Mekong River Commission

Regional Flood and Drought Management Centre

Weekly Flood Situation Report for the Mekong River Basin

Prepared at: 02/07/2019, covering the week from 25th June to 01st July 2019

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

General weather patterns

During the week of 25th June to 01st July 2019, the weather bulletins and maps were issued by the Thailand Meteorology Department (TMD). It was stated that the scattered to fairly widespread thundershowers with isolated heavy rain and the developed low pressure (L) at the upper of the Mekong region in China and move pass the Philippines toward the South China Sea, and the total rainfall is lower than long term average about 10%. This influences the prevailing Southwest Monsoon over in the Mekong Region. **Figures 1 & 2** presented the weather map for 27th June and 01st July 2019.

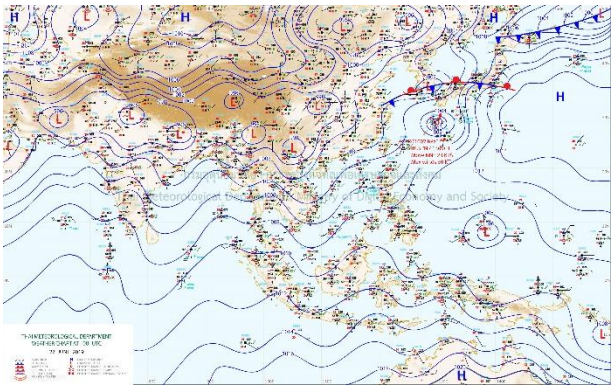

Figure 1: Weather map for 27th June 2019

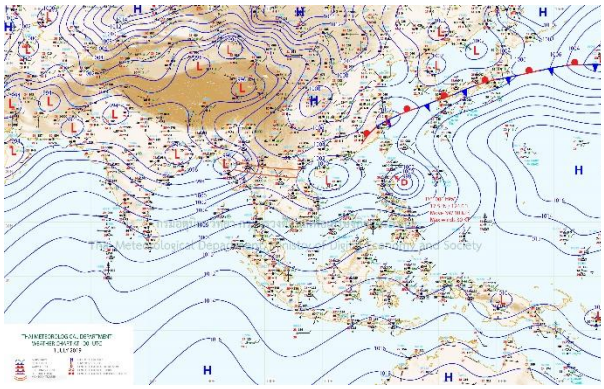

Figure 2: Weather map for 01st July 2019

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), wetter than usual conditions are forecasted over the southern parts of Myanmar, Thailand and Viet Nam, as well as over Cambodia in the second fortnight of June 2019. Based on the Madden Julian Oscillation (MJO) monitoring, it is expected to bring wetter than usual conditions over the southern parts of the Mekong Sub-region. **Figure 2** showed the rainfall outlook over southern Southeast Asia.

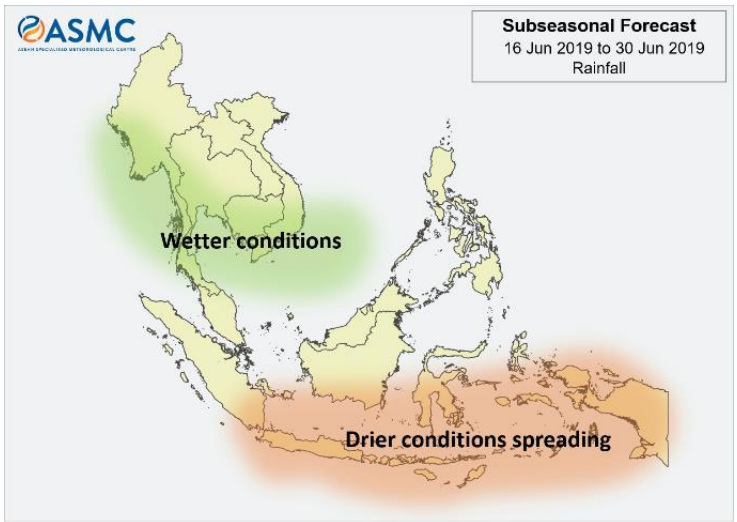

Figure 2: The predicted higher likelihood of below-normal rainfall over southern Southeast Asia

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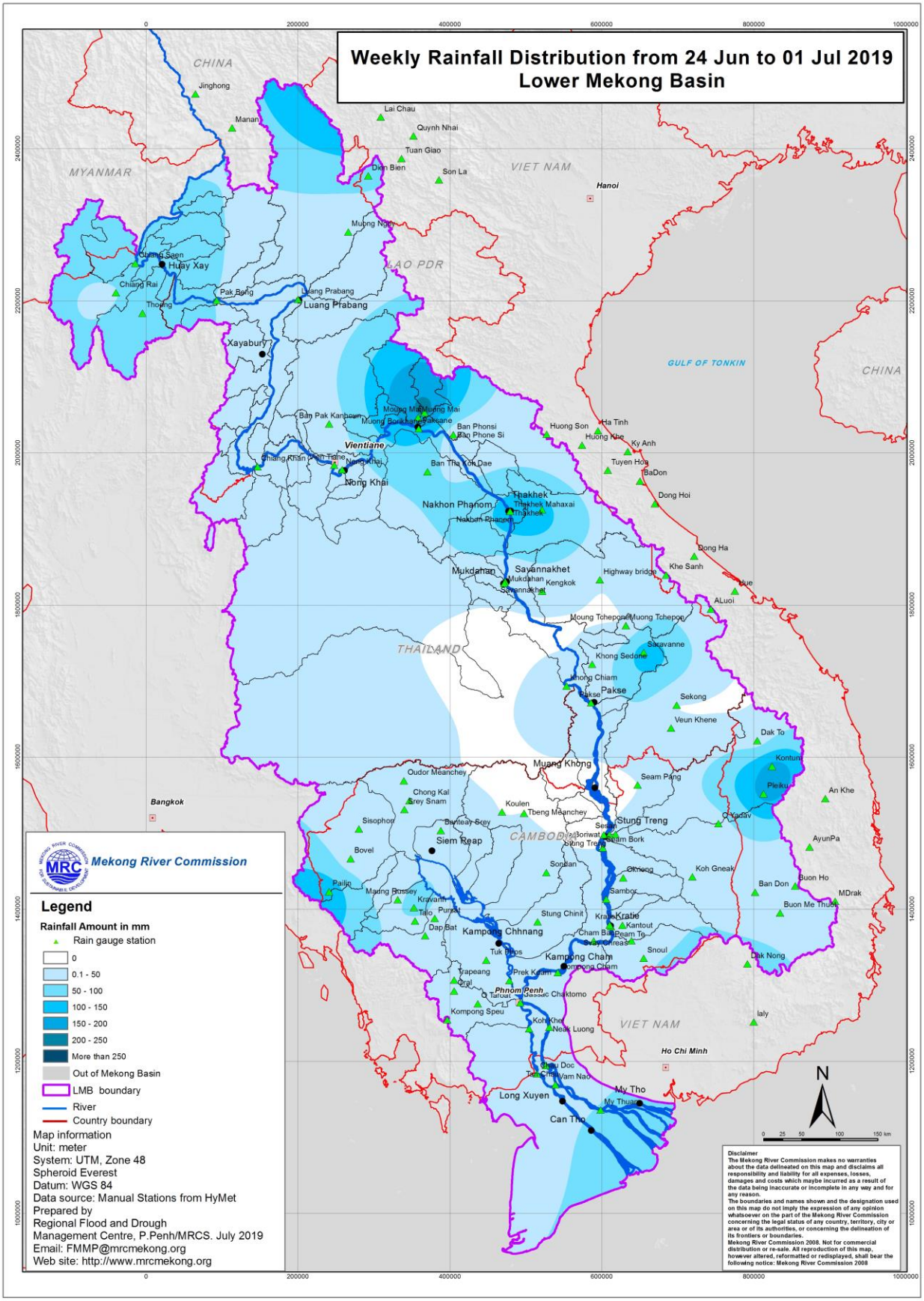

Figure 3: Weekly Rainfall Distribution over the LMB from 24th June to 01st July 2019

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 Paksane to Pakse, including the 3S area. The rainfall varies from 50 to 100 mm. Rainfall in the floodplain area of Cambodia and the Mekong Delta in Vietnam also showed between 50 to 100 mm. The weekly rainfall distribution is shown in **Figure 3** and daily rainfall at key stations in the Lower Mekong Basin are shown **Table A2**.

General behaviour of the Mekong River

During the last week, the water levels at stations from upper to middle part of LMB has been decreasing significantly, due to low rainfall and the inflow operation upstream part.

For stations from Chiang Saen and Luang Prabang

Water levels from 25th June to 01st July 2019 at Chiang Sean station were decreased significantly and reached to the historical minimum levels (1992), while at Luang Prabang station water levels followed the same trend as upstream which decreased and stay below their long-Term Averages (LTAs) since middle of June this year. 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 25th June to 01st July 2019 at these stations were also follow the same trend of upstream inflowed from Luang Prabang, which water level decreased significantly below their LTAs condition. It was observed that at Vientiane and Nong Khai stations, water levels decreased below their historical low levels (1992). The water level hydrographs at each key station are showed in **Annex C**.

For stations from Nakon Phanom/Thakhet to Mukdaha/Sovannakhet

Water levels from 25th June to 01st July 2019 at Nakhon Phanom/Thakhet to Mukdahan/Sovannakhet stations were also followed the same trend of upstream inflow, in which water levels were significantly decreased and stay below their historical low levels (1992) condition.

For stations from Khong Chiam to Pakse

Also water levels from 25th June to 01st July 2019 at Khong Chiam to Pakse stations were in which water levels were significantly decreased and stay below their historical low levels (1992-1998) condition.

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

Water levels from 25th June to 01st July 2019 at Stung Treng, Kratie, Kompong Cham and Phnom Penh stations were significantly decreased and stay below their historical low levels (1992-1998) condition.

Tan Chau and Chau Doc

Water levels from 25th June to 01st July 2019 at these 2 tidal stations were also maintained fluctuated over their LTAs but did not follow the same trend as previous years as indicated in Annex C for water level hydrographs. It might affect by the El Nino process in the South China Sea.

Note: For more detail the flood situation from upstream to downstream during the last week, the hydrograph of water level at each key station is showed in **Annex C**.

Conclusion

From 25th June to 01st July 2019, the trend of water levels at Chiang Sean was decreased and dropped significantly below their historical low level (1992) due to the low rainfall in early Wet Season and some parts of inflows from operation of hydropower dams on the Lancang River in Yunnan, China. The impact could obviously see the decreasing water level to downstream of Phnom Penh at Chaktomuk of Cambodia, in which water levels all key stations were reached below their historical level (1992-1998).

Based on a hydrological phenomenon, the inflow contribution of water from the upstream of Lancang-Mekong in China to the Mekong mainstream is about 11% 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.

According to the Asian Specialized Meteorological Center (ASMC), wetter than usual conditions are forecasted over the southern parts of Myanmar, Thailand and Viet Nam, as well as over Cambodia in the second fortnight of June 2019. Based on the Madden Julian Oscillation (MJO) monitoring, it is expected to bring wetter than usual conditions over the southern parts of the Mekong Sub-region.

The abnormal raised water levels at Luang Prabang is still impacted by the impounding hydropower at Xaiyaburi Dam. It is needed to further investigate and discuss among the relevant stakeholder (MRCS, DMH and Hydro-per dam companies) about the reasons cause of these rising water levels and solution.
In general, water levels in the Mekong mainstream were staying below their LTAs, although there are reported of raining in some areas.

On the other hand, the hydrological conditions (rainfall and flows) of the Mekong River during early Wet Season 2019 (June) is characterized as low flow and low rainfall, compared to the long-term average. This caused a low-water level in the mainstream and many tributaries in rainfed watershed areas of the Lower Mekong Basin. This low-flow condition is likely caused by the low rainfall and the impact of hydropower operation at upstream parts.

For more detail information of flood forecasting outcomes and its system, please see the following annexes:

- tables and graphs for water level and rainfall for the last week in Annex A
- a graph for accuracy in Annex B
- a table of forecast achievement in Annex B
- tables and graphs for performance in Annex B
- the water level graphs showing the observed water level for the season in Annex C

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Annex A: Graphs and Tables

Table A1: observed water levels

Unit in m

25th June to 01st July

2019	Jinghong	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
25/06/2019	536.22	2.53	7.82	5.54	1.88	2.52	4.56	3.13	4.37	3.40	2.50	4.02	3.05	3.70	9.65	4.71	2.53	1.58	2.40	1.68	1.55	-0.11	-0.18
26/06/2019	536.23	2.44	7.70	5.22	1.92	2.52	4.62	3.05	4.30	3.26	2.48	3.80	2.60	3.60	9.58	4.64	2.41	1.45	2.32	1.68	1.46	-0.06	-0.13
27/06/2019	535.96	2.52	7.82	5.12	1.86	2.57	4.62	3.10	4.35	3.24	2.25	3.62	2.44	3.50	9.37	4.54	2.33	1.37	2.22	1.58	1.38	-0.03	-0.10
28/06/2019	536.06	2.59	7.65	5.36	1.72	2.19	4.60	3.13	4.30	3.30	2.26	3.55	2.41	3.43	9.16	4.36	2.22	1.26	2.13	1.68	1.29	0.22	0.20
29/06/2019	536.07	2.47	7.32	5.00	1.86	2.32	4.32	3.13	4.40	3.37	2.28	3.56	2.32	3.40	9.01	4.25	2.20	1.25	2.05	1.70	1.22	0.68	0.75
30/06/2019	536.16	2.44	7.16	4.93	1.75	2.27	4.22	2.95	4.20	3.33	2.28	3.61	2.40	3.28	8.90	4.14	2.11	1.15	2.04	1.60	1.16	0.86	0.92
01/07/2019	536.18	2.40	7.10	4.86	1.65	2.10	4.15	2.78	4.05	3.16	2.20	3.61	2.41	3.26	8.71	4.04	2.10	1.15	2.00	1.50	1.16	0.87	0.94

Table A2: observed rainfall

Unit in mm

2019	Jinghong	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
25/06/2019	0.5	86.1	0	1.5	22.6	17.3	23.1	2.5	8.1	0	0	0	0	0	2.6	1.3	12.5		6.3	1.6	8.3	0	0
26/06/2019	21	0.5	0	0	0	0	20.9	6.9	13.5	7.8	2.8	14.2	2.2	0	0	1.1	13.5		6.3	8.2	0	0.2	2.2
27/06/2019	4	2.1	0	0	3.8	0	30.5	51.7	63.1	0	0	0	0	0	0	0	0		0	0	0	0	0
28/06/2019	0	0	0	0	1.5	4.7	3.1	0.3	0	0	0	0	0	0	0	0	0		0	0	0	0	0
29/06/2019	0	0	0	0	0	0	0	1	0	5.4	1.7	3.5	0	0	0	0	0		0	0	0	1.7	6.1
30/06/2019	0	0	0	0	0	0.7	16.2	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0.1
01/07/2019	1.5	3.8	0	2.5	1.8	0	41.1	38.9	40	0	0	1.7	0	0.5	4.6	7.3	3.9		0	0	0	0.4	12

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Figure A1: Observed water level and rainfall for Jinghong, Chiang Saen, and Luang Prabang

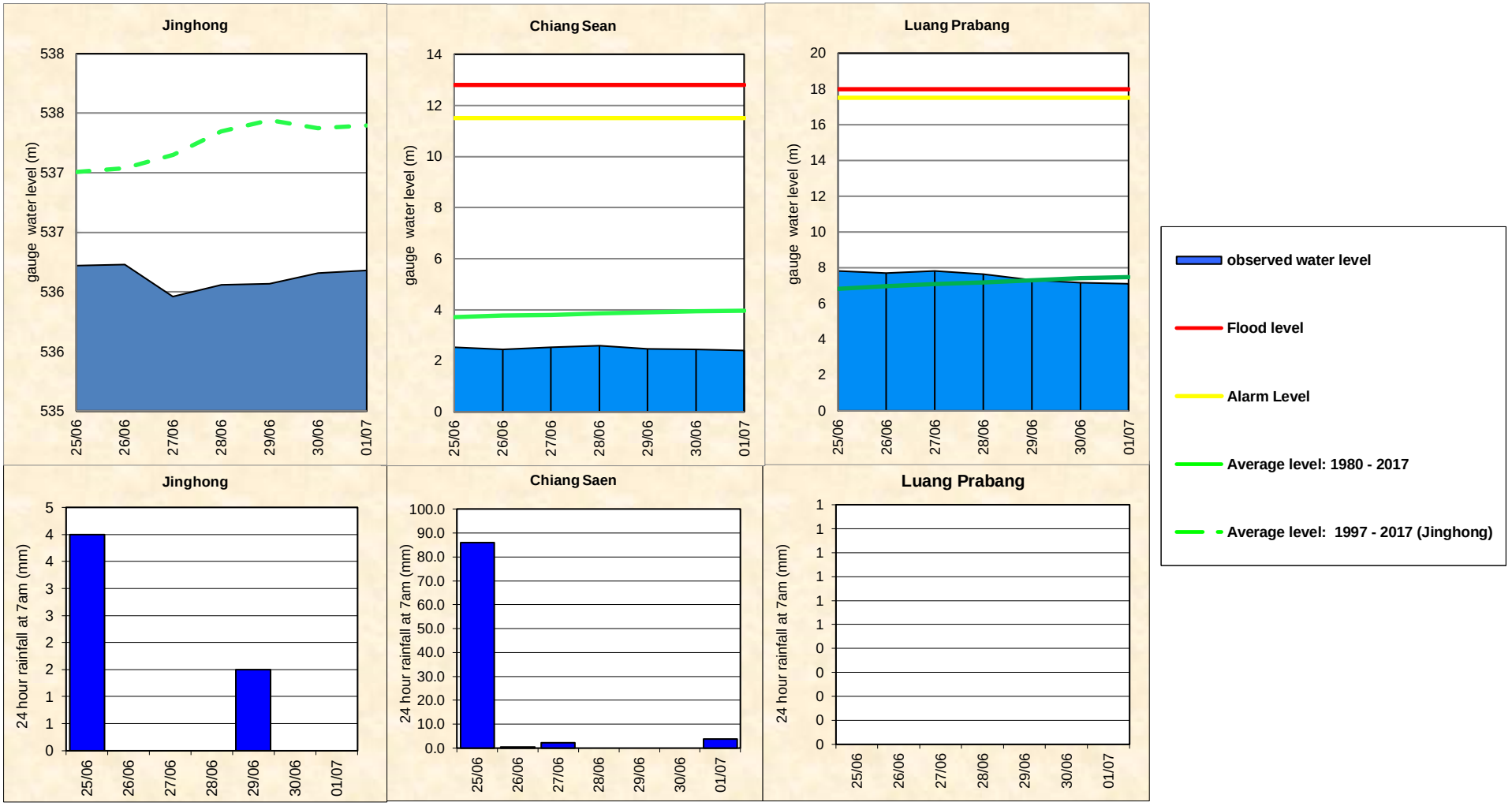

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Figure A2: Observed water level and rainfall for Chiang Khan, Vientiane, Nongkhai, and Paksane

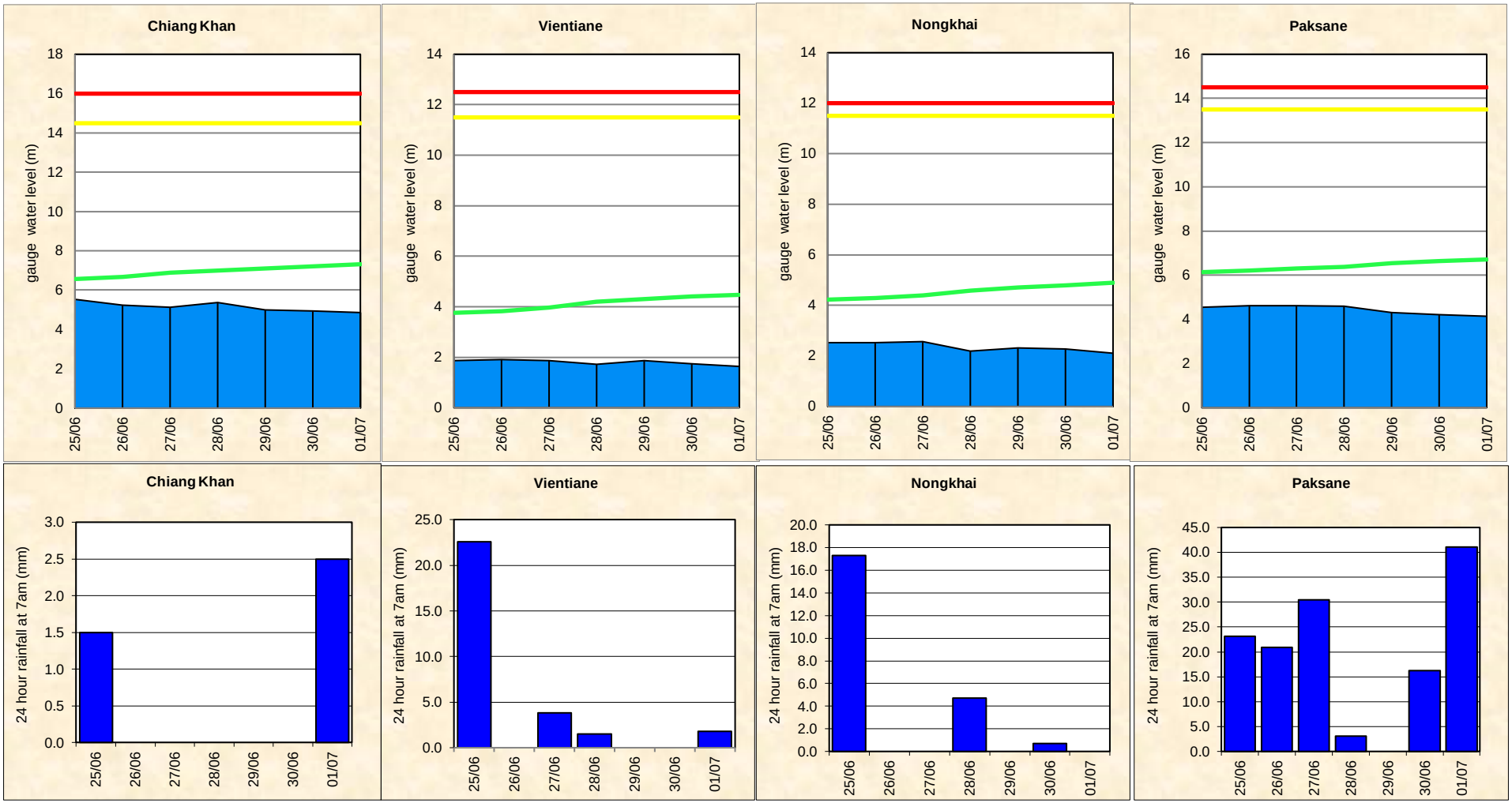

Figure A3: Observed water level and rainfall for Nakhon Phanom, Thakhek, Mukdahan and Savannakhet

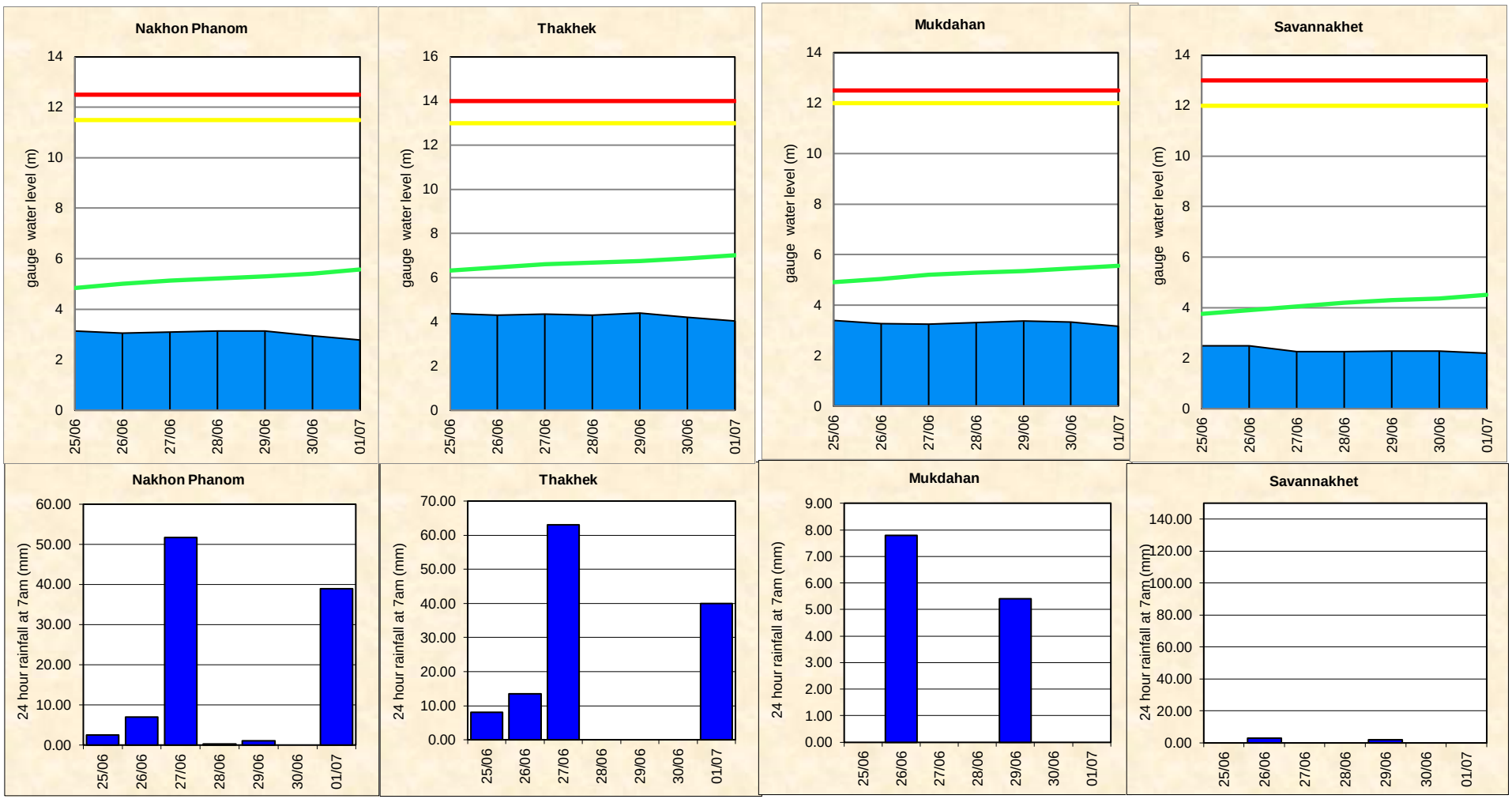

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Figure A4: Observed water level and rainfall for Khong Chiam, Pakse, Stung Treng, and Kratie

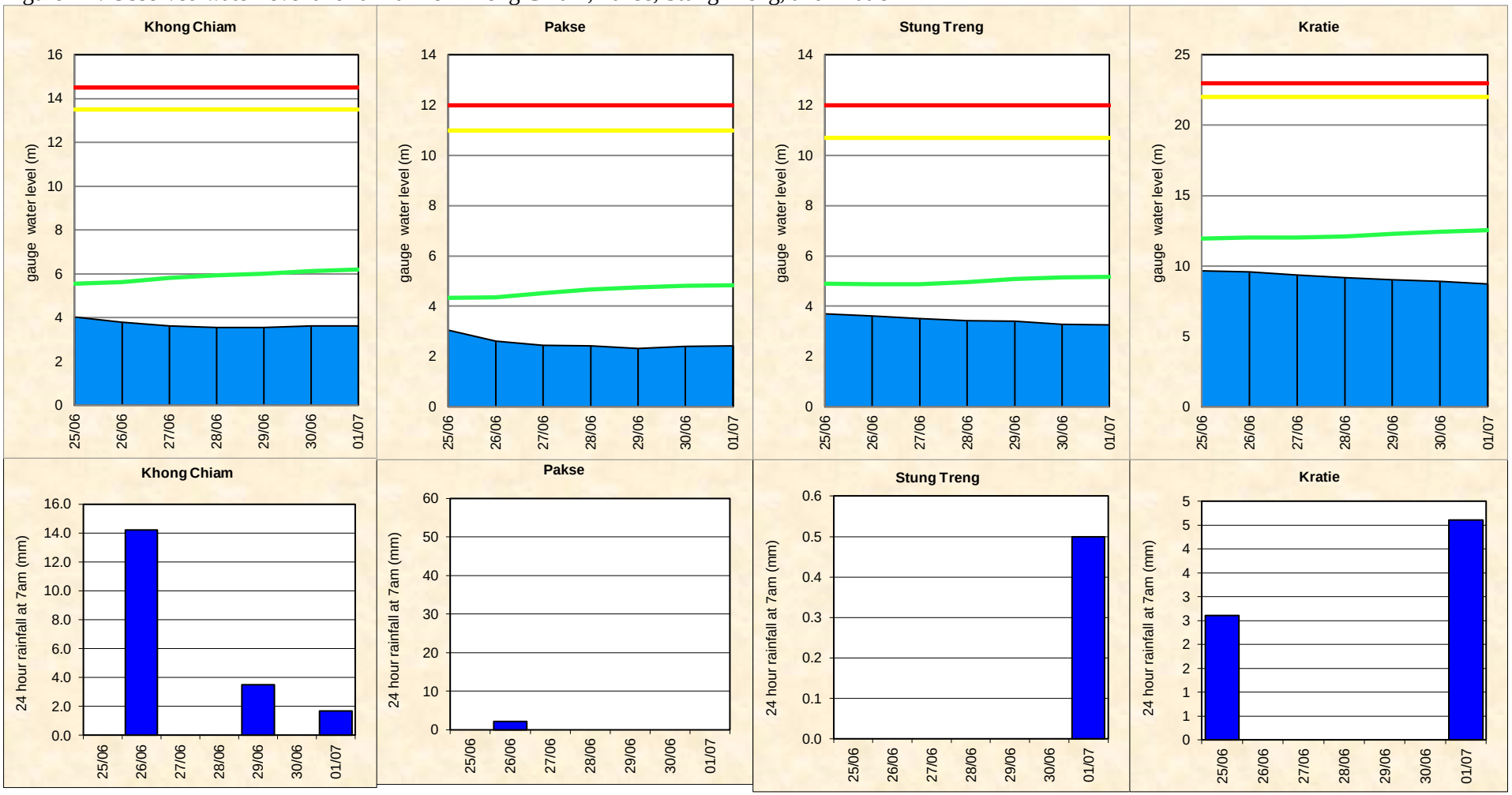

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Figure A5: Water level and rainfall for Kompong Cham, Phnom Penh (Bassac and Port), and Koh Khel

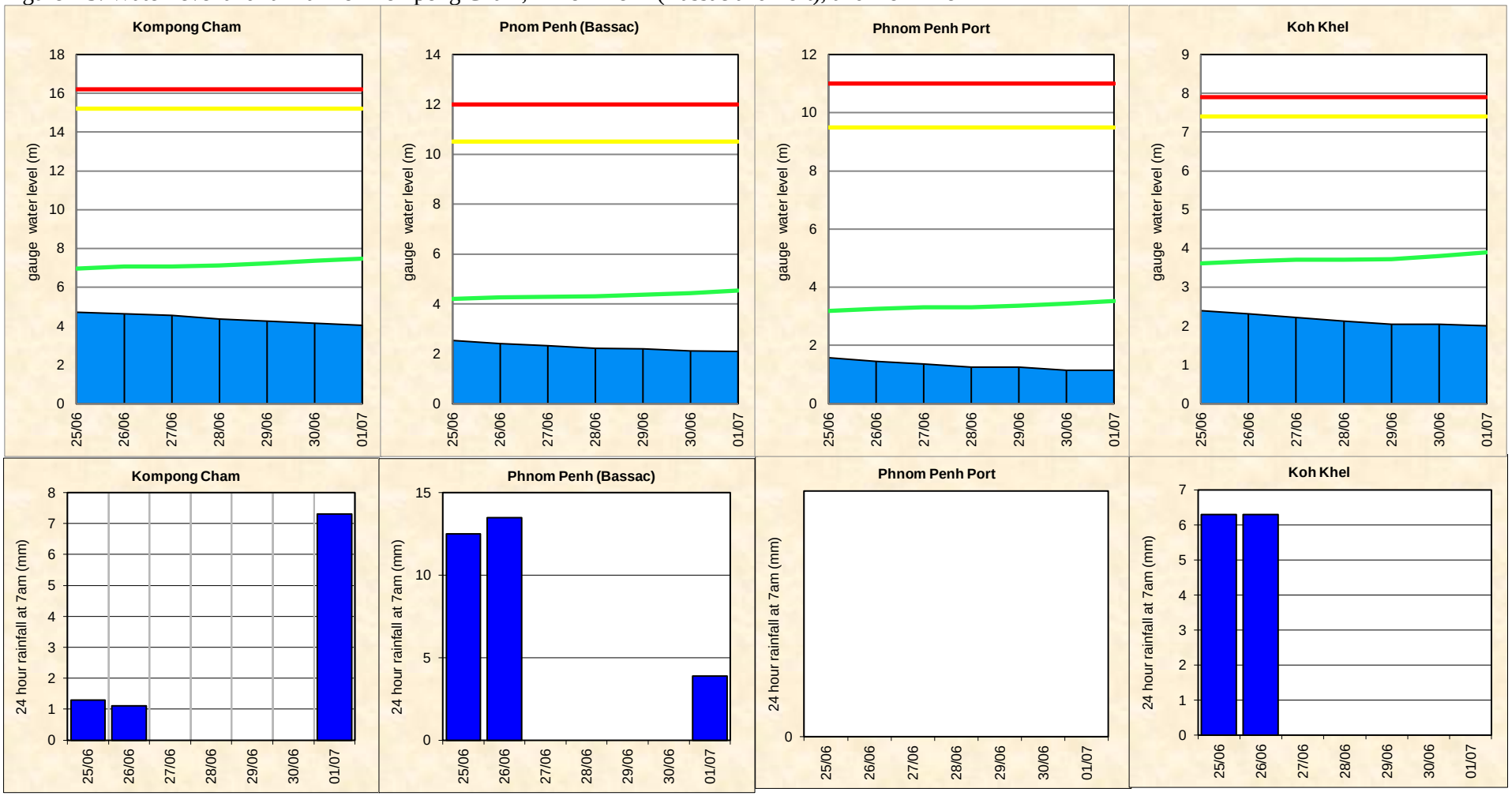
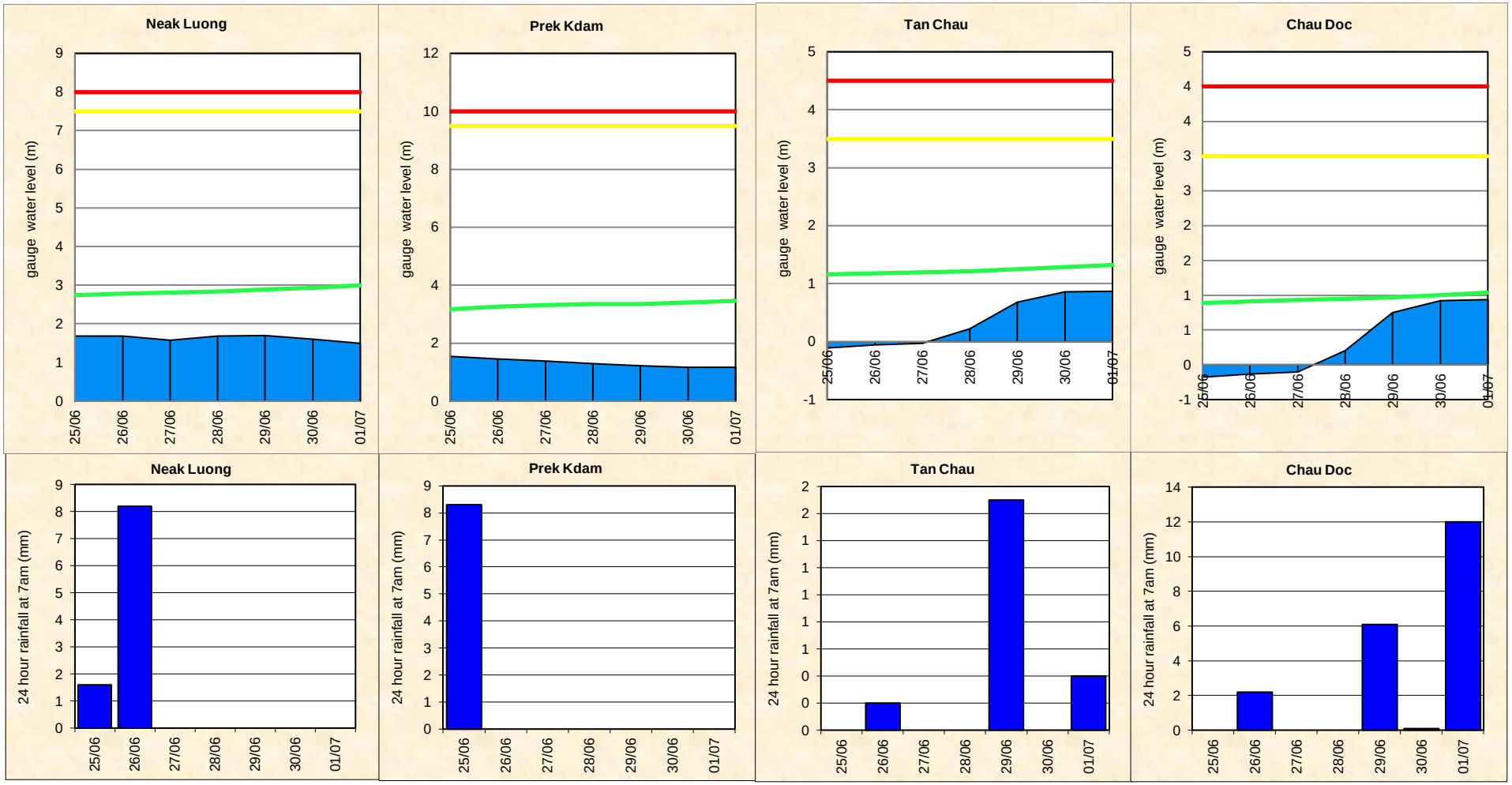


Figure A6: Water level and rainfall for Neak Luong, Prek Kdam, Tan Chau and Chau Doc



Annex B: Accuracy and performance

Accuracy

"Accuracy" describes the accuracy of the adjusted and published forecast, based on the results of the MRC Mekong Flood Forecasting System, which are then adjusted by the Flood Forecaster in Charge taking into consideration known biases in input data and his/her knowledge of the response of the model system and the hydrology of the Mekong River Basin. The information is presented as a graph below, showing the average flood forecasting accuracy along the Mekong mainstream.

In general, the overall accuracy is fair for 1-day to 5-day forecast lead time at stations in the upper and lower parts of the LMB. However, the accuracies at downstream reaches of the LMB stations at Luang Prabang and Tan Chau and Chau Doc for 4-day to 5-day forecast were considered large. This could be effected by the impounding reservoir upstream on the tributaries inflow into the Mekong (upper Luang Prabang) and the abnormal tidal on the Mekong and Bassac rivers.

The above differences due to three main factors: (1) internal model functionality in forecasting; for which the parameter adjustment in the model is not possible especially at stations in the upper part and in the Mekong delta where are affected by tidal; (2) the adjustment by utilizing the practical knowledge and experience of flood forecaster-in-charge; and (3) the forecasted accumulated rainfall was not well represented and abnormal tidal trends.

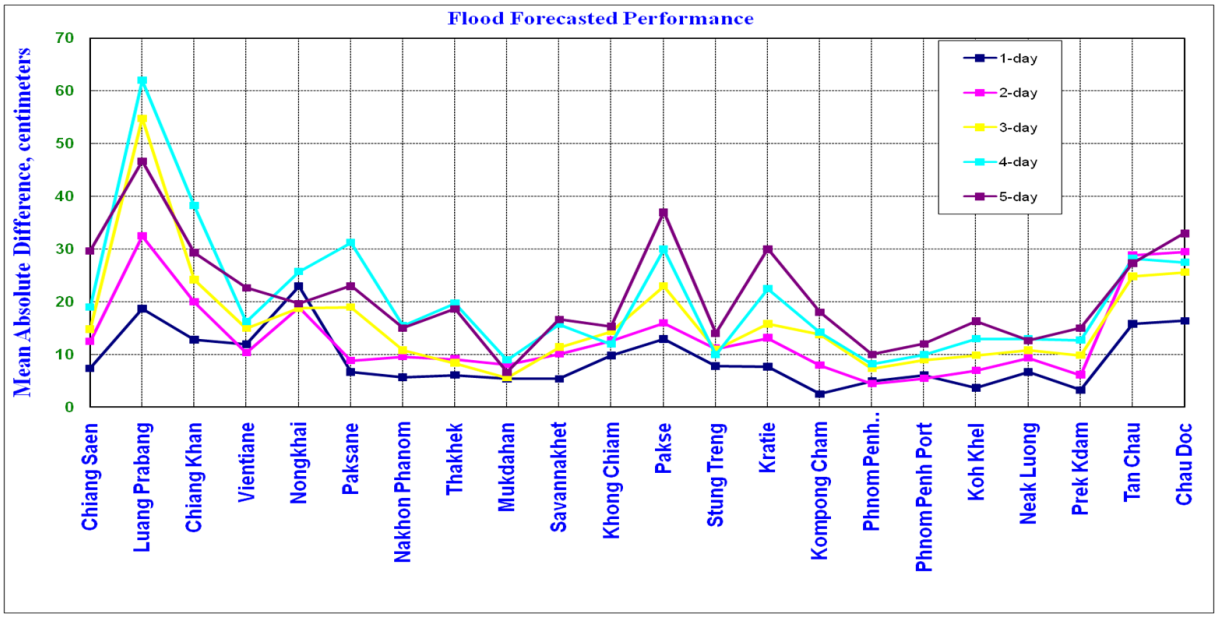


Figure B1: Average flood forecast accuracy along the Mekong mainstream

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Forecast Achievement

The forecast achievement indicates the % of days that the forecast at a particular station for a lead-time is successful against a respective benchmark (Table B2).

Table B1: Evaluation performance forecasting (from 18 to 24 June 2019) base on New Benchmark (%).

Unit in %

Lead time Forecast	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	100	85.714	71.429	71.429	42.857	100	100	100	100	85.714	100	85.714	85.714	100	100	100	85.714	85.714	71.429	100	14.286	0	***81.17***
2-day	100	66.667	83.333	100	83.333	100	100	100	100	100	100	83.333	100	100	100	100	100	100	66.667	100	33.333	16.667	***87.88***
3-day	100	80	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	40	60	***94.55***
4-day	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	50	50	***95.45***
5-day	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	66.667	33.333	***95.45***

Unit in cm

Lead time Forecast	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	22	31	22	23	23	23	20	20	20	20	24	22	18	28	20	9	9	6	7	9	6	6
2-day	39	55	41	42	43	42	38	39	39	38	46	41	33	52	38	18	18	12	14	17	11	11
3-day	51	76	57	59	59	58	54	54	55	54	65	58	46	73	54	26	26	18	20	24	16	16
4-day	60	93	70	72	74	72	68	68	70	68	82	73	57	92	69	34	34	22	26	31	20	21
5-day	66	107	81	84	86	85	81	81	83	80	98	87	67	109	82	41	41	27	31	38	24	24

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Table B2: Evaluation performance forecasting (from 18 to 24 June 2019) base on Old Benchmark (%).

Unit in %

Lead time Forecast	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	100	85.714	85.714	42.857	42.857	85.714	85.714	100	100	85.714	57.143	42.857	71.429	71.429	100	100	100	100	71.429	100	57.143	28.571	***77.92***
2-day	100	66.667	100	83.333	66.667	83.333	83.333	83.333	100	100	100	83.333	100	100	100	83.333	66.667	83.333	50	83.333	33.333	16.667	***80.3***
3-day	100	40	80	80	80	80	80	80	100	100	100	40	100	80	80	80	80	60	40	60	20	0	***70.91***
4-day	100	75	75	100	75	75	100	75	100	100	100	75	100	100	100	50	100	50	100	100	25	25	***81.82***
5-day	100	66.667	66.667	100	100	100	100	100	100	100	100	66.667	100	100	100	100	100	100	100	100	66.667	33.333	***90.91***

Unit in cm

Lead time Forecast	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	25	25	25	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2-day	50	50	50	25	25	25	25	25	25	25	25	25	25	25	25	10	10	10	10	10	10	10
3-day	50	50	50	25	25	25	25	25	25	25	25	25	25	25	25	10	10	10	10	10	10	10
4-day	75	75	50	50	50	50	50	50	50	50	50	50	50	50	50	10	25	10	25	25	10	10
5-day	75	75	50	50	50	50	50	50	50	50	50	50	50	50	50	25	25	25	25	25	25	25

Note: *An indication of the accuracy given in the Table B2 is based on the performance of the forecast made in 2008 from the new flood forecasting system and the configuration for the 2009 flood season and is published on the website of MRC (http://ffw.mrcmekong.org/accuracy.htm).*

A new set of performance indicators that is established by combining international standards and the specific circumstances in the Mekong River Basin, is applied officially for the flood season of 2011 onward.

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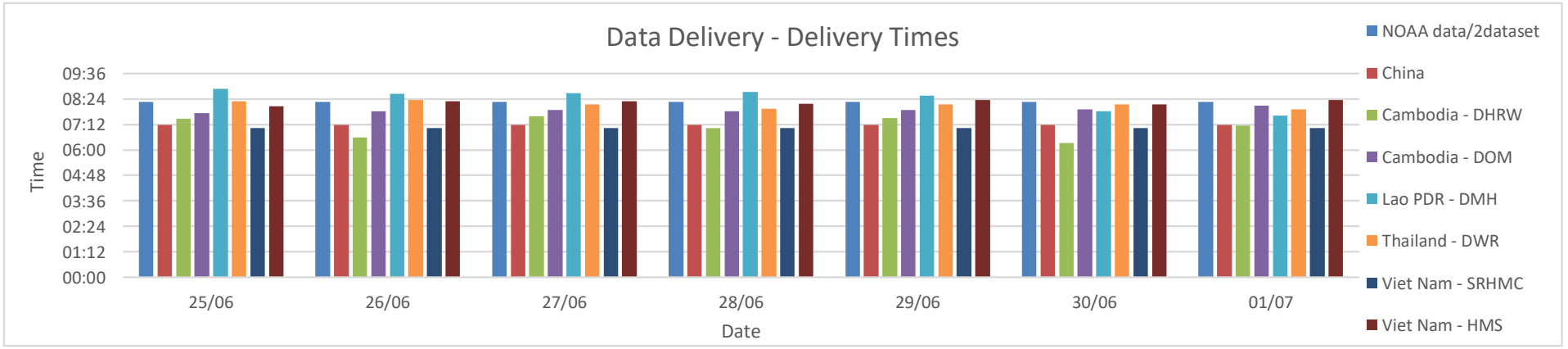
Performance

Performance is assessed by evaluating a number of performance indicators, see table and graphs below:

	FF time sent				Arrival time of input data								Missing data (number-mainstream and trib.st.)							
2019	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	*10:25*	*00:00*	-	-	*08:15*	*07:10*	*07:05*	*07:52*	*08:25*	*08:08*	*07:01*	*08:14*	*0*	*0*	*1*	*0*	*106*	*0*	*0*	*0*
month	*10:24*	*00:00*	-	-	*08:15*	*07:14*	*07:25*	*07:55*	*08:16*	*08:10*	*07:26*	*08:16*	*0*	*0*	*7*	*1*	*28*	*4*	*1*	*0*

Table B3: Overview of performance indicators for the past 7 days including the current report date



Week is the week for which this report is made; *Month* is actually the last 30 days (or less if the flood season has just begun); *Season* is the current flood season up to the date of this report.

Figure B2: Data delivery times for the past 8 days including the current report date

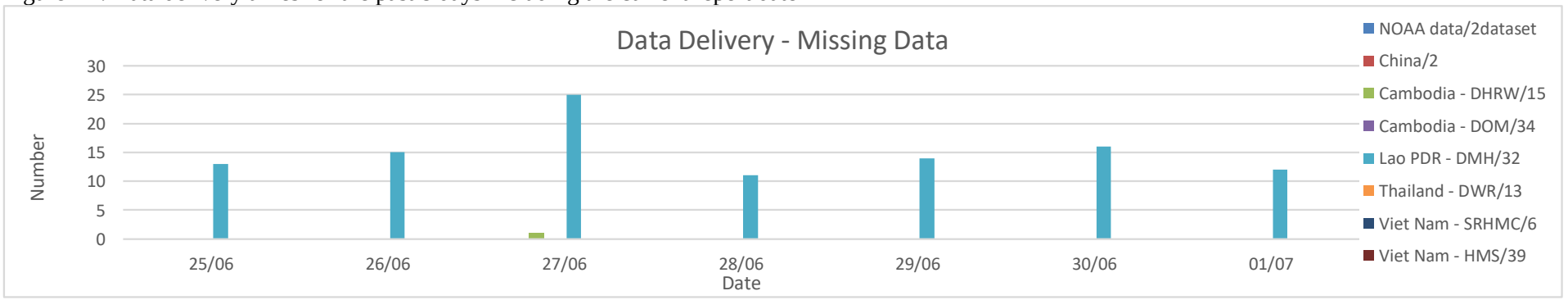


Figure B3: Missing data for the past 8 days including the current report date

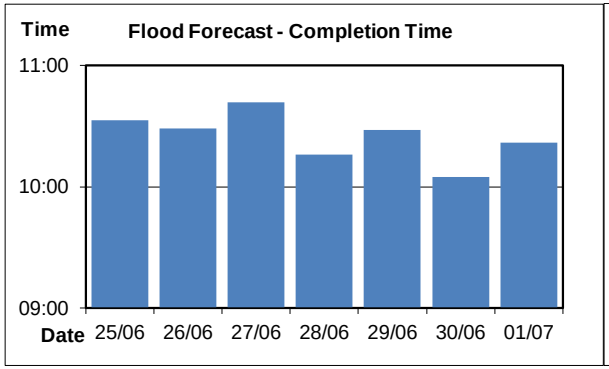


Figure B4: Flood forecast completion time

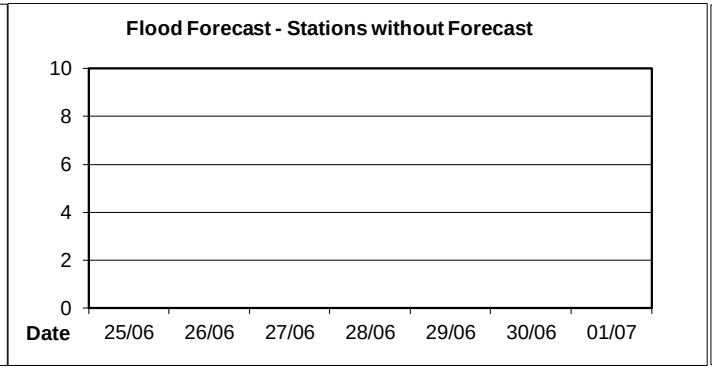


Figure B5: Flood forecast stations without forecast

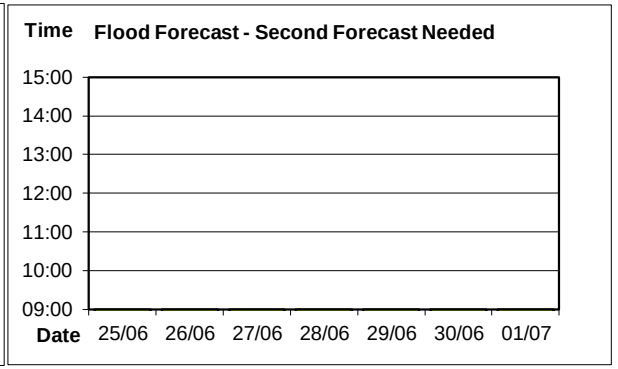


Figure B6: Second forecast needed

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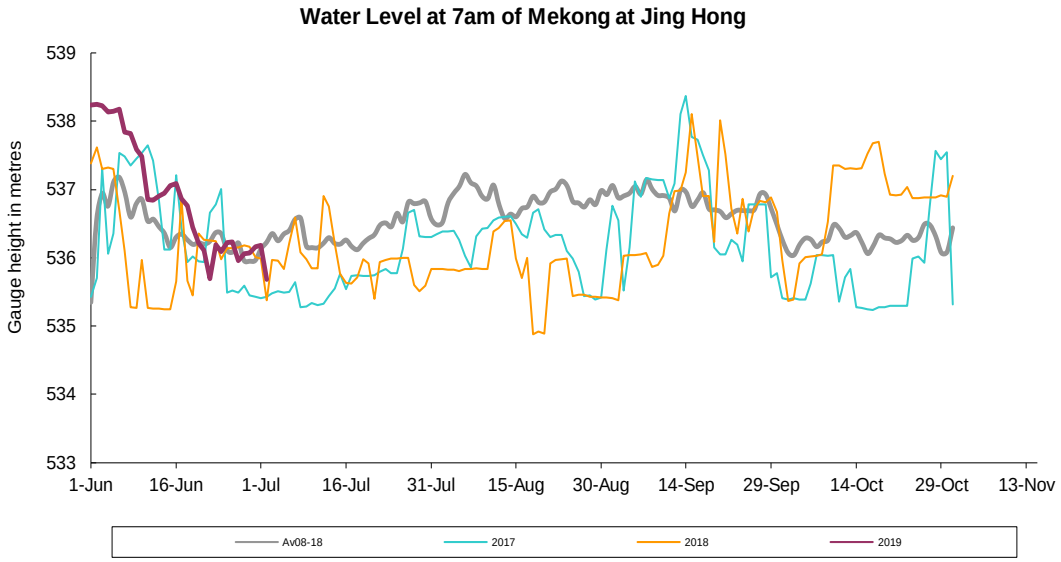
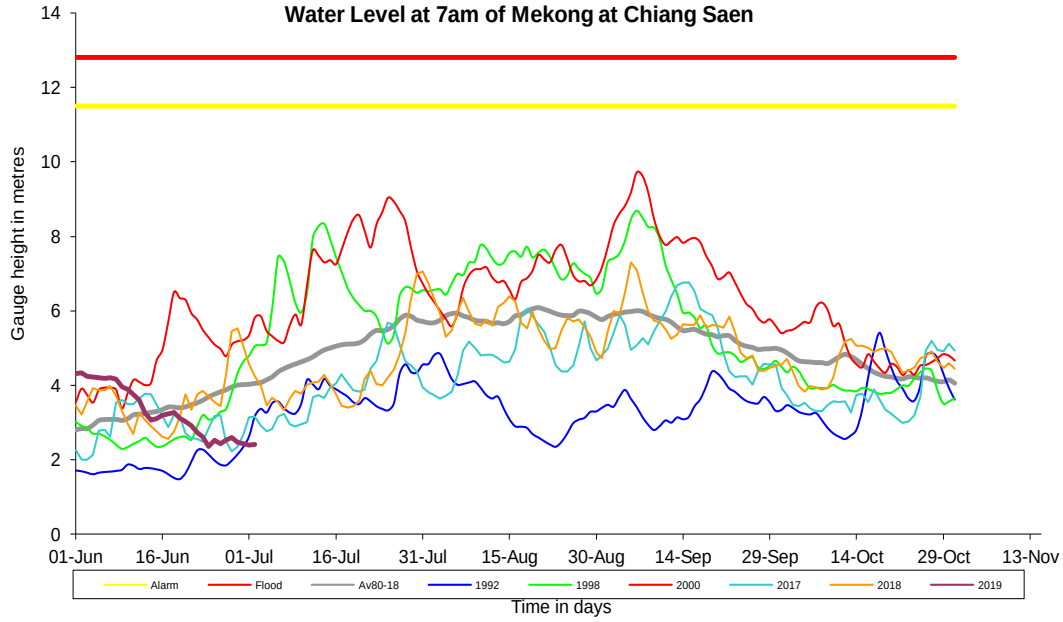
Annex C: Season Water Level Graphs

This Annex has the water level graphs of the report date. These graphs are distributed daily by email together with the Flood Bulletins.

HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS

IN FLOOD SEASON FROM 25 JUNE TO 01 JULY 2019





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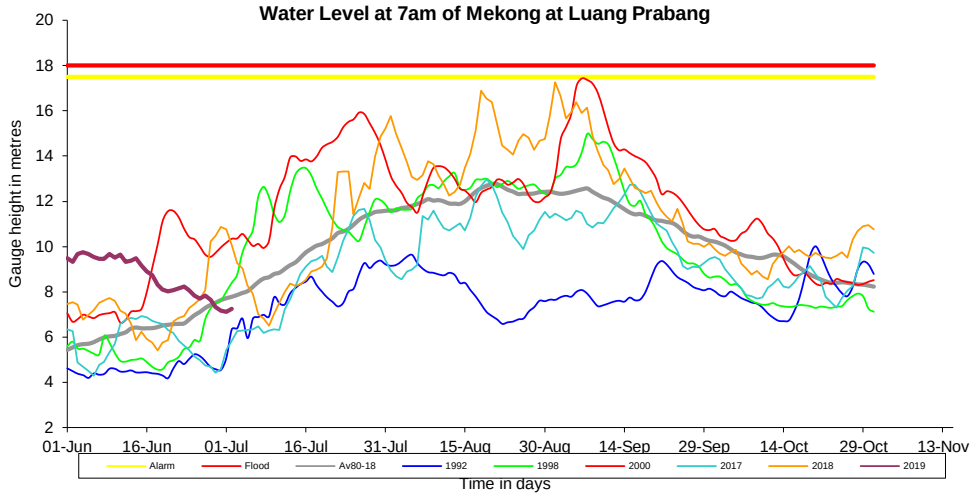

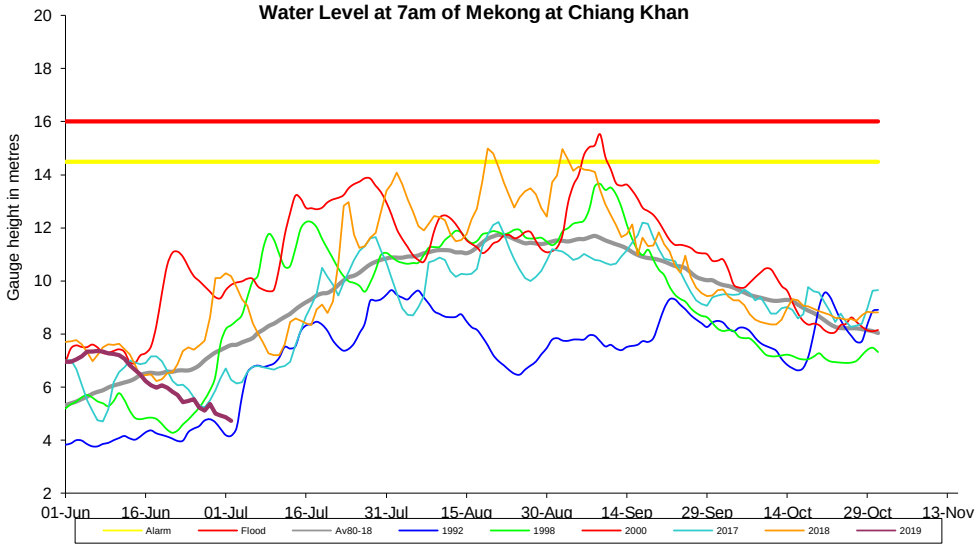

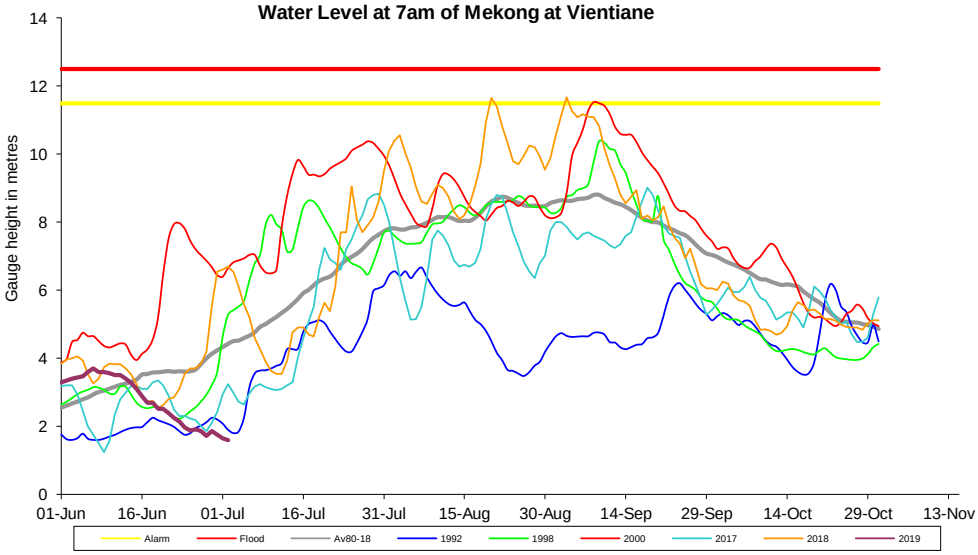

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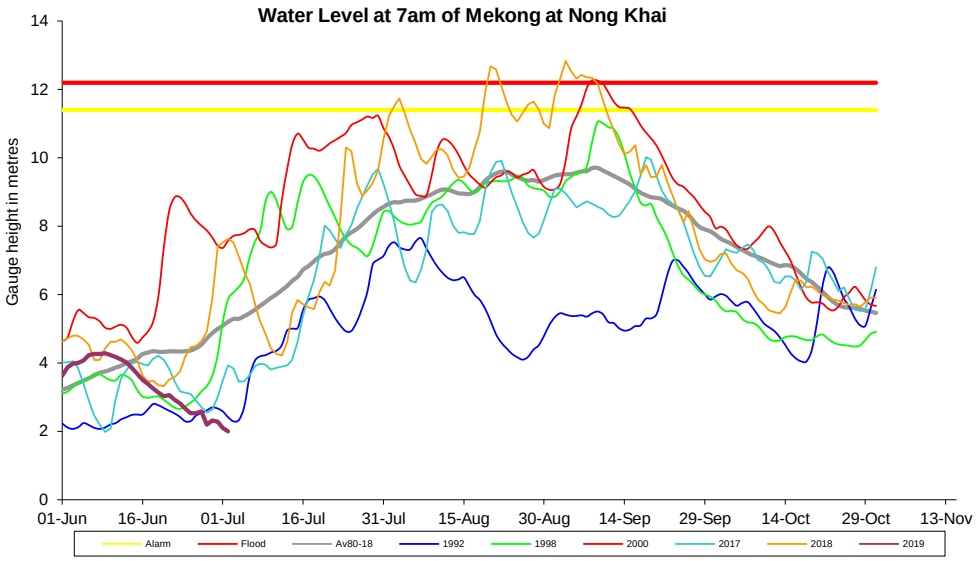

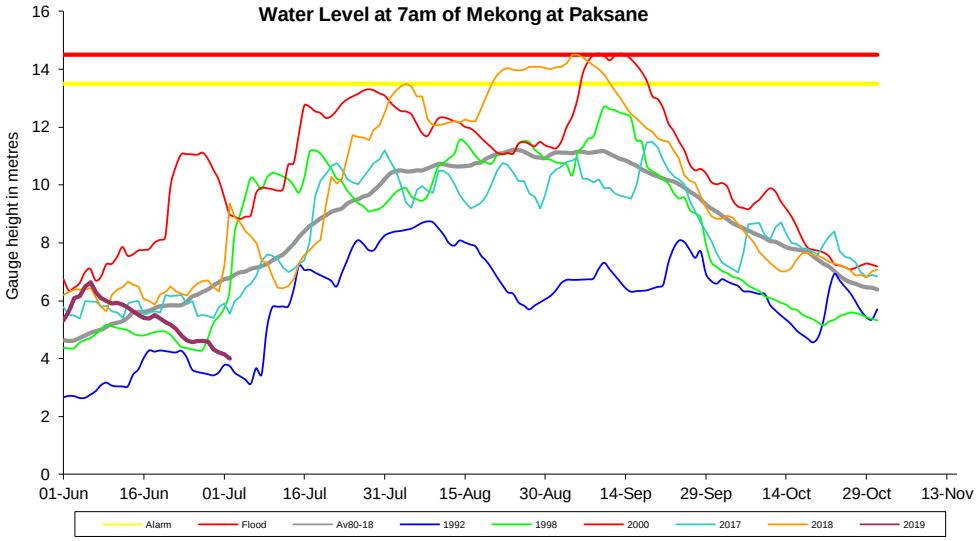

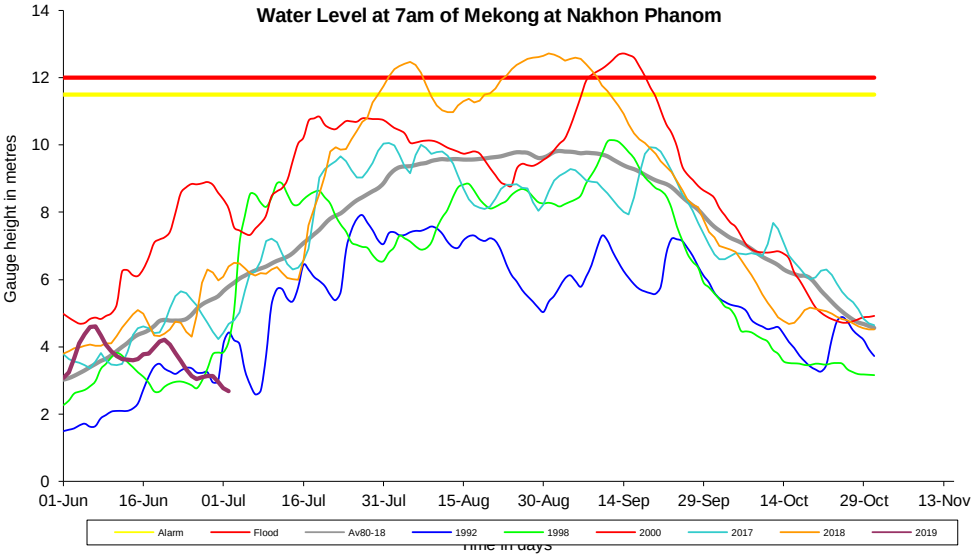

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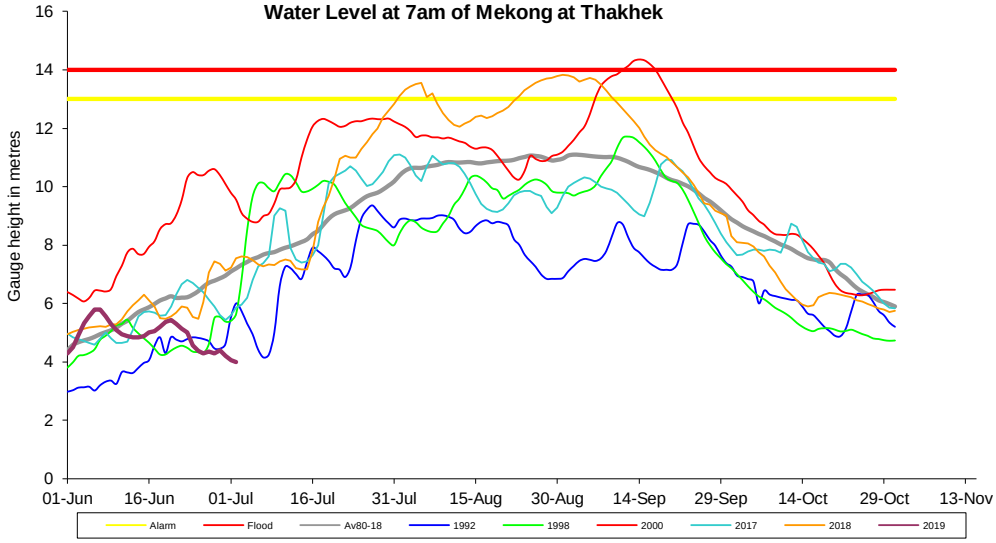

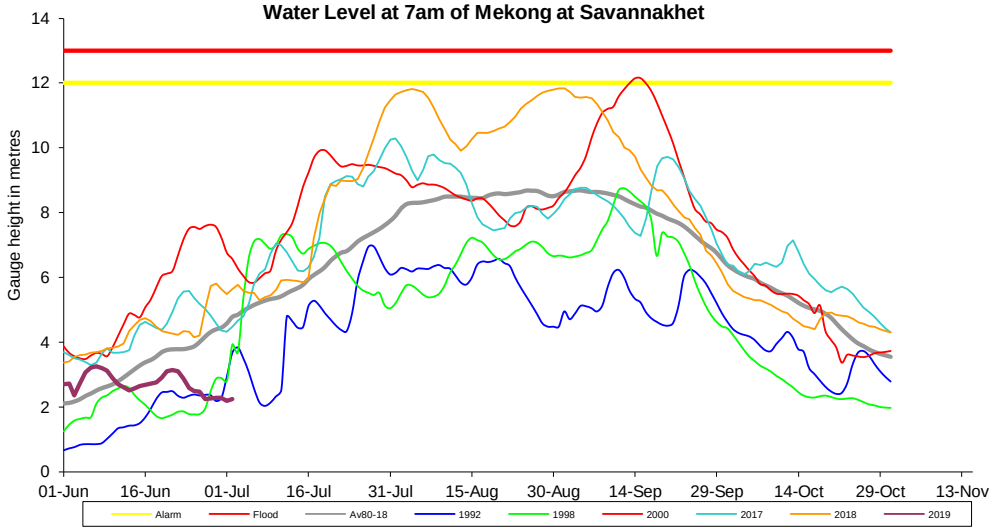

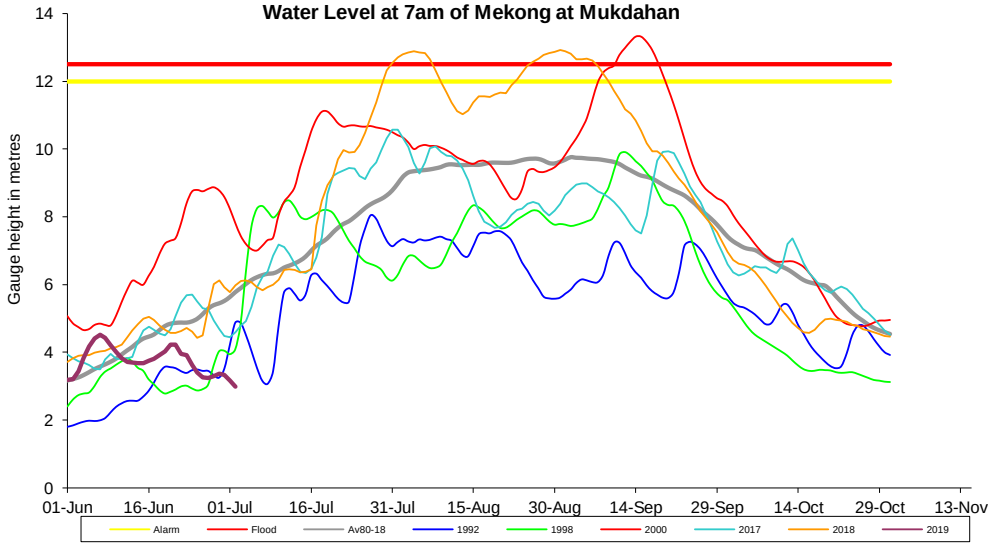

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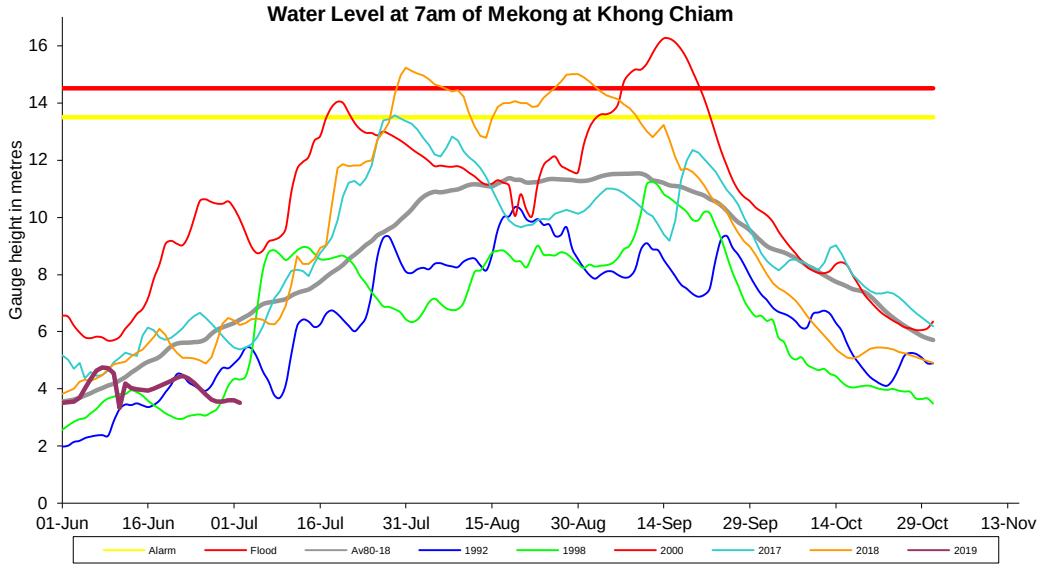

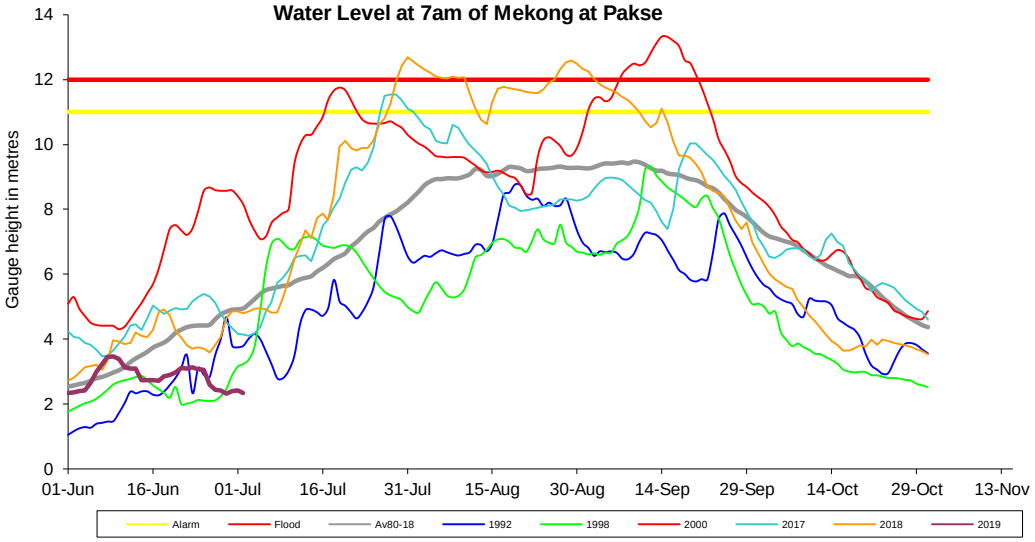

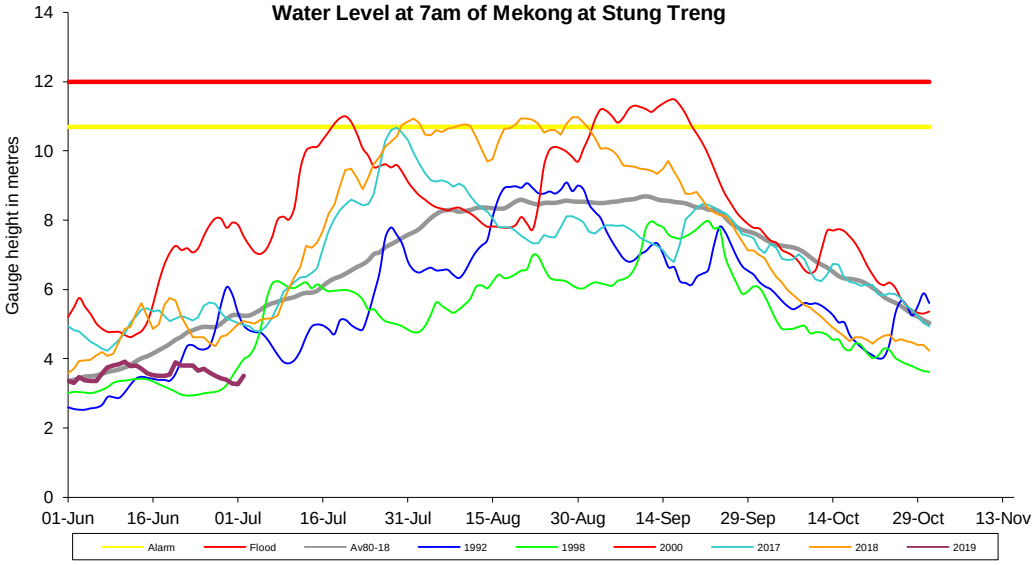

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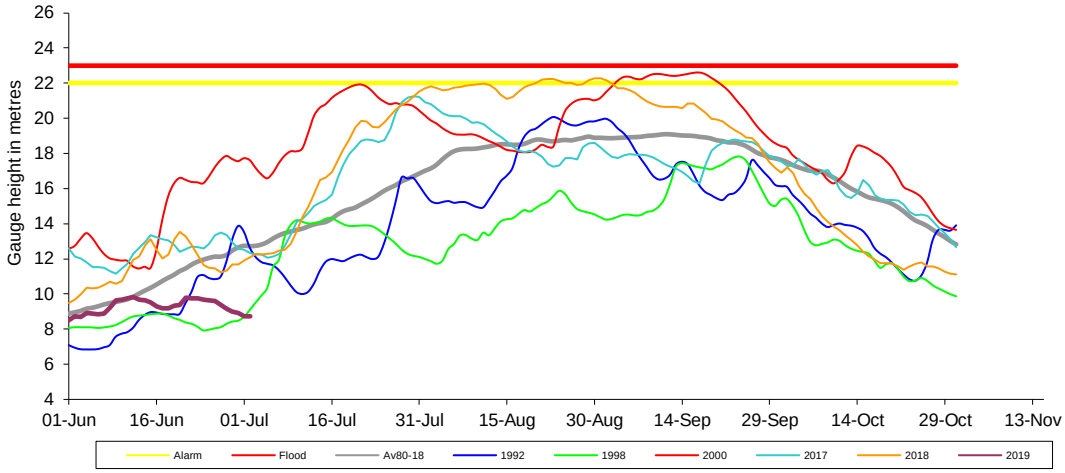
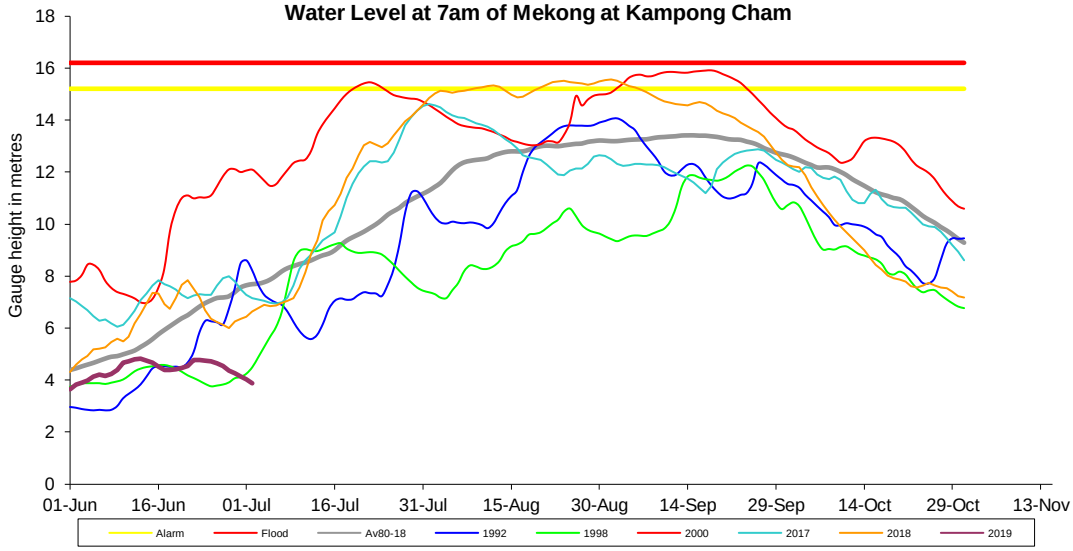
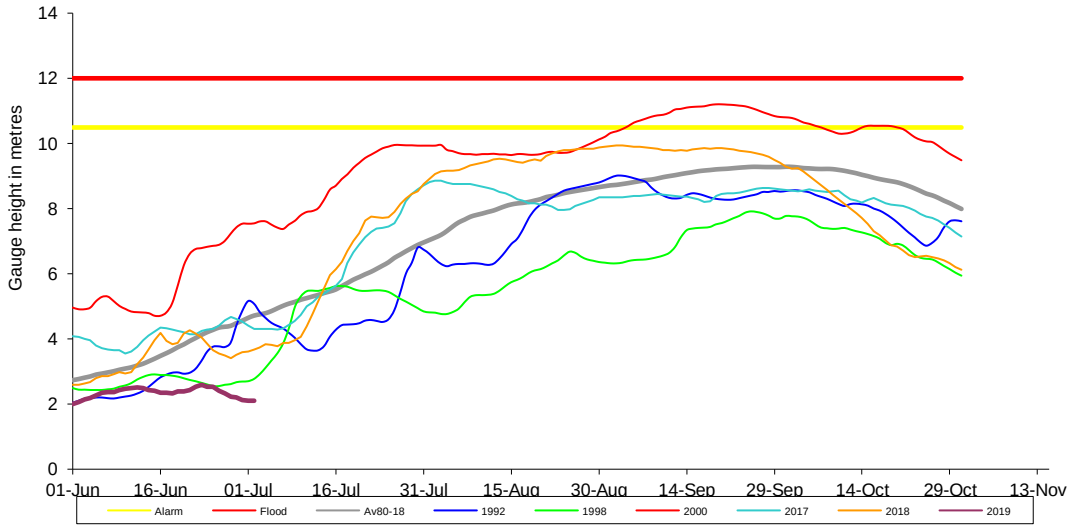
Water Level at 7am of Mekong at Kratie



Water Level at 7am of Mekong at Kampong Cham



Water Level at 7am of Mekong at Phnom Penh Chaktomuk



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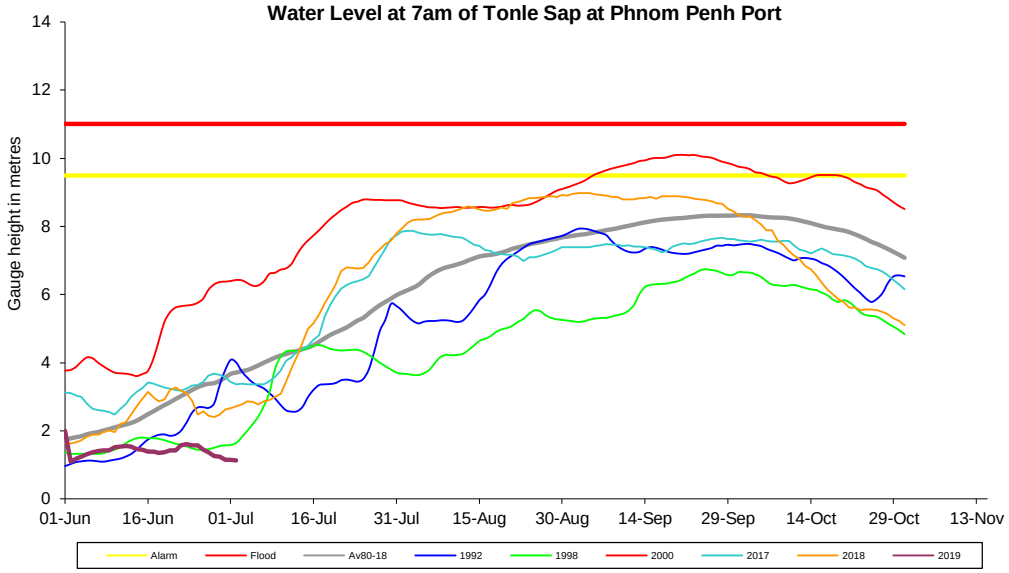

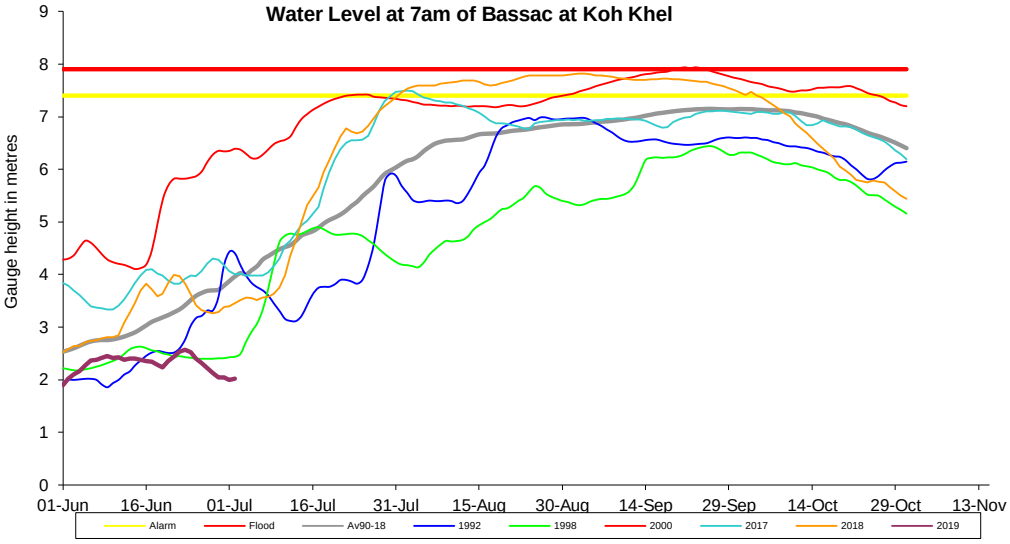

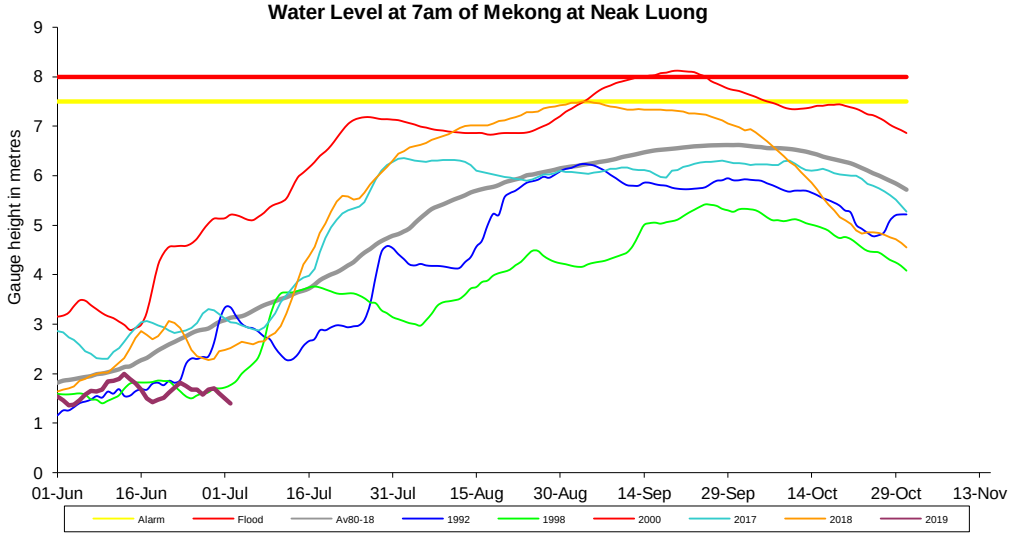

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