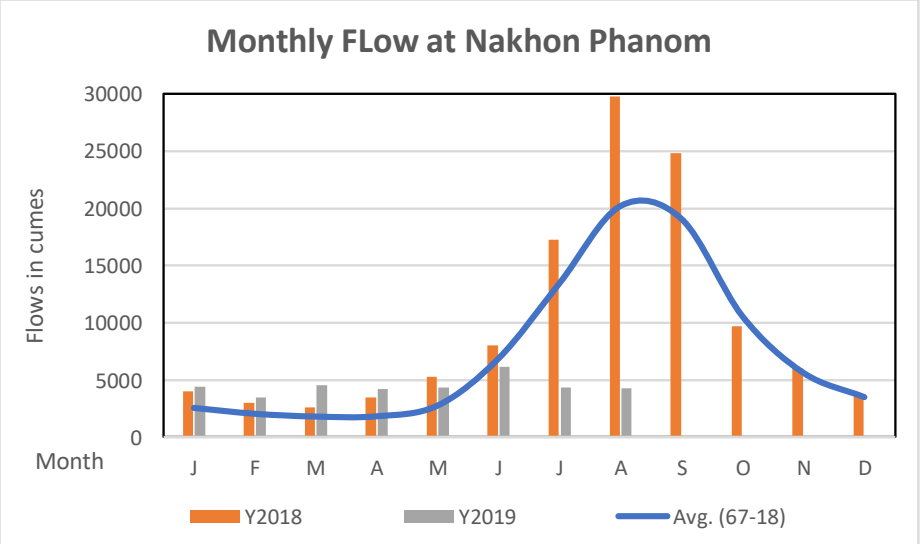
MONTHLY FLOWS HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON FROM JAN TO JULY 2019

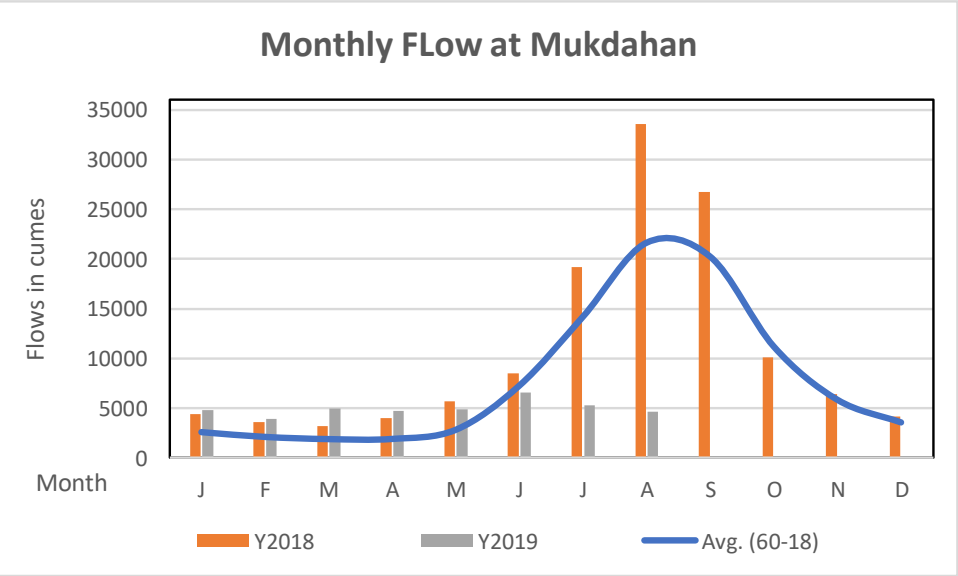


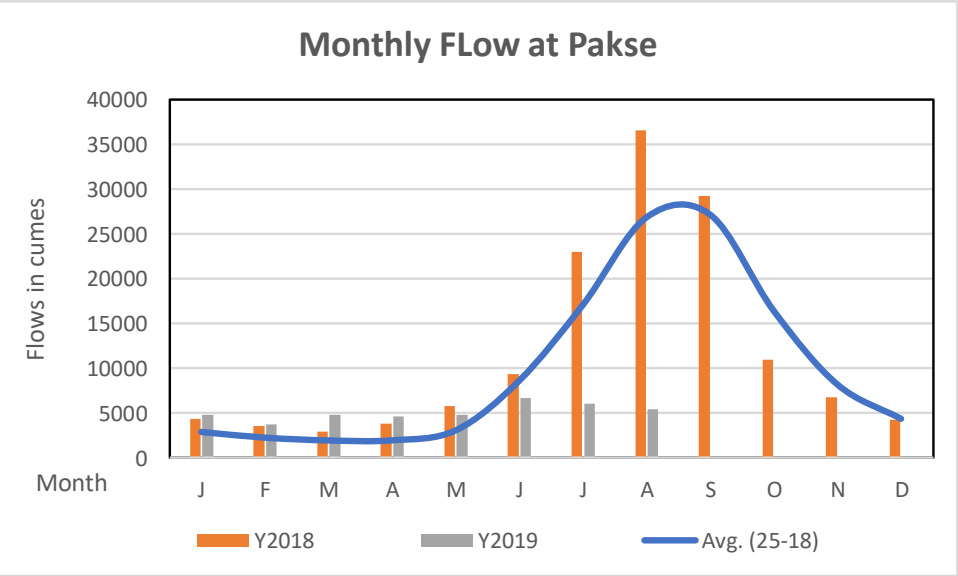


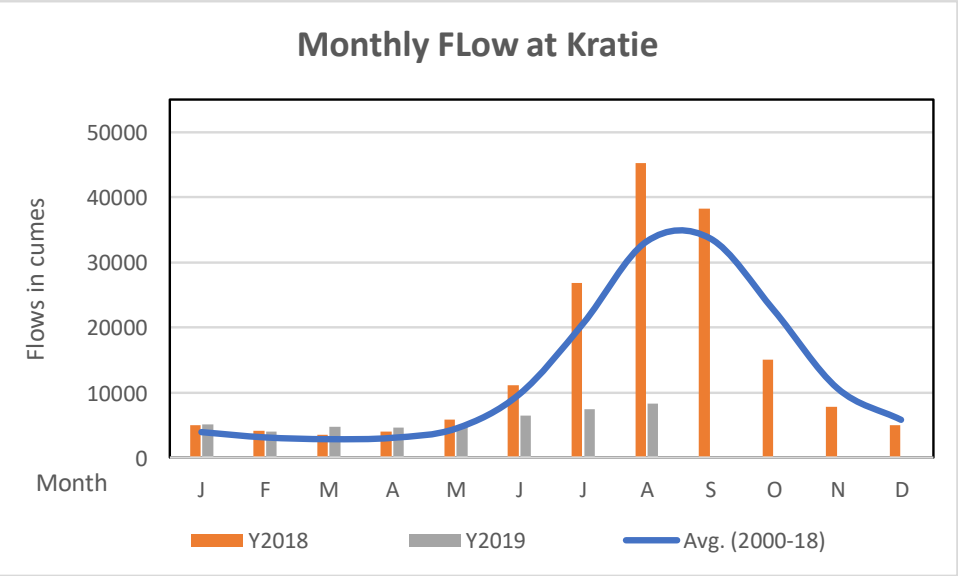

Monthly FLow at Luang Prabang
Flows in cumes
14000
12000
10000
8000
6000
4000
2000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (50-18)


Monthly FLow at Nong Khai
Flows in cumes
16000
14000
12000
10000
8000
6000
4000
2000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (70-18)


Monthly FLow at Nakhon Phanom
Flows in cumes
30000
25000
20000
15000
10000
5000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (67-18)

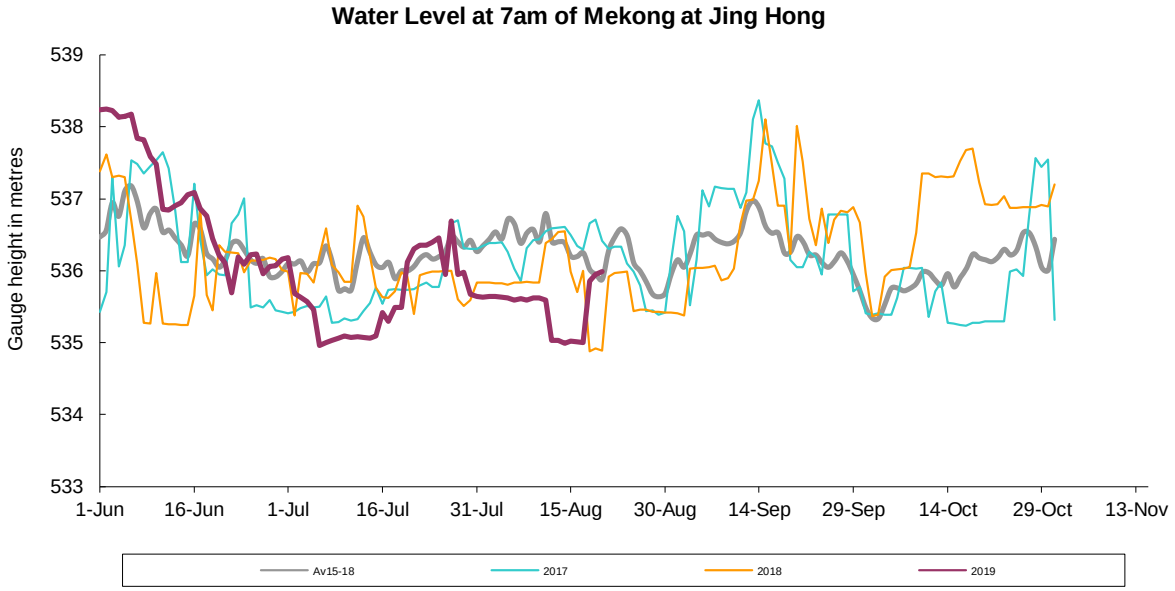

Monthly FLow at Mukdahan
Flows in cumes
35000
30000
25000
20000
15000
10000
5000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (60-18)

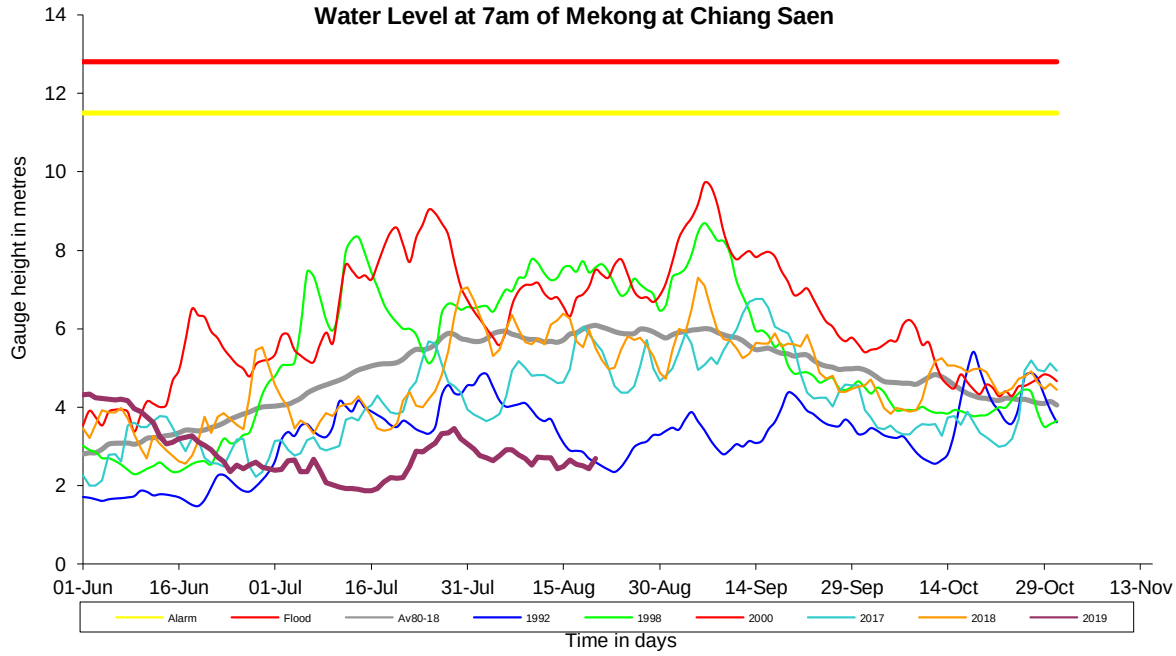

Monthly FLow at Pakse
Flows in cumes
40000
35000
30000
25000
20000
15000
10000
5000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (25-18)

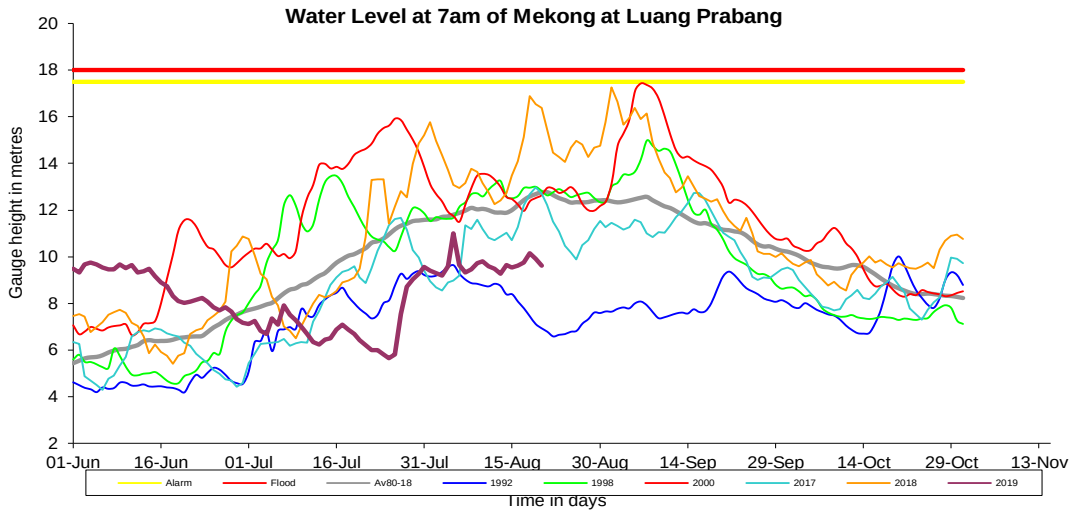

Monthly FLow at Kratie
Flows in cumes
50000
40000
30000
20000
10000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (2000-18)

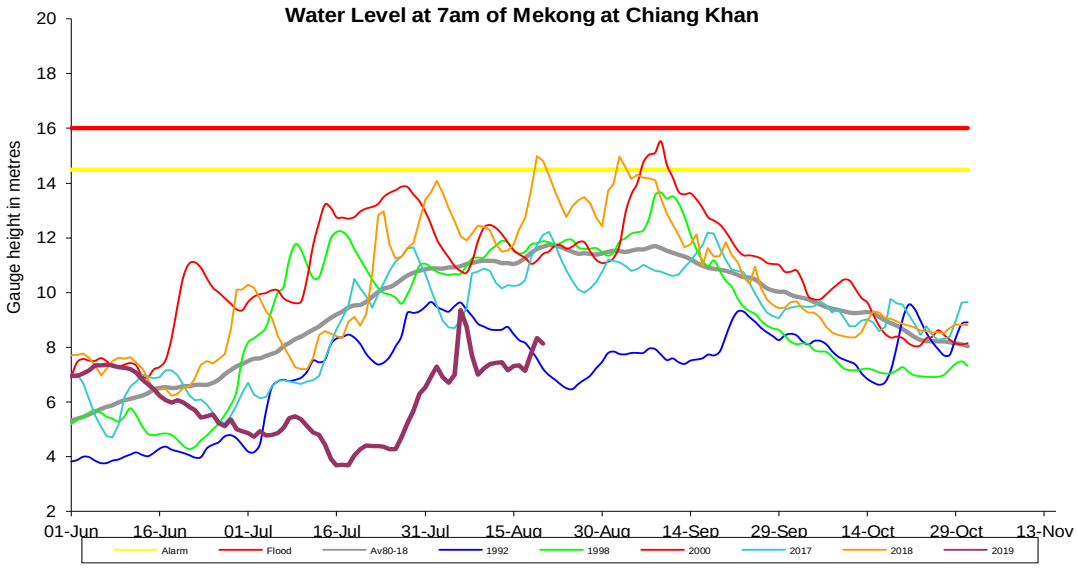
Annex B: Seasonal Water Level Hydrographs

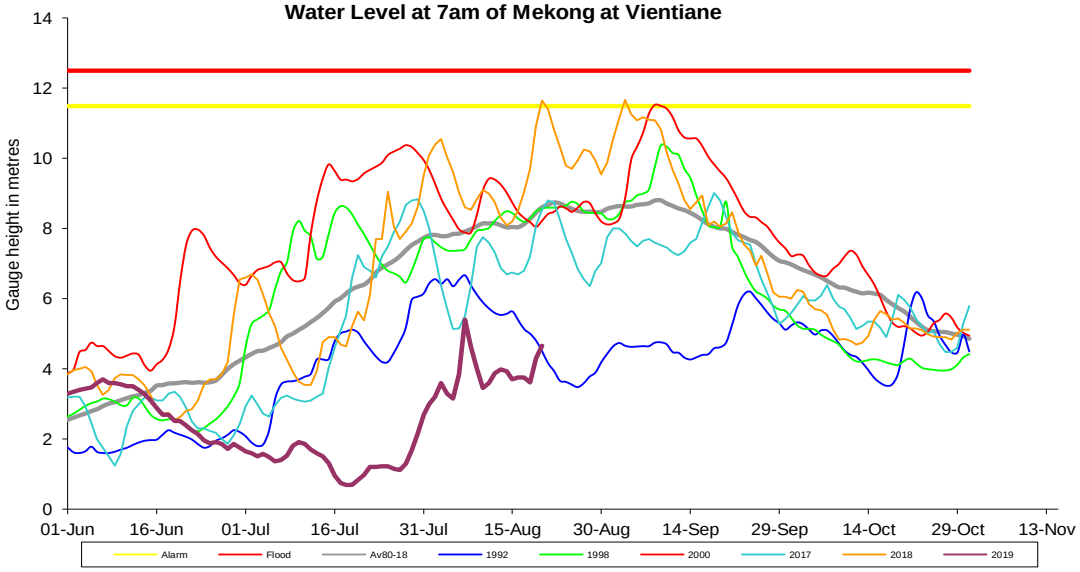
HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON FROM UP TO 19th AUG 2019

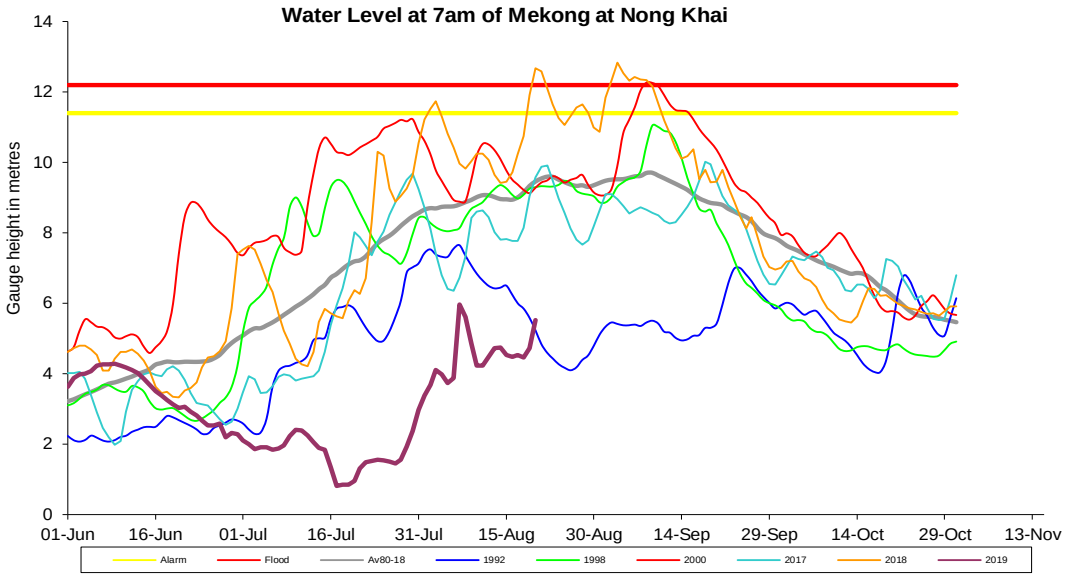


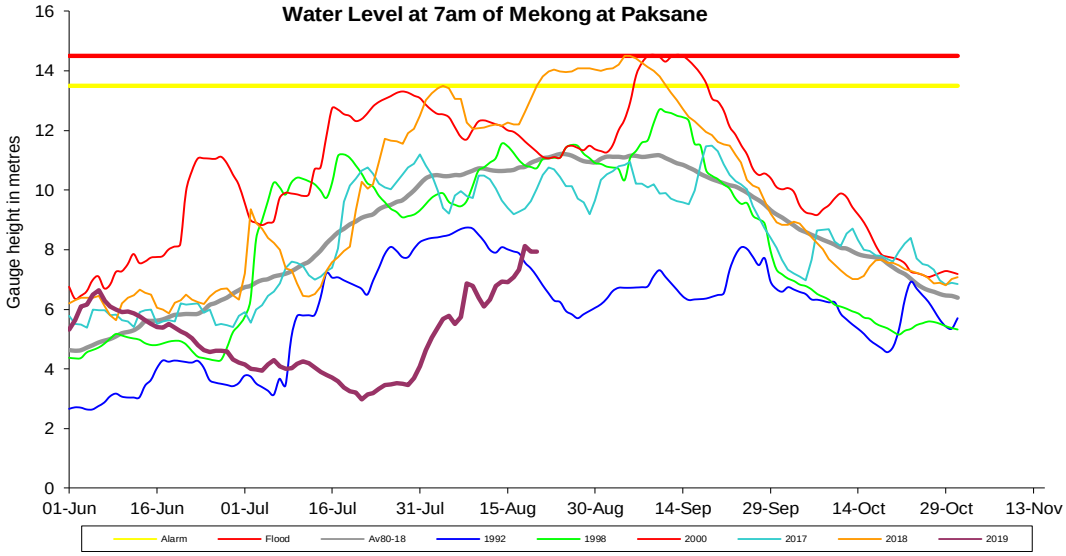


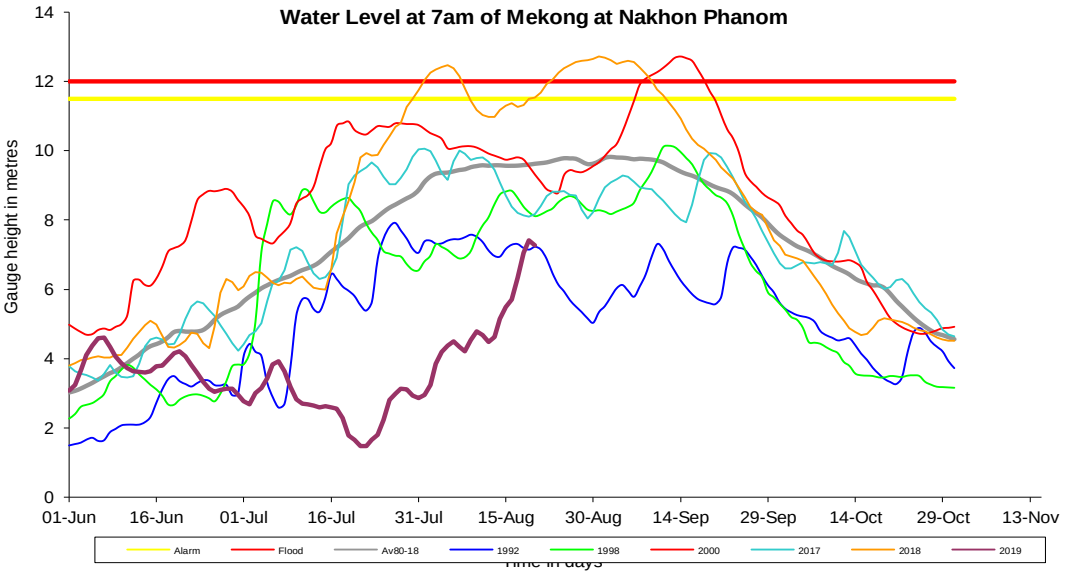

Water Level at 7am of Mekong at Luang Prabang
Gauge height in metres
20
18
16
14
12
10
8
6
4
2
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019
Time in days

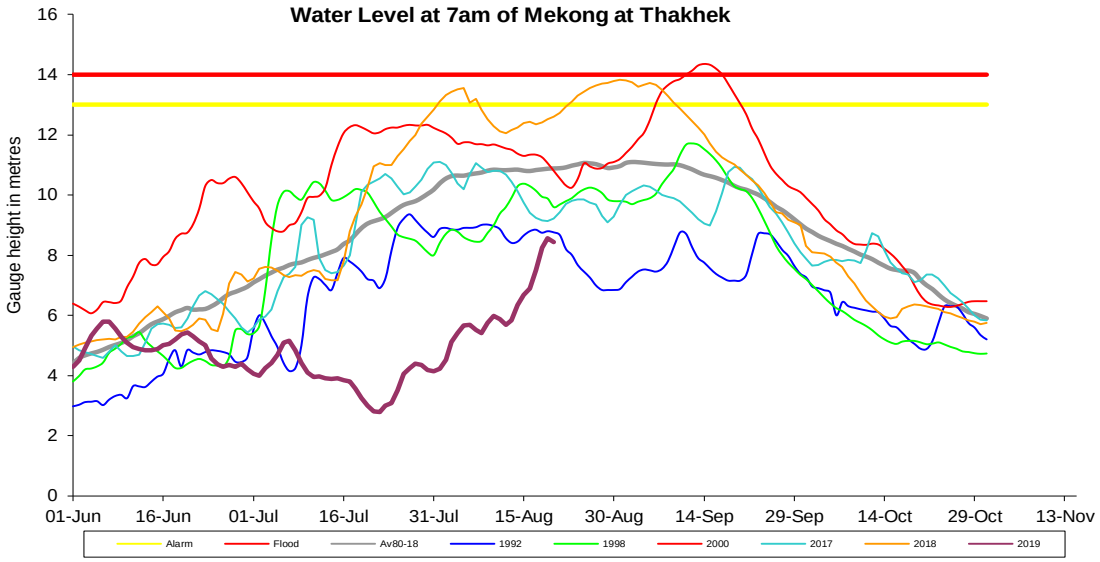

Water Level at 7am of Mekong at Chiang Khan
Gauge height in metres
20
18
16
14
12
10
8
6
4
2
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

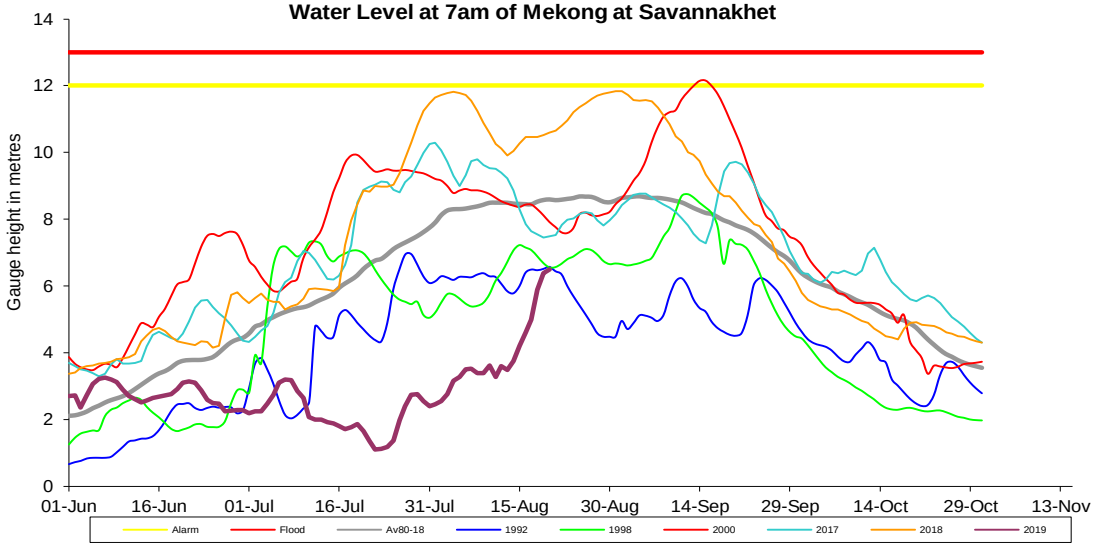

Water Level at 7am of Mekong at Vientiane
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


Water Level at 7am of Mekong at Nong Khai
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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


Water Level at 7am of Mekong at Paksane
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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


Water Level at 7am of Mekong at Nakhon Phanom
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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


Water Level at 7am of Mekong at Thakhek
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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


Water Level at 7am of Mekong at Savannakhet
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
Alarm
Flood
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1992
1998
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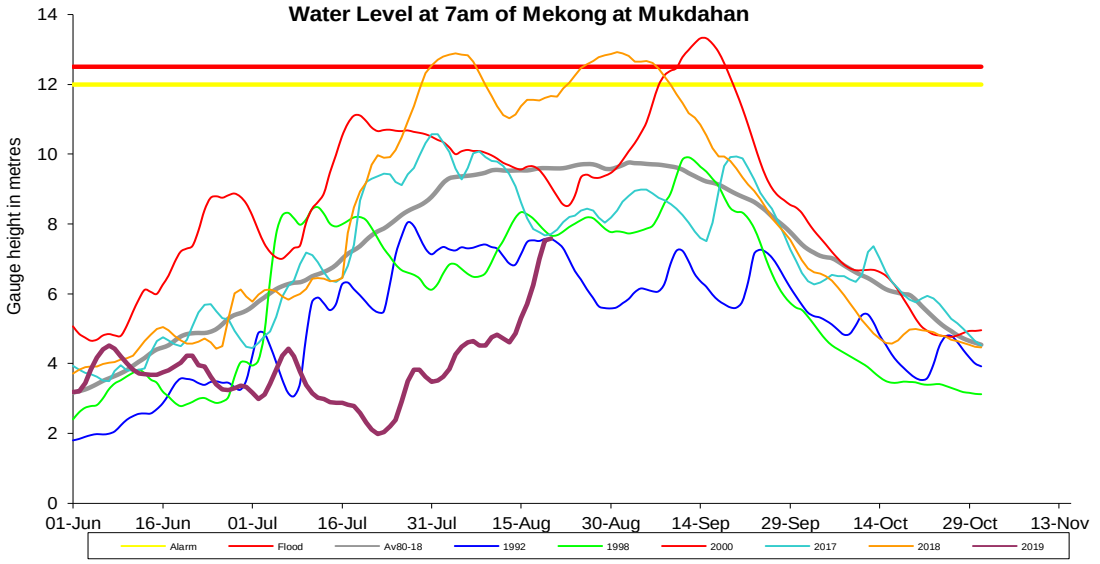
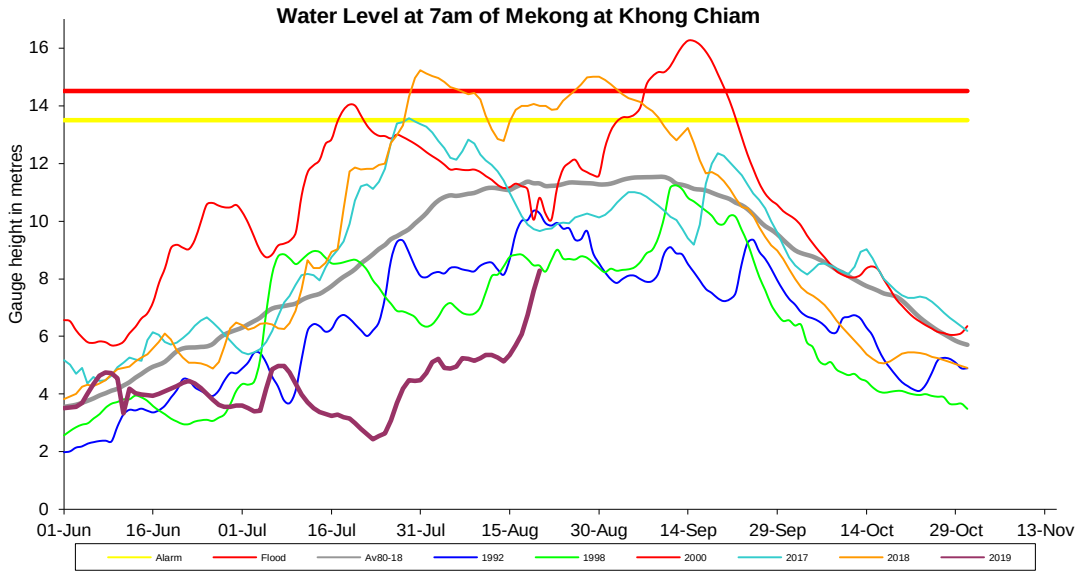
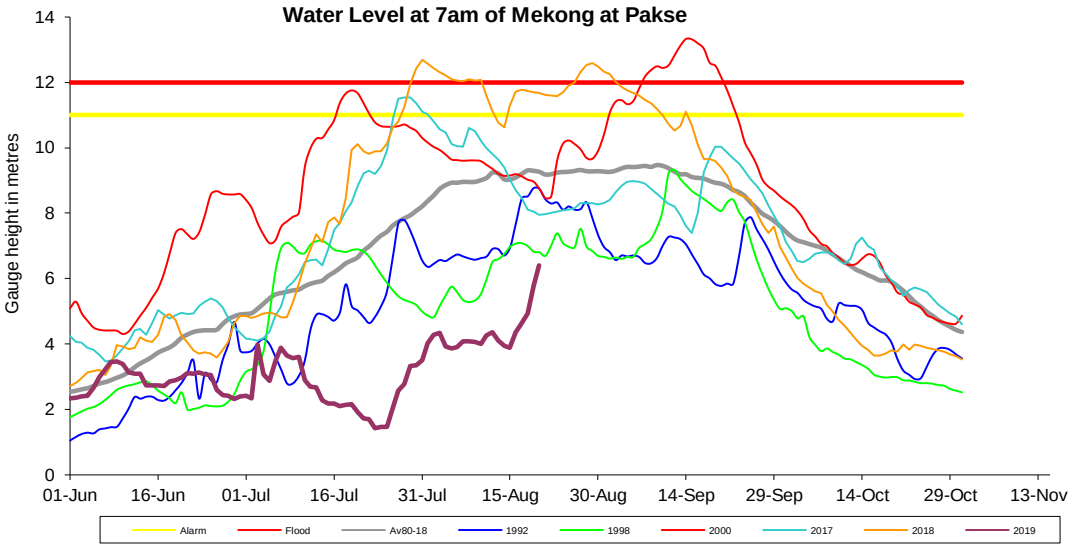
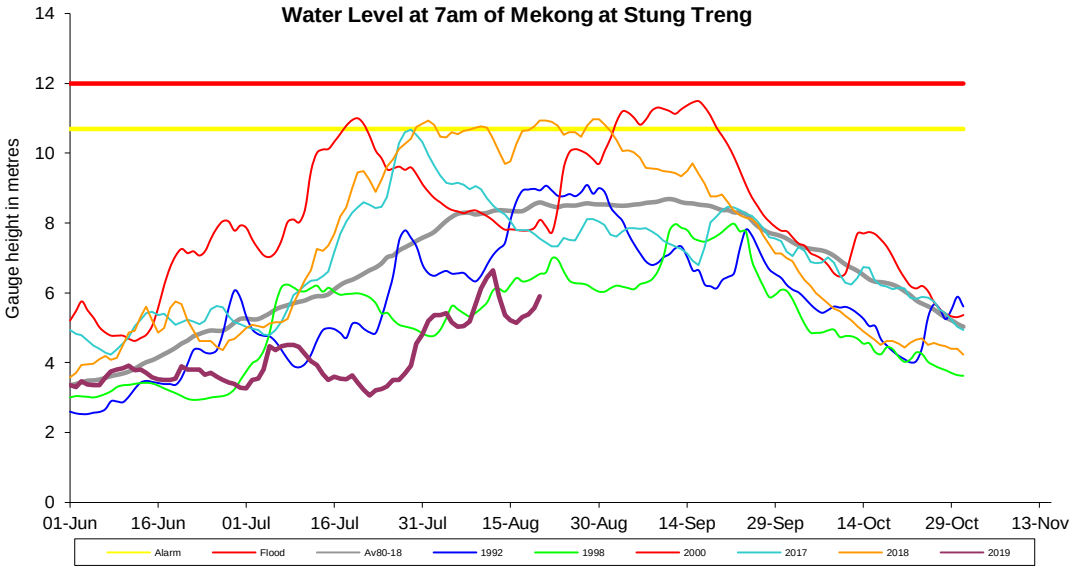
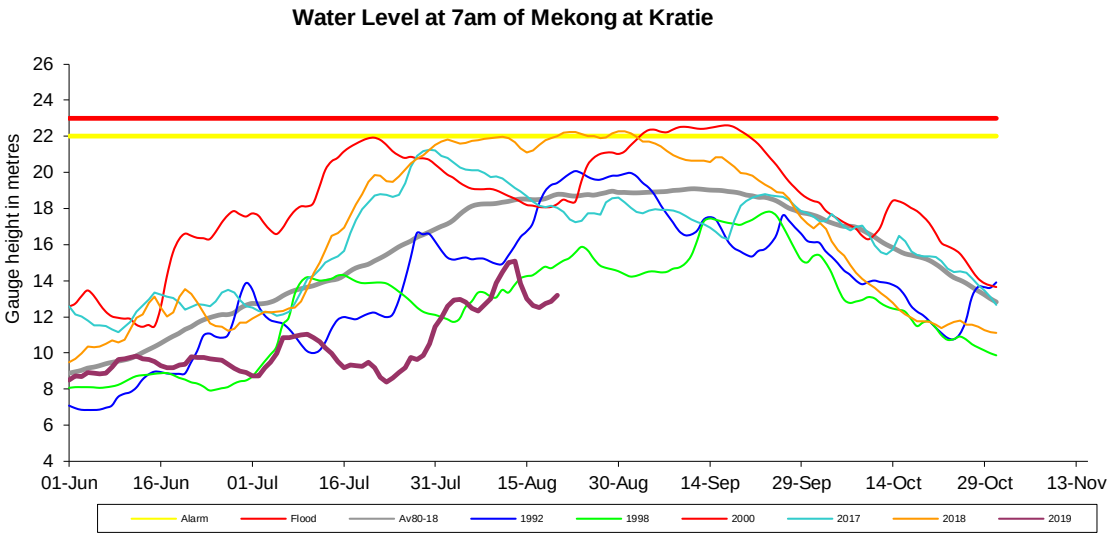
2017
2018
2019

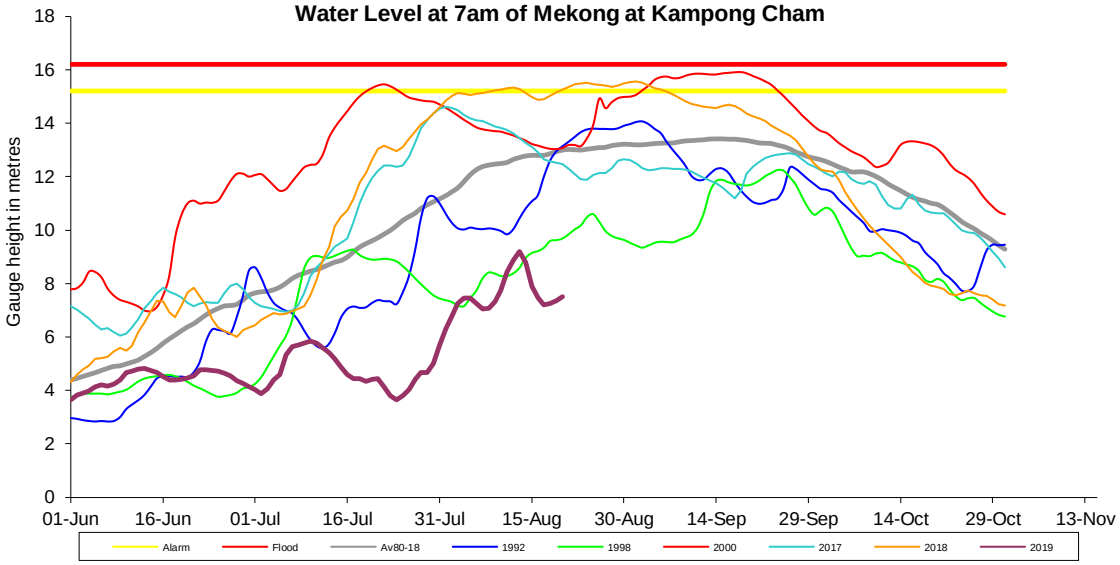

Water Level at 7am of Mekong at Mukdahan
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

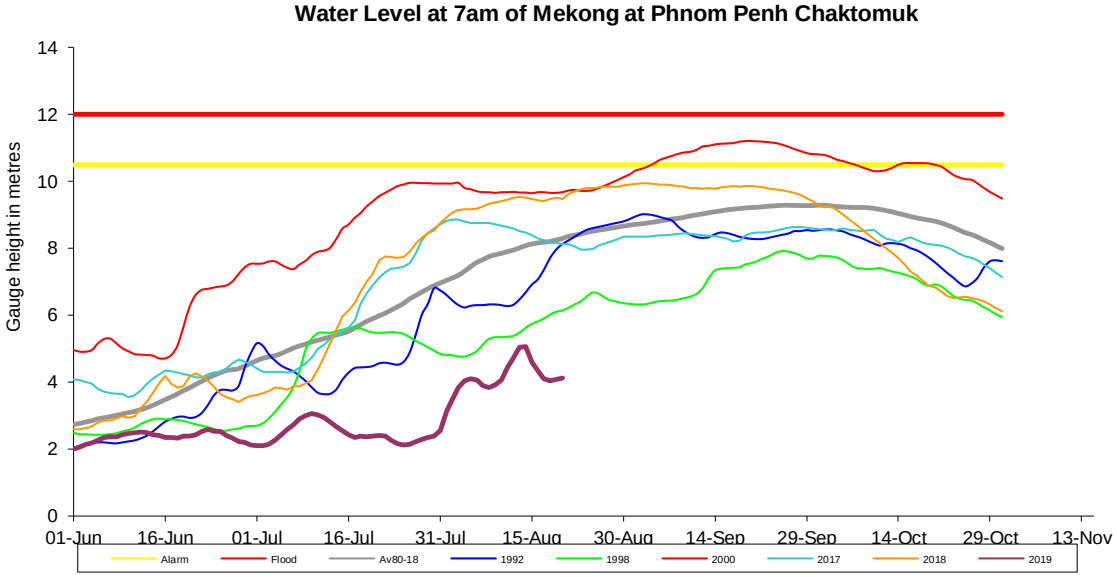

Water Level at 7am of Mekong at Khong Chiam
Gauge height in metres
0
2
4
6
8
10
12
14
16
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

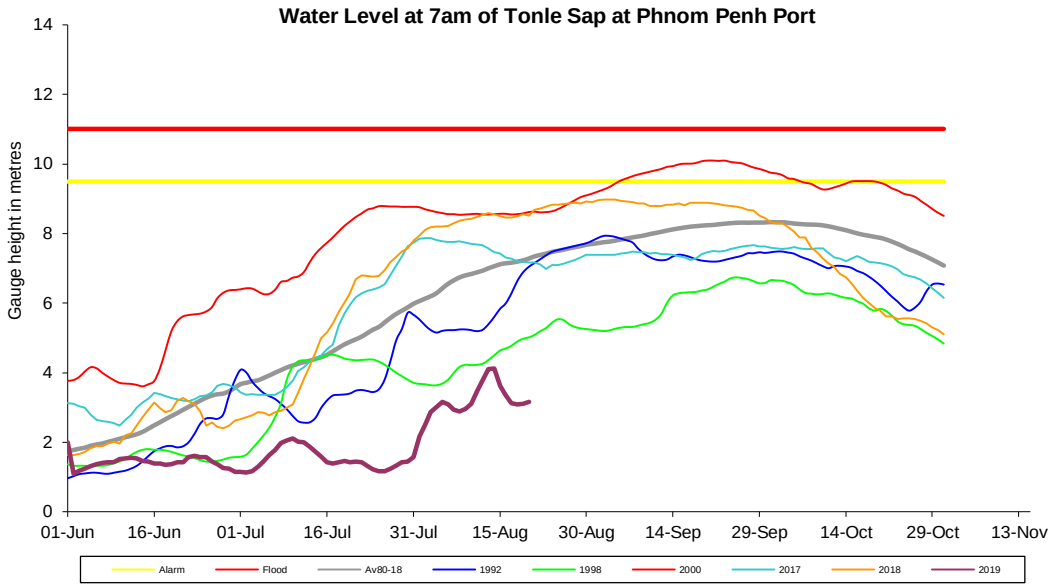

Water Level at 7am of Mekong at Pakse
Gauge height in metres
0
2
4
6
8
10
12
14
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

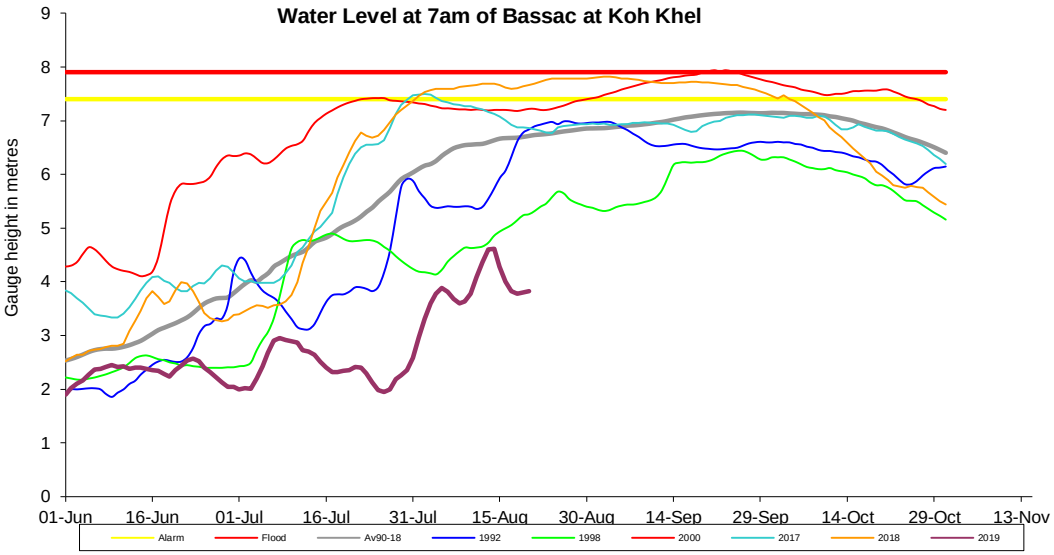

Water Level at 7am of Mekong at Stung Treng
Gauge height in metres
0
2
4
6
8
10
12
14
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

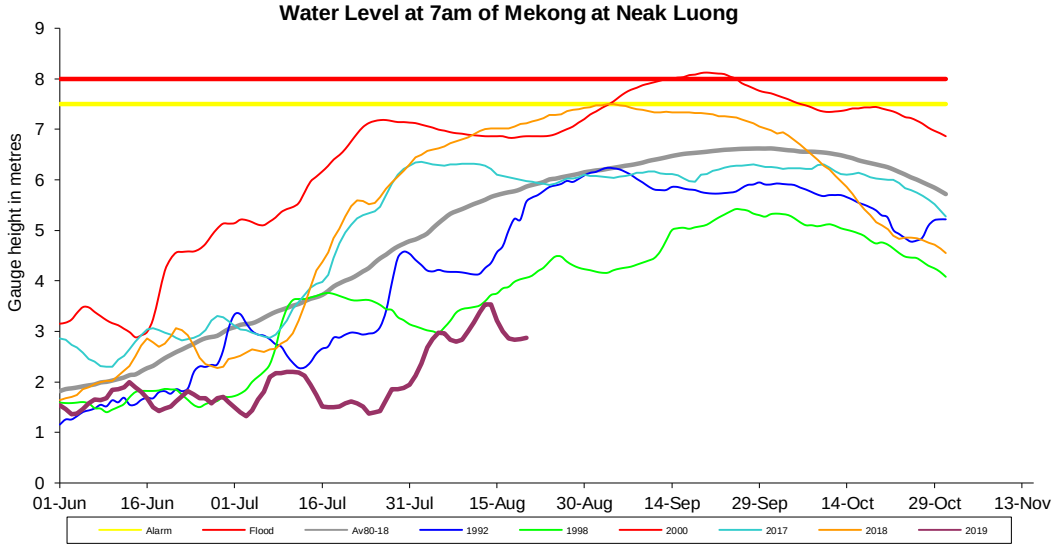

Water Level at 7am of Mekong at Kratie
Gauge height in metres
26
24
22
20
18
16
14
12
10
8
6
4
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

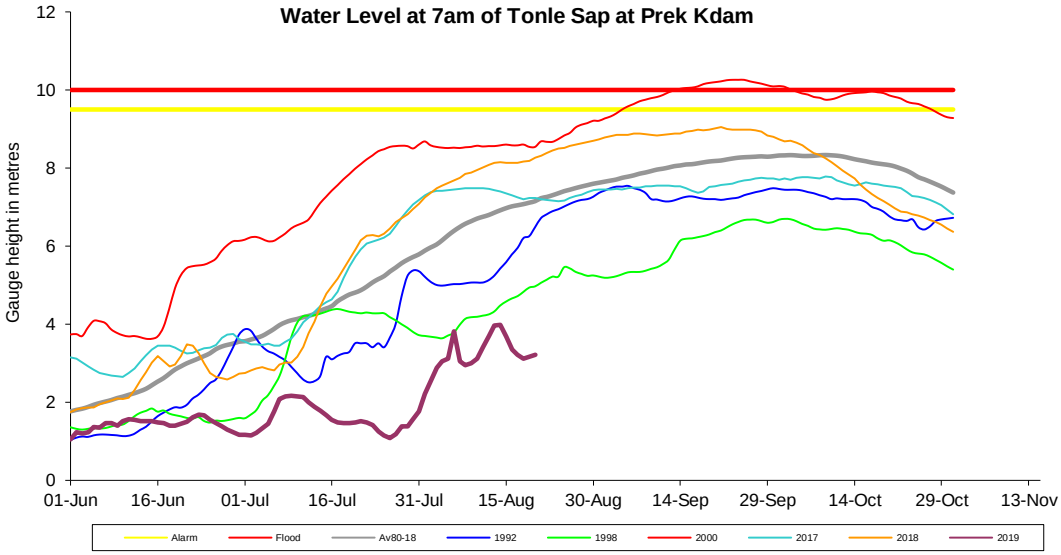

Water Level at 7am of Mekong at Kampong Cham
Gauge height in metres
18
16
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

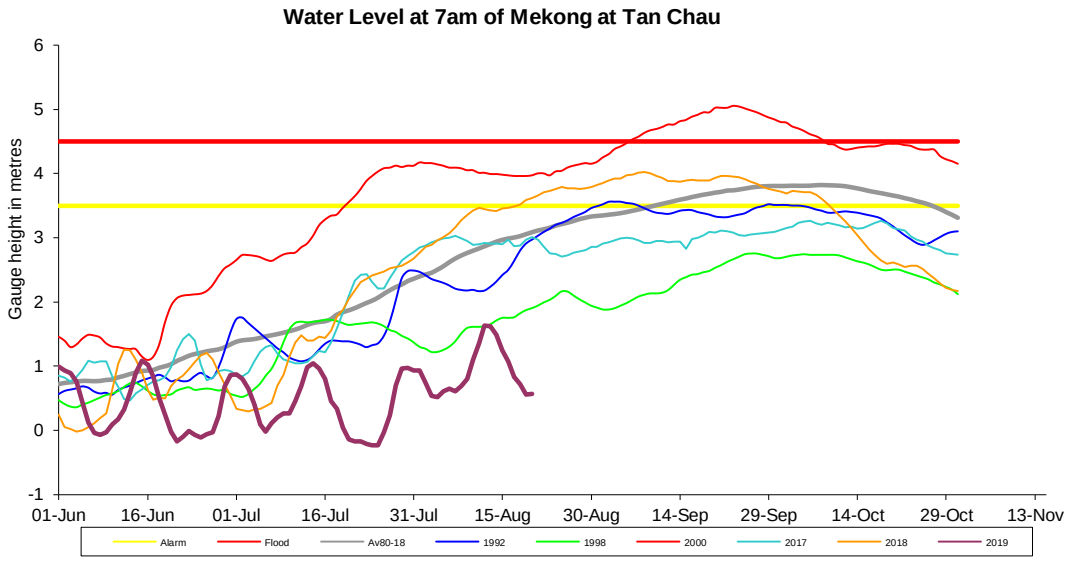

Water Level at 7am of Mekong at Phnom Penh Chaktomuk
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

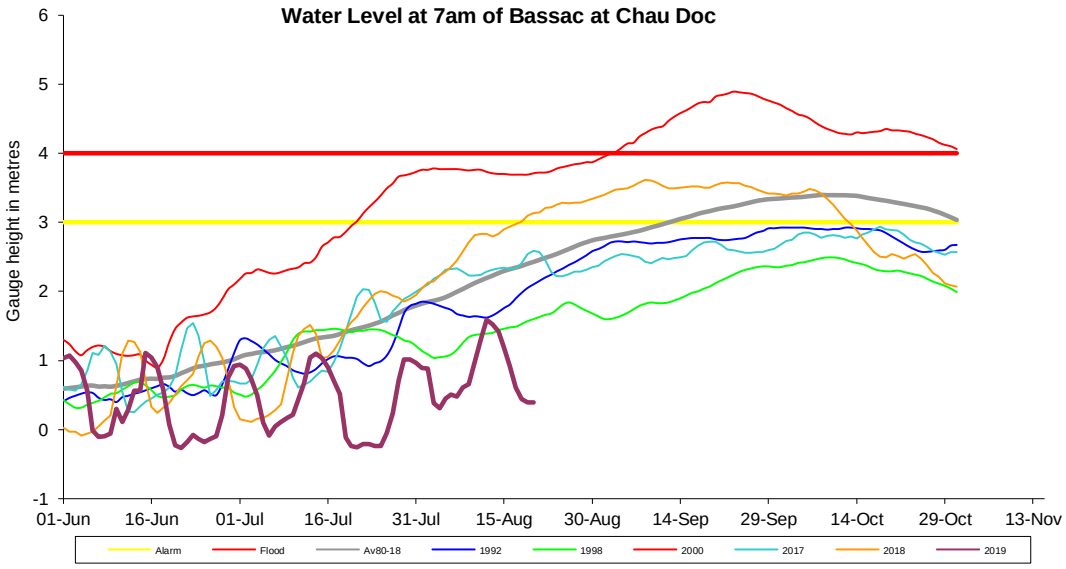

Water Level at 7am of Tonle Sap at Phnom Penh Port
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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
Alarm
Flood
Av90-18
1992
1998
2000
2017
2018
2019


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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019