Mekong River Commission

Regional Flood and Drought Management Centre

Weekly Dry Season Situation Report for the Mekong River Basin

Prepared on: 24/03/2020, covering the week from 17 to 23 March 2020

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

General weather patterns:

From 17 to 23 March 2020, 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 from March to April 2020, sweltering and dry weather with little humidity will occurs with very hot weather on some days, especially around the Upper Thailand because mostly southerly wind prevails over LMB. However, sometime coldly high-pressure air masses from China will meet hot air masses already prevailing over LMB, resulting in abnormal rain. They also stated that summer thunderstorms will often occur at short durations over the LMB. **Figure 1** presented the weather map for 17 and 23 Mar 2020.

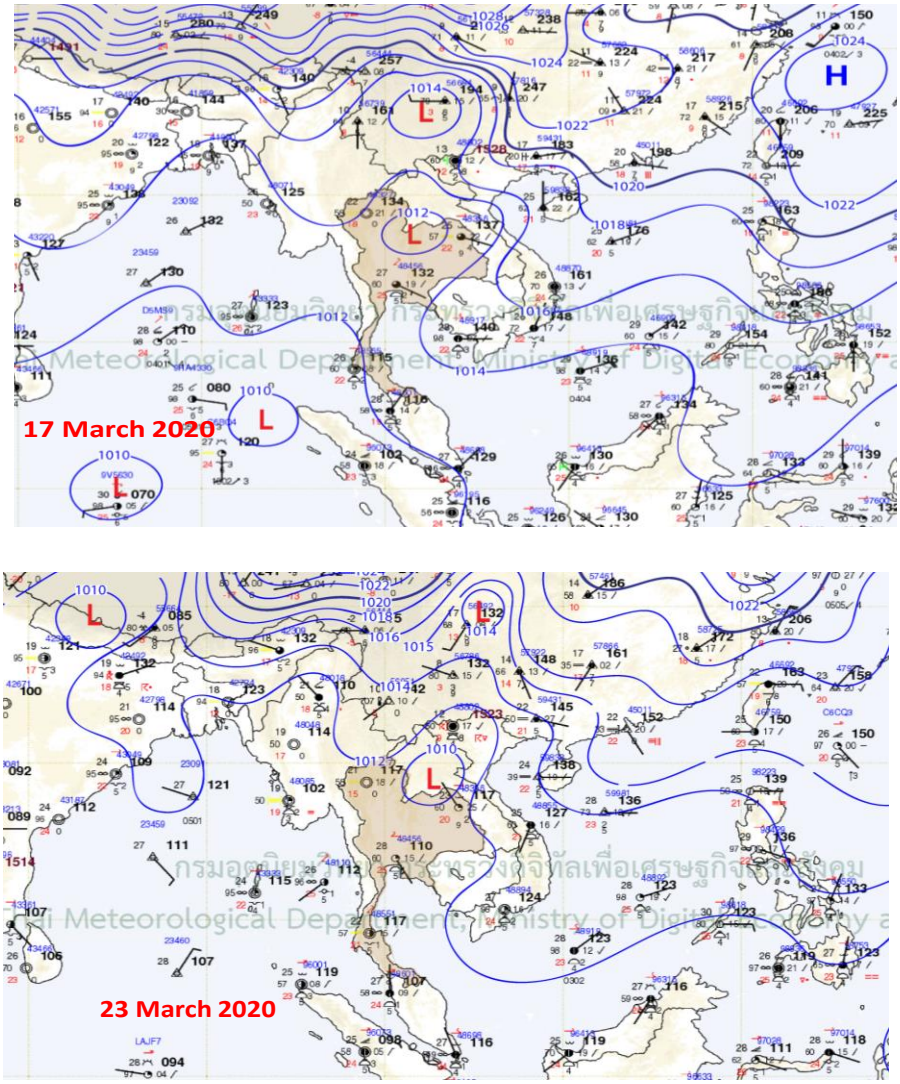


Figure 1: Summary of weather condition over the LMB from 17 and 23 Mar 2020

General Situation on water levels of the Mekong River:

This week from 17 to 23 March 2020, water levels at the upper most station of Chiang Sean were slightly decreased varied from -0.03 m to -0.09 m since finishing the test of equipment of hydropower station at Jinghong, China at 4 Jan 2020. Water levels at this station were fluctuated above its Long-Term-Average (LTA). However, water level at Luang Prabang and Chiang Khan are likely impacted by hydropower dam at Xayaburi and upstream hydropower dams in which water level at this station were also increased and stay close to its maximum levels. Water levels at Chaing Khan (downstream of Xayaburi) were slightly increased and reached upper its LTA, varied from -0.03 m to - 0.13 m. Water levels at stations in the middle part of LMB from Lao's Vientiane to Thailand's Nakhon Phanom were followed the same trends of Chiang Khan which increased and reached closed to their LATs, except at Nong Khai that water levels were still below its LTA. Follow the same trend, water levels at Mukdahand to Pakse were reached to their LTAs, which considered back to normal condition. This week water levels at stations of Stung Treng and Kratie were above their LTAs, while at Kompong Cham, Chaktomuk, Phnom Penh Port and Prekdam were still below their LTAs. For the 2 tidal stations at Tan Chau and Chau Doc, water levels are having been fluctuating over their LTAs due to the daily tidal effect from the sea. The attached hydrograph at each key station is showed in **Annex B**. **Figure 2** presented the stations for river monitoring with model application.

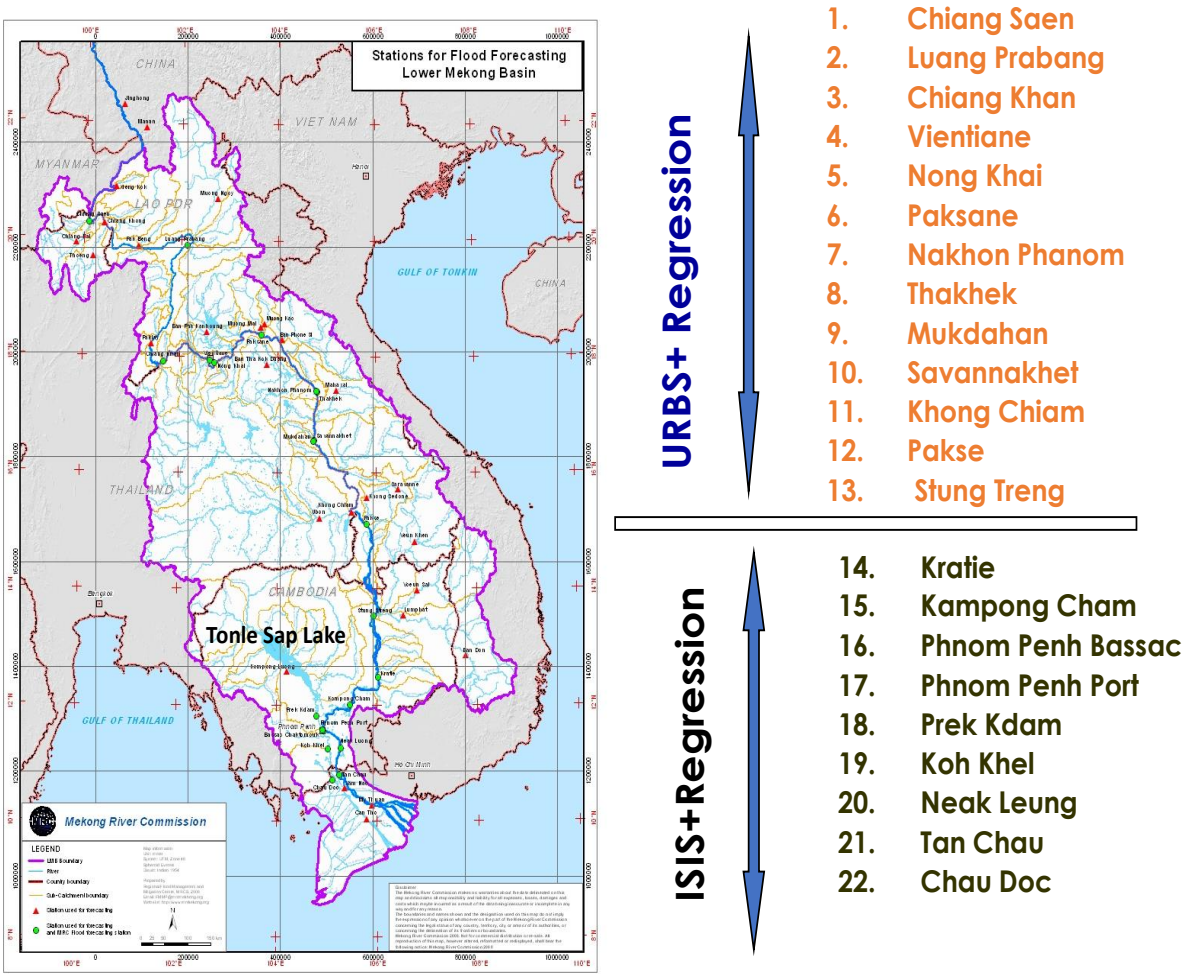


Figure 2 Stations for River Monitoring with Models Application

For stations from Chiang Saen and Luang Prabang

Water levels from 17 to 23 March 2020 at Chiang Sean station were slightly decreased, varied from -0.01 m to -0.09 m since finishing the test of equipment of hydropower station at Jinghong, China at 4 Jan 2020. At Luang Prabang station, water levels were increased and kept above its historical maximum levels. Water levels at this station increased in between 0.05 m to 0.13 m, due to the reservoir operation of upstream and downstream at Xayaburi.

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

Water levels from 17 to 23 March 2020 at Chiang Khan station were likely nominated by upstream hydropower dam of Xayaburi, which was noted that water levels increased, varied from 0.03 m to –0.10 m. The current observed water levels at Vientiane is became normal except at Nong Khai stations water levels were below their LTAs, which still consider as low flow condition.

For stations from Nakhon Phanom to Pakse

Water levels from 17 to 23 March 2020 at Nakhon Phanom to Pakse stations were slightly decreased varied from -0.02 m to -0.03 m. However, this week water levels at these stations were reached to their LTAs indicating of normal condition.

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

This week water levels at stations of Stung Treng and Kratie, were on normal situation, while at Kompong Cham, Chaktomuk, Phnom Penh Port and Prekdam were slightly dropped below their LTAs. However, water levels at Neak Luong on the Mekong and Koh Khel on the Bassac seems to have effected by tidal from the sea due to the low water level of the Mekong from August 2019 to March 2020 (followed the same trends of 2015-2016).

Tan Chau and Chau Doc

For the 2 tidal stations at Tan Chau and Chau Doc, water levels are having been fluctuating their LTAs due to the tidal effect from the sea.

According to the Japan Meteorological Agency (JMA), Sea surface temperature (SST) variability in the tropics Neutral, which has no major impact in to the South China Sea from March to April 2020.

Discussion and Conclusion

From 17 to 23 March 2020, the trend of water levels at Chiang Sean were increased after finishing test of equipment of hydropower dam at Jinghong at 4 Jan 2020. Water level at Chiang Sean is relied from inflow at 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

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.

Analysis of the Mekong River Commission's data revealed that the rises of water levels at some stations on the Mekong mainstream (Chiang Sean and Luang Prabang) are the result of the upstream dams' operation in Chiang's Hydropower Station at Jinghong for example.

Most parts of the region have been experiencing the Mekong state of **"regional low-flow"**. However, the current water levels at some stations have been changed back to normal situation, except the Tonle Sap Lake that its water levels are still below average magnitudes, compared to previous years 2018-2019.

Water levels at stations in the middle part of LMB from Vientiane to Nakhon Phanom were slightly increased based on the trend inflows from upstream, and their water levels were closely reach to their LTAs, except Nong Khai there is still considered critical condition.

From Komgpong Cham on the Mekong river, Phnom Penh Port to Prekdam on the Tonle Sap and Chaktomuk and Koh Khel on the Bassac river, the water levels were stay below their LTAs. These stations were still considered as critical condition.

Based on the low flow analyses of the Mekong from Chiang Saen to Kratie, the upcoming ***Dry Season*** can be possible of facing problem, related to the shortage of drinking water and agricultural productions, 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 Mekong river flow depends not only on the flow from the upstream, but also on the rainfall from sub-catchment inflows. The contribution to the Mekong river's flow from the Upper Mekong Basin in China (Yunnan component) is about 16% by the time the river discharges through the Mekong Delta into the South China Sea. By far the major contribution comes from the two majors 'left-bank' (eastern) tributaries between Vientiane – Nakhon Phanom and Pakse – Stung Treng, which together contribute more than 40% of the flows.

First, it was the drier-than-average conditions that happened in 2019 (June-Dec), over parts of the southern ASEAN region. Thailand, Lao PDR and Myanmar were some of the countries that were hit the hardest, according to data we have from the Asian Specialized Meteorological Center (ASMC).

Second, it was due to low rainfall in the basin in 2019. Since the beginning of this year, there has been very deficient rainfall over the Mekong basin. In fact, this year's rainfall for the Mekong Basin is considered below average, in particular since early June. Like many parts of the world, the Mekong region has been affected by the prolonged El Nino phenomenon, the phenomenon that usually causes extreme heat and insufficient rain. The cause of below average water levels in the Mekong mainstream in early 2020 is likely due to unusual low rainfall in 2019 over the Mekong region and the effected El Nino process in the Mekong region 2019.

Third, it was the volume of water flowing from the upper part in China. The amount of water flowing from Jinghong dam in China could also be a potential contribution of the low flow. According to the notification from China, were decreased about 0.76m, due to the test of equipment of hydropower dam at Jinghong from 27 Dec 2019 to 4 Jan 2020.

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

The Tonle Sap Flow

At the end of wet season when the inflow of the Mekong is receded, the flow of the Tonle Sap Lake (TLS Lake) is being flow out. **Figure 3** showed the seasonal change of inflow/reversed flows and **Table 1** showed the monthly change in volume of the Tonle Sap Lake, comparing the flow between 2018, 2019 and the recent year 2020 (up to 23 March). The low inflow from the Mekong and the less rainfall in the surrounding sub-catchments caused the outflow from the TLS Lake in 2020 very low. It is even matched to the historical year (1997-2019) of its minimum levels.

Due to the low flow of the Mekong in the wet season, there is now a concern during this dry season, which may face a possible shortage of water for drinking and agricultural production, fishery production, ecological systems, biodiversity, bank erosion, salinity intrusion. The low outflow from the Tonle Sap could also affect the expanding unsaturated soil that may cause bank erosion and increase salinity intrusion from the sea in the low-lying area up to Cambodia floodplain.

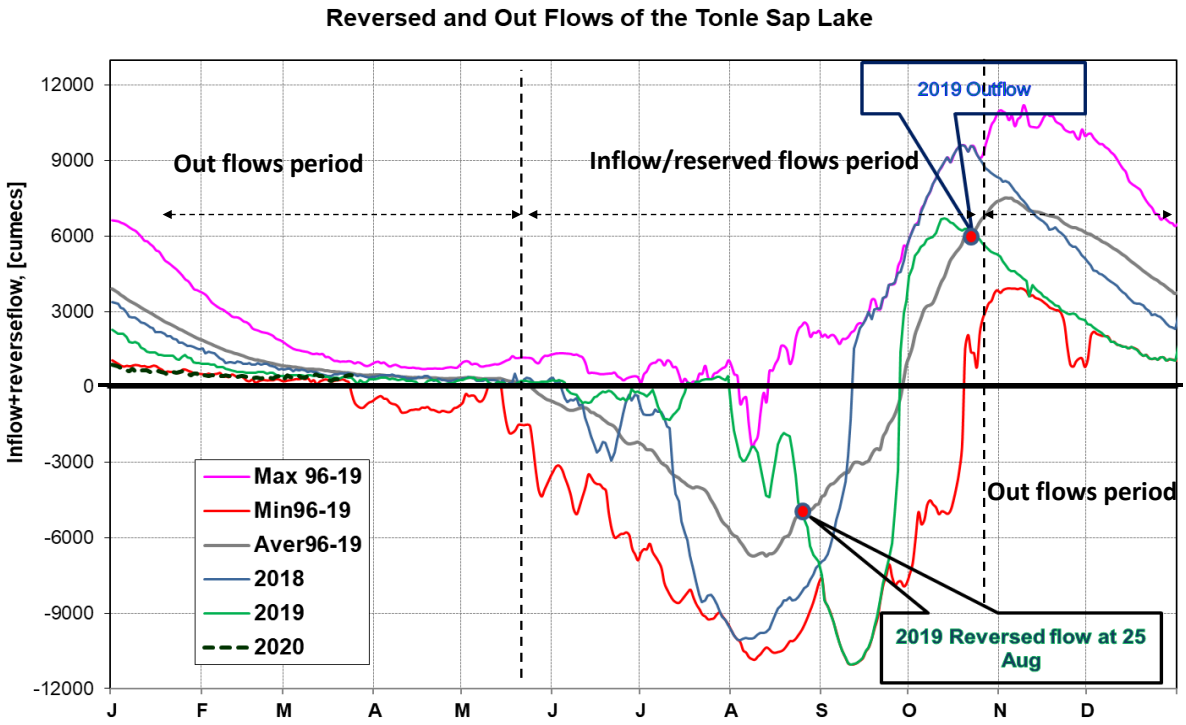


Figure 3 The seasonal change of inflow/reversed flows of the Tole Sap Lake

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

Month	Average (97-18)	Volume2018	Volume2019	Volume2020
Jan	16452.95	13633.41	10285.31	5906.80
Feb	9392.13	7784.12	6057.31	4264.19
Mar	5868.92	5037.06	4387.48	3645.00
Apr	4502.51	3978.57	3688.09	
May	4154.68	3838.63	3266.43	
Jun	5919.22	5814.46	3508.31	
Jul	12179.21	11628.51	3979.76	
Aug	19275.58	21784.36	7364.72	
Sep	42196.41	53310.21	23434.07	
Oct	49773.40	48716.52	30680.83	
Nov	39996.78	31540.68	19471.72	
Dec	26537.70	18656.94	10697.45	
	Low-flow condition, comapred with LTA			
	Normal condition, compared with LTA			

The Trend of water level and its Outlook

From 24 to 30 Mar 2020, water levels along the lower Mekong River from Thailand's Chiang Saen will continue to increase varies from 0.03 m to 0.13 m. From Lao PDR's Vientiane and Thailand's Nong

Khai, water levels will also be increased, followed the same trend from upstream vary from 0.02 m to 0.06 m. From Thailand's Nakhon Phanom to Lao PDR's at Pakse, water levels will be also increased, varying from 0.02 m to 0.06 m.

From Cambodia's Stung Treng to Neak Loung on the Mekong River, water will be slightly increased varies from 0.03 m to 0.06 m.

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

Perhaps even more expecting based on the historical hydrology phenomenon, the abnormal rainfall van be occurred at the end of March or early April 2020, which can contribute to the flow in the Mekong River.

Many different offices within the National Weather Service are actively engaged in providing national climate and weather information, including the warnings and forecasts information. The Thai Meteorological Department (TMD) issued the 3 months climate prediction in Thailand, provided the outlooks for the coming season from March-April-May 2020. It was stated that some low-pressure air mass cells will develop around the Andaman Sea, which may strengthen to become depressions and tropical cyclones in the Mekong region. These movements are toward the northern to eastern parts and may move closely toward the western side of Thailand. Thus, the western portions of both of the northern and central parts, including with that of the Southern Thailand will meet more rain.

According to the Asian Specialized Meteorological Centre (ASMC), climatologically, the weather over the Mekong sub-region remained dry. Scattered hotspots were detected in Cambodia and Thailand, and isolated ones were also detected in Myanmar, Lao PDR and southern Viet Nam. With the prevailing dry weather over the Mekong sub-region forecast to persist, a further deterioration in the hotspot and smoke haze situation can be expected.

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

2020	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
17-03-2020	-	2.04	8.02	2.86	0.60	0.72	2.58	0.89	1.46	0.80	2.47	6.67	2.48	1.94	2.14	1.45	1.05	0.09	0.16
18-03-2020	-	1.98	7.95	2.87	0.62	0.72	2.70	0.89	1.41	0.80	2.44	6.78	2.40	1.93	1.97	1.34	1.04	0.10	0.20
19-03-2020	-	1.97	8.03	2.88	0.62	0.74	2.63	0.93	1.43	0.80	2.40	6.80	2.45	1.85	1.81	1.34	1.02	0.17	0.31
20-03-2020	-	2.00	8.09	2.91	0.65	0.77	2.69	0.98	1.48	0.80	2.40	6.73	2.45	1.76	1.68	1.48	1.03	0.36	0.51
21-03-2020	-	2.03	8.16	2.97	0.66	0.78	2.69	1	1.5	0.81	2.4	6.68	2.35	1.63	1.6	1.52	1.02	0.07	0.81
22-03-2020	-	2.07	8.21	3.00	0.72	0.84	2.68	1.00	1.55	0.84	2.36	6.67	2.37	1.54	1.57	1.54	1.02	0.86	1.01
23-03-2020	-	1.98	8.29	3.34	0.80	0.91	2.64	0.99	1.52	0.84	2.36	6.64	2.38	1.50	1.57	1.22	1.02	0.87	1.02

Table A2: observed rainfall

Unit: mm

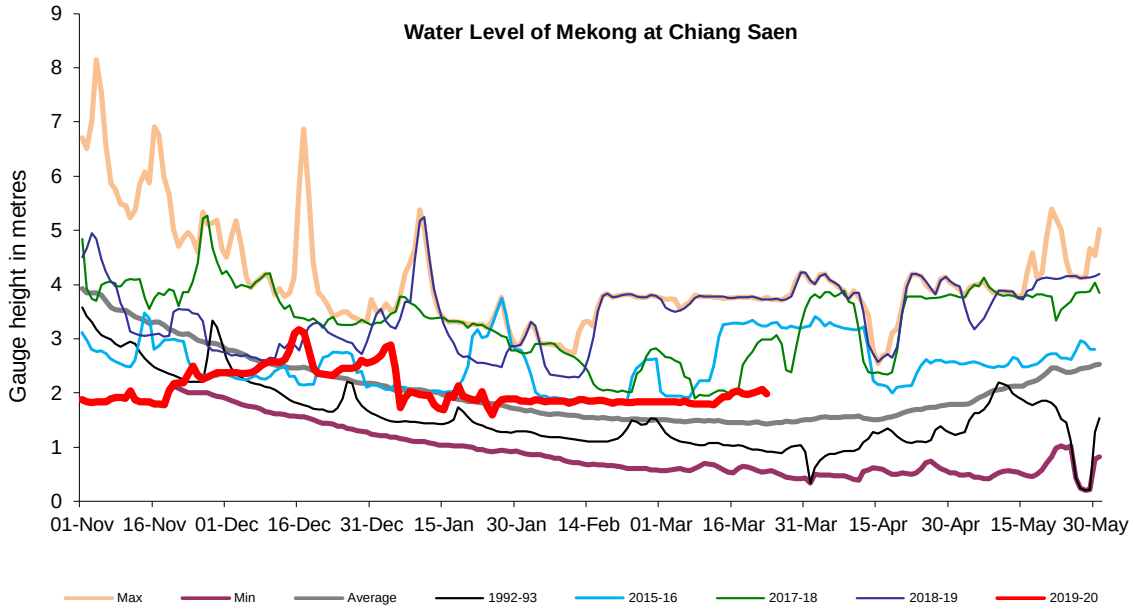
2020	Jinghong	Chiang Saen	Luang Prabang	Chiang Khan	Vientiane	Nongkhai	Paksane	Nakhon Phanom	Mukdahan	Pakse	Stung Treng	Kratie	Kompong Cham	Phnom Penh (Bassac)	Koh Khel	Neak Luong	Prek Kdam	Tan Chau	Chau Doc
17-03-2020	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-03-2020	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-03-2020	-	0	0	0	0	0	0	19.4	0	0	0	0	0	0	0	0	0	0	0
20-03-2020	-	0	0	0	0	0	0	12.4	0	0	0	0	0	0	0	0	0	0	0
21-03-2020	-	0	0	3.2	0	0	0	2.9	1	0	0	0	0	0	0	0	0	0	0
22-03-2020	-	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0
23-03-2020	-	0	0	9	0	0	20.9	0	0	0	0	0	0	0	0	0	0	0	0

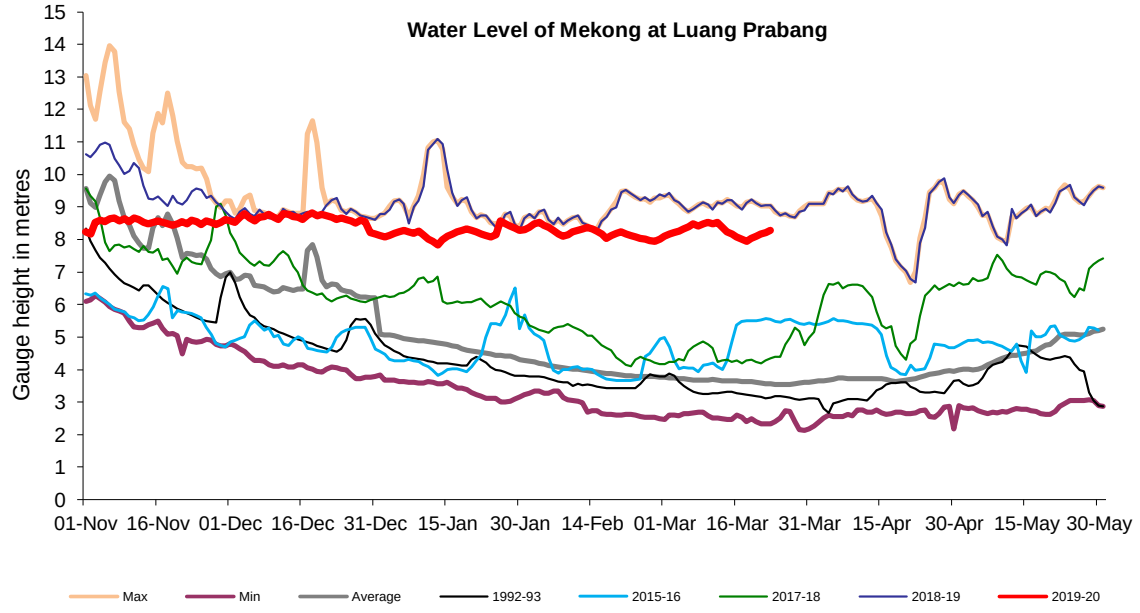
Note: No data available from China during the Dry Season

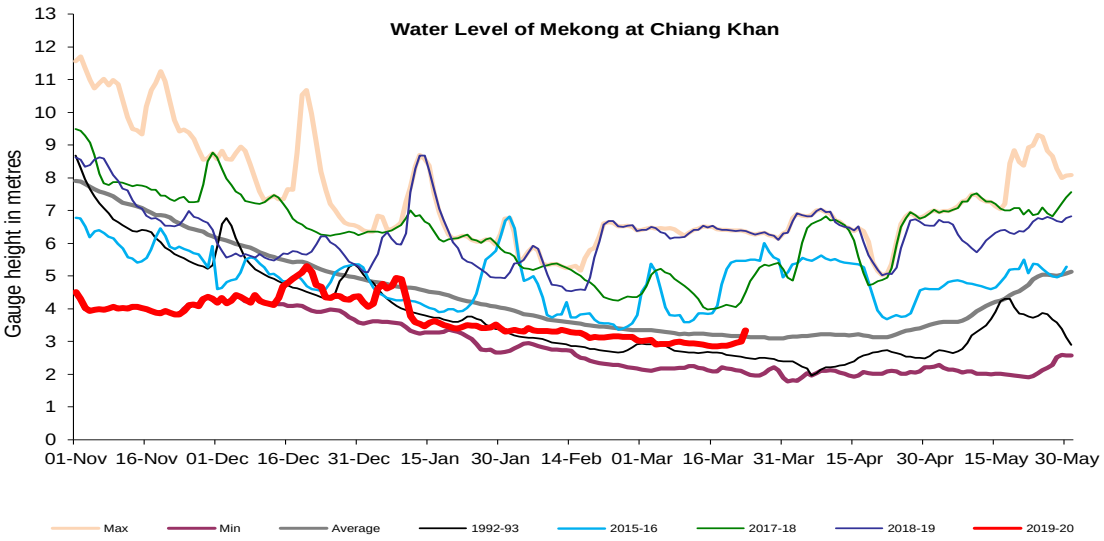
Annex B: Season Water Level Hydrographs

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 23 MARCH 2020






Water Level of Mekong at Chiang Khan
Gauge height in metres
13
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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1992-93
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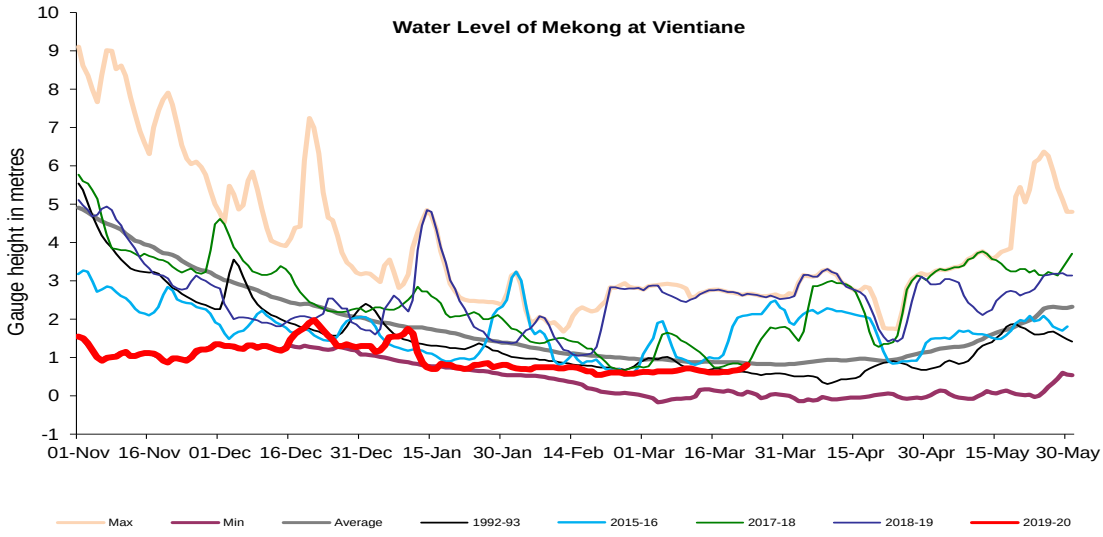
2017-18
2018-19
2019-20


Water Level of Mekong at Vientiane
Gauge height in metres
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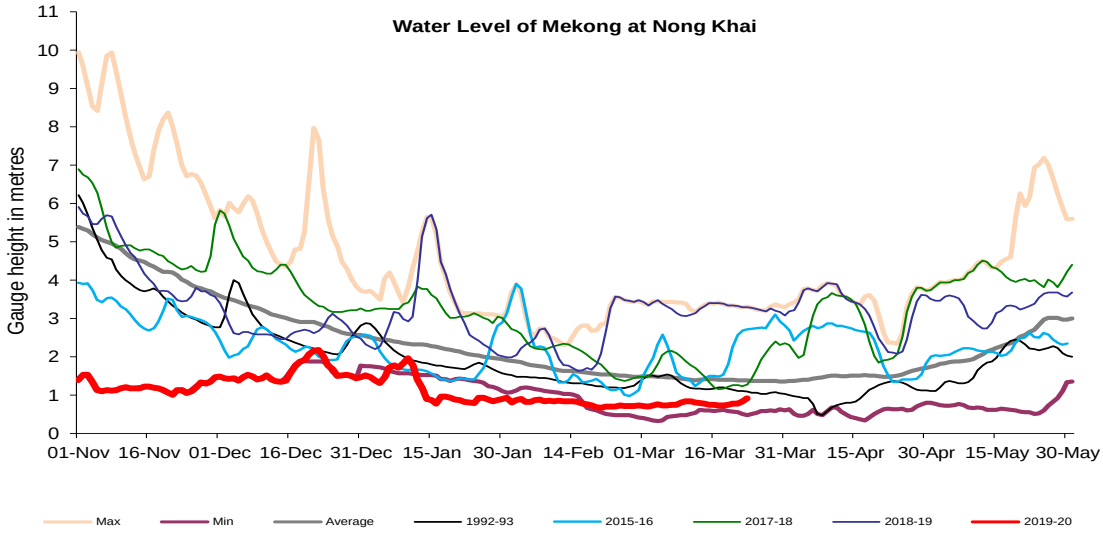
2019-20


Water Level of Mekong at Nong Khai
Gauge height in metres
11
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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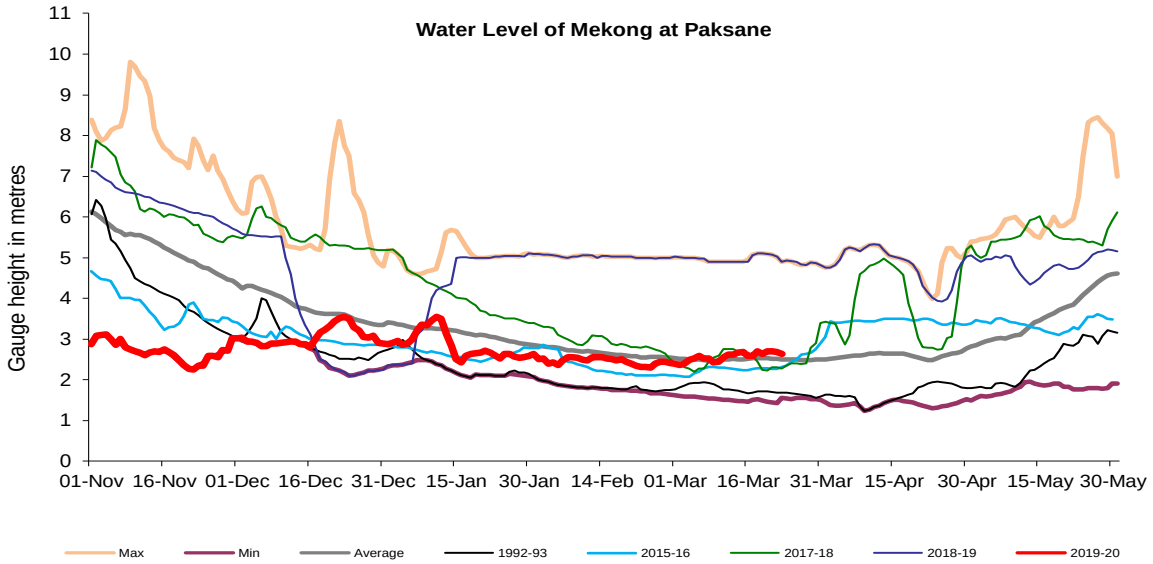
Water Level of Mekong at Paksane
Gauge height in metres
11
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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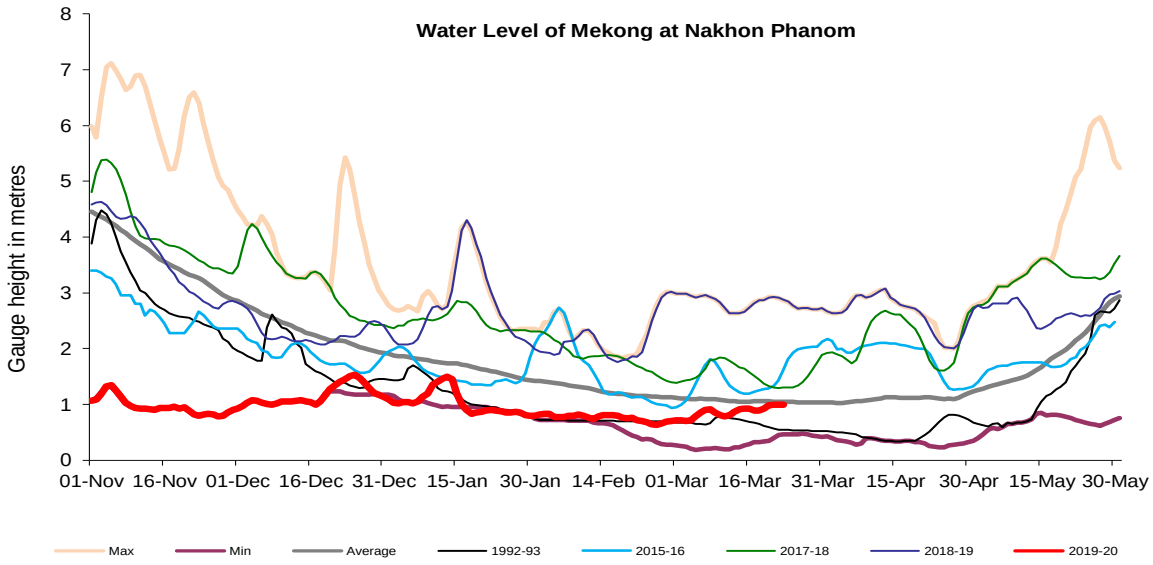
Water Level of Mekong at Nakhon Phanom
Gauge height in metres
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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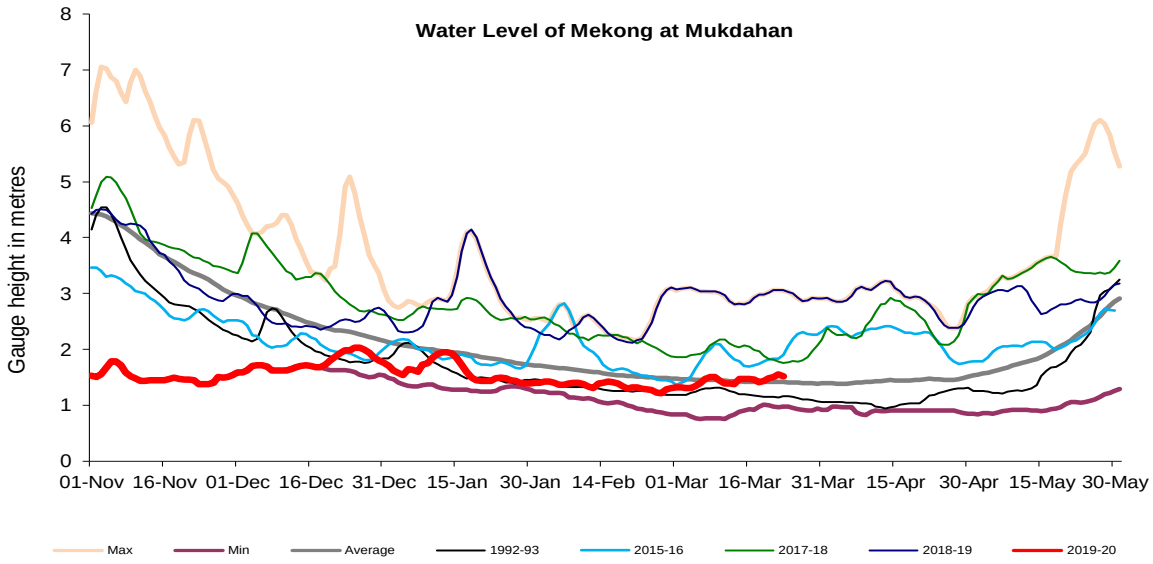
Water Level of Mekong at Mukdahan
Gauge height in metres
8
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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2017-18
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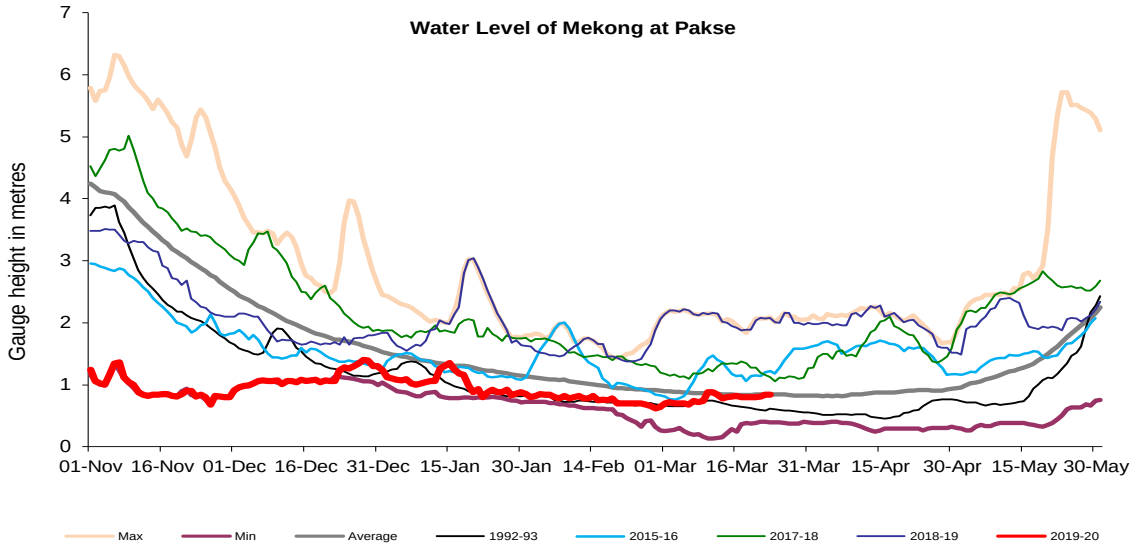
Water Level of Mekong at Pakse
Gauge height in metres
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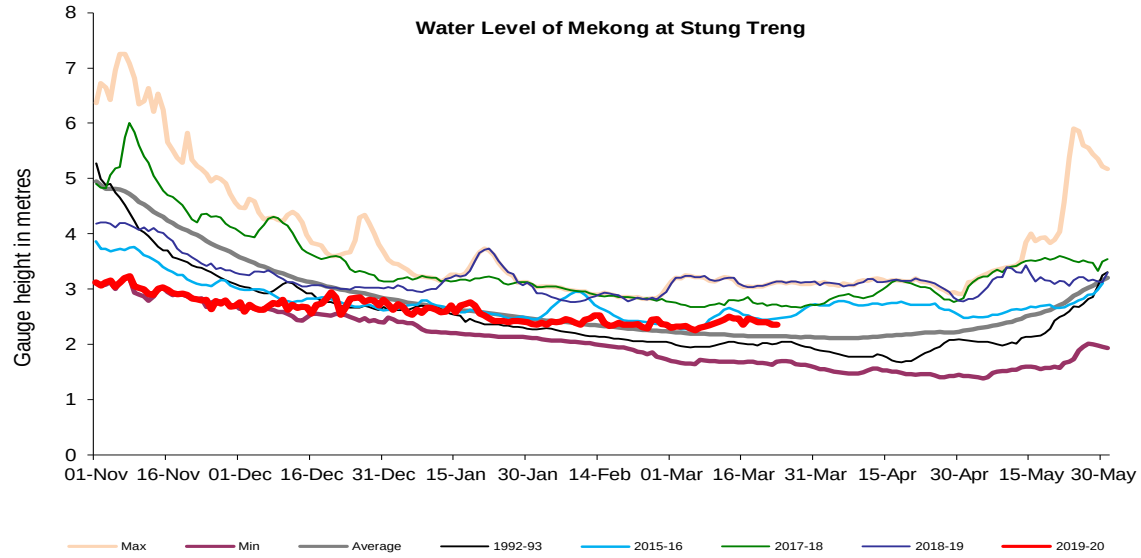
Water Level of Mekong at Stung Treng
Gauge height in metres
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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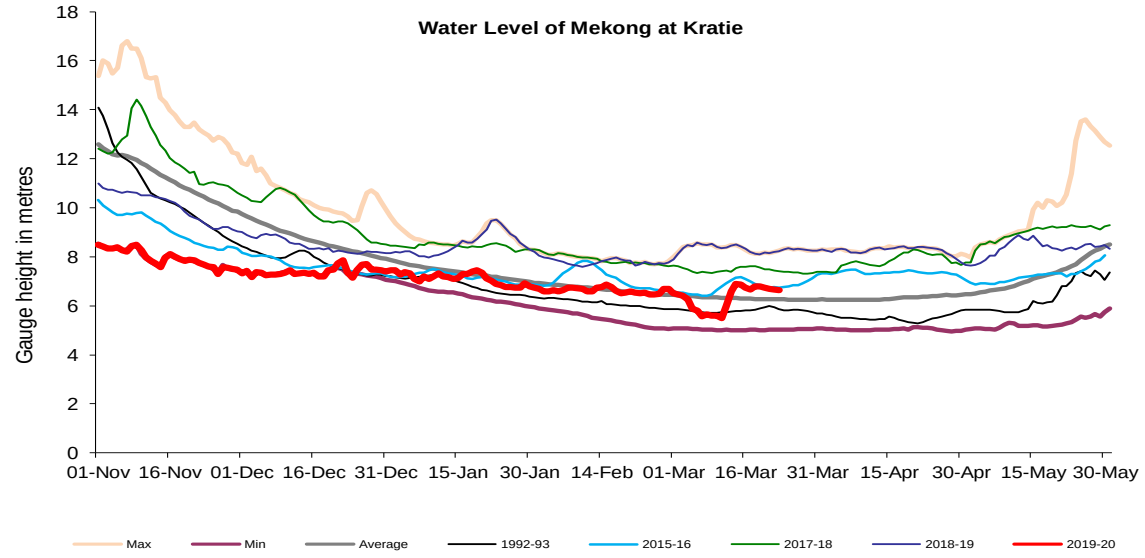
Water Level of Mekong at Kratie
Gauge height in metres
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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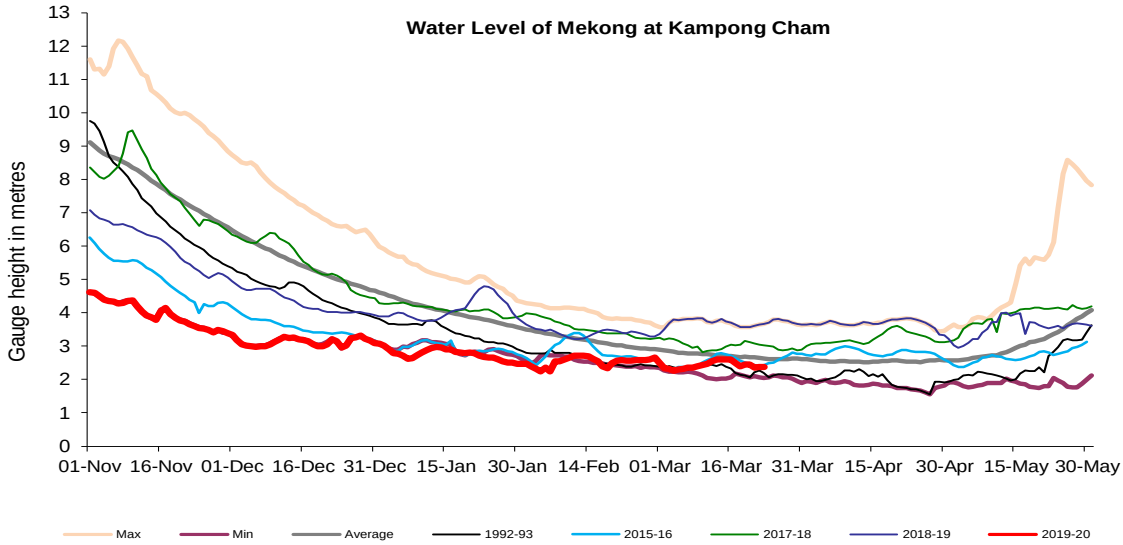
Water Level of Mekong at Kampong Cham
Gauge height in metres
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01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
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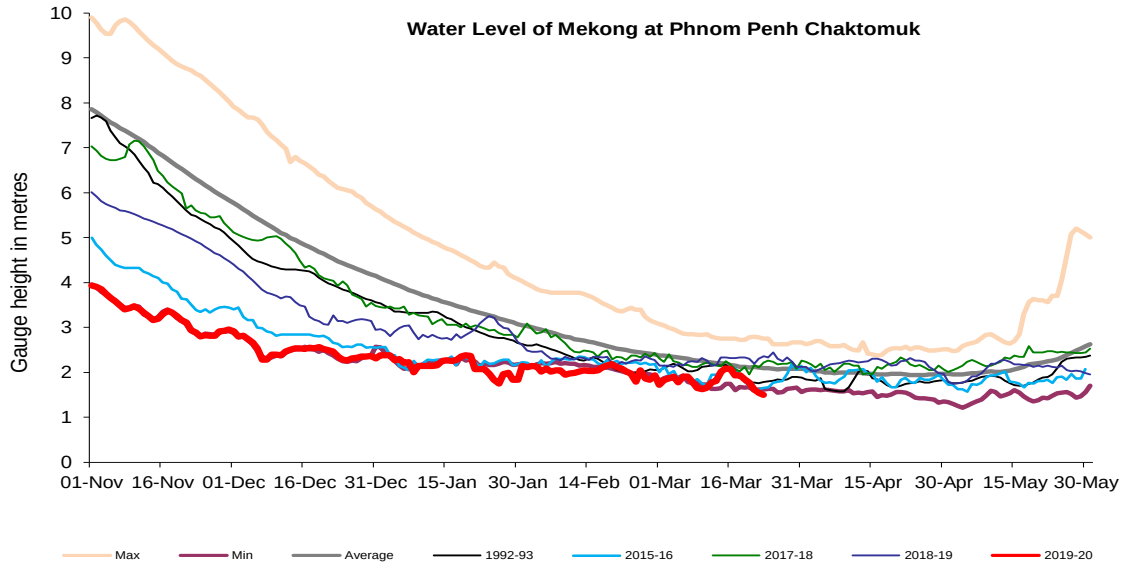
Water Level of Mekong at Phnom Penh Chaktomuk
Gauge height in metres
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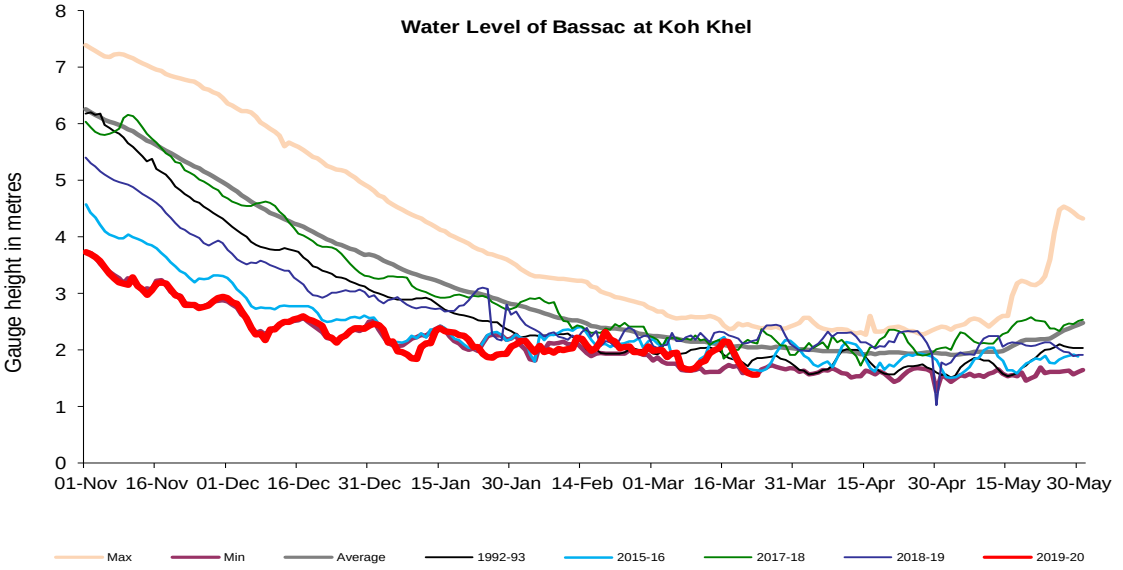
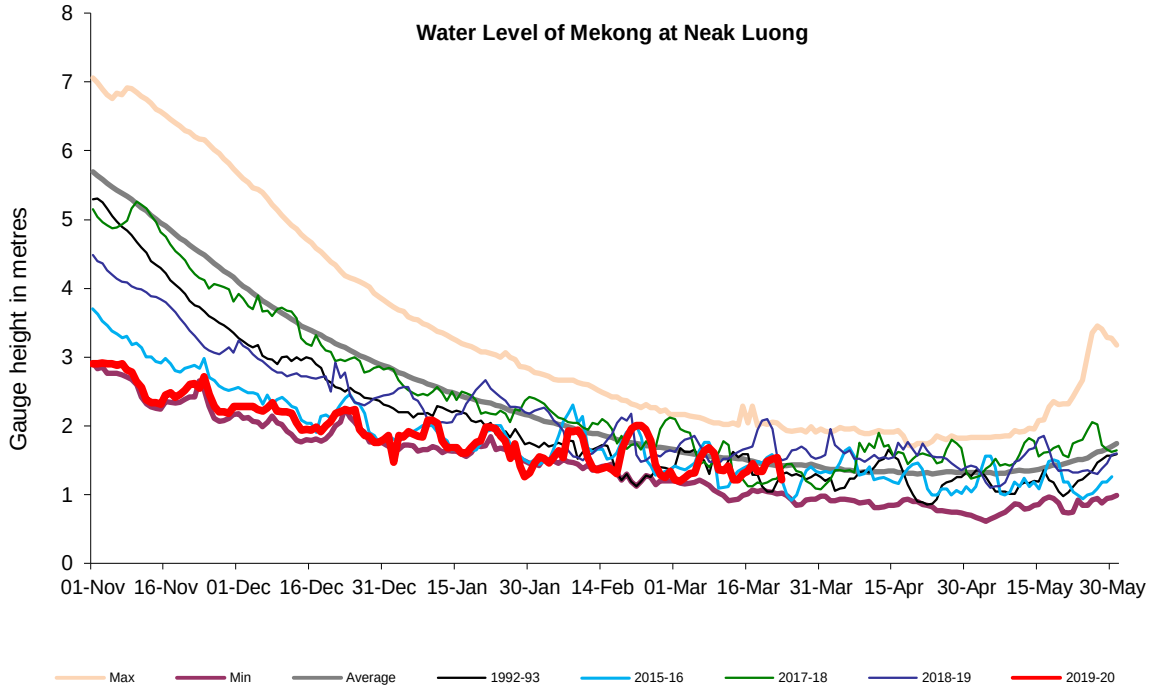
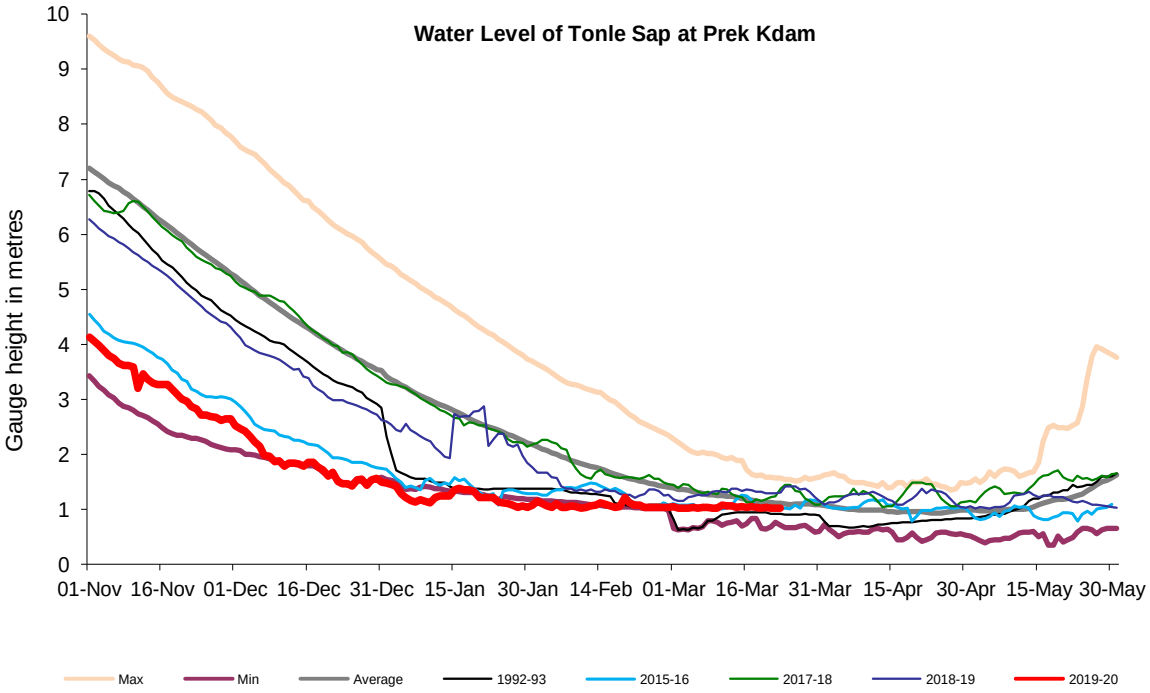
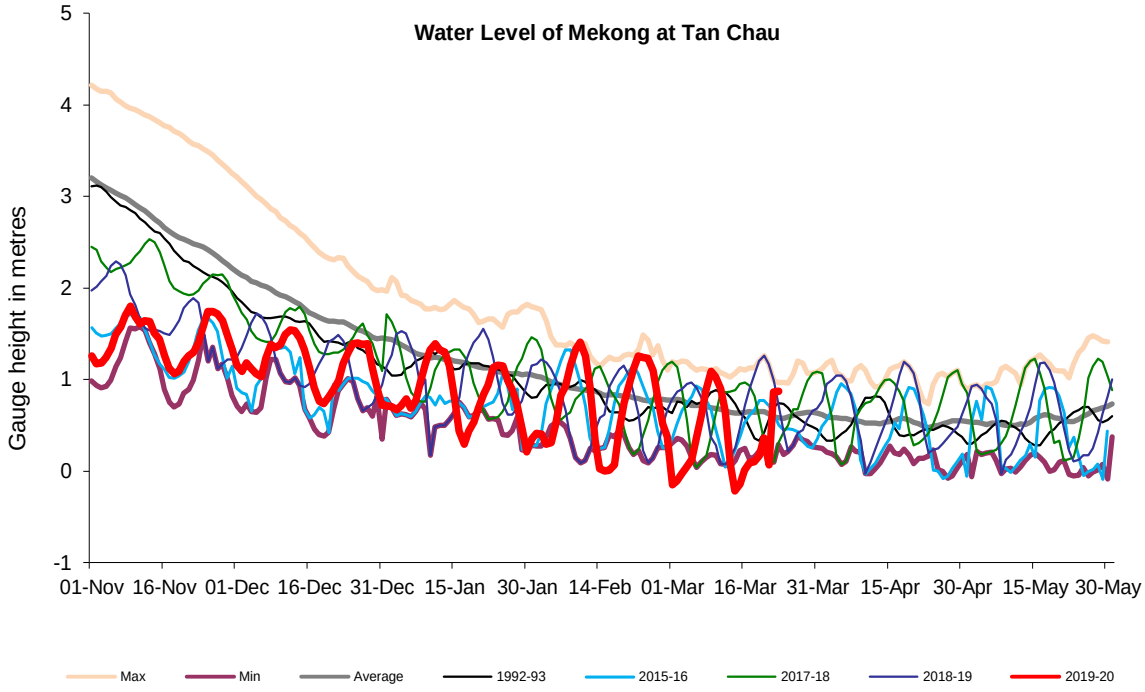
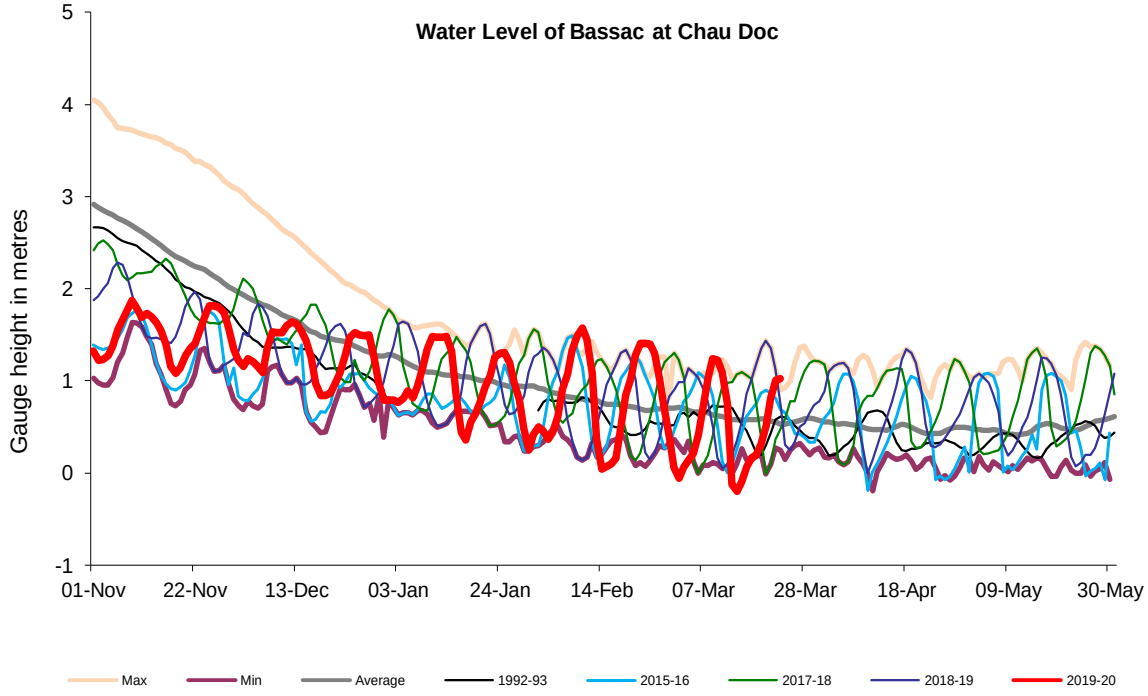
01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20


Water Level of Bassac at Koh Khel
Gauge height in metres
8
7
6
5
4
3
2
1
0
01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20


Water Level of Mekong at Neak Luong
Gauge height in metres
8
7
6
5
4
3
2
1
0
01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20


Water Level of Tonle Sap at Prek Kdam
Gauge height in metres
10
9
8
7
6
5
4
3
2
1
0
01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20


Water Level of Mekong at Tan Chau
Gauge height in metres
5
4
3
2
1
0
-1
01-Nov 16-Nov 01-Dec 16-Dec 31-Dec 15-Jan 30-Jan 14-Feb 01-Mar 16-Mar 31-Mar 15-Apr 30-Apr 15-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20


Water Level of Bassac at Chau Doc
Gauge height in metres
5
4
3
2
1
0
-1
01-Nov 22-Nov 13-Dec 03-Jan 24-Jan 14-Feb 07-Mar 28-Mar 18-Apr 09-May 30-May
Max
Min
Average
1992-93
2015-16
2017-18
2018-19
2019-20