

Weekly Flood Situation Report for the Mekong River Basin

Prepared on: 27/06/2011, covering the week from the 20th to the 26th June 2011

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

General weather patterns

During the week of the 20th to the 26th June 2011, seven weather bulletins were issued by the Department of Meteorology (DOM) of Cambodia. The weather charts of the 20th and the 26th June bulletins are presented in the figures below:

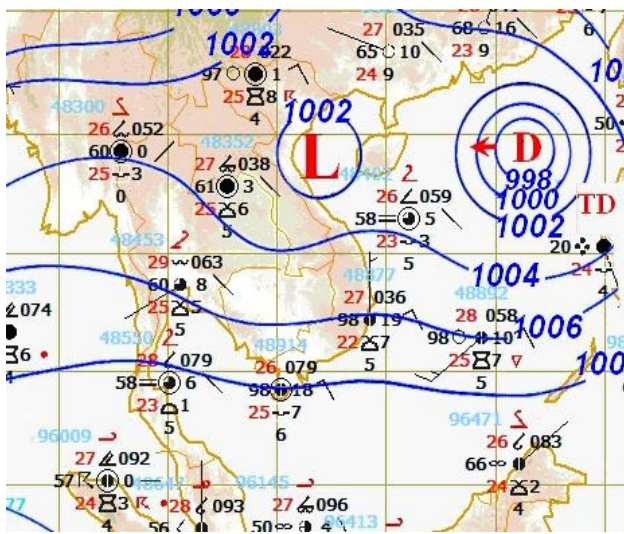


Figure 1: Weather map for 20th June 2011

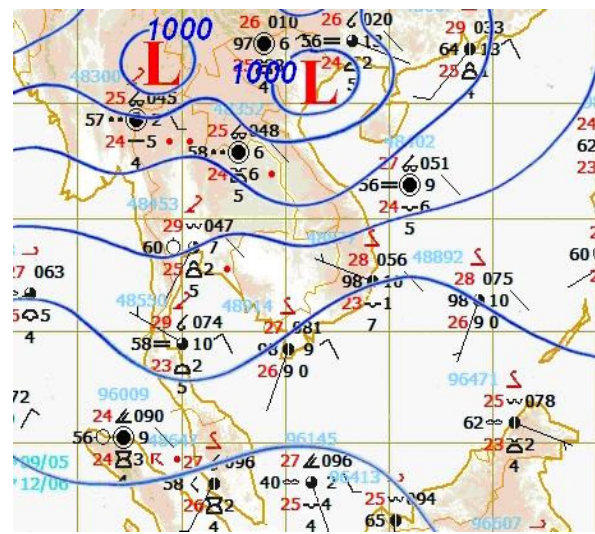


Figure 2: Weather map for 26th June 2011

Strong South-West (SW) Monsoon

Strong SW monsoon prevailed over Andaman Sea and the Gulf of Thailand and was almost stationary during last week (Figure 1 and 2).

Inter Tropical Convergence Zone (ITCZ)

No ITCZ was observed in this week.

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

During last week, a Tropical Depression (TD) mentioned in the weekly flood situation report 13th – 19th June, upgraded into Tropical Storm (TS) named **HAIMA** (1104) on the 21st June when travelling through South China Sea. After moving across Leizhou Peninsular of China on 23rd June, the TS **HAIMA** landed over the North of Viet Nam on 24th June and then downgraded into low pressure and disappeared when it hit to the Northern part of Lao PDR on 26th June (Figure 5).

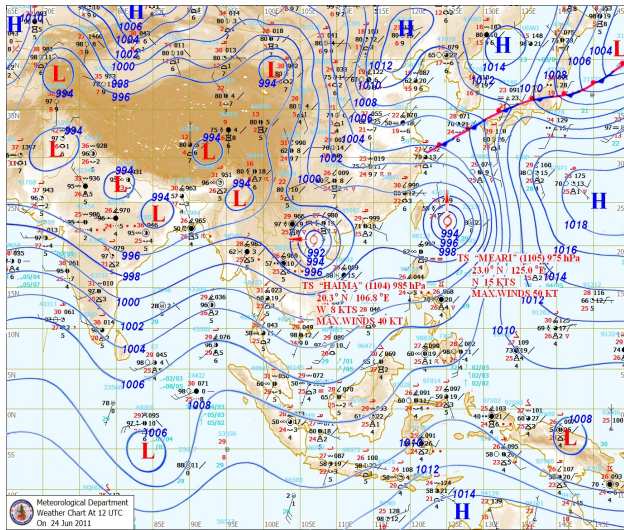


Figure 3: Weather map for HAIMA Tropical Storm on 24th June 2011, before landing

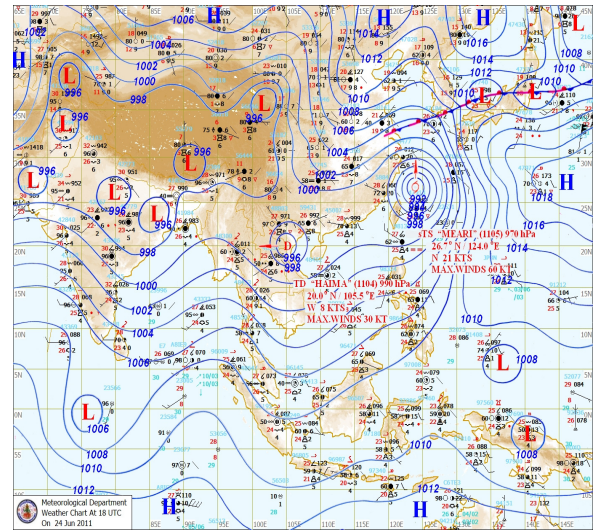


Figure 4: Weather map for HAIMA Tropical Storm on 25th June 2011, after landing

Source: Thai Meteorological Department

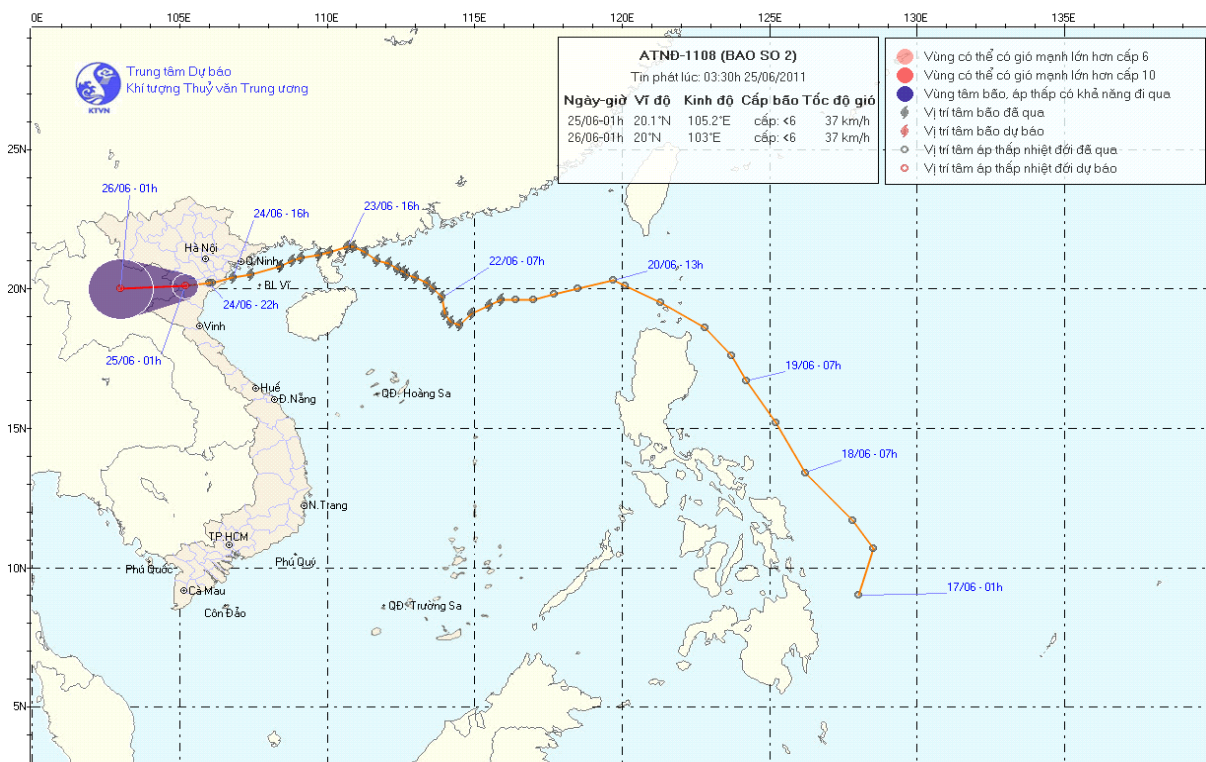


Figure 5: Storm track of HAIMA

Source: Viet Nam National Centre for Hydro-Meteorological Forecasting

Other weather phenomena that affect the discharge

No other weather phenomena affecting the discharge were observed.

Over weather situation

Severe weather situation occurred from 24th to 26th June. As the result of TS **HAIMA** influence together with strong SW monsoon appearance in the whole last week, heavy rain were occurred in the whole areas of Northern of Thailand, Lao PDR and Vietnam in this week particularly the areas from Luang Prabang to Mukdahhan/Savannakhet in the Lower Mekong Basin (LMB) (figure 6).

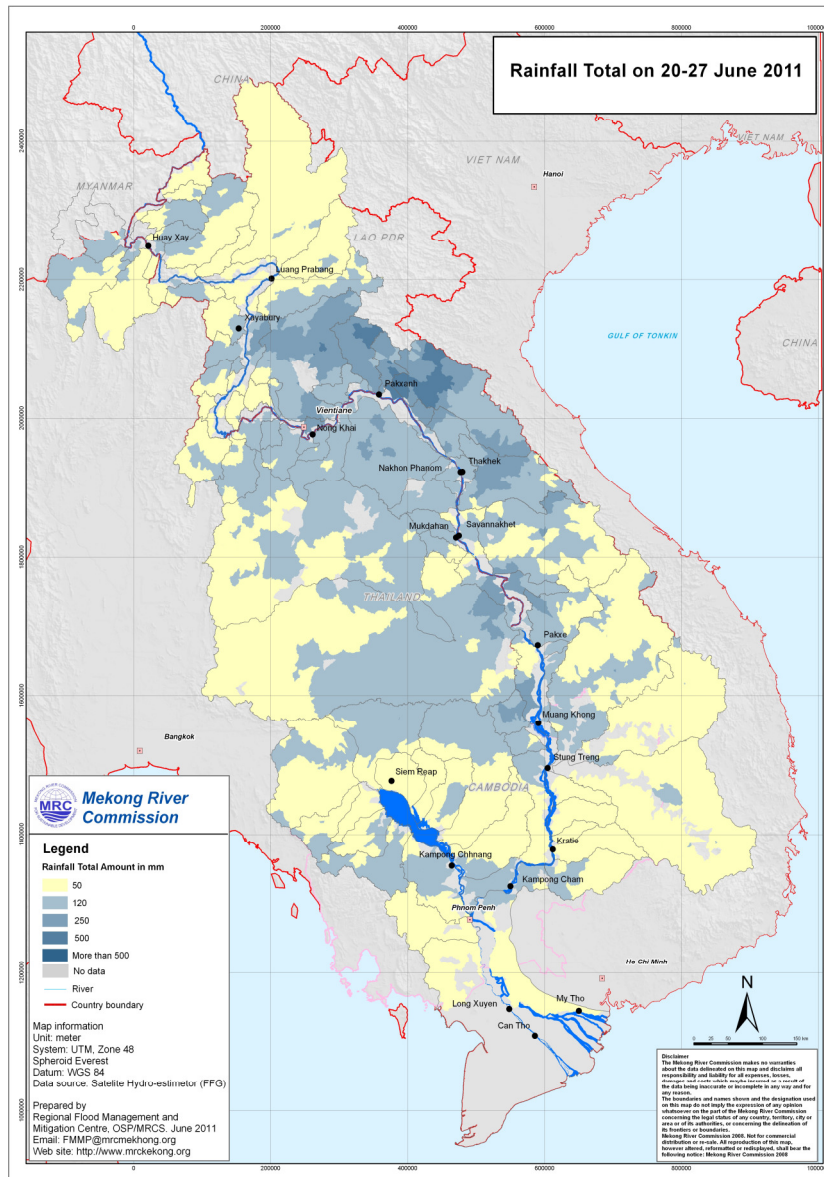


Figure 6: Rainfall distribution over the LMB, covering the week 20 - 26 June

General behaviour of the Mekong River

There is some inconsistency of water levels along the Mekong River during monitoring period. While water levels at most stations in the upper and middle reaches were rising sharply at the end of the week by the influence of HAIMA storm, water levels at stations in the lower reach from Strung Treng to Phnom Penh Port/Pnom Penh Bassac show a slightly rising trend during the first half of the week and then falling at the end of the week. Regarding to two stations in downstream at Tan Chau and Chau Doc, water levels at those two stations were fluctuated by tidal with an increasing trend toward the end of the week.

For stations from Chiang Saen to Vientiane/ Nong Khai

Water levels at Chiang Saen and Vientiane/Nong Khai were more-or-less stable and three those stations were recording levels that are somewhat around the long-term average for this time of the year. Water levels at stations Luang Prabang to Chiang Khan were more-or-less stable till the mid of the week and then rose up rapidly toward the end of the week as the result of heavy rain due to HAIMA tropical storm (Figure 7).

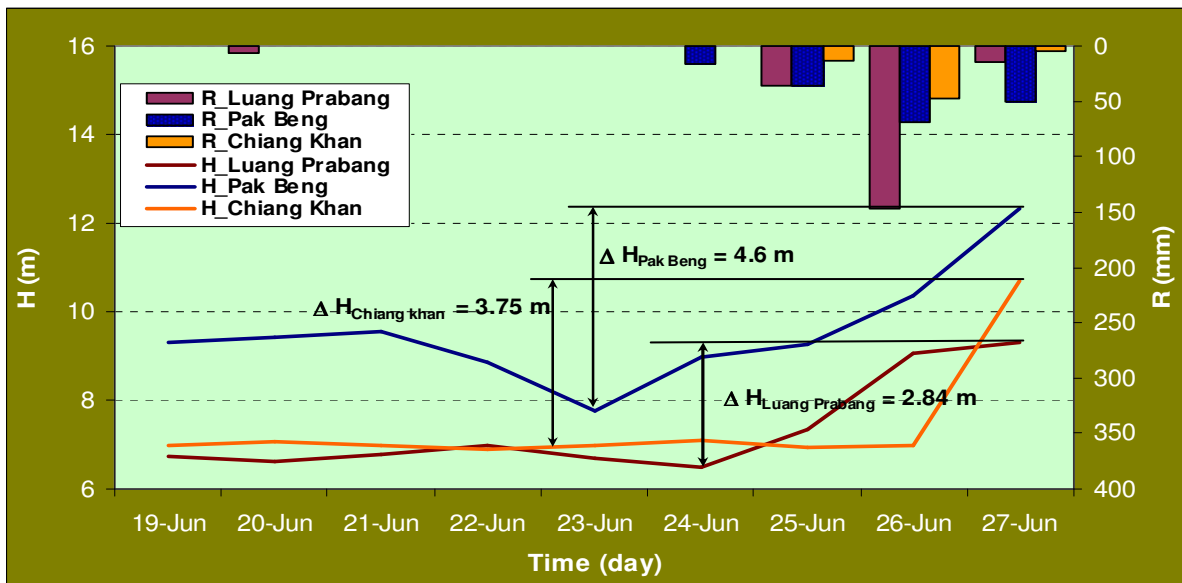


Figure 7: Rapidly rising of water levels at stations: Luang Prabang, Chiang Khan and Pak Beng

For stations Paksane, Nakhon Phanon/Thakhet

In the first half of the week, water levels at Paksane, Nakhon Phanon and Thakhet were more-or-less stable and somewhat below the long-term average for this time of the year. From 24th to the end of the week, as the result of HAIMA TS influence, water levels at three those stations were increasing rapidly with water rising intensity of 1.0 – 1.3 per/days and its were recording levels that are above the long-term average for this time of the year (Figure 8).

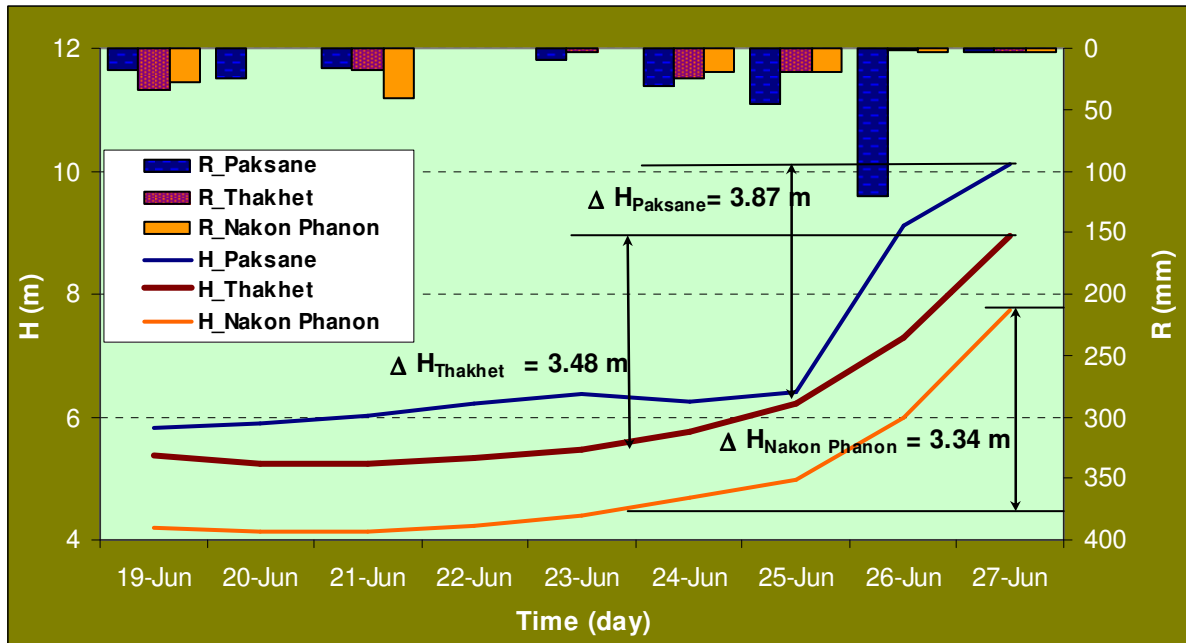


Figure 8: Rapidly rising of water levels at stations: Paksane, Nakon Phanon and Thakhet

Water levels at stations on the left bank tributaries of Lao PDR such as at Muong Kao of Nam Sane River, at Muong Mai of Nam Nhiep, at Ban Phone Si of Nam Ca Dinh, at Mahaxai of Se Bang Fai River, were increasing sharply with water increasing intensity of 4.27m; 7.5m and 3.6m, respectively from 25 to 26 June (Figure 9).

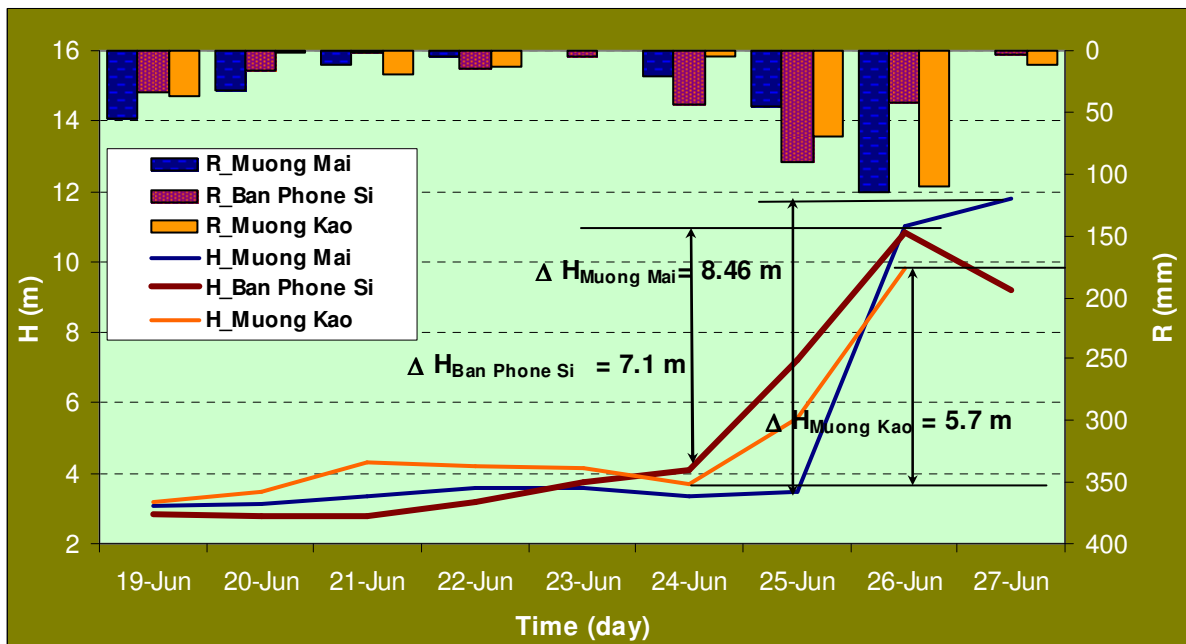


Figure 9: Sharply increasing of water levels at stations on tributaries: Nam Sane at Muong Kao, Nam Nhiep at Muong Mai, Nam Ca Dinh at Ban Phone Si

Figure 10 shows amount rainfall distribution in the whole LMB from 24th to 27th June, when HAIMA storm together with strong South west monsoon activity affected to the upper and middle parts of LMB. Recorded rainfall was 199.4mm at Paksane; 180.6mm at Muong Mai; 180.2mm at Ban Phone Si; 196.5mm at Muong Kao.

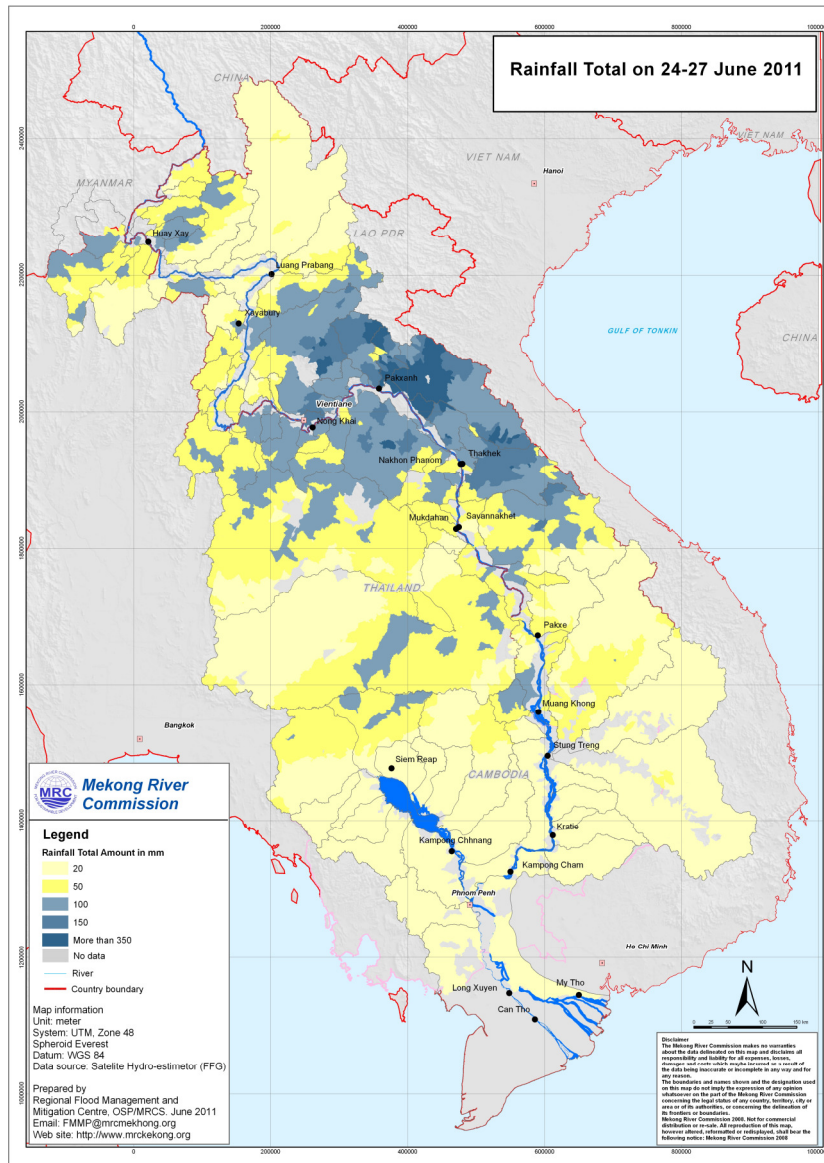


Figure 10: Rainfall distribution over the LMB, covering the period of TS HAIMA affect (24- 27) June

For stations from Mukdahan/Savannakhet to Pakse

Water levels were more-or-less stable till the mid of the week and then increasing towards the end of the reporting period. Most stations are somewhat around the long-term average for this time of the year. Water levels at Mukdahan and Savannakhet rose up rapidly during the 26th and 27th June as the result of upstream water rising and contribution of tributary as Se Ban Fai river.

For stations from Strung Treng to Kampong Cham

Water levels at these stations show a rising trend from the beginning of the week to the mid of the week, then falling during the rest of the monitoring period. Most stations are somewhat above the long-term average for this time of the year.

For stations from Phnom Penh to Koh Khel/Neak Luong

Water levels were increasing in the first half of the week and then slightly falling down toward the end of the week. Most stations were recording levels that are somewhat around the long-term average for this time of the year.

Tan Chau and Chau Doc

Water levels show a rising trend during the reporting period. Both stations were recording levels that are somewhat below the long-term average for this time of the year and significantly affected by tidal.

Note: for areas between forecast stations, please refer to the nearest forecast station.

Flood Situation

- Flood stage or alarm stage:

No alarm stage (where the forecast is expected to reach flood level within three days) was reported anywhere on the mainstream of the Mekong River during the past week. Water levels are still significantly below flood levels (as defined by the national agency) at all forecast stations.

- Damage or victims:

No damage or loss of life due to river flooding was recorded anywhere along the Mekong River during the past week.

For more details see the following annex:

- 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

Annex A: Graphs and Tables

Table A1: observed water levels

unit in m

| 2011 | 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 |
|-------------|----------|-------------|---------------|-------------|-----------|----------|---------|---------------|---------|----------|-------------|-------------|-------|-------------|--------|--------------|---------------------|-----------------|----------|------------|-----------|----------|----------|
| 20/06 | 536.71 | 3.96 | 6.60 | 7.08 | 3.62 | 4.45 | 5.88 | 4.12 | 5.23 | 4.10 | 2.38 | 4.60 | 3.87 | 5.20 | 11.95 | 6.36 | 3.57 | 2.76 | 3.29 | 2.26 | 2.64 | 0.43 | 0.19 |
| 21/06 | 537.02 | 3.53 | 6.76 | 6.98 | 3.70 | 4.60 | 6.03 | 4.13 | 5.25 | 4.07 | 2.40 | 4.57 | 3.91 | 5.27 | 12.75 | 7.16 | 3.88 | 2.92 | 3.52 | 2.48 | 2.92 | 0.57 | 0.27 |
| 22/06 | 536.90 | 3.42 | 6.99 | 6.88 | 3.65 | 4.57 | 6.20 | 4.24 | 5.34 | 4.15 | 2.87 | 4.65 | 4.08 | 5.67 | 13.20 | 7.67 | 4.22 | 3.15 | 3.82 | 2.72 | 3.23 | 0.73 | 0.40 |
| 23/06 | 536.17 | 3.99 | 6.69 | 6.96 | 3.55 | 4.48 | 6.36 | 4.40 | 5.47 | 4.24 | 3.01 | 4.72 | 3.87 | 5.69 | 13.64 | 8.13 | 4.48 | 3.59 | 4.03 | 2.88 | 3.47 | 0.82 | 0.45 |
| 24/06 | 536.20 | 3.83 | 6.48 | 7.09 | 3.58 | 4.47 | 6.26 | 4.68 | 5.74 | 4.36 | 3.05 | 4.81 | 3.91 | 5.45 | 13.55 | 8.32 | 4.69 | 3.81 | 4.22 | 3.02 | 3.67 | 0.91 | 0.55 |
| 25/06 | 535.65 | 3.45 | 7.34 | 6.94 | 3.73 | 4.62 | 6.42 | 4.98 | 6.20 | 4.66 | 3.38 | 4.91 | 4.04 | 5.10 | 13.07 | 8.17 | 4.67 | 3.80 | 4.23 | 3.02 | 3.66 | 0.96 | 0.65 |
| 26/06 | 535.98 | 3.81 | 9.06 | 6.99 | 3.85 | 4.72 | 9.09 | 5.98 | 7.27 | 5.14 | 4.02 | 5.05 | 4.06 | 5.10 | 12.55 | 7.70 | 4.48 | 3.60 | 4.09 | 2.88 | 3.52 | 1.00 | 0.75 |
| 27/06 | 537.01 | 3.81 | 9.32 | 10.69 | 4.32 | 5.00 | 10.13 | 7.74 | 8.95 | 6.80 | 5.82 | 5.59 | 4.35 | 5.25 | 12.46 | 7.42 | 4.30 | 3.41 | 3.98 | 2.77 | 3.37 | 1.11 | 0.94 |
| Flood level | | 11.80 | 18.00 | 17.40 | 12.50 | 12.20 | 14.50 | 12.70 | 14.00 | 12.60 | 13.00 | 16.20 | 12.00 | 12.00 | 23.00 | 16.20 | 12.00 | 11.00 | 7.90 | 8.00 | 10.00 | 4.20 | 3.50 |

Table A2: observed rainfall

Unit in mm

| 2011 | 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 | |
|-------|----------|-------------|---------------|-------------|-----------|----------|---------|---------------|---------|----------|-------------|-------------|-------|-------------|--------|--------------|---------------------|-----------------|----------|------------|-----------|----------|----------|-----|
| 20/06 | nr | nr | 5.8 | nr | nr | 0.6 | 24.2 | 0.5 | 0.5 | 5.8 | 5.2 | 7.2 | nr | 125.0 | nr | nr | nr | | nr | nr | nr | nr | nr | nr |
| 21/06 | 8.0 | 9.0 | nr | nr | 4.5 | nr | 15.6 | 40.5 | 17.1 | 40.2 | 44.4 | 19.7 | 28.3 | 60.0 | 12.0 | 0.7 | nr | | nr | 0.2 | nr | 7.4 | 3.0 | nr |
| 22/06 | nr | nr | nr | nr | nr | nr | 0.1 | 0.3 | nr | nr | nr | nr | nr | 30.0 | 6.2 | 25.7 | nr | | nr | nr | nr | nr | nr | 0.0 |
| 23/06 | nr | nr | nr | nr | nr | nr | 10.5 | 0.3 | 3.3 | nr | nr | nr | 3.4 | 1.0 | 12.4 | 5.3 | nr | | nr | nr | nr | 22.7 | 10.0 | nr |
| 24/06 | 5.0 | nr | nr | nr | nr | nr | 31.0 | 20.2 | 23.7 | nr | nr | nr | nr | nr | 12.8 | nr | 0.6 | | nr | 1.8 | nr | 0.0 | 11.0 | nr |
| 25/06 | 3.0 | 8.4 | 36.4 | 12.3 | 35.5 | 44.9 | 46.0 | 19.4 | 19.3 | 2.7 | 2.1 | 57.0 | - | nr | nr | nr | nr | | nr | nr | nr | nr | nr | nr |
| 26/06 | 2.0 | 87.0 | 147.6 | 46.9 | 48.4 | 49.5 | 119.9 | 2.5 | 1.3 | nr | nr | nr | nr | nr | nr | nr | nr | | nr | nr | nr | nr | nr | nr |
| 27/06 | 13.0 | 46.50 | 15.4 | 4.3 | 4.2 | 2.1 | 2.5 | 4.0 | 4.0 | 6.1 | 5.7 | 1.8 | nr | 30.5 | nr | nr | nr | | 1.80 | 11.40 | nr | 6.90 | 1.00 | nr |

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

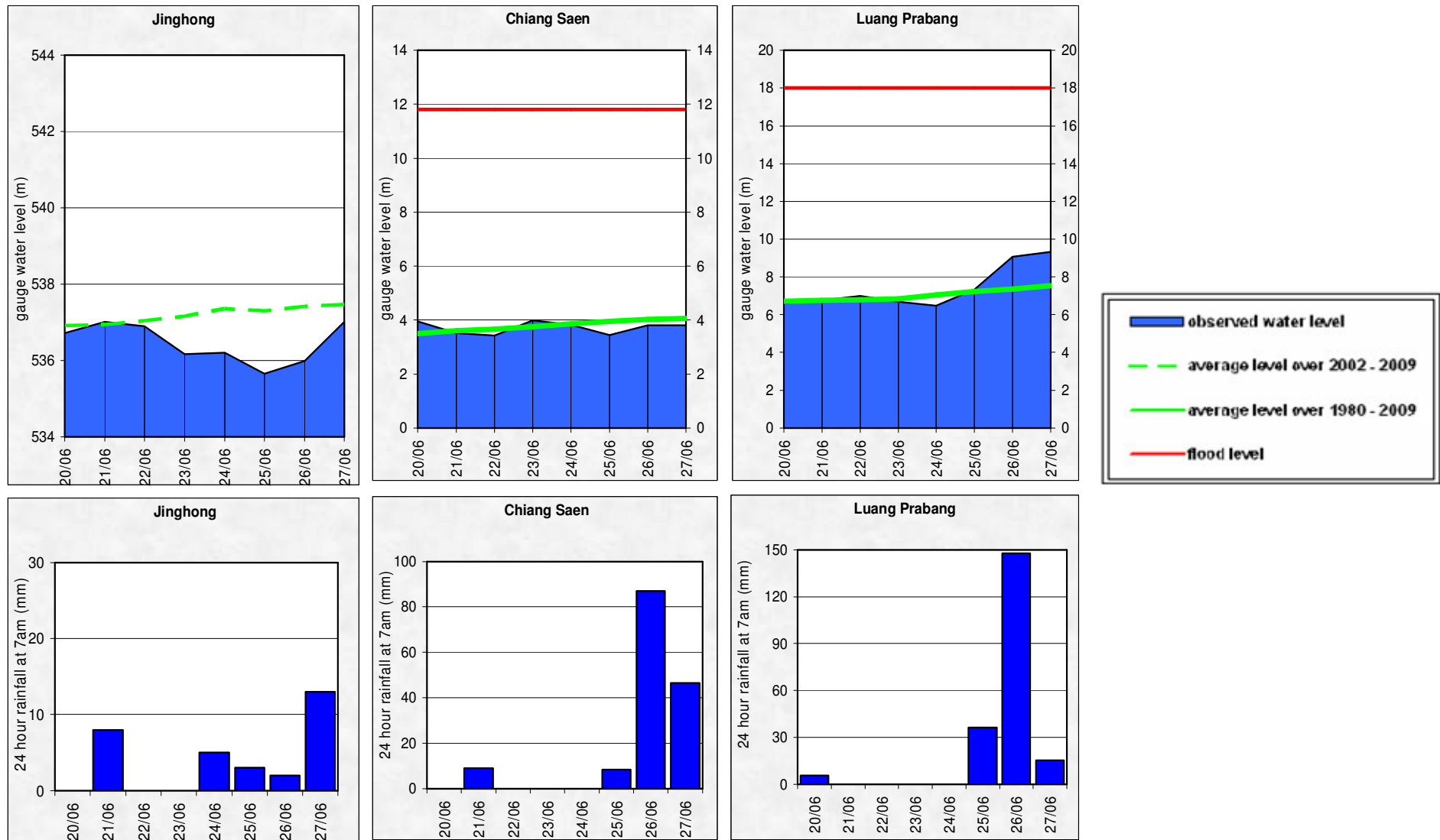


Figure A2: Water level and rainfall for Chiang Khan, Vientiane, Nongkhai, and Paksane

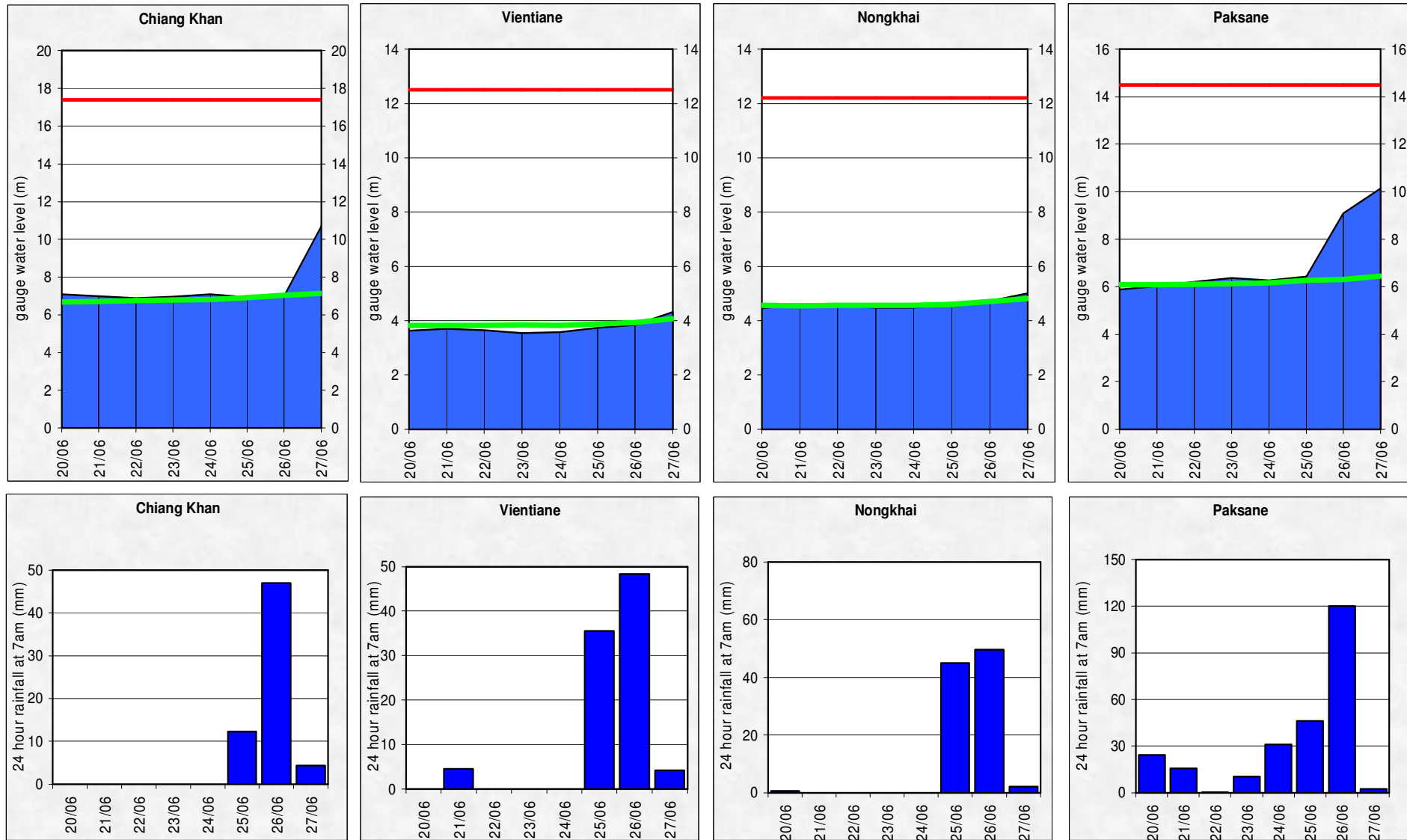


Figure A3: Water level and rainfall for Nakhon Phanom, Thakhek, Mukdahan and Savannakhet

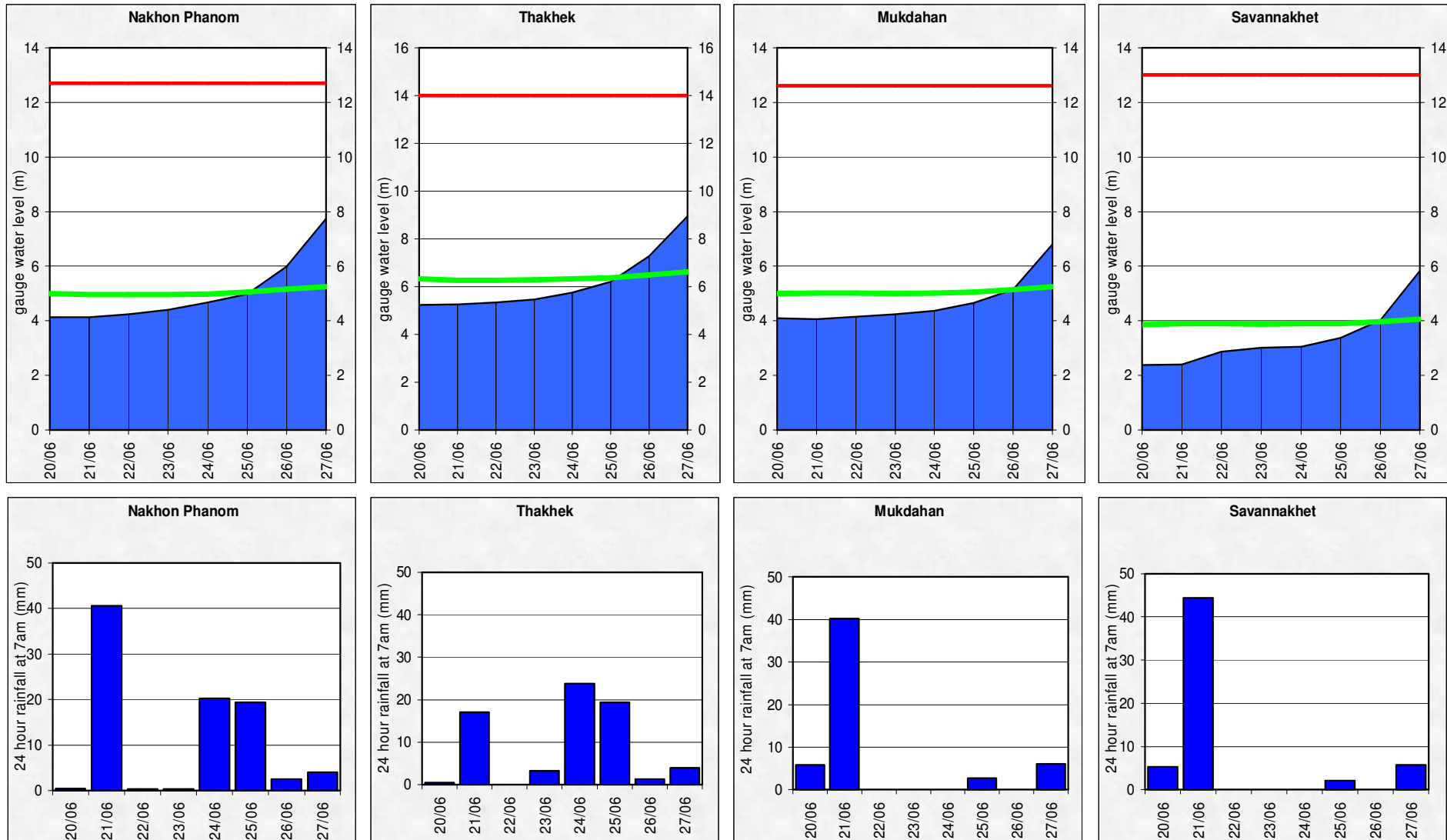


Figure A4: Water level and rainfall for Khong Chiam, Pakse, Stung Treng, and Kratie

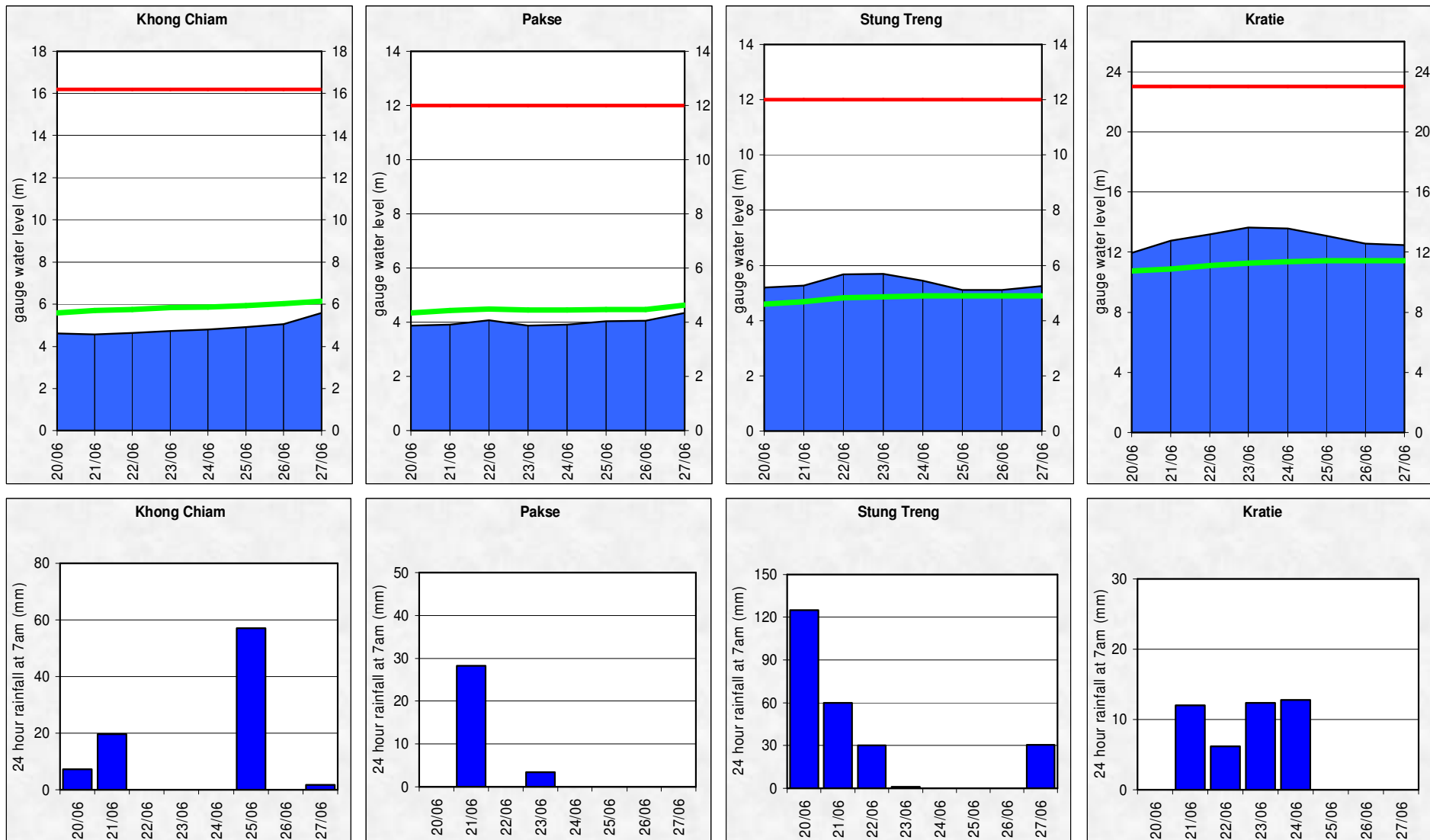


Figure A5: Water level and rainfall for Kampong Cham, Phnom Penh (Bassac and Port), and Koh Khel

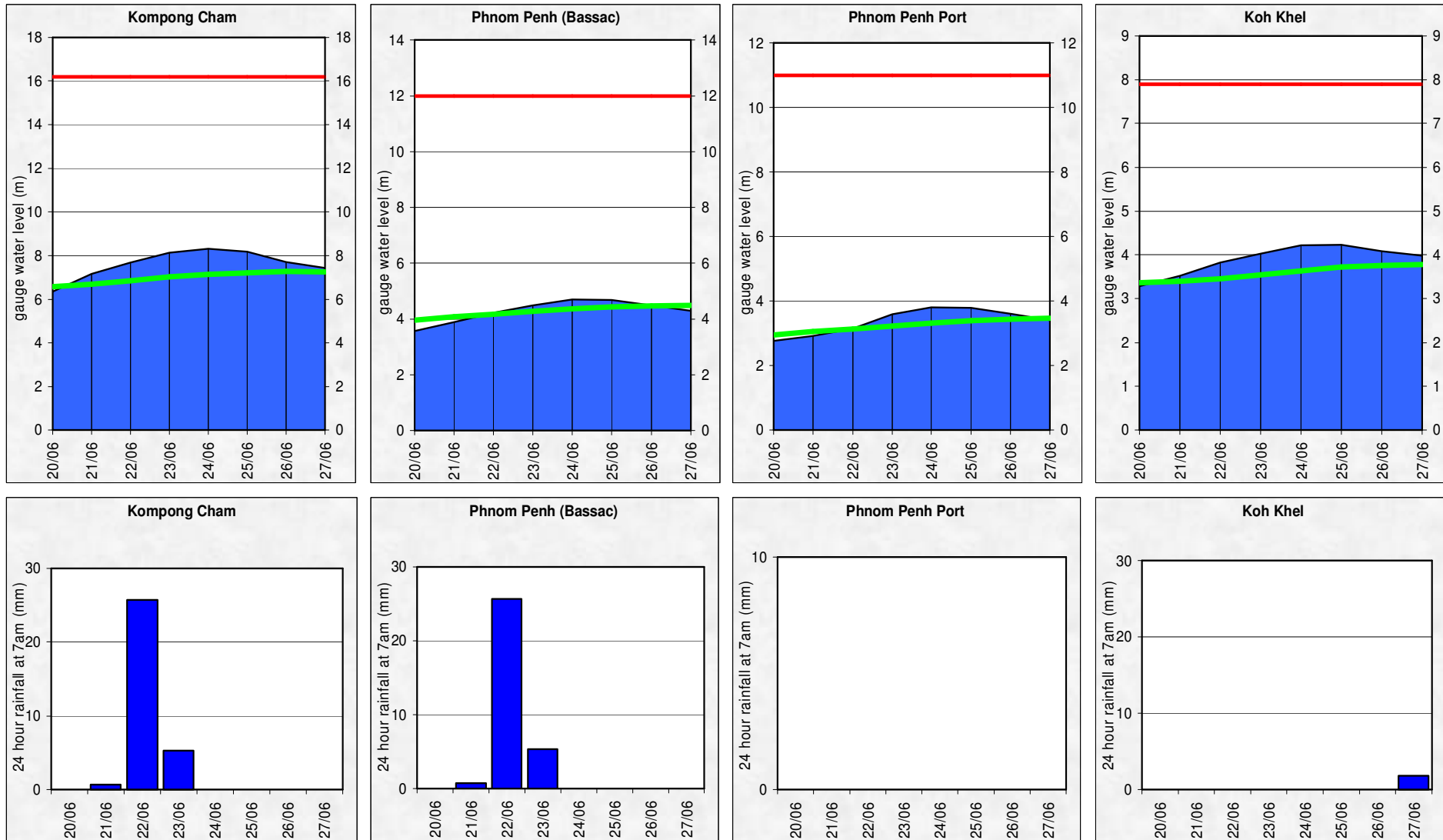
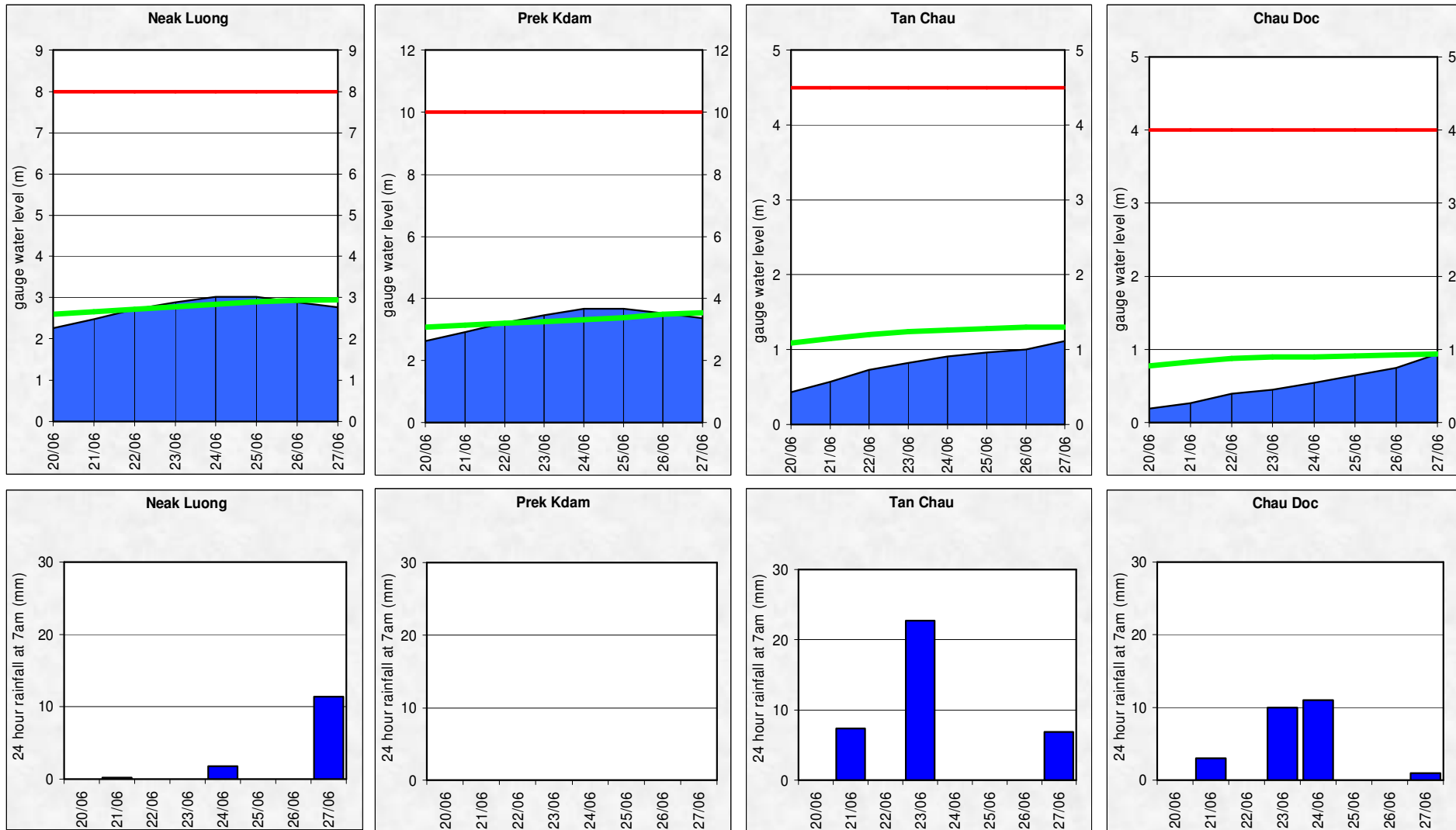


Figure A6: Water level and rainfall for Neak Luong, Prek Kdam, Tan Chau and Chau Doc



Annex B: Accuracy and performance

Accuracy

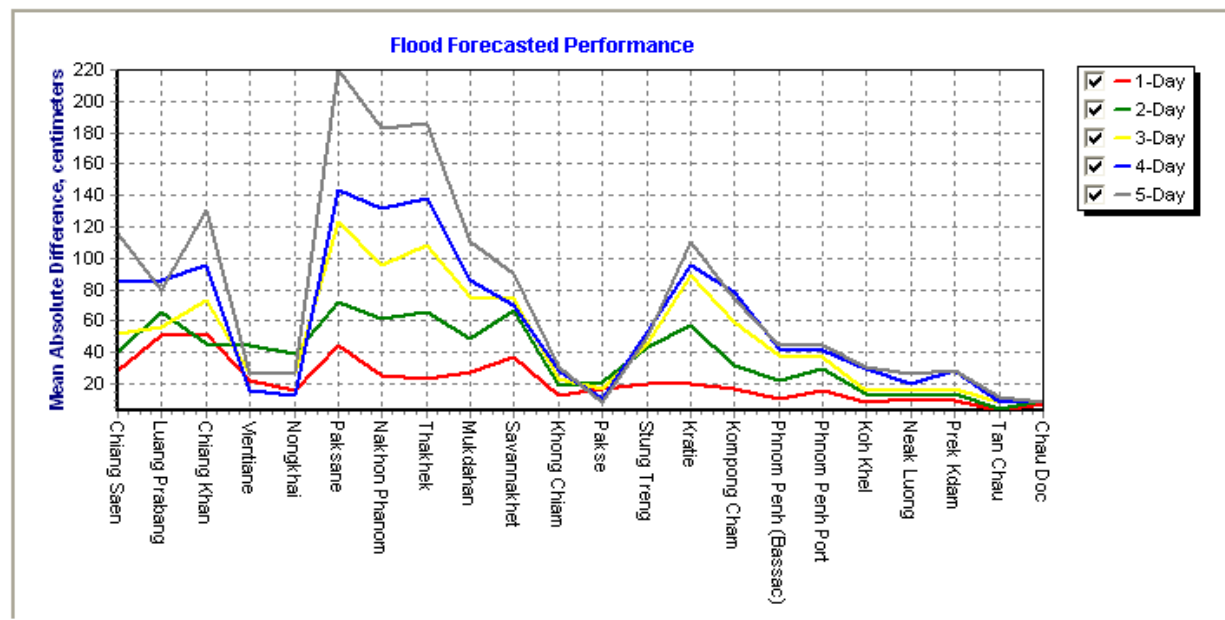
“Accuracy” describes the accuracy of the adjusted and published forecast, based on the results of the MRC Mekong Flood Forecasting System, which are then adjusted by the Flood Forecaster in Charge taking into consideration known biases in input data and his/her knowledge of the response of the model 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.

The graph of average difference between forecast and actual water levels for the past week shows the abnormal pattern in which the accuracies at stations in the upper reach were much better than that in the middle reach.

In general the overall accuracy is good for 1-day to 3day forecast lead time at stations in the upper and lower reaches of LMB, however accuracies at stations Paksane, Nakon Phanon/Thakhet and Kratie in the middle reach for 4-day and 5-day forecast were less than expected.

The differences due to 2 main factors: (1) high variability of the SRE and NWP when severe weather appearance by influences of strong SW and tropical storm; (2) internal model functionality in forecasting especially at those stations; for which the parameter adjustment in the model is not possible.

Figure B1: Average flood forecast accuracy along the Mekong mainstream



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: Achievement of daily forecast against benchmarks

unit in %

| | 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 | 28.6 | 57.1 | 71.4 | 42.9 | 57.1 | 42.9 | 42.9 | 28.6 | 57.1 | 14.3 | 71.4 | 28.6 | 28.6 | 14.3 | 57.1 | 71.4 | 28.6 | 71.4 | 57.1 | 71.4 | 100.0 | 71.4 | 71.4 | 50.6 |
| 2-day | 66.7 | 66.7 | 83.3 | 16.7 | 33.3 | 66.7 | 33.3 | 33.3 | 50.0 | 16.7 | 83.3 | 83.3 | 0.0 | 0.0 | 50.0 | 33.3 | 16.7 | 50.0 | 66.7 | 66.7 | 100.0 | 66.7 | 66.7 | 49.2 |
| 3-day | 40.0 | 60.0 | 80.0 | 60.0 | 60.0 | 60.0 | 20.0 | 40.0 | 40.0 | 40.0 | 80.0 | 80.0 | 40.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 20.0 | 20.0 | 80.0 | 80.0 | 80.0 | 41.8 |
| 4-day | 25.0 | 50.0 | 50.0 | 100.0 | 100.0 | 50.0 | 25.0 | 25.0 | 50.0 | 75.0 | 75.0 | 100.0 | 75.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.0 | 25.0 | 50.0 | 75.0 | 75.0 | 46.6 |
| 5-day | 0.0 | 66.7 | 66.7 | 100.0 | 100.0 | 33.3 | 0.0 | 0.0 | 33.3 | 33.3 | 100.0 | 100.0 | 66.7 | 0.0 | 33.3 | 66.7 | 66.7 | 33.3 | 66.7 | 33.3 | 100.0 | 100.0 | 100.0 | 54.5 |

Table B2: Benchmarks of success (Indicator of accuracy in mean absolute error)

Unit in cm

| | 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 | 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 | 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 | 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 | 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 | 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.

Performance

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

Table B3: Overview of performance indicators for the past 5 days including the current report date

| | Flood Forecast: time sent | | | | Arrival time of input data (average) | | | | | | | Missing data (number) | | | | | | |
|---------------|------------------------------|---------------------------|-------------------------------|--|--------------------------------------|-------|-----------------|----------------|---------------|----------------|------------------|-----------------------|-------|-----------------|----------------|---------------|----------------|------------------|
| | FF completed and sent (time) | stations without forecast | FF2 completed and sent (time) | Weather information available (number) | NOAA data | China | Cambodia - DHRW | Cambodia - DOM | Lao PDR - DMH | Thailand - DWR | Viet Nam - NCHMF | NOAA data | China | Cambodia - DHRW | Cambodia - DOM | Lao PDR - DMH | Thailand - DWR | Viet Nam - NCHMF |
| 2011 | | | | | | | | | | | | | | | | | | |
| <i>week</i> | 10:22 | 0 | - | 8 | 08:12 | 09:54 | 07:25 | 05:21 | 09:05 | 07:58 | 07:13 | 0 | 4 | 8 | 54 | 134 | 0 | 36 |
| <i>month</i> | 10:10 | 1 | - | 25 | 08:12 | 10:32 | 07:30 | 05:51 | 09:06 | 08:01 | 07:14 | 0 | 4 | 32 | 374 | 568 | 12 | 180 |
| <i>season</i> | 10:10 | 1 | - | 25 | 08:12 | 10:32 | 07:30 | 05:51 | 09:06 | 08:01 | 07:14 | 0 | 4 | 32 | 374 | 568 | 12 | 180 |

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.

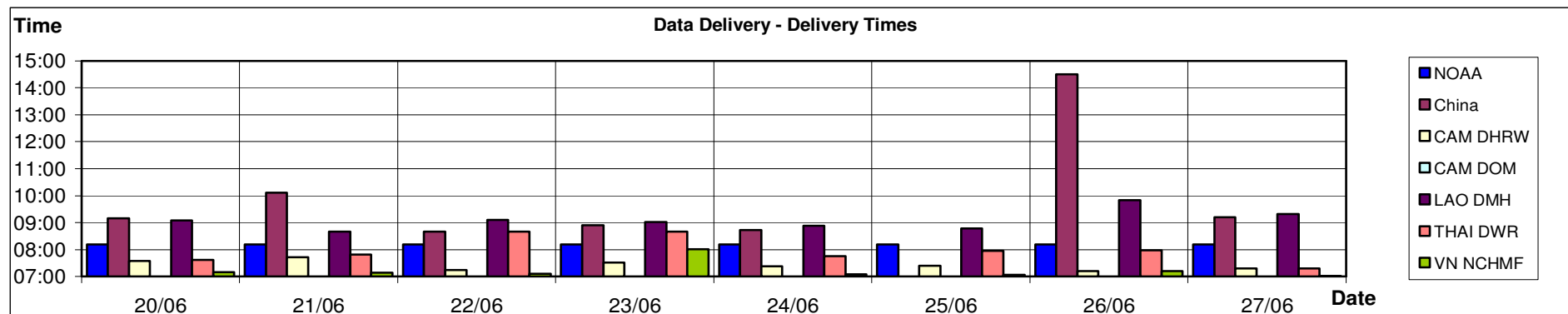


Figure B2: Data delivery times for the past 8 days including the current report date

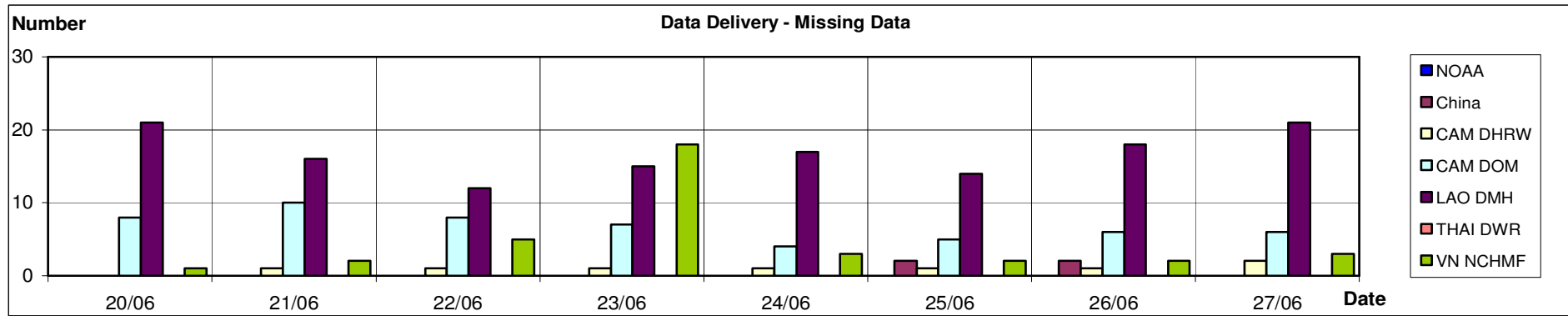


Figure B3: Missing data for the past 8 days including the current report date

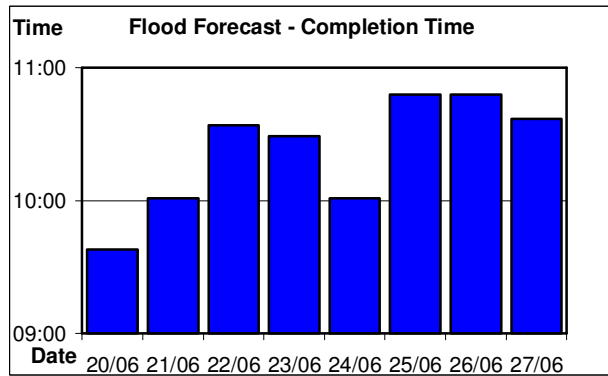


Figure B4: Flood forecast completion time

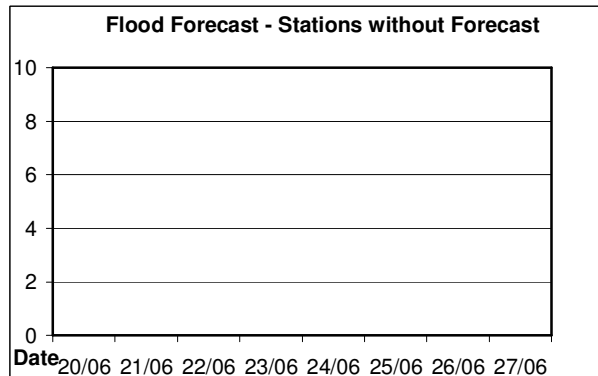


Figure B5: Flood forecast stations without forecast

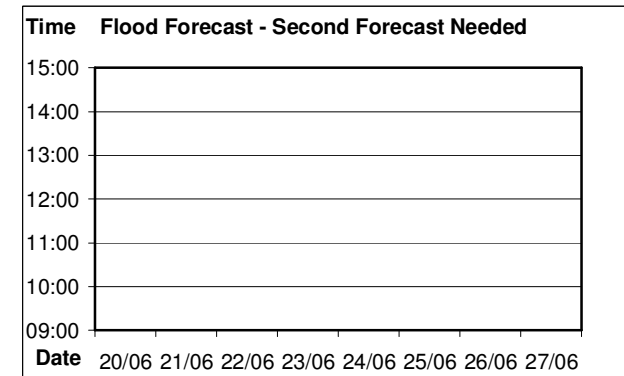


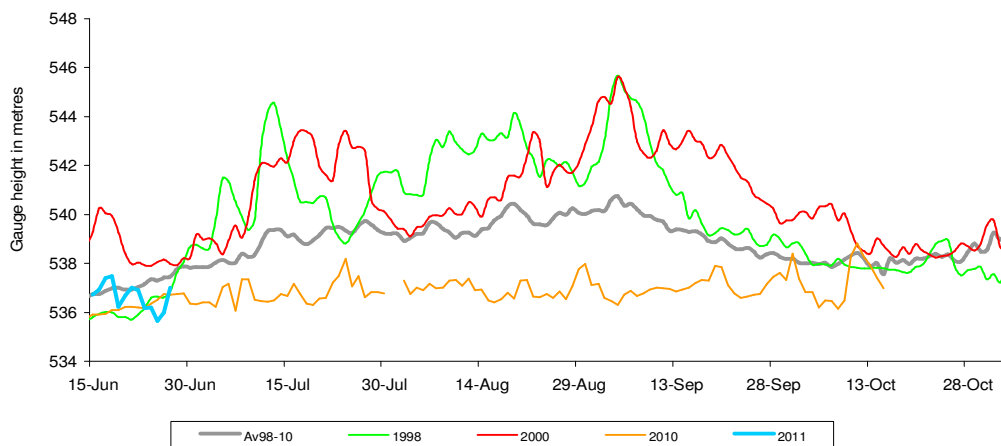
Figure B6: Second forecast needed

Annex C: Season Water Level Graphs

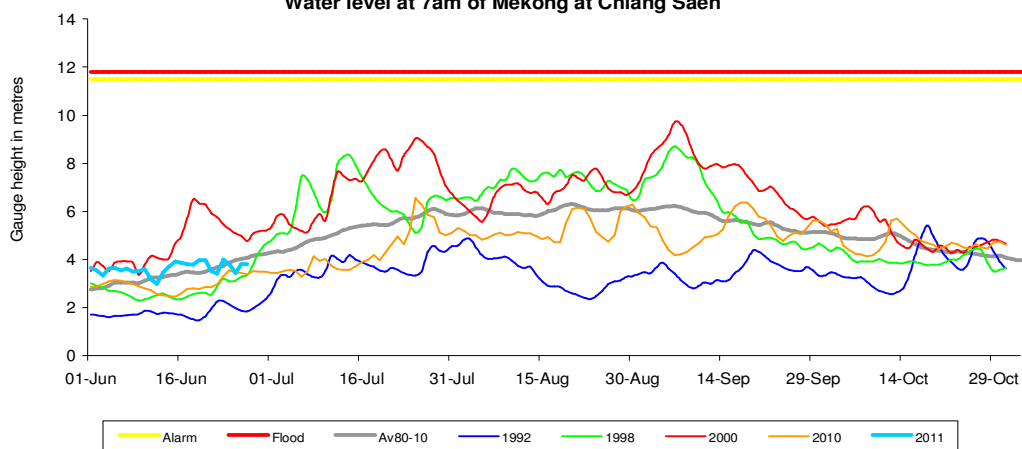
This Annex has the water level graphs of the report date. These graphs are distributed daily by email together with the Flood Bulletins.

HYDROGRAPHS OF THE MEKONG AT MAINSTREAM STATIONS IN FLOOD SEASON FROM 1 JUNE TO 31 OCTOBER

Water level at 7am of Mekong at Jing Hong



Water level at 7am of Mekong at Chiang Saen



Water level at 7am of Mekong at Luang Prabang

