Weekly Flood Situation Report for the Mekong River Basin

Prepared by RFDMC

covering the week from 23th to 29th July 2019 and potential trend next week

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

General weather patterns

During the week of 23th to 29th July 2019, the weather bulletins and maps were issued by the Thailand Meteorology Department (TMD). It was stated that this month, the dry spell still occurs continuously from early July because the low-pressure trough still places on the southern portion of China along with the Southwest Monsoon prevailing over Thailand mostly weakens. As a result, there were rainfall for some areas, but not covered the whole region. **Figures 1 & 2** presented the weather map for 25nd July and 29th 2019.

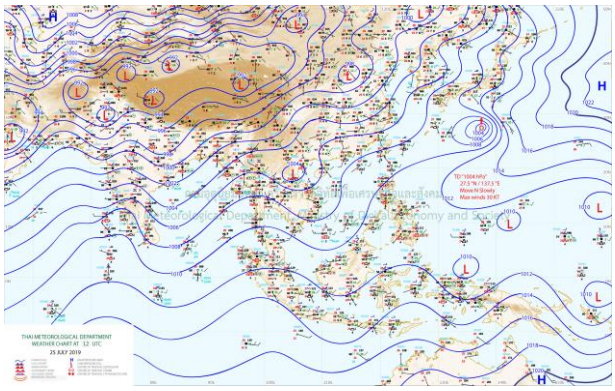


Figure 1: Weather map for 25th July 2019

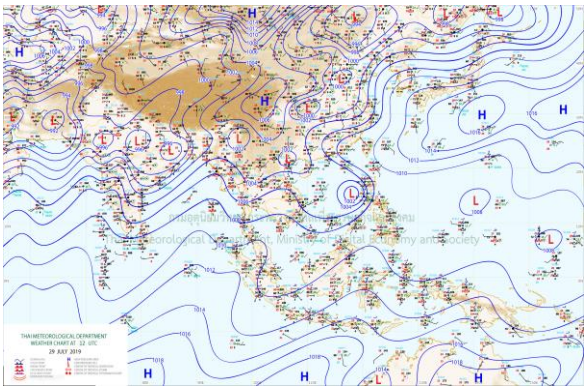


Figure 2: Weather map for 29th July 2019

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), July 2019, drier-than-average conditions are expected over parts of the southern ASEAN region, including the southern parts of Sumatra and Kalimantan, and Java. In the first week of this fortnight, warmer-than-average conditions are predicted over Myanmar and Thailand as well as over Lao PDR. **Figure 2** showed the rainfall outlook over southern Southeast Asia.

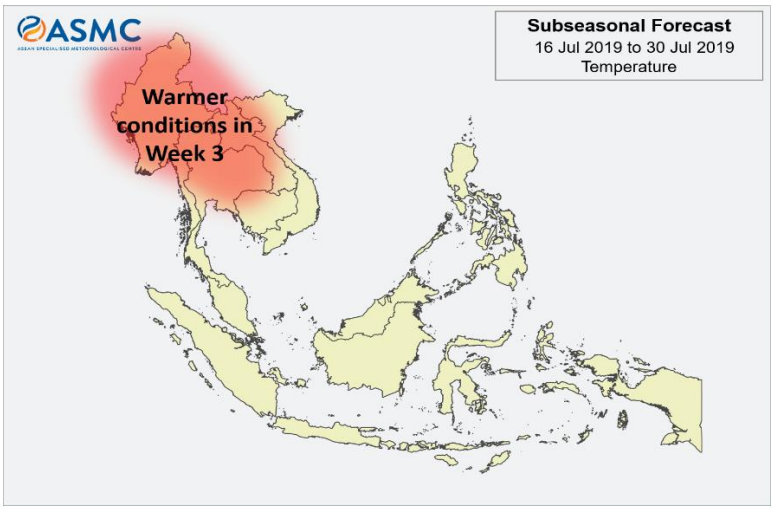


Figure 2: The predicted higher likelihood of below-normal rainfall over southern Southeast Asia

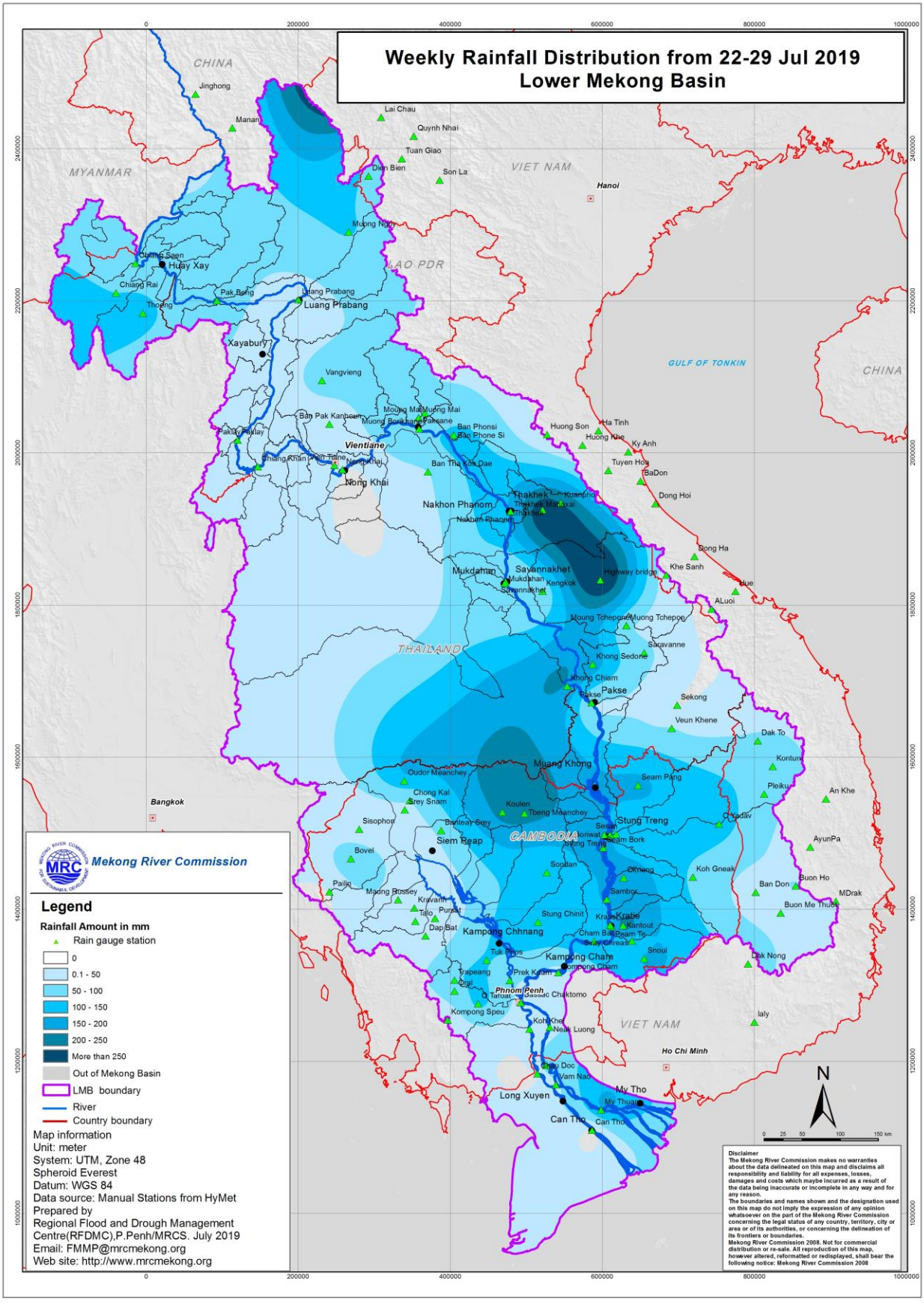


Figure 3: Weekly Rainfall Distribution over the LMB from 22th to 29th July 2019

Over weather situation

The weather of this week was scattered thundershowers with moderate rain of the Southwest monsoon. Consequently, in this week there was moderate rainfall covered from upper part of upper part of Luang Prabang and concentrated at Nakhon Phanom down to Pakse, varied from 100 mm to 150 mm. It was also happened from Pakse down to 3S area in Cambodia, showed varied from 100 to 150 mm. The weekly rainfall distribution in the Lower Mekong Basin from 23th to 29th July 2019 is showed in **Figure 3**. The monthly distributed rainfall over the LMB, compared to their Long-Term Average (LTA) and rainfall in 2018 is depicted in **Figure 4**. It indicated the July' s rainfall is lower than 15% compared to its LTA and about 40% lower than 2018.

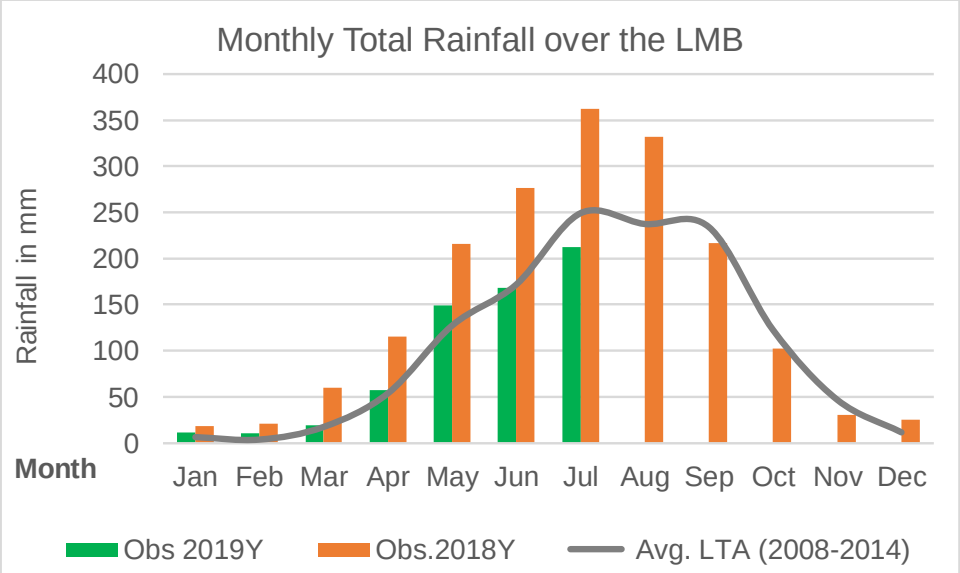


Figure 4: Monthly distributed Rainfall over the LMB

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 gradually, due to some rainfall in the catchment inflows. Since 3rd July 2019, China sent the notification of operation information of Jinghong Hydropower Station on Lancang River, informing the stored water at Jinghong Station from 5 – 19 July 2019 reducing from 1250 m3/s to 504m3/s. Current water levels at Chiang Saen to downstream in the floodplain area in Cambodia are gradually increased, varied from 0.05m to 0.50 m. 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). This tends to suggest a significant reduction in the natural groundwater contribution to these tributaries over the last month. 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 23th to 29th July 2019 at Chiang Sean station were gradually increased but still stay below their historical minimum levels (1980-2018). It was varied from 0.01 m to 0.35 m. For Luang Prabang station, water levels seem nominated by upstream inflow and downstream reservoir of Xayaburi where water can be increased up to 1.73 m on 27th. The current water level at this station is higher than their minimum levels. 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 stay 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 23th to 29th July 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 from 0.01 m to 0.45 m but still lower than their historical minimum levels (1980-2018).

For stations from Nakhon Phanom/Thakhet to Mukdaha/Sovannakhet

Water levels from 23th to 29th July 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 from 0.02m t 0.50m. However, the current water levels at those stations are still staying below their historical minimum levels (1980-2018).

For stations from Khong Chiam to Pakse

The same trend as upstream part, water levels from 23th to 29th July 2019 at Khong Chiam to Pakse stations were increased from 0.02 m to 0.55 m. However, those are still staying below their historical minimum levels (1980-2018).

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

Water levels from 23th to 29th July 2019 at Stung Treng, Kratie, Kompong Cham and Phnom Penh stations on the Mekong, Bassac and Tonle Sap were infected by rainfall from catchment inflow and at the stations, drawing water levels increased from 0.02 m to 0.45 m. It was found that water levels at Stung Trend, Kratie and Kompong Cham stations were reached close to 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 staying below their Minimum Levels (1980-2018).

Tan Chau and Chau Doc

Water levels from 23th to 29th July 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.

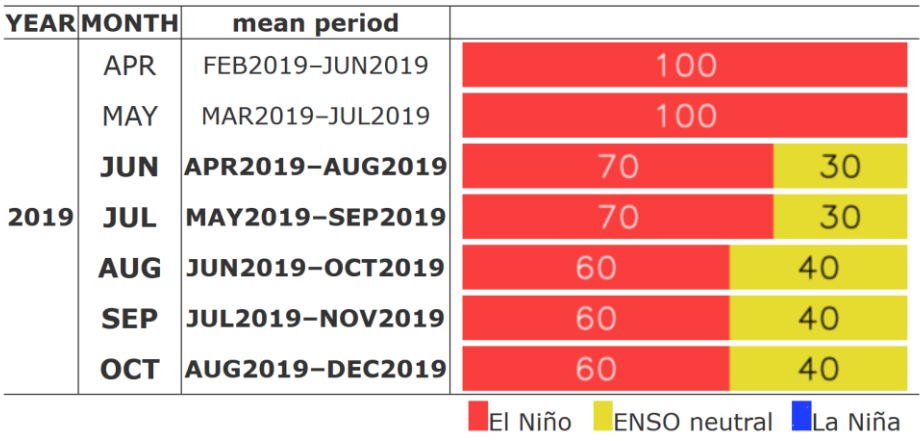


Figure 5 Five-month running mean of the SST deviation for NINO.3 predicted by JMA's El Niño prediction model (JMA/MRI-CGCM2)

Discussion and Conclusion

From 23th to 29th July 2019, the trend of water levels at Chiang Sean was increased but still staying below their minimum level, due to some realises flow from upstream and rainfall at the end of July. Water flow realised from Jinghong Hydropower Station on Lancang was considered small. The impact could obviously see the gradually increasing water level to Vientiane are too slow.

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 rainfall distribution.

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 rapidity of the decrease 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 (June-July) 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 large northern Lao tributaries, need to be clarified

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 **Annex B** presented hydrographs of water level at the 22 key stations on the Mekong River.

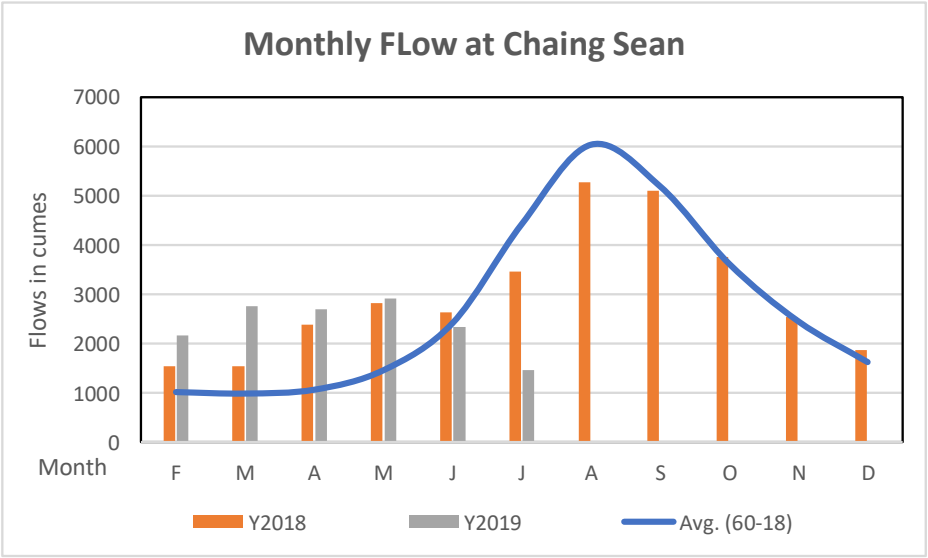
The Trend of water level and its Outlook

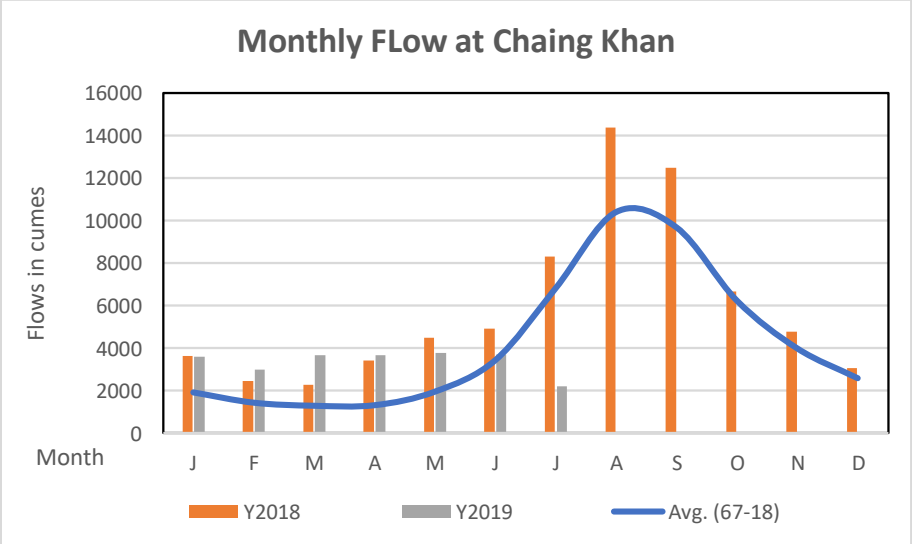
Based on of the daily river flood forecasting outcomes, next week water levels will continue to increase from Chiang Sean to downstream, due to rainfall over the catchment inflow and direct rainfall into the Mekong river system. Water levels at those stations will increase from **0.02 m to 0.45m** for the next 5days ahead. The 5 days forecasted rainfall of NOAA (GFAS) of showed high rainfall in the next 5 days.

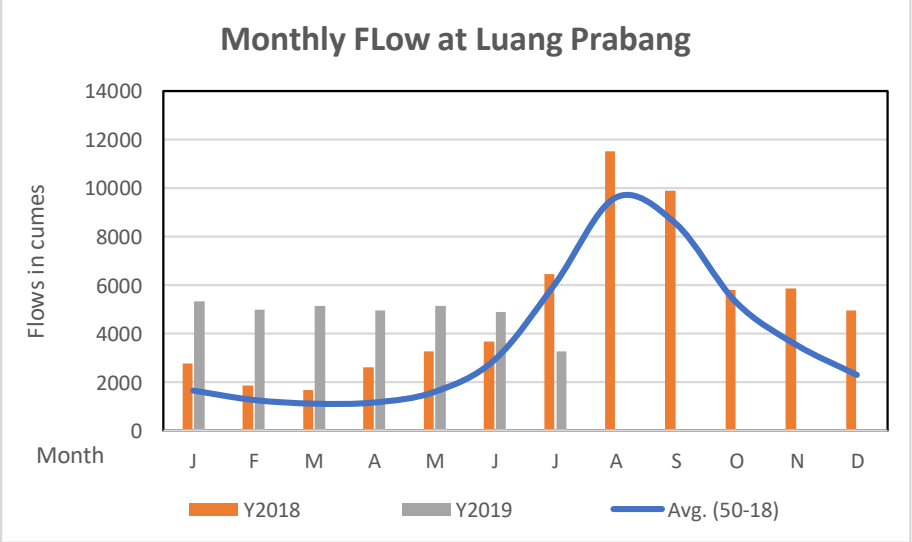
ASMC also expected that for July-August-September 2019, above-normal rainfall will be nominated the northern Southeast Asia (southern parts of Myanmar, Thailand, Laos, Cambodia and Vietnam).

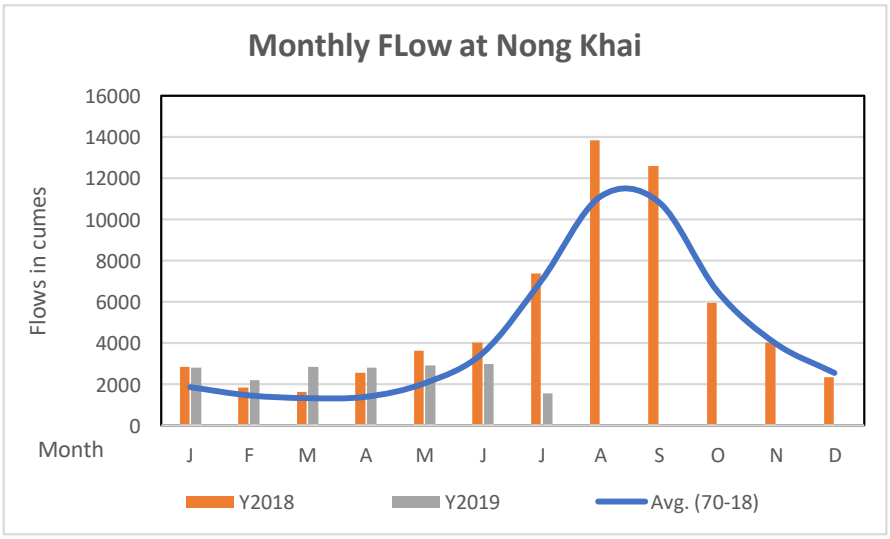
Annex A: Monthly Flow Hydrographs

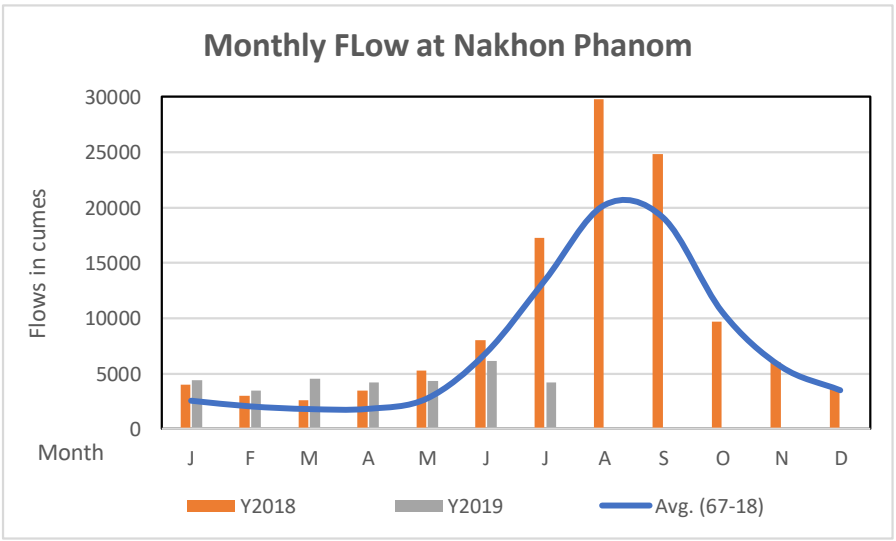
MONTHLY FLOWS HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON FROM JAN TO JULY 2019

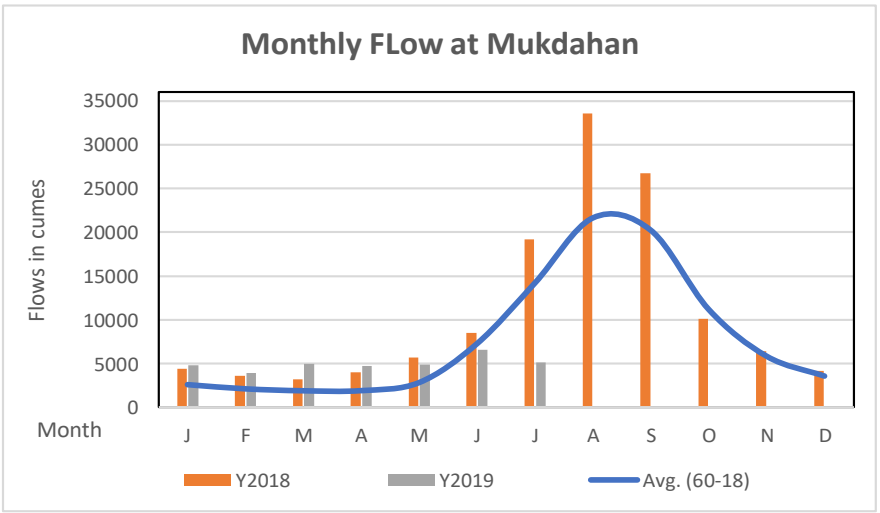


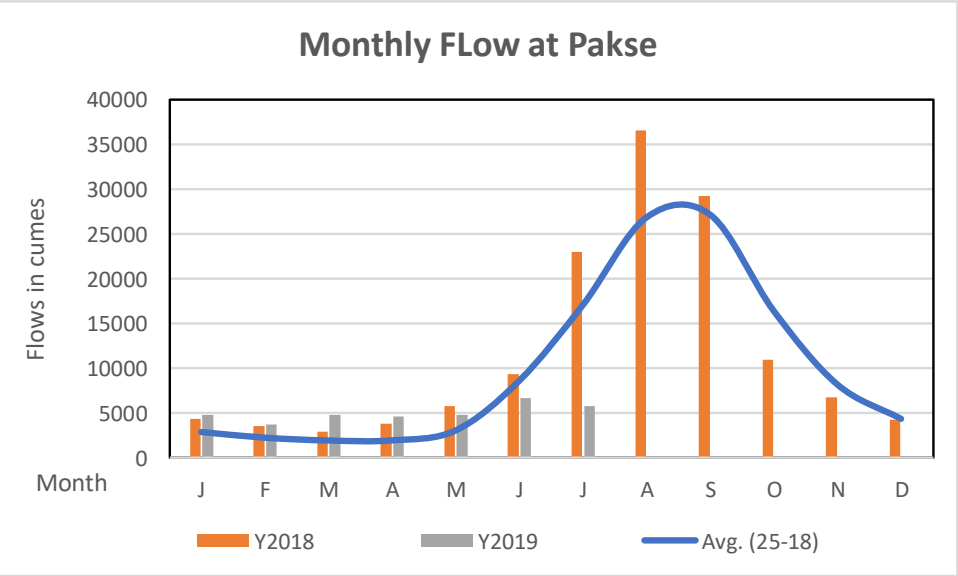


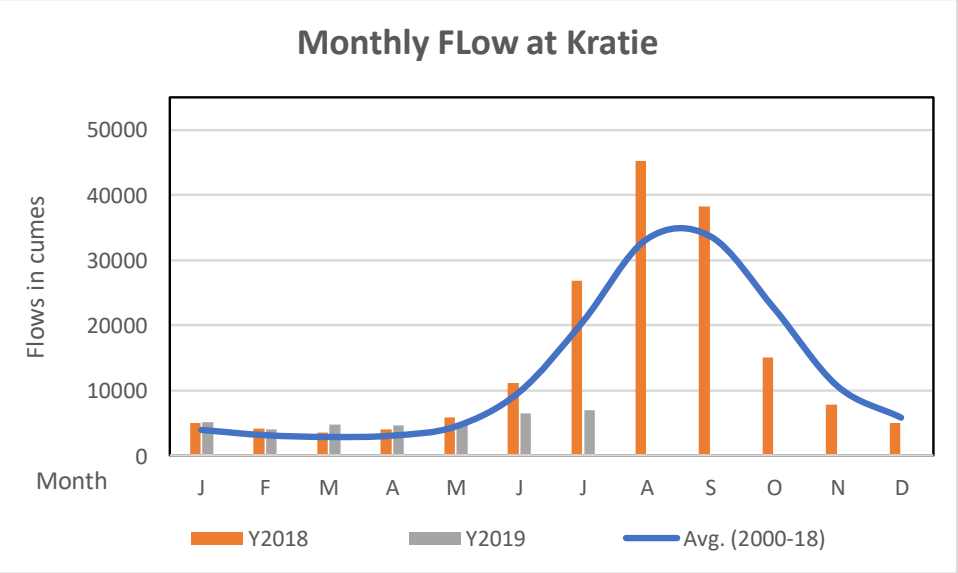



Monthly FLow at Nong Khai
Flows in cumes
16000
14000
12000
10000
8000
6000
4000
2000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (70-18)


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)

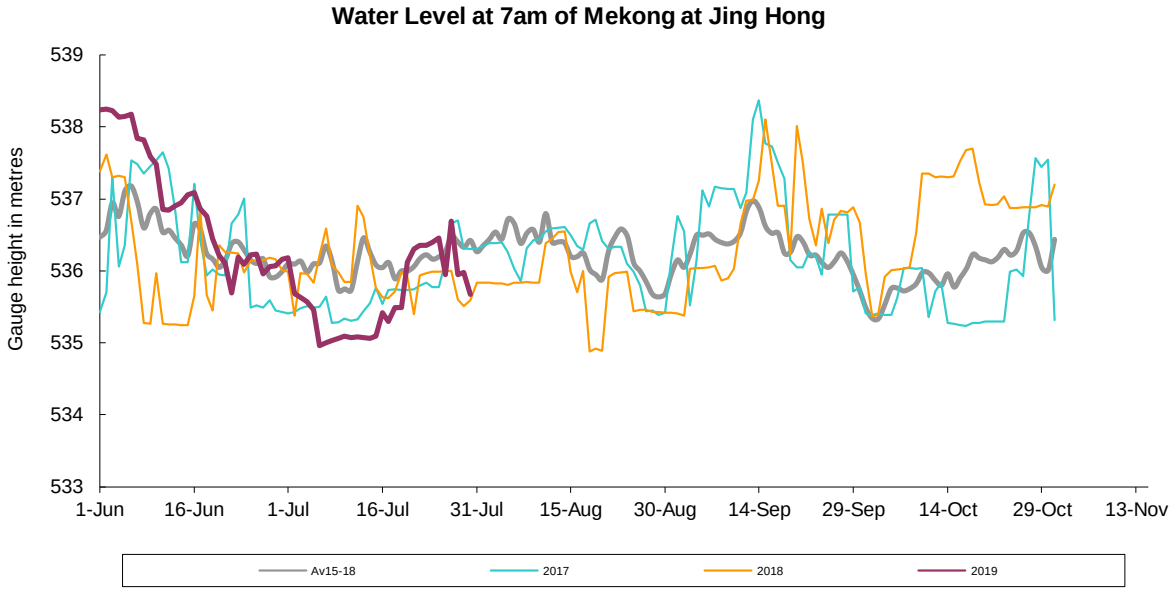

Monthly FLow at Mukdahan
Flows in cumes
35000
30000
25000
20000
15000
10000
5000
0
Month
J F M A M J J A S O N D
Y2018
Y2019
Avg. (60-18)

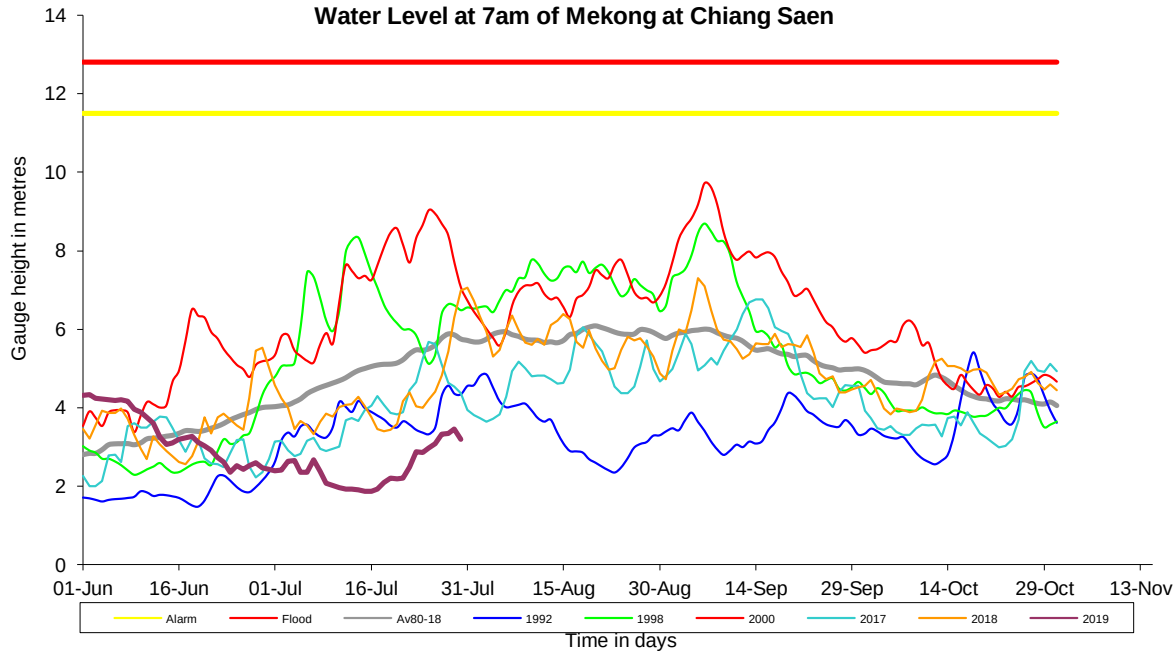

Monthly FLow at Pakse
Flows in cumes
40000
35000
30000
25000
20000
15000
10000
5000
0
Month
J
F
M
A
M
J
J
A
S
O
N
D
Y2018
Y2019
Avg. (25-18)

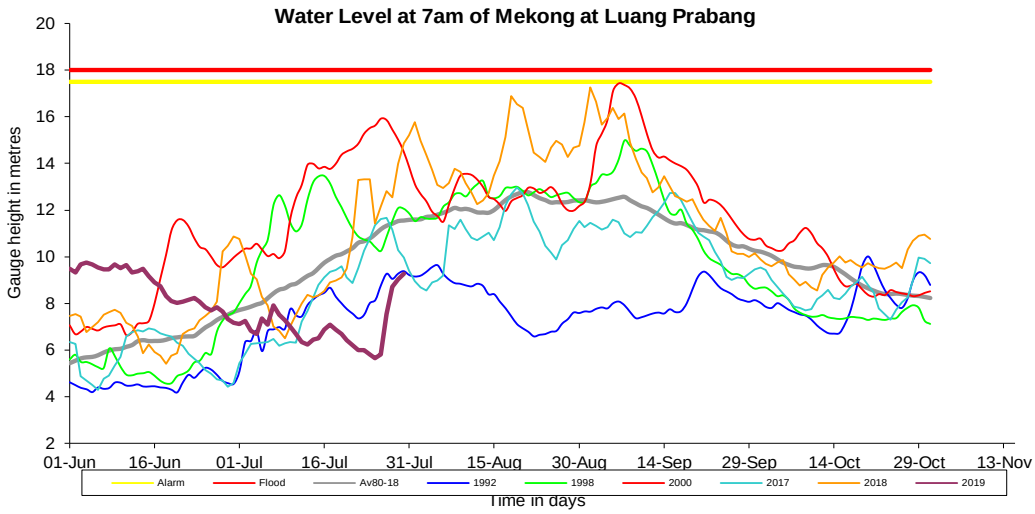

Monthly FLow at Kratie
Flows in cumes
50000
40000
30000
20000
10000
0
Month
J
F
M
A
M
J
J
A
S
O
N
D
Y2018
Y2019
Avg. (2000-18)

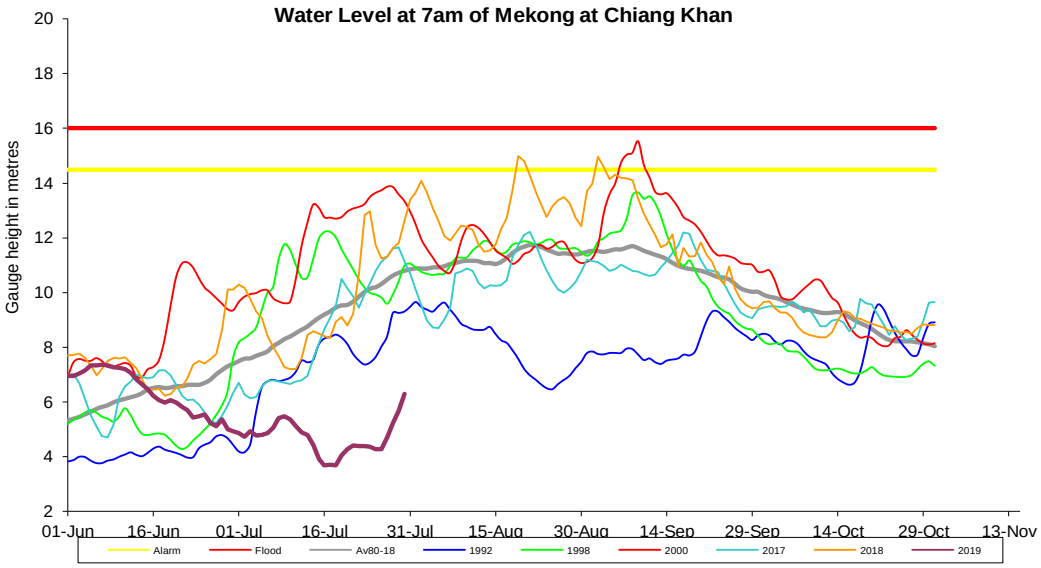
Annex B: Seasonal Water Level Hydrographs

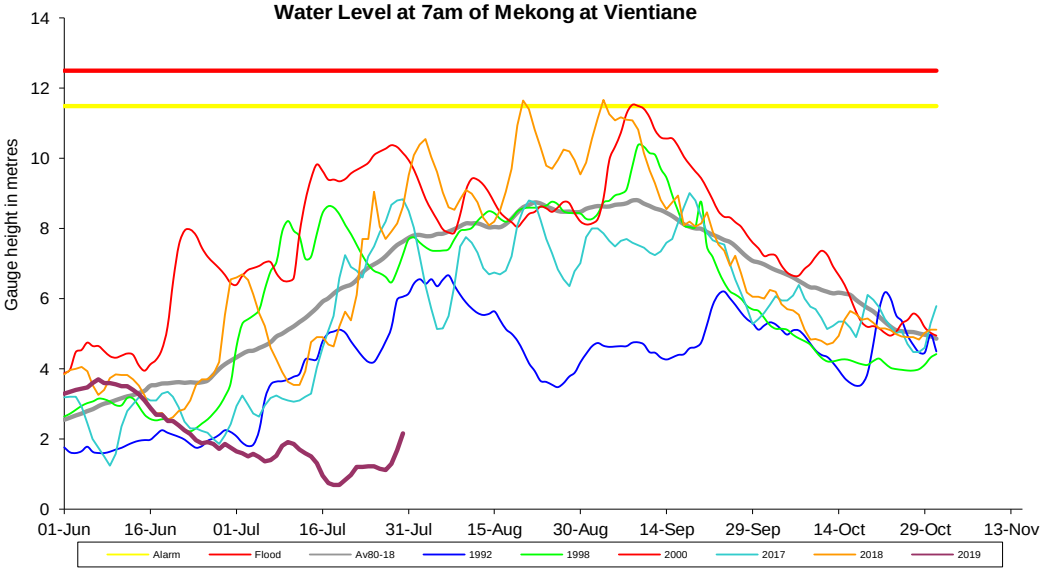
HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON FROM 1 JUNE TO 29 JULY 2019

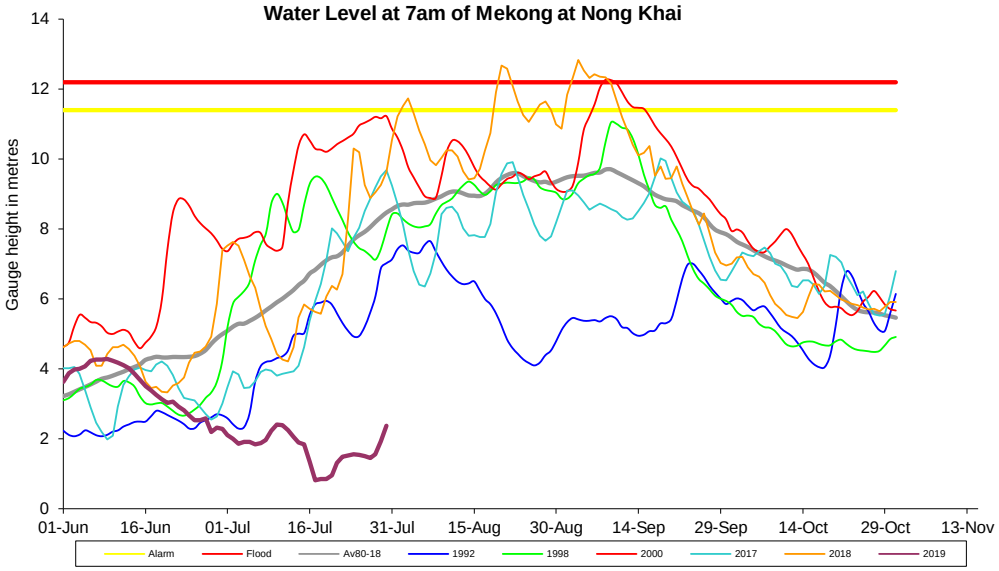





Water Level at 7am of Mekong at Luang Prabang
Gauge height in metres
20
18
16
14
12
10
8
6
4
2
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019
Time in days


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
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
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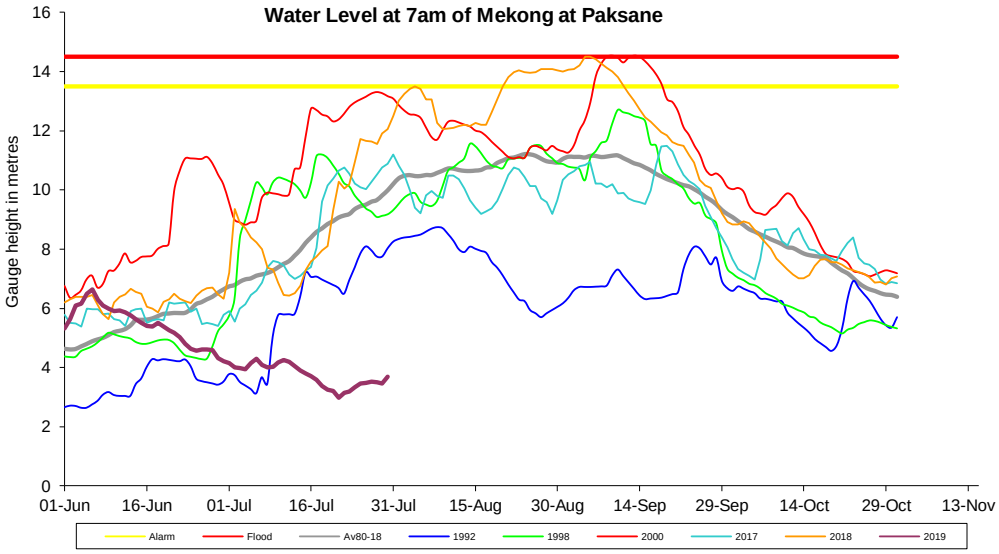
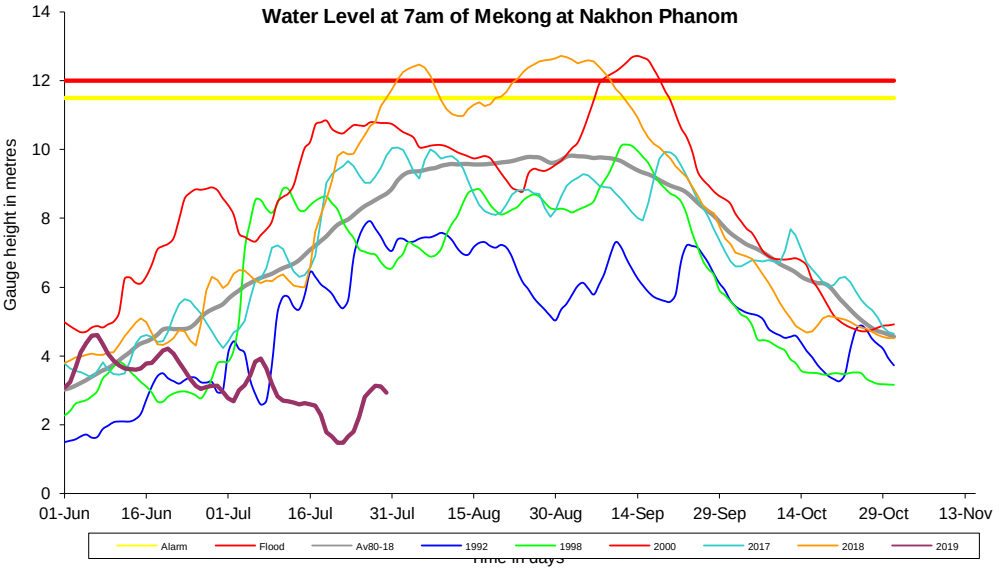
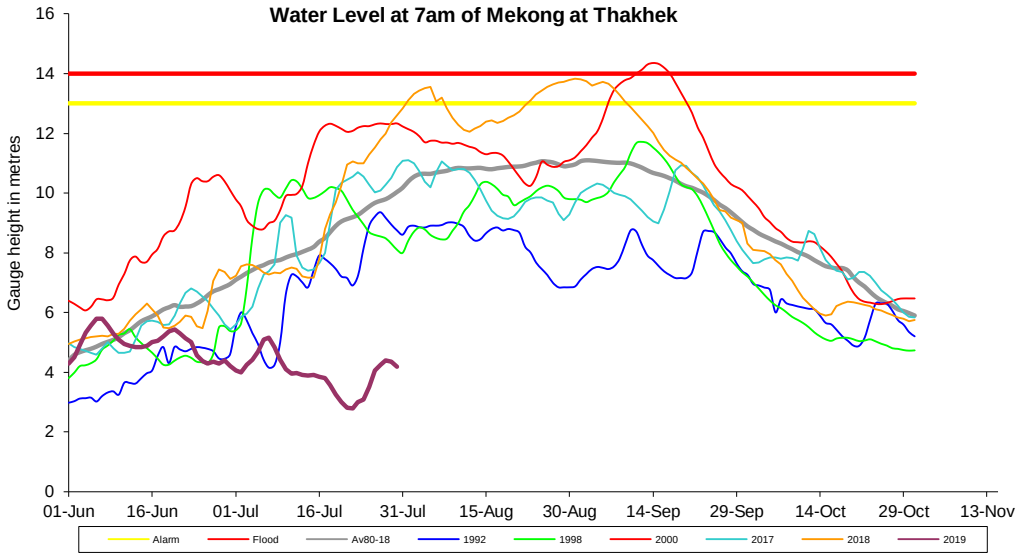
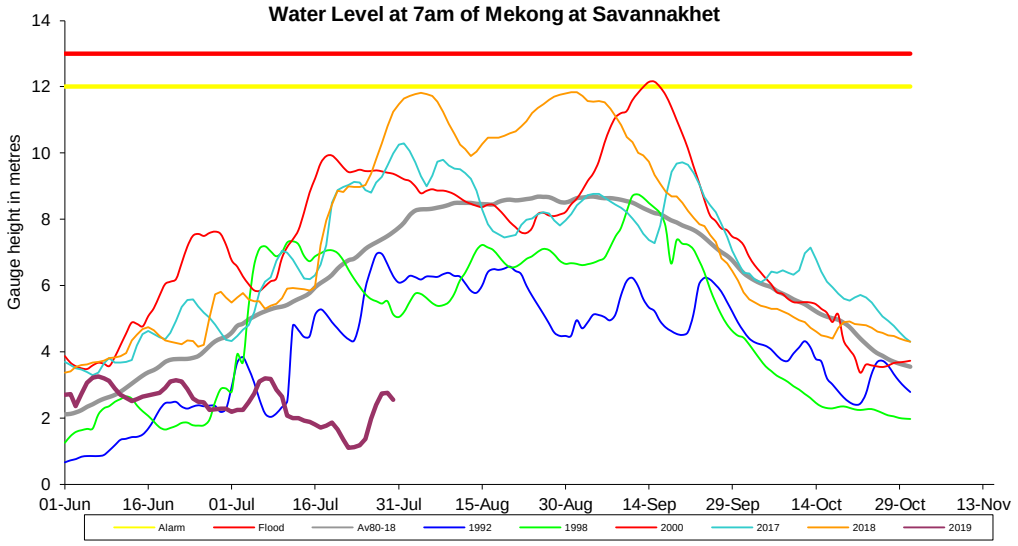
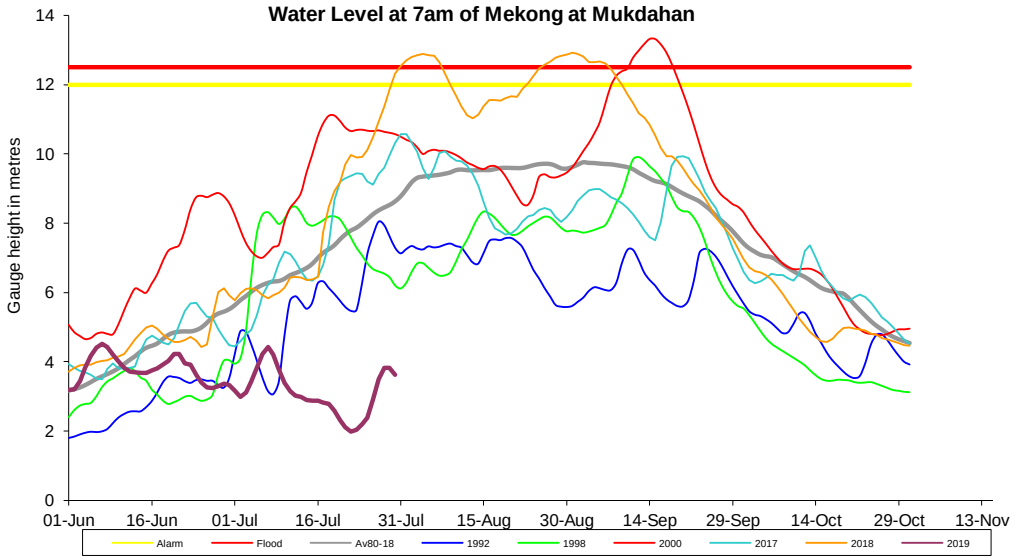
2017
2018
2019


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


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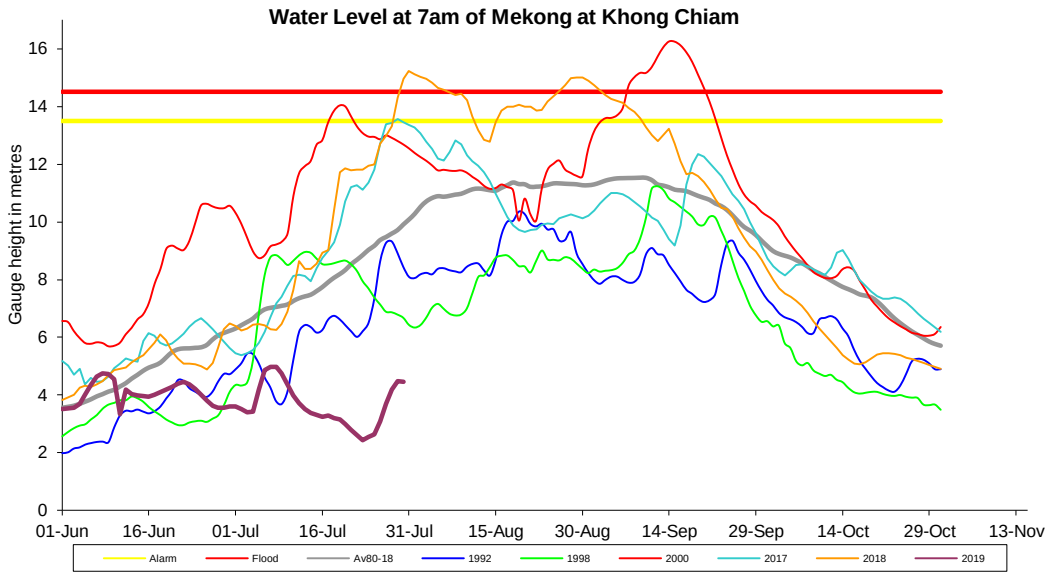
2017
2018
2019


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
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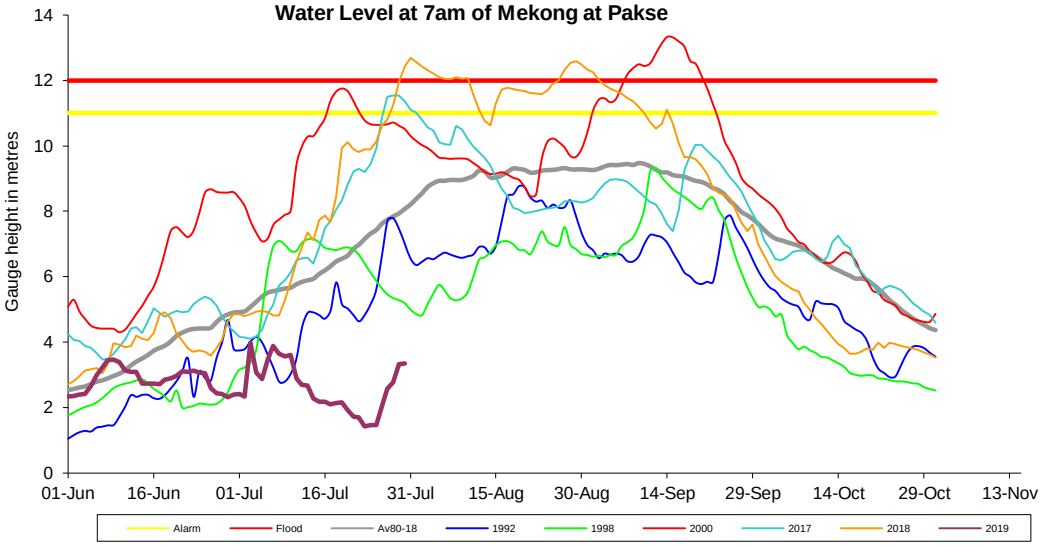
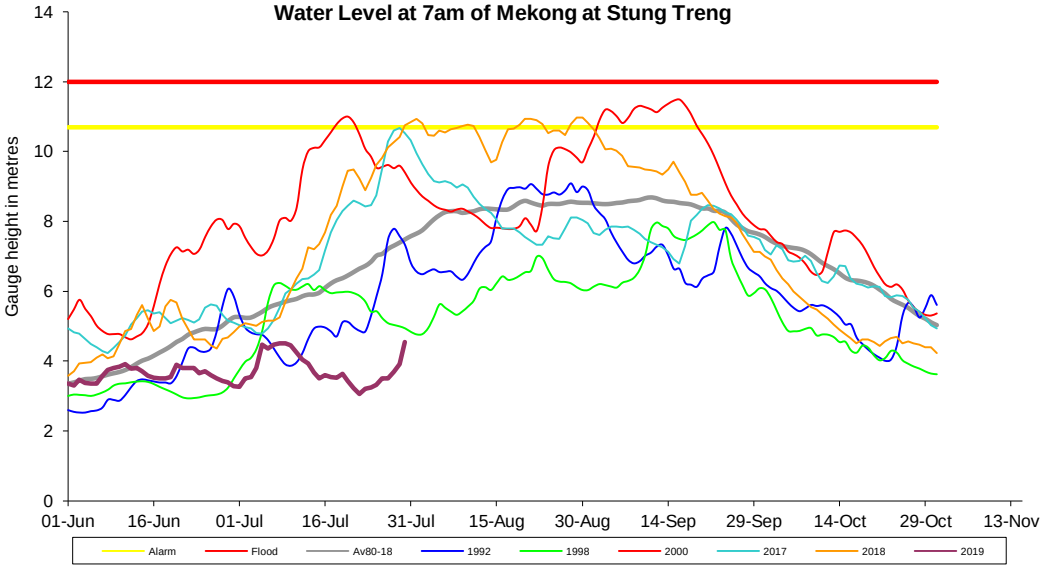
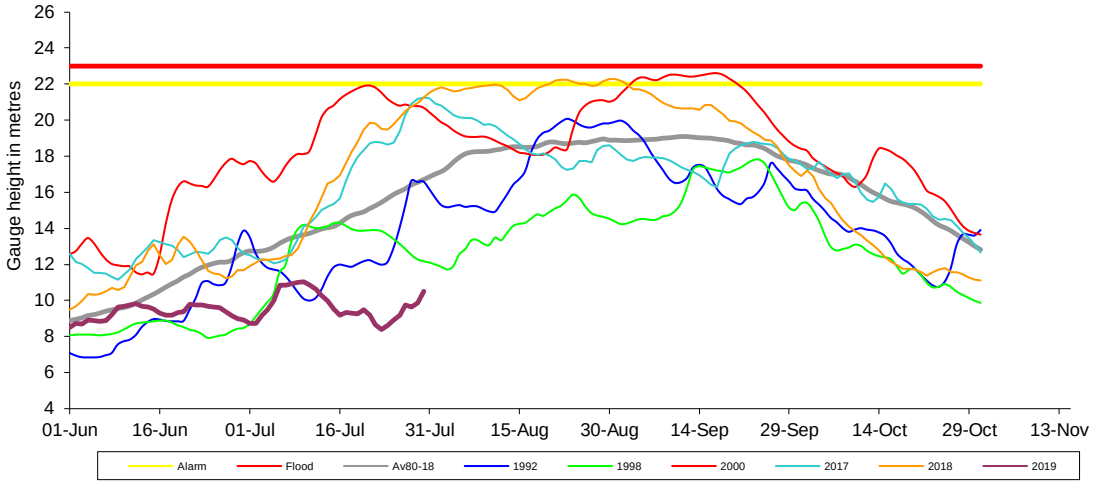
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019

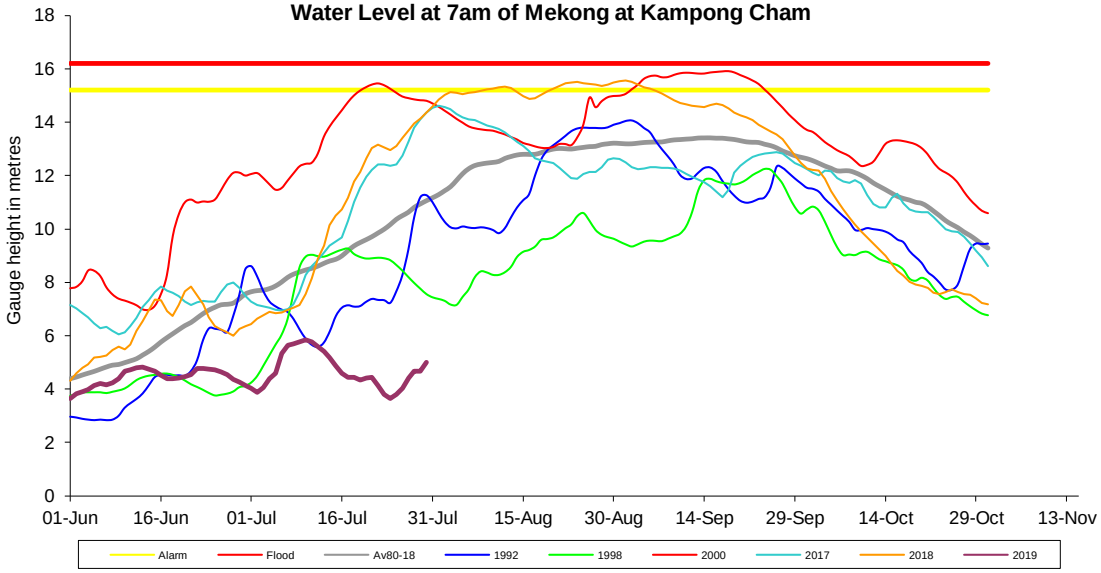

Water Level at 7am of Mekong at Pakse
Gauge height in metres
0
2
4
6
8
10
12
14
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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

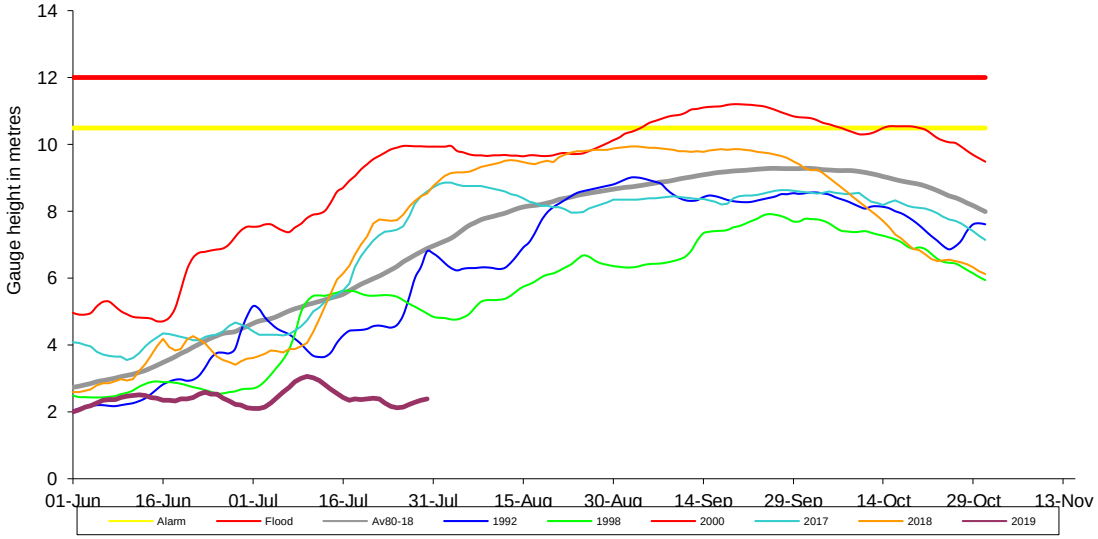
Water Level at 7am of Mekong at Kratie

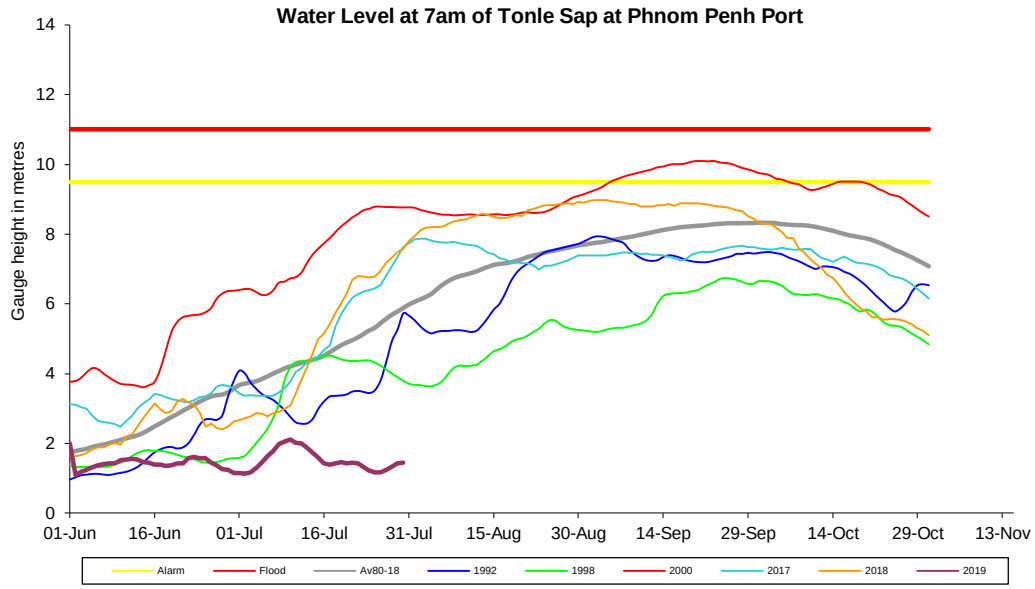


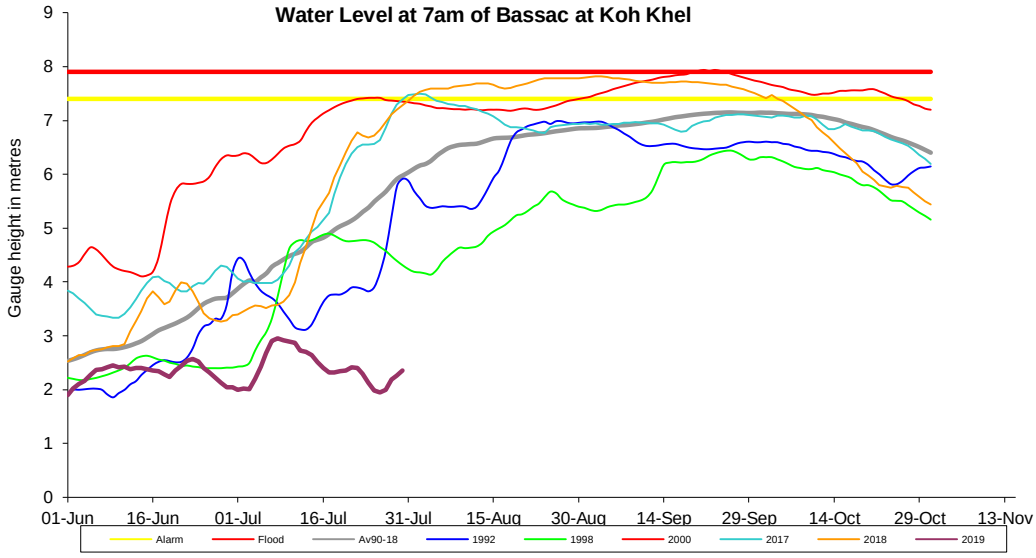
Water Level at 7am of Mekong at Kampong Cham

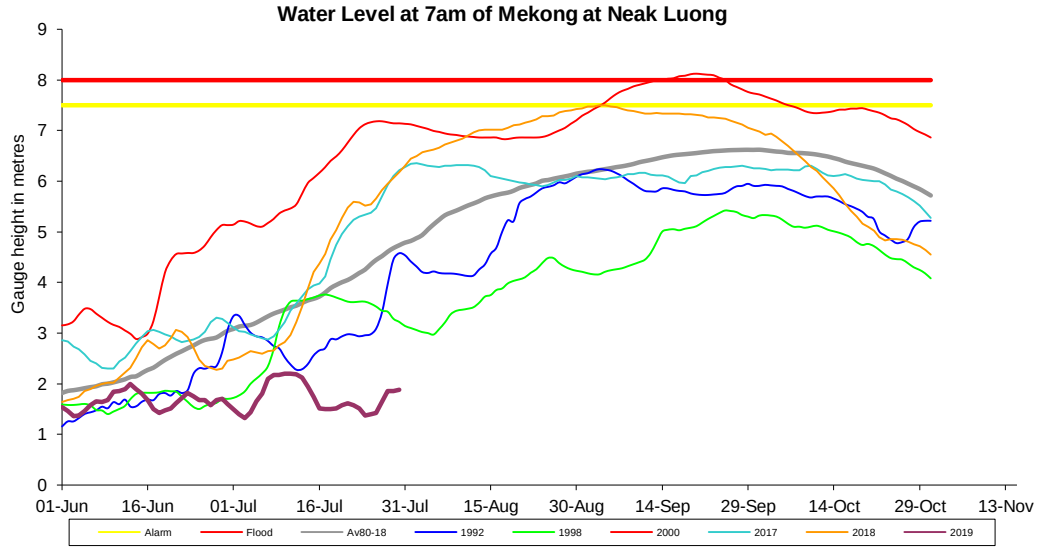


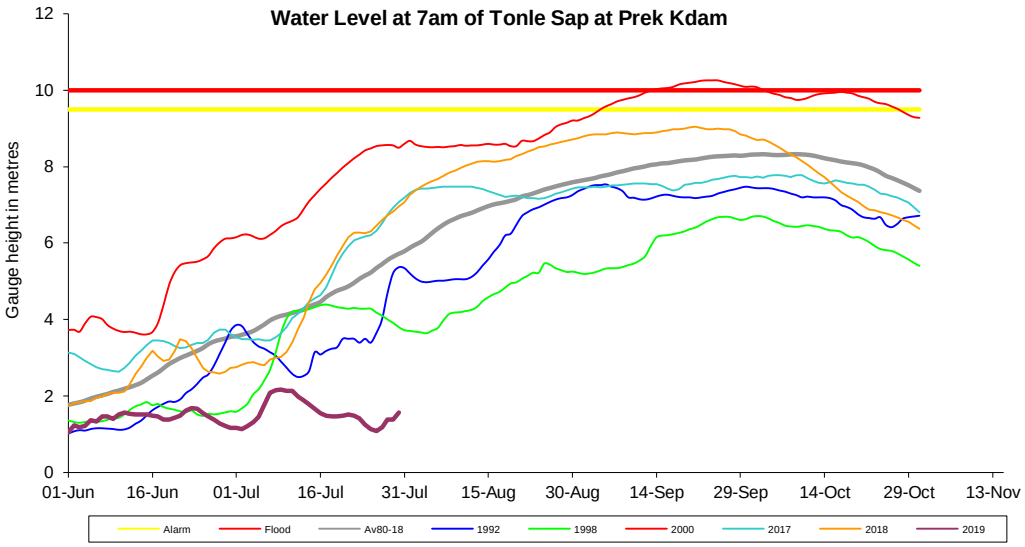
Water Level at 7am of Mekong at Phnom Penh Chaktomuk

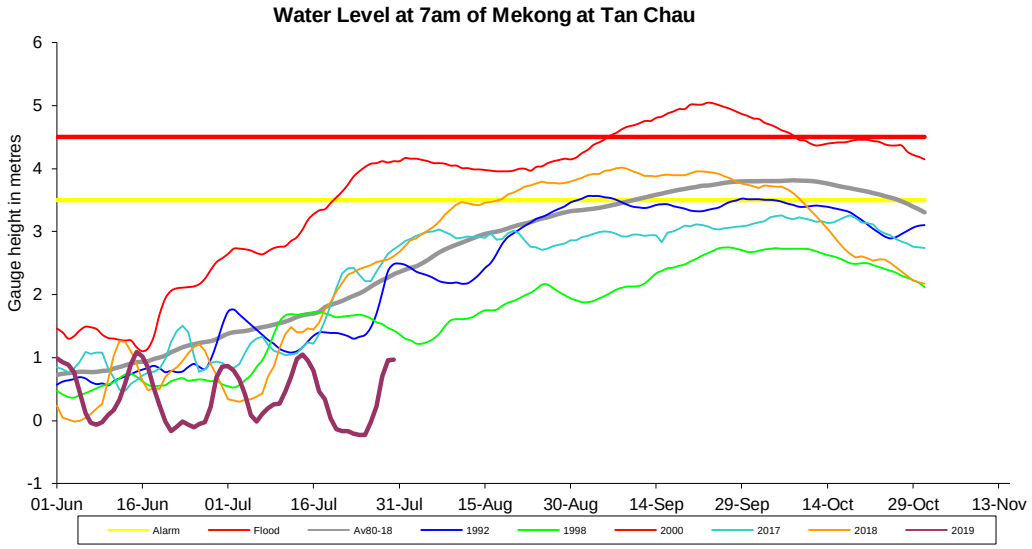


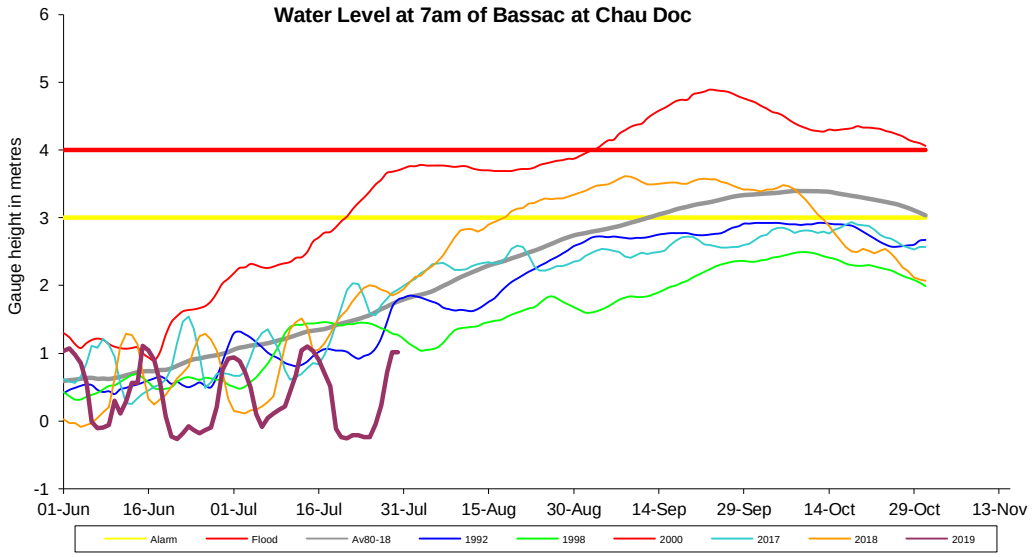

Water Level at 7am of Tonle Sap at Phnom Penh Port
Gauge height in metres
14
12
10
8
6
4
2
0
01-Jun
16-Jun
01-Jul
16-Jul
31-Jul
15-Aug
30-Aug
14-Sep
29-Sep
14-Oct
29-Oct
13-Nov
Alarm
Flood
Av80-18
1992
1998
2000
2017
2018
2019


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