Mekong River Commission

# Weekly Wet Season Situation Report in the Lower Mekong River Basin

## 10 – 16 September 2024

Prepared by
The Regional Flood and Drought Management Centre
17 September 2024

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# Key Messages

**Key messages for this weekly report are presented below.**

**Rainfall monitoring and forecast**

- In the period of 10 – 16 September 2024, light to very heavy rainfall has been observed over the LMB. Especially, heavy to very heavy rain occurred in some areas in Chiang Saen, Nong Khai, Muong Kao, Paksane, Nakhon Phanom, Thakhek, Pursat, Kratie, Svay Chrea, Sekong, Sesan.
- From 17 – 23 September 2024, moderate to heavy rain is expected in some areas in the central and lower part of the Lower Mekong Basin. Particularly, 20 – 21 September, heavy to very heavy rain is likely to occur in some areas of the central part of Lao PDR.

**Water level monitoring and forecast**

- At 22 key monitoring stations along the Mekong mainstream from 10 – 16 September 2024, water levels in all stations significantly increased, particularly at the upper stretch of the LMB. At Chiang Saen, Luang Prabang, Chiang Khan, Vientiane and Nongkhai, water level increased approximately 5 meters with few days. This caused those stations except for Chiang Saen to reach flood levels for few days. The total accumulated volume of the reverse flow to Tonle Sap Lake remains 18.28 Km3.
- In the period of 17 – 21 September 2024, water levels at upstream stations along Mekong mainstream from are likely expected to drop and return to normal conditions. From Nakhon Phanom downward, water levels are expected to significantly rise. However, it is expected that those station are likely still in normal conditions, which do not reach alarm and flood levels.

**Drought condition and forecast**

- From 10 - 16 September 2024, the LMB is experiencing moderate and severe droughts in some areas of the central and lower part. Severe drought occurs in some areas of the eastern part of Borikhamxai and Khammouan (Lao PDR); Battamabang, Banteay Meanchey, and Mondulkiri (Cambodia). The observed drought was caused primarily by meteorological indicator.
- From 17 - 23 September: the Lower Mekong Basin is likely at normal conditions. No drought is forecasted for the whole region.

# 1 Introduction

This Weekly Wet Season Situation Report presents a preliminary analysis of the weekly hydrological situation in the Lower Mekong River Basin (LMB) for **10** – **16 September 2024**. The trend and outlook for water levels are also presented.

This analysis is based on the daily hydro-meteorological data provided by the Mekong River Commission (MRC) Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – and on satellite data. The water level indicated in this report refers to an above zero gauge of each station.

The report covers the following topics that are updated weekly:

- General weather patterns, including rainfall patterns over the LMB.
- Water levels in the LMB, including in the Tonle Sap Lake.
- Flash flood and drought situation in the LMB.
- Weather, water level and flash flood forecast, and
- Possible implications.

Mekong River water levels are updated daily and can be accessed from:
http://ffw.mrcmekong.org/bulletin.php.

Drought monitoring and forecasting information is available at:
http://droughtforecast.mrcmekong.org

Flash flood information is accessible at: http://ffw.mrcmekong.org/ffg.php

# 2 General Weather Patterns

During 10 - 16 September 2024, light to very heavy rainfall has been observed over the LMB. Especially, heavy to very heavy rain occurred in some areas in Chiang Saen, Nong Khai, Muong Kao, Paksane, Nakhon Phanom, Thakhek, Pursat, Kratie, Svay Chrea, Sekong, Sesan.

**Figure 1** presents the mean sea level pressure over the region. At 07:00 on 17 September, the centre of the tropical depression was at about 16.9 degrees North latitude; 120.9 degrees East longitude, on the mainland of Lu Dong Island (Philippines). The strongest wind near the centre of the tropical depression is from 50-60km/h, moving westward at a speed of 15-20km/h. In the next 24 to 48 hours, the tropical depression will move to the East Sea, at a speed of 25km/h, and strengthen into a storm. And in the next 48 to 72 hours, the storm is likely to change direction, moving West Northwest, at a speed 10km/h. Moderate to heavy rain is expected in some areas in the central and lower part of the Lower Mekong Basin. Particularly, 20 – 21 Sep, heavy to very heavy rain is likely to occur in some areas of the central part of Lao PDR due to the impact from the storm.

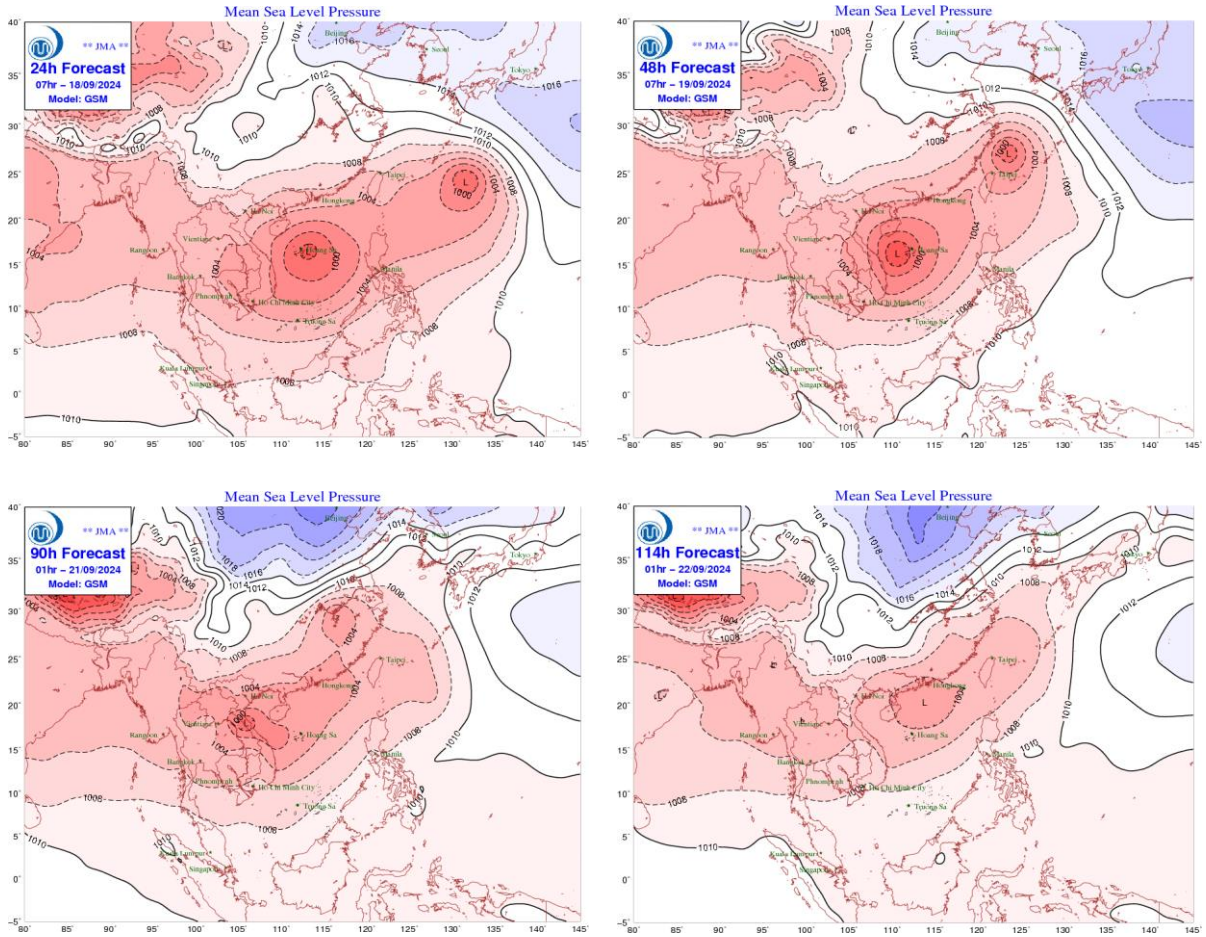



**Figure 1: Weather conditions over the LMB**

According to the ASEAN Specialised Meteorological Centre (ASMC, http://asmc.asean.org/home/), the subseasonal weather outlook (02 – 15 September 2024) indicates that wetter

conditions is expected to from lower to central part of the LMB, while warmer conditions are predicted at the upper part. **Figure 2** shows the outlook of weather condition from 02 – 15 September 2024 in Southeast Asia based on results from the NCEP model (National Centres for Environmental Prediction).

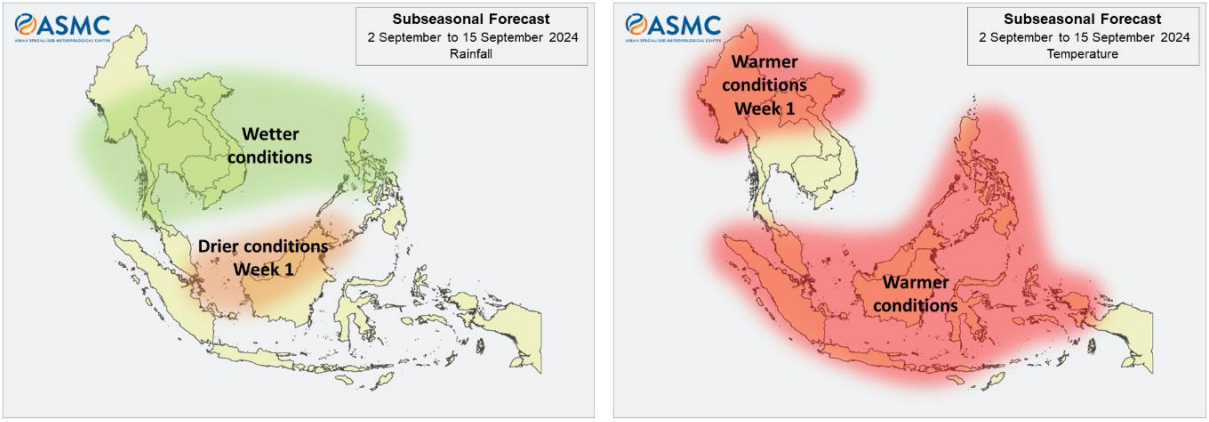



**Figure 2: Outlook of wet and dry conditions over the Asian countries by ASMC.**

Based on the tropical storm risk (TS) (https://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm), there is two active NW pacific system as of 17 September 2024 as displayed in **Figure 3.** This tropical depression may affect central LMB.

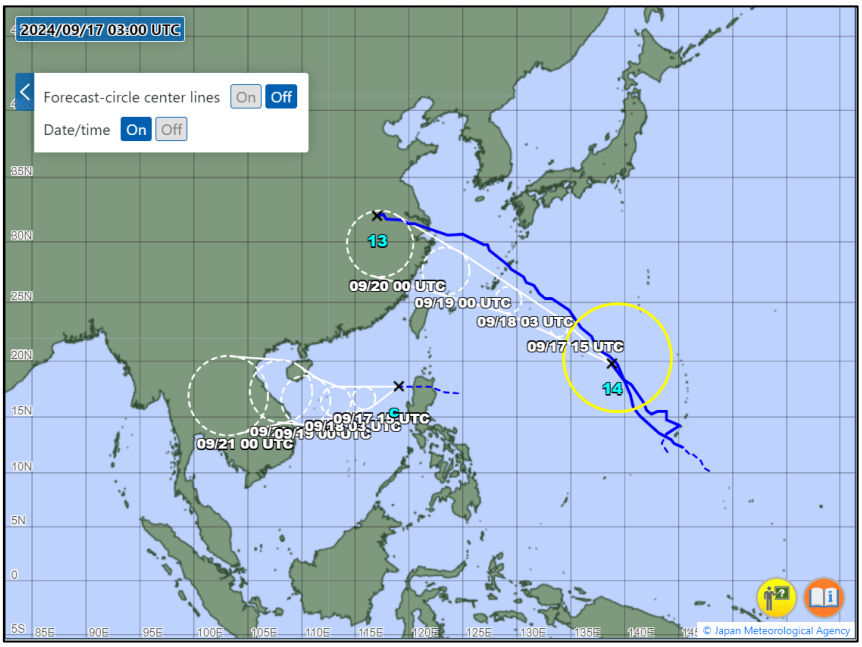



**Figure 3: One tropical storm risk observed on 16 September 2024**

# 3. Rainfall and Water Level Monitoring

## 3.1. Rainfall monitoring

The weekly accumulated rainfall is based on the observed data provided by the MRC Member Countries – Cambodia, Lao PDR, Thailand, and Viet Nam – from 10 - 16 September 2024 (**Figure 4**) light to very heavy rainfall has been observed over the LMB. Especially, heavy to

very heavy rain occurred in some areas in Chiang Saen, Nong Khai, Muong Kao, Paksane, Nakhon Phanom, Thakhek, Pursat, Kratie, Svay Chrea, Sekong, Sesan.

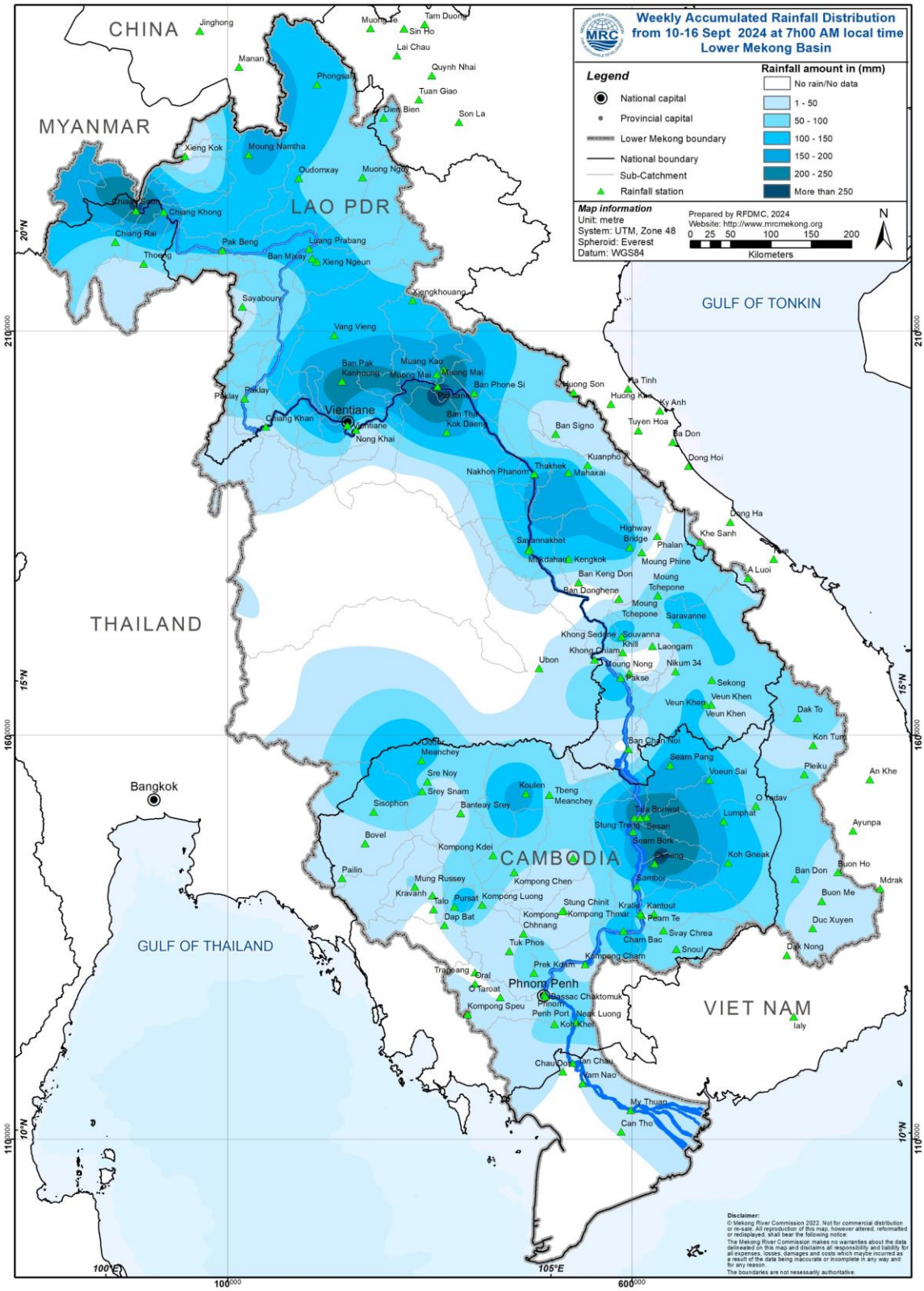



**Figure 4: Weekly rainfall distribution over the LMB during 10 – 16 September 2024**

## 3.2. Water level monitoring

The hydrological regimes of the Mekong mainstream are illustrated by recorded water levels and flows at key mainstream stations: at Chiang Saen to capture mainstream flows entering from the Upper Mekong Basin (UMB); at Vientiane to present flows generated by climate conditions in the upper part of the LMB; at Pakse to investigate flows influenced by inflows from the larger Mekong tributaries; at Kratie in Cambodia to capture overall flows of the Mekong Basin; and at Viet Nam's Tan Chau and Chau Doc to monitor flows to the Delta.

The key stations along the LMB and their respective model application for River Flood Forecasting during the wet season from June to October and River Monitoring during the dry season from November to May are presented in **Figure 5**. The hydrograph for each key station is available from the MRC's River Flood Forecasting: http://ffw.mrcmekong.org/overview.php.

During 10 – 16 September 2024, the observed water level (WL) at Jinghong hydrological station[1], was almost constant and ranges between 535.94 m and 535.32 m, which are corresponding to the outflow between 1,320.00 $m^3/s$ to 885.00 $m^3/s$ (recorded on 7:00 am), respectively (**Figure 6**). The water level in Chiang Saen station significantly increased approximately 5.37 m within just 3 days ranging from 4.36 m to 9.73 m. At the same period, the water level in Luang Prabang station also increased with an approximate value of 4.36 m from 14.66 m to 19.02 m as compared to the previous week. Water levels at Chiang Khan, Vientiane and Nongkhai have increased 5.04 m, 5.19 m, and 4.99 m, respectively. In this situation, water levels at Luang Prabang, Chiang Khan, Vientiane and Nongkhai had reached flood levels on 12 September, 13 September, 13 September, and 12 September, respectively. The increasing propagation also affects the downstream stations such as Paksane and Nakhon Phanom. Nakhon Phanom reached the alarm level on 16 September. However, they have not reached flood levels.

Water levels from Thakhek downward to stations in Cambodia such as Stung Treng, Kratie and other stations significantly increased as well. However, the flood risk for those stations has not yet been anticipated.

From to the previous week, the water levels from 10 to 16 September 2024 at Viet Nam's Tan Chau and Chau Doc, water levels have decrease from 2.06 m to 2.52 m and from 1.84 m to 2.41 m, respectively.

[1] Near-real time data of hydro-meteorological monitoring at the Jinghong hydrological station is available at https://portal.mrcmekong.org/monitoring/river-monitoring-telemetry.

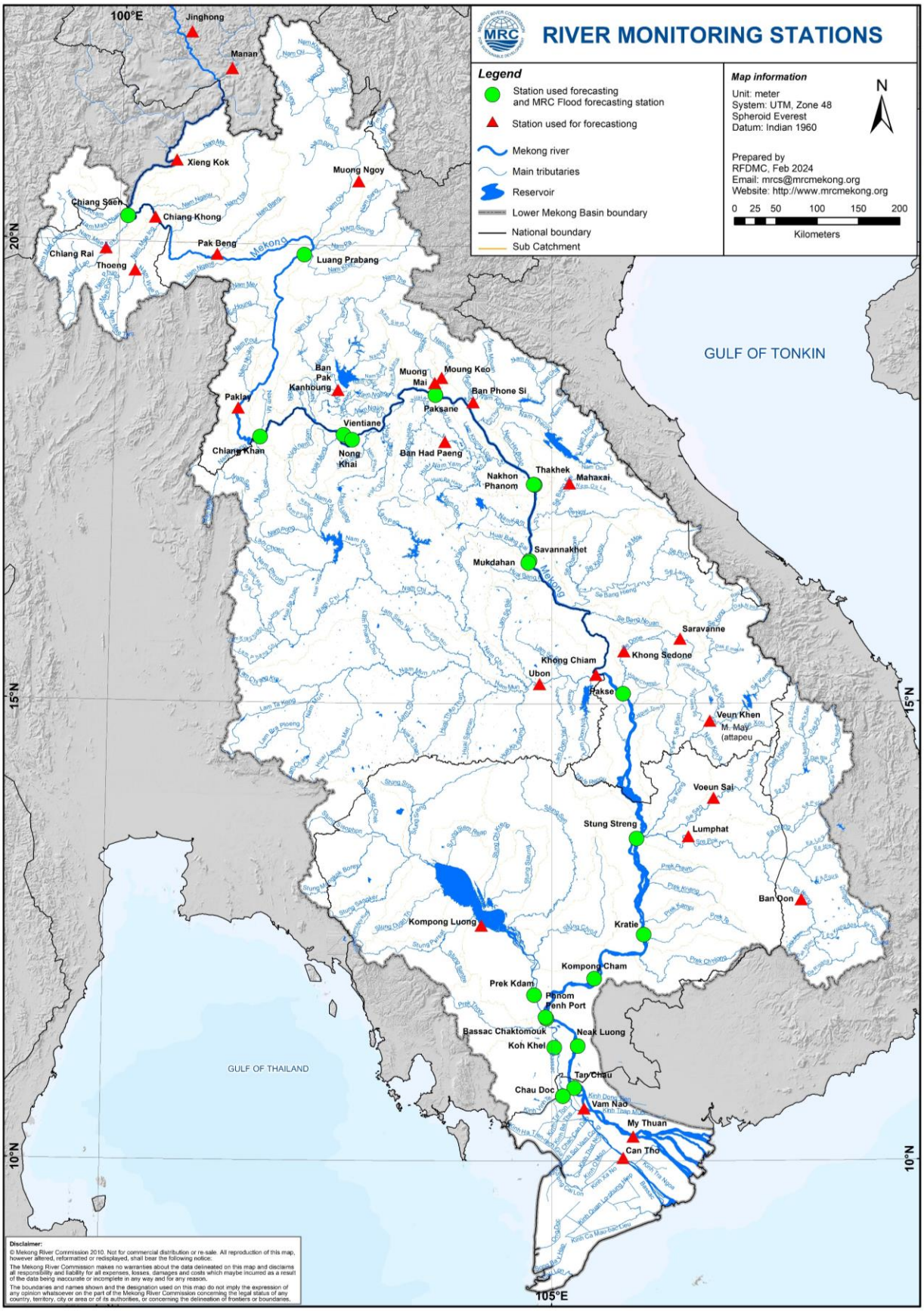



**Figure 5: The key stations along LMB for river flood forecasting**

The water levels in key monitoring stations on 16 September, water levels at upper stretch of LMB have reached alarm and flood levels. However, from Thakhek downward, it does not neither reach alarm nor flood levels. Moreover, all stations with available PMFM (Article 6C) thresholds are in normal conditions except for Chiang Saen and Vientiane. The graphics of water level monitoring in all key stations are presented in **Annex A** and the weekly water levels and rainfall at each key station are summarised in **Annex B**.

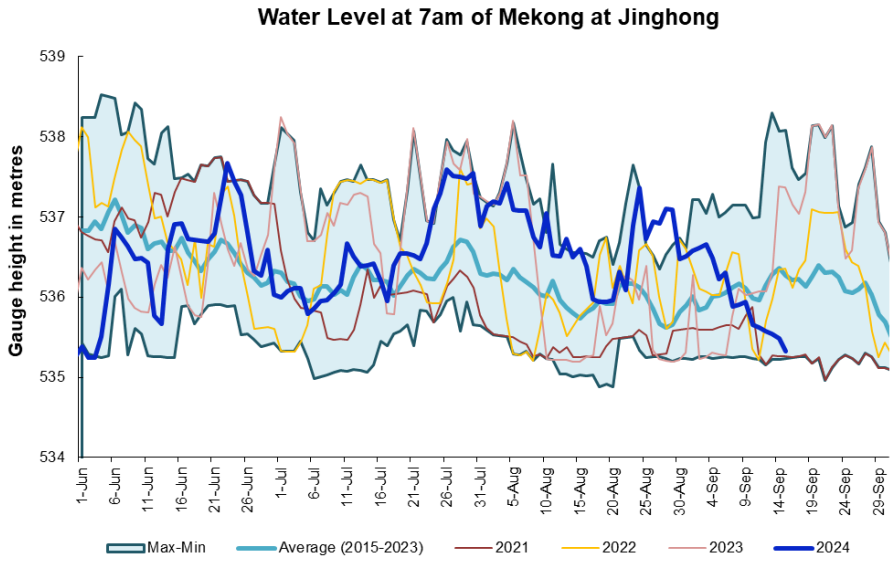



**Figure 6. Water level at the Jinghong hydrological station up to 16 September 2024.**

At the end of the wet season, when water levels along the Mekong River subside, the outflow of the Tonle Sap Lake (TSL) returns to the Mekong River and then to the Delta. This phenomenon normally takes place between September and October. Based on flow observation at Prek Kdam monitoring station, the inflow/reverse of the Tonle Sap Lake took place since 29 June 2024.

The outflow flow is calculated based on a formula of rating-curves using by difference of water levels at Kompong Luong and Phnom Penh Port stations for slop and Prek Kdam as cross-section of the Lake. The formula of flow is as follows:

$$Flow = WL_{Prek\ Kdam}^{1.2} \times \sqrt{|WL_{Phnom\ Penh\ Port} - WL_{Kampong\ Luong}|}$$

Where, WL is water level in m (msl).

The seasonal changes of the inflow/reverse flow and the outflow of the TSL at Prek Kdam in comparison with the flows of 2020, 2021 and 2022, 2023 and their LTA level (1997-2023) are illustrated in **Figure 7**. The reversed flow to the lake has returned since 16 September 2024 with accumulated volume of 18.28 $Km^3$. This may be resulted from high water contribution from upstream part of the LMB due to high rainfall in the past weeks.

The seasonal changes in monthly flow volumes up to 16 September 2024 for the TSL compared with that in 2020, 2021, 2022, 2023 and their LTAs, and the fluctuation levels (1997–2023) are

presented in **Table 8**. The mean monthly water volume of the Tonle Sap Lake in August 2024 is lower than its LTA (about 67.32 %), 2019, 2021, 2022 and 2023 but higher than only that in 2020 during the same period **(Figure 8 and Table 1)**. However, updated until 16 September 2024, the volume of the lake is approximately 59.21% of its LTA in September.

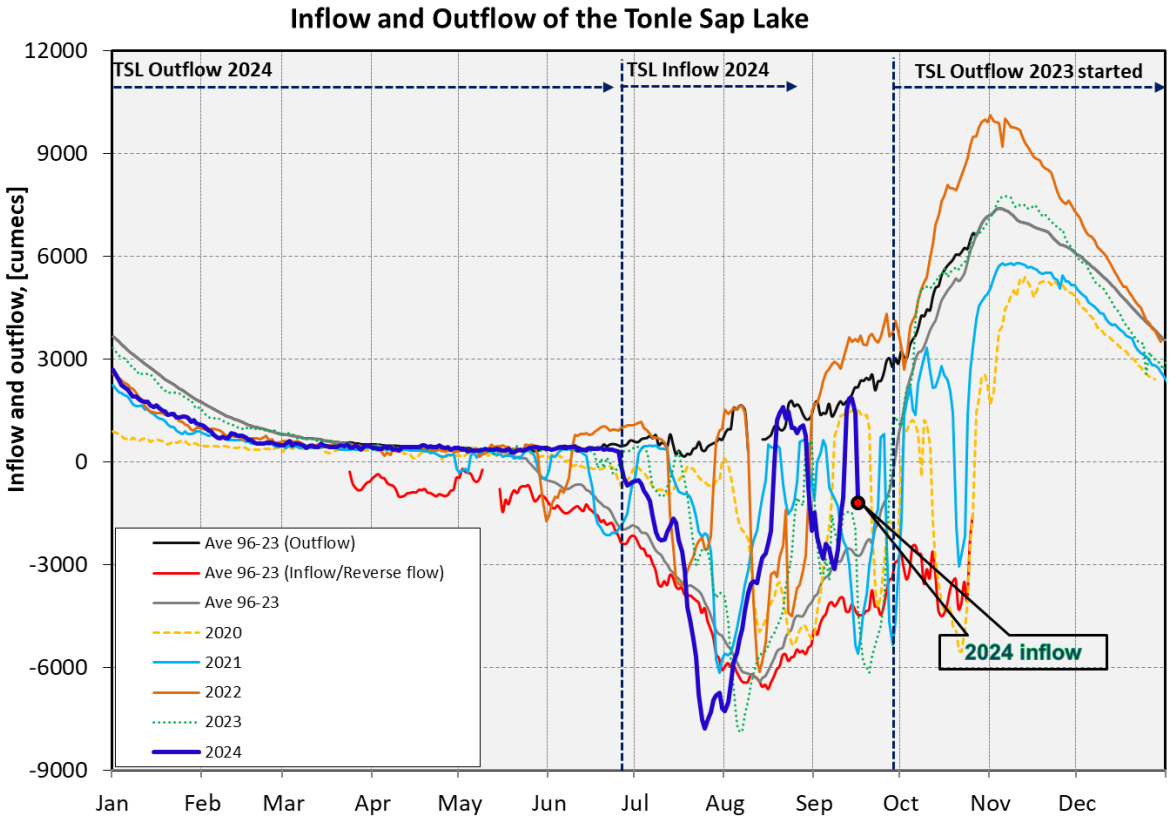



**Figure 7: Seasonal change of inflows and outflows of Tonle Sap Lake.**

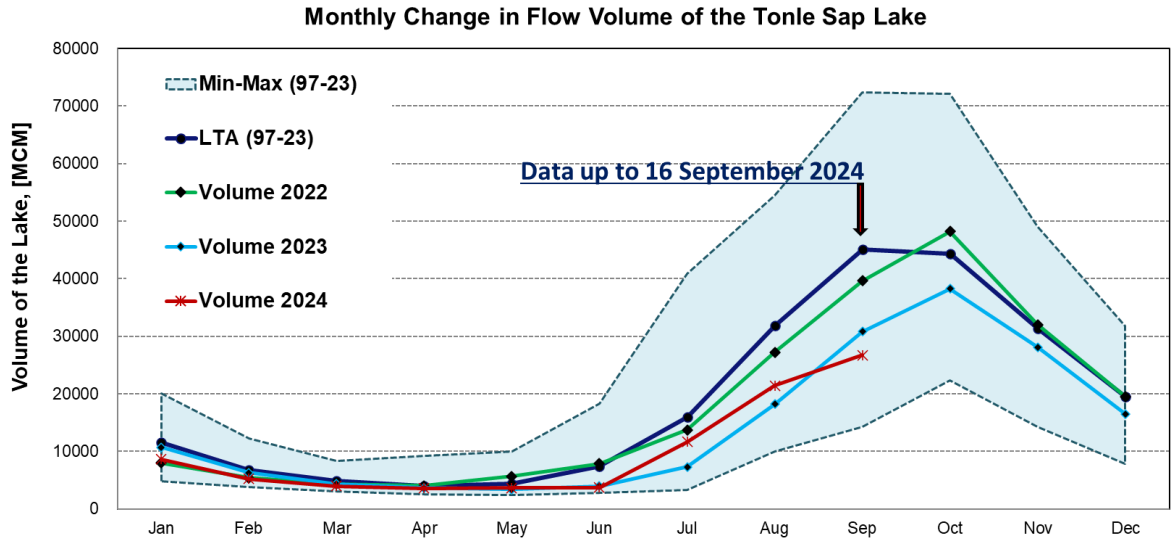



**Figure 8. The seasonal change in monthly volume of Tonle Sap Lake.**

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

| Month | LTA (97-22) [MCM] | Max Volume [MCM] | Min Volume [MCM] | Volume 2019 [MCM] | Volume 2020 [MCM] | Volume 2021 [MCM] | Volume 2022 [MCM] | Volume 2023 [MCM] | Volume 2024 [MCM] | Volume in 2024 [%], compared with its LTA |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan | 11487.13 | 20039.88 | 4796.69 | 7998.69 | 4796.69 | 7405.81 | 7998.69 | 10700.62 | 8610.88 | 74.96 |
| Feb | 6697.79 | 12266.87 | 3757.30 | 4954.90 | 3757.30 | 4671.15 | 5405.65 | 6309.00 | 5211.05 | 77.80 |
| Mar | 4822.51 | 8340.62 | 3030.40 | 3936.30 | 3259.79 | 4147.46 | 4330.50 | 4299.86 | 3936.30 | 81.62 |
| Apr | 4033.80 | 9203.09 | 2552.38 | 3317.61 | 2635.83 | 3259.79 | 4026.48 | 3609.52 | 3580.11 | 88.75 |
| May | 4376.15 | 9938.04 | 2441.69 | 3317.61 | 2469.30 | 3462.96 | 5668.52 | 3404.68 | 3609.52 | 82.48 |
| Jun | 7357.50 | 18344.65 | 2775.77 | 3580.11 | 2832.04 | 4765.22 | 7886.07 | 3936.30 | 3698.04 | 50.26 |
| Jul | 16001.18 | 40825.01 | 3230.96 | 4269.27 | 3230.96 | 7333.01 | 13751.91 | 7260.51 | 11671.87 | 72.94 |
| Aug | 31847.52 | 54529.13 | 10021.39 | 12266.87 | 10021.39 | 12453.19 | 27226.87 | 18168.63 | 21440.19 | 67.32 |
| Sep | 45088.00 | 72427.44 | 14251.59 | 35070.22 | 14251.59 | 22430.63 | 39624.67 | 30811.08 | 26696.26 | 59.21 |
| Oct | 44317.53 | 72124.19 | 22296.87 | 25074.27 | 28782.41 | 32331.33 | 48230.13 | 38255.90 | | |
| Nov | 31391.74 | 49030.83 | 14302.12 | 14302.12 | 23867.31 | 25218.90 | 31989.11 | 28075.12 | | |
| Dec | 19550.90 | 31734.10 | 7886.07 | 7886.07 | 13900.73 | 15599.94 | 19545.75 | 16466.19 | | |
| | Critical situation: lower than long-term minimum values (LTMIN) | | | | | | | | | |
| | Normal condition: within the range of long-term min (LTMIN) and max (LTMAX) values | | | | | | | | | |
| | Low volume situation: lower than long-term average (LTA) | | | | | | | | | |
| Unit: Million Cubic Meter (1 MCM= 0.001 $Km^3$) | | | | | | | | | | |

**Remarks:** the monthly volume of Tonle Sap Lake in 2024 is updated untill 16 Sept 2024.

## 4. Flash Flood in the Lower Mekong Basin

During the weekly monitoring period from 10 - 16 September 2024, the LMB received light to very heavy rain in some areas over the LMB.

According to the Southeast Asian Flash Flood Guidance System (SEAFFGS) and analysis, flash flood guidance was detected high level in the next 1, 3, and 6 hours in some areas of Lao PDR and Cambodia during this period, the reporting period as shown in Figure 14 and Table 2.

**Table 2.** Detected moderate to high-risk flash flood in Cambodia and Lao PDR on 11 September

| FLASH FLOOD GUIDANCE IN THE LOWER MEKONG BASIN | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| In the next 1hrs | | | In the next 3hrs | | | In the next 6hrs | | |
| Provinces | Districts | Level | Provinces | Districts | Level | Provinces | Districts | Level |
| Kampong Cham | Stueng Trang | Moderate | Mondul Kiri | Kaoh Nheaek | Moderate | Mondul Kiri | Kaoh Nheaek | Moderate |
| Mondul Kiri | Kaoh Nheaek | Moderate | Mondul Kiri | Pechr Chenda | Moderate | Mondul Kiri | Pechr Chenda | Moderate |
| Mondul Kiri | Ou Reang | Moderate | Ratana Kiri | Andoung Meas | Moderate | Ratana Kiri | Andoung Meas | Moderate |
| Mondul Kiri | Pechr Chenda | Moderate | Ratana Kiri | Koun Mom | Moderate | Ratana Kiri | Koun Mom | High |
| Mondul Kiri | Saen Monourom | Moderate | Ratana Kiri | Ou Chum | Moderate | Ratana Kiri | Ou Chum | High |
| Preah Vihear | Chhaeb | Moderate | Ratana Kiri | Ta Veaeng | High | Ratana Kiri | Ta Veaeng | High |

## FLASH FLOOD GUIDANCE IN THE LOWER MEKONG BASIN

| In the next 1hrs | | | In the next 3hrs | | | In the next 6hrs | | |
|---|---|---|---|---|---|---|---|---|
| **Provinces** | **Districts** | **Level** | **Provinces** | **Districts** | **Level** | **Provinces** | **Districts** | **Level** |
| Ratana Kiri | Andoung Meas | High | Ratana Kiri | Veun Sai | Moderate | Ratana Kiri | Veun Sai | Moderate |
| Ratana Kiri | Koun Mom | High | Stung Treng | Sesan | Moderate | Stung Treng | Sesan | Moderate |
| Ratana Kiri | Ou Chum | High | Stung Treng | Siem Bouk | Moderate | Stung Treng | Siem Bouk | Moderate |
| Ratana Kiri | Ta Veaeng | High | Stung Treng | Siem Pang | High | Stung Treng | Siem Pang | High |
| Ratana Kiri | Veun Sai | Moderate | Stung Treng | Thala Barivat | High | Stung Treng | Thala Barivat | High |
| Stung Treng | Sesan | Moderate | | | | | | |
| Stung Treng | Siem Bouk | Moderate | | | | | | |
| Stung Treng | Siem Pang | High | | | | | | |
| Stung Treng | Thala Barivat | High | | | | | | |

## FLASH FLOOD GUIDANCE IN THE LOWER MEKONG BASIN

| In the next 1hrs | | | In the next 3hrs | | | In the next 6hrs | | |
|---|---|---|---|---|---|---|---|---|
| **Provinces** | **Districts** | **Level** | **Provinces** | **Districts** | **Level** | **Provinces** | **Districts** | **Level** |
| Bokeo | Meung | Moderate | Bokeo | Meung | Moderate | Bokeo | Meung | Moderate |
| Khammuane | Xaybouath | High | Khammuane | Xaybouath | Moderate | Khammuane | Xaybouath | Moderate |
| Luangnamtha | Sing | Moderate | Luangnamtha | Sing | Moderate | Oudomxay | Xay | Moderate |
| Oudomxay | Hoon | Moderate | Oudomxay | Xay | Moderate | Phongsaly | Bounneua | Moderate |
| Oudomxay | Xay | High | Phongsaly | Bounneua | Moderate | Phongsaly | Bountay | Moderate |
| Phongsaly | Bounneua | Moderate | Phongsaly | Bountay | Moderate | Savannakhet | Vilabuly | Moderate |
| Phongsaly | Bountay | High | Savannakhet | Vilabuly | Moderate | Xiengkhuang | Morkmay | Moderate |
| Savannakhet | Atsaphone | Moderate | Xiengkhuang | Morkmay | Moderate | | | |
| Savannakhet | Vilabuly | Moderate | | | | | | |
| Xayaboury | Khop | Moderate | | | | | | |
| Xiengkhuang | Khoune | Moderate | | | | | | |
| Xiengkhuang | Morkmay | Moderate | | | | | | |
| Xiengkhuang | Pek | Moderate | | | | | | |

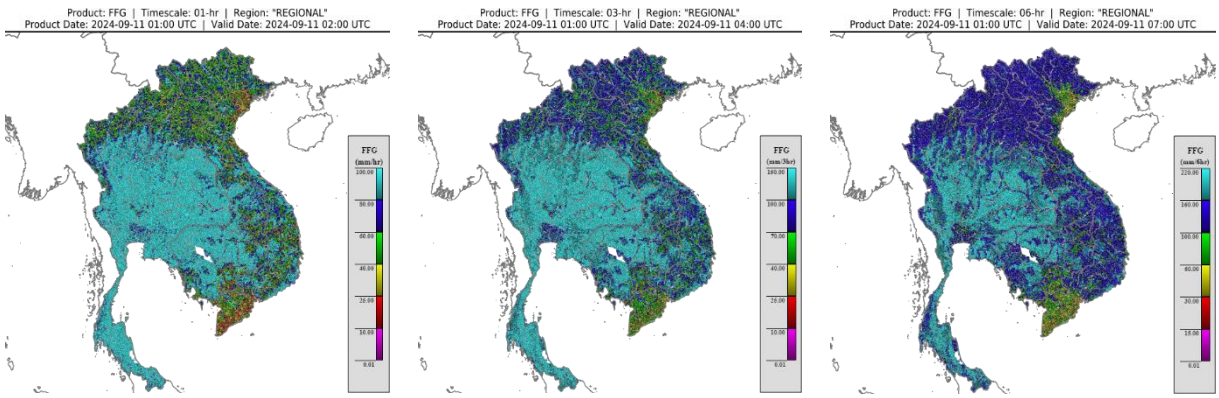



**Figure 9. Flash Flood risk for the next 12-hr and 24-hr on 11 September**

# 5. Drought Monitoring in the Lower Mekong Basin

## 5.2. Weekly drought monitoring from 10 - 16 September 2024

Drought monitoring data for 2024 are available from Monday to Sunday every week; thus, the reporting period is normally delayed by one day compared to Flood and Flash Flood reports. We adopt the Index of Soil Water Fraction (ISWF) data obtained from FFGS to represent soil moisture of agricultural indicator for both dry and wet seasons.

- **Weekly Standardised Precipitation Index (SPI1)**

As indicated in **Figure 10** below, during 10 - 16 September, the LMB is experiencing moderate and severe droughts in some areas of the central and lower part. Severe drought occurs in some areas of the eastern part of Borikhamxai and Khammouan (Lao PDR); Battamabang, Banteay Meanchey, and Mondulkiri (Cambodia).

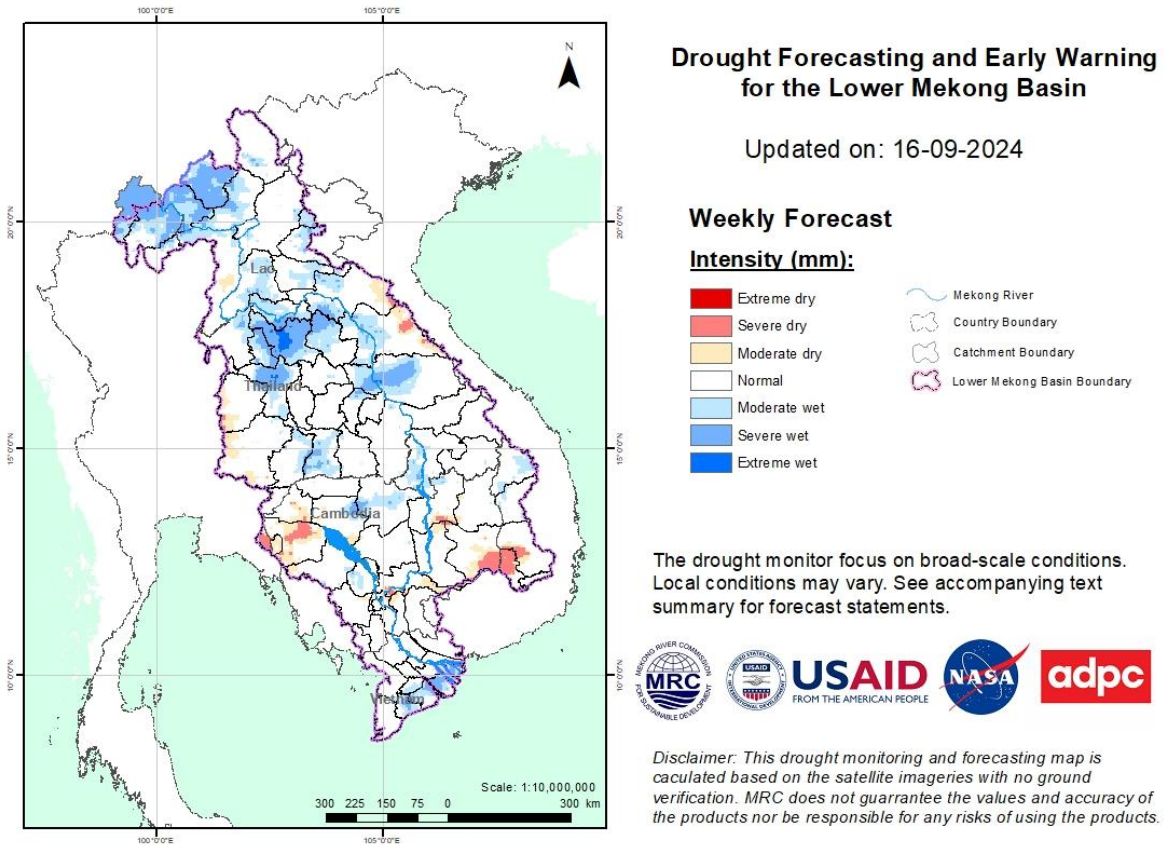



**Figure 10: Weekly standardized precipitation index from 10 – 16 September.**

- **Weekly Index of Soil Water Fraction (ISWF)**

There were some moderate agricultural droughts taking place during the monitoring week from 10 – 16 September 2024 and mainly in southern Lao PDR and Cambodia, see **Figure 10**.

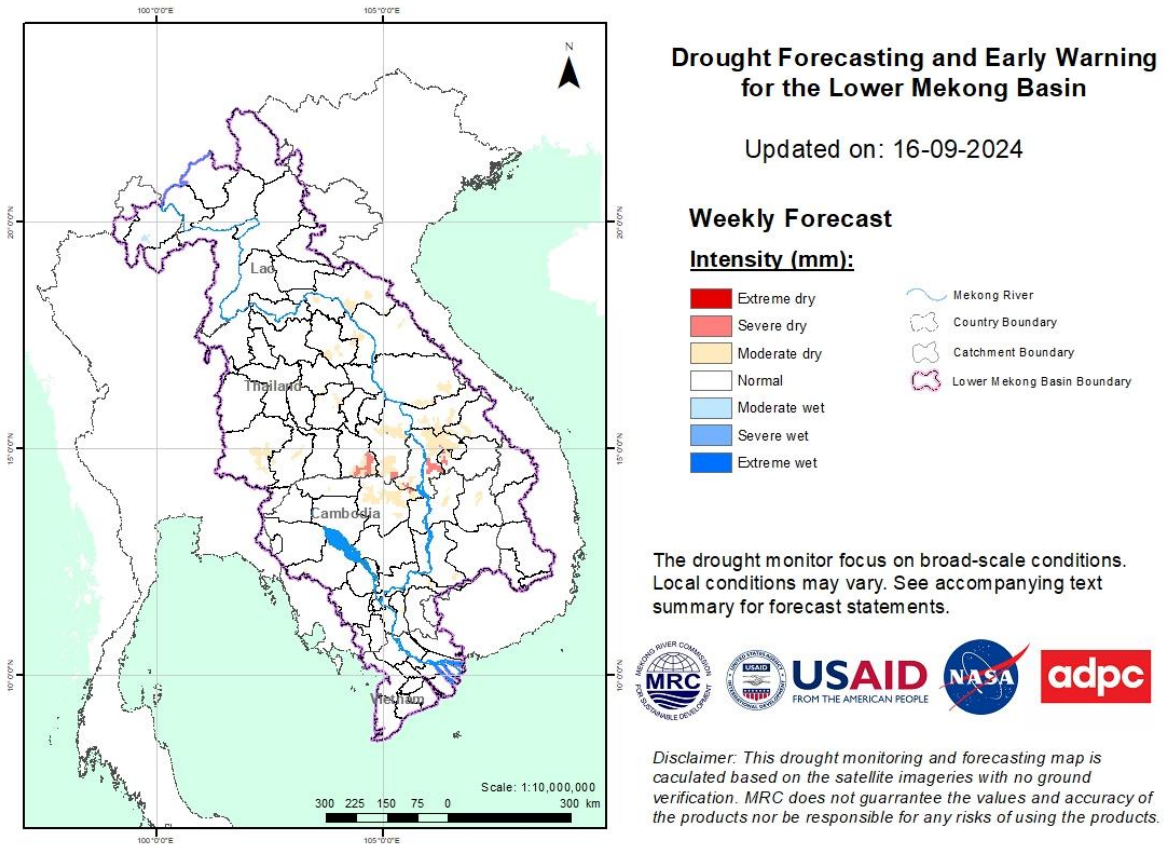



**Figure 11: Weekly Index of Soil Water Fraction from 10 – 16 September.**

- **Weekly Combined Drought Index (CDI)**

The combined drought indicator, **Figure 11**, shows that the LMB was experiencing moderate droughts droughts in some areas of the eastern part of Borikhamxai and Khammouan (Lao PDR); Battamabang, Banteay Meanchey, and Mondulkiri (Cambodia).

The impacted areas are listed below:

| Number | Country | Province | Mderate | Severe | Extreme | Exceptiona | Number | Country | Province | Mderate | Severe | Extreme | Exceptiona | Number | Country | Province | Mderate | Severe | Extreme | Exceptiona |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cambodia | Battamabang | | | | | 24 | Lao PDR | Oudomxai | | | | | 47 | Thailand | Udon Thani | | | | |
| 2 | Cambodia | Banteay Meanchey | | | | | 25 | Lao PDR | Loungprabang | | | | | 48 | Thailand | Sakon Nakhon | | | | |
| 3 | Cambodia | Kampong Cham | | | | | 26 | Lao PDR | Xayaburi | | | | | 49 | Thailand | Bueng Kan | | | | |
| 4 | Cambodia | Pursat | | | | | 27 | Lao PDR | Xiengkhouang | | | | | 50 | Thailand | Nakhon Phanom | | | | |
| 5 | Cambodia | Kampong Chhnang | | | | | 28 | Lao PDR | Vientiane | | | | | 51 | Thailand | Kalasin | | | | |
| 6 | Cambodia | Otdar Meanchey | | | | | 29 | Lao PDR | Vientiane Capital | | | | | 52 | Thailand | Mukdahan | | | | |
| 7 | Cambodia | Preah Vihear | | | | | 30 | Lao PDR | Xaisomboun | | | | | 53 | Thailand | Roi Et | | | | |
| 8 | Cambodia | Kampong Thom | | | | | 31 | Lao PDR | Borikhamxai | | | | | 54 | Thailand | Yasothon | | | | |
| 9 | Cambodia | Kratie | | | | | 32 | Lao PDR | Khammouan | | | | | 55 | Thailand | Amnat Charoen | | | | |
| 10 | Cambodia | Mondulkiri | | | | | 33 | Lao PDR | Savanakhet | | | | | 56 | Thailand | Ubon Ratchathani | | | | |
| 11 | Cambodia | Ratanakiri | | | | | 34 | Lao PDR | Salavan | | | | | 57 | Thailand | Si Sa Ket | | | | |
| 12 | Cambodia | Tbong Khmum | | | | | 35 | Lao PDR | Xekong | | | | | 58 | Thailand | Surin | | | | |
| 13 | Cambodia | Prey Veng | | | | | 36 | Lao PDR | Attapu | | | | | 59 | Thailand | Buri Ram | | | | |
| 14 | Cambodia | Kampot | | | | | 37 | Lao PDR | Champasack | | | | | 60 | Thailand | Nakhon Ratchasima | | | | |
| 15 | Cambodia | Takeo | | | | | 38 | Thailand | Chiang Mai | | | | | 61 | Viet Nam | Kon Tum | | | | |
| 16 | Cambodia | Svai Rieng | | | | | 39 | Thailand | Chiang Rai | | | | | 62 | Viet Nam | Gia Lai | | | | |
| 17 | Cambodia | Stung Treng | | | | | 40 | Thailand | Payao | | | | | 63 | Viet Nam | Dak Nong | | | | |
| 18 | Cambodia | Kampong Speu | | | | | 41 | Thailand | Loei | | | | | 64 | Viet Nam | Dak Lak | | | | |
| 19 | Cambodia | Kandal | | | | | 42 | Thailand | Nong Bua Lam Phu | | | | | 65 | Viet Nam | Dong Thap | | | | |
| 20 | Cambodia | Siem Reap | | | | | 43 | Thailand | Khon Kaen | | | | | 66 | Viet Nam | Tien Giang | | | | |
| 21 | Lao PDR | Bokeo | | | | | 44 | Thailand | Nong Khai | | | | | 67 | Viet Nam | An Giang | | | | |
| 22 | Lao PDR | Luangnamtha | | | | | 45 | Thailand | Chaiyaphum | | | | | | Other provinces of the Mekong Delta of Viet Nam have no data | | | | | |
| 23 | Lao PDR | Phongsali | | | | | 46 | Thailand | Maha Sarakham | | | | | | | | Moderate | | Severe | |
| | | | | | | | | | | | | | | | | | Extreme | | Exceptional | |

*Note:* S: short-term drought, less than 1 months; L: long-term drought, more than 1 month

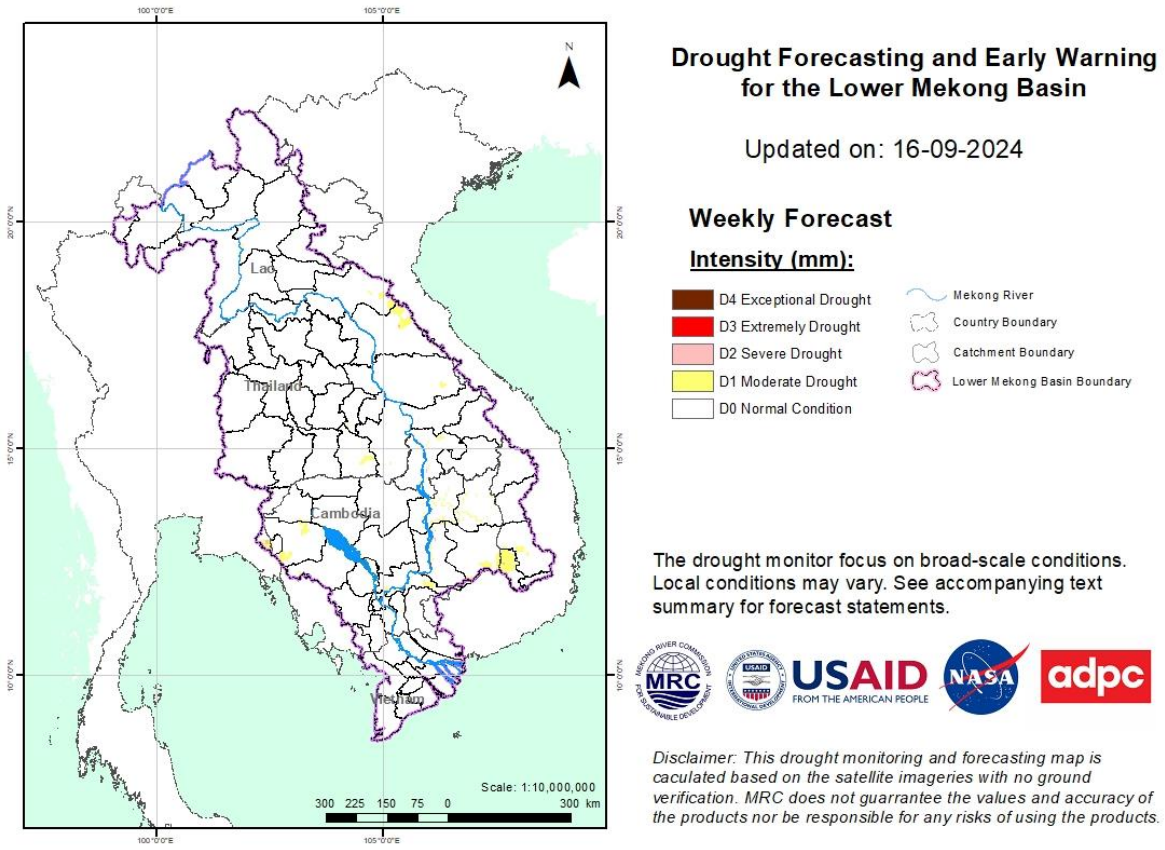



**Figure 12: Weekly Combined Drought Index from 10 - 16 September.**

More information on Drought Forecasting and Early Warning (DFEW) as well as the explanation is available here: http://droughtforecast.mrcmekong.org/templates/view/our-product. DFEW provides not only weekly monitoring and forecasting information but also a three-month forecast of drought indicators with seasonal outlook which are updated every month based on international weather forecast models. Details on drought forecast are described in section 6.4 of this report.

# 6 Weather and Water Level Forecast and Flash Flood information

## 6.1 Rainfall forecast

From 17 – 23 September 2024, the accumulated rainfall over the entire Lower Mekong Basin is distributed with light to heavy rain based on CHIRPS-GFS (**Figure 12**). The accumulated rainfall over the entire Lower Mekong Basin is distributed with moderate to heavy rain is expected in some areas in the central and lower part of the Lower Mekong Basin. Particularly, 20 – 21 September, heavy to very heavy rain is likely to occur in some areas of the central part of Lao PDR.

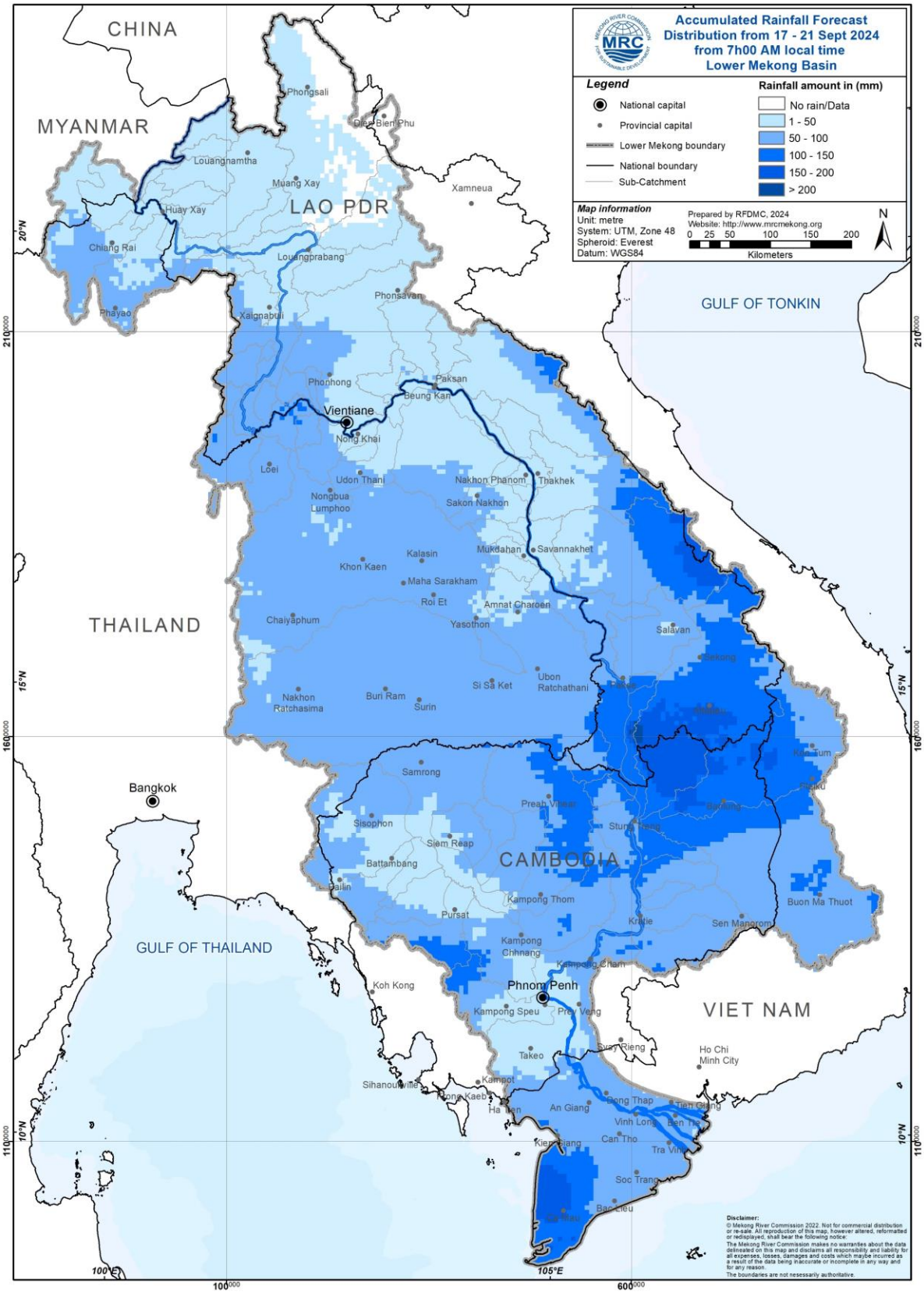



**Figure 13: Accumulated rainfall forecast from CHIRPS-GEFS (17 – 21 September 2024)**

## 6.2 Water level forecast

The five-day forecast is carried out from 17 to 21 September 2024 for 22 forecasting station along the Mekong mainstream. Overall, water levels at upper stretch of the LMB from Chiang to Thakhek stations are expected to decrease, while from Mudahan downward, water levels are expected to increase significantly.

At Chiang Saen, Luang Prabang, Chiang Khan, Vientiane, Nongkhai, Paksane and Nakhon Phanom stations, water levels are expected to drop with approximated value of-1.33 m, -4.06 m, -2.13 m, -2.76 m, -2.97 m, -1.67 m, -0.04 m, and -0.08 m, respectively. Moreover, at Mukdahan, Savannakhet, Khong Chiam, Pakse, Stung Treng, Kratie, Kompong Cham, Phnom Penh (Bassac), Phnom Penh Port, Koh Khel, Neak Luong, and Prek Kdam, water levels are expected to rise approximately 0.29 m, 0.31 m, 0.89 m, 0.78 m, 0.90 m, 1.92 m, 1.50 m, 0.50 m, 0.54 m, 0.30 m, 0.42 m, 0.49 m, respectively.

For the Tan Chau station on the Mekong River and Chau Doc station on the Bassac River, water levels are also expected to be rise as well. At Tan Chau, water level will rise approximately 0.13 m, while at Chau Doc 0.19 m.

The weekly River Monitoring Bulletin and forecasting issued on 16 September 2024 can be found in **Table 2.** Results of the weekly river monitoring and forecasting bulletin are also available at http://ffw.mrcmekong.org/bulletin.php

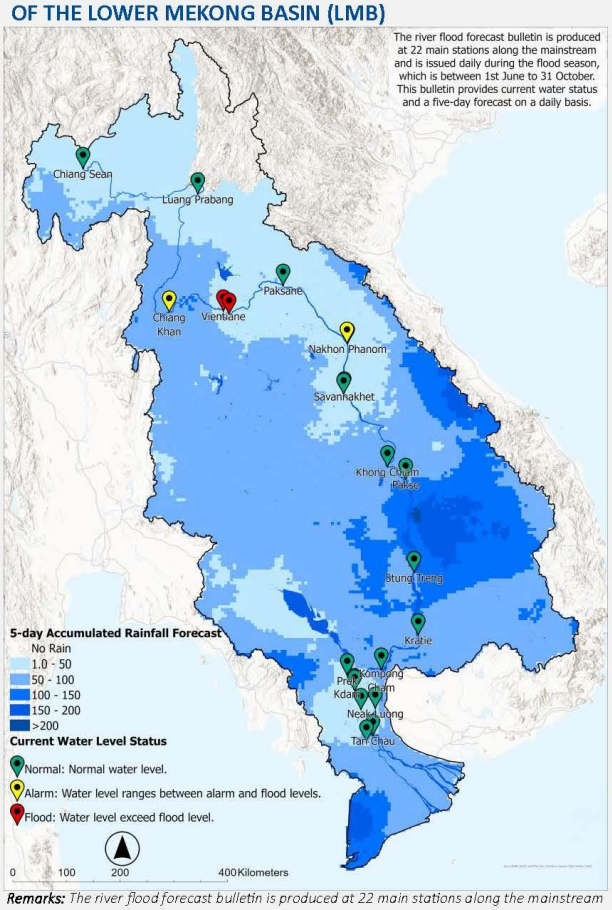
**Table 3. River Monitoring and Forecasting Bulletin**

# MEKONG RIVER MONITORING AND FORECASTING BULLETIN

## Monitoring on 16 September 2024, *7:00 AM (UTC+7)*

**Highlights**: *Water levels at stations in the upper part of LMB have decreased. However, **Vientiane** and **Nongkhai** stations are still above **FLOOD LEVELS**. Chiang Khan and Nakhon Phanom stations are still at ALARM LEVELS.*

### THE FORECASTING HYDROLOGICAL STATION MAP OF THE LOWER MEKONG BASIN (LMB)




***Remarks:*** *The river flood forecast bulletin is produced at 22 main stations along the mainstream and is issued daily during the flood season, which runs from 1st June to 31st October. This bulletin provides information on the current water level status and a five-day forecast on a daily basis.*

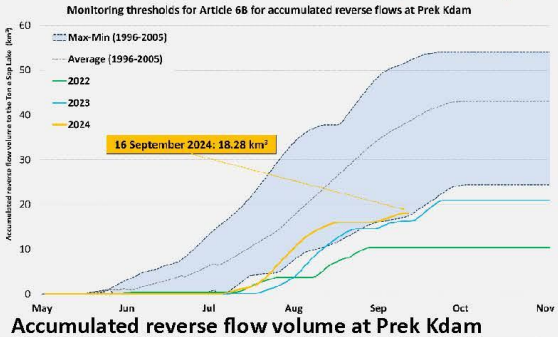
### CURRENT WATER LEVEL STATUS

| Monitoring Station | Water Level | Flow Threshold (PMFM*6C) |
|---|---|---|
| Jinghong | - | |
| Chiang Saen | Normal | Normal |
| Luang Prabang** | Normal | - |
| **Chiang Khan** | **Alarm** | - |
| **Vientiane** | **Flood** | Stable |
| **Nongkhai** | **Flood** | - |
| Paksane | Normal | - |
| **Nakhon Phanom** | **Alarm** | - |
| Thakhek | Normal | - |
| Mukdahan | Normal | - |
| Savannakhet | Normal | - |
| Khong Chiam | Normal | Normal |
| Pakse | Normal | Normal |
| Stung Treng | Normal | Normal |
| Kratie | Normal | Normal |
| Kompong Cham | Normal | - |
| Phnom Penh (Bassac) | Normal | - |
| Phnom Penh Port | Normal | - |
| Koh Khel | Normal | - |
| Neak Luong | Normal | - |
| Prek Kdam | Normal | - |
| Tan Chau | Normal | - |
| Chau Doc | Normal | - |

** Procedures for Maintenance of Flows on the Mainstream*

*** Luang Prabang station is influenced by hydropowers at its upstream and downstream*

### REVERSE FLOW VOLUME PREK KDAM (PMFM*6B)




### Accumulated reverse flow volume at Prek Kdam

| | |
|---|---|
| Flow volumes on 16 September 2024: | 18.28 $Km^3$ |
| Minimum reverse flow volume (1996-2005): | 23.848 $Km^3$ |
| Average reverse flow volume (1996-2005): | 42.84 $Km^3$ |
| Maximum reverse flow volume (1996-2005): | 54.046 $Km^3$ |

**Procedures for Maintenance of Flows on the Mainstream*

### WATER LEVEL STATUS DEFINITIONS

| | |
|---|---|
| Normal | Normal water level. |
| Alarm | Alarm when the water level ranges between alarm and flood levels. |
| Flood | Flood is when the flood level exceeds. A flood level is determined by member countries. |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http://www.mrcmekong.org/
http://ffw.mrcmekong.org/bulletin_wet.php
**http://ffw.mrcmekong.org/reportflood.php**
https://pmfm.mrcmekong.org/

# MEKONG RIVER MONITORING AND FORECASTING BULLETIN

## Forecasting from 17 to 21 September 2024 (*updated on 16 September, 7:00 AM UTC+7*)

**Highlights:** *Water levels at **Chiang Khan** is expected to be in normal condition on **19 September**. Water levels at **Vientiane** and **Nongkhai** stations are expected to be below **FLOOD LEVELS** until **17** and **19 September**, respectively. **Nakhon Phanom** is expected to reach **FLOOD LEVEL** on **18 September**.*

| Forecasting Station | 24 h Observed Rainfall (mm) | Zero gauge above M.S.L (m) | Observed Water Level againt zero gauge (m) | | Forecasted Water Level (m) | | | | | Alarm Level (m) | Flood Level (m) | Forecasted Water Levels Change in 5 days (m) | Max. Water levels change within next 5 days (m) | Min. distance to alarm level within next 5 days (m) | Min. distance to flood level within next 5 days (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15-Sep | | 15-Sep | 16-Sep | 17-Sep | 18-Sep | 19-Sep | 20-Sep | 21-Sep | | | | | | |
| Jinghong | 0.0 | - | 535.47 ↓ | 535.32 | - | - | - | - | - | - | - | - | - | - | - |
| Chiang Saen | 0.0 | 357.110 | 7.48 ↓ | 6.51 | ↓ 5.65 | ↓ 5.24 | ↓4.97 | → 5.02 | ↑ 5.18 | 11.50 | 12.80 | ↓ -1.33 | -1.55 | 5.85 | 7.15 |
| Luang Prabang | 0.0 | 267.195 | 17.71 ↓ | 16.57 | ↓ 15.60 | ↓ 14.45 | ↓13.36 | ↓ 12.82 | ↓ 12.51 | 17.50 | 18.00 | ↓ -4.06 | -4.06 | 1.90 | 2.40 |
| Chiang Khan | 0.8 | 194.118 | 16.02 ↓ | 15.30 | ↓ 15.12 | ↓ 14.62 | ↓14.07 | ↓ 13.48 | ↓ 13.17 | 14.50 | 16.00 | ↓ -2.13 | -2.13 | -0.62 | 0.88 |
| Vientiane | 27.0 | 158.040 | 13.24 ↓ | 12.72 | ↓ 12.24 | ↓ 11.69 | ↓11.18 | ↓ 10.57 | ↓ 9.97 | 11.50 | 12.50 | ↓ -2.76 | -2.76 | -0.74 | 0.26 |
| Nongkhai | 31.1 | 153.648 | 13.82 ↓ | 13.58 | ↓ 12.93 | ↓ 12.40 | ↓11.94 | ↓ 11.15 | ↓ 10.61 | 11.40 | 12.20 | ↓ -2.97 | -2.97 | -1.53 | -0.73 |
| Paksane | 20.1 | 142.125 | 13.24 ↑ | 13.38 | ↑ 13.69 | ↓ 13.58 | ↓13.09 | ↓ 12.44 | ↓ 11.71 | 13.50 | 14.50 | ↓ -1.67 | -1.67 | -0.19 | 0.81 |
| Nakhon Phanom | 0.0 | 130.961 | 11.38 ↑ | 11.65 | ↑ 11.83 | ↑ 12.18 | →12.20 | ↓ 11.96 | ↓ 11.61 | 11.50 | 12.00 | → -0.04 | 0.55 | -0.70 | -0.20 |
| Thakhek | 0.1 | 129.629 | 12.32 ↑ | 12.57 | ↑ 12.73 | ↑ 13.06 | →13.07 | ↓ 12.83 | ↓ 12.49 | 13.00 | 14.00 | → -0.08 | 0.50 | -0.07 | 0.93 |
| Mukdahan | 32.5 | 124.219 | 10.66 ↑ | 11.01 | ↑ 11.20 | ↑ 11.51 | ↑11.66 | → 11.56 | ↓ 11.30 | 12.00 | 12.50 | ↑ 0.29 | 0.65 | 0.34 | 0.84 |
| Savannakhet | 10.8 | 124.219 | 9.07 ↑ | 9.42 | ↑ 9.63 | ↑ 9.97 | ↑10.13 | ↓ 10.02 | ↓ 9.73 | 12.00 | 13.00 | ↑ 0.31 | 0.71 | 1.87 | 2.87 |
| Khong Chiam | 2.0 | 89.030 | 11.85 ↑ | 12.30 | ↑ 12.59 | ↑ 12.75 | ↑13.10 | ↑ 13.25 | → 13.19 | 13.50 | 14.50 | ↑ 0.89 | 0.95 | 0.25 | 1.25 |
| Pakse | 1.6 | 86.490 | 9.78 ↑ | 10.80 | ↑ 11.42 | ↑ 11.76 | ↑11.92 | → 11.87 | ↓ 11.58 | 11.00 | 12.00 | ↑ 0.78 | 1.12 | -0.92 | 0.08 |
| Stung Treng | 4.0 | 36.790 | 8.59 ↑ | 9.06 | ↑ 9.26 | ↑ 9.48 | ↑9.60 | ↑ 9.79 | ↑ 9.96 | 10.70 | 12.00 | ↑ 0.90 | 0.90 | 0.74 | 2.04 |
| Kratie | 52.4 | -0.101 | 18.27 ↑ | 19.34 | ↑ 20.00 | ↑ 20.47 | ↑20.69 | ↑ 20.97 | ↑ 21.26 | 22.00 | 23.00 | ↑ 1.92 | 1.92 | 0.74 | 1.74 |
| Kompong Cham | 7.5 | -0.930 | 11.36 ↑ | 11.86 | ↑ 12.35 | ↑ 12.70 | ↑13.01 | ↑ 13.19 | ↑ 13.36 | 15.20 | 16.20 | ↑ 1.50 | 1.50 | 1.84 | 2.84 |
| Phnom Penh (Bassac) | 0.3 | -1.020 | 7.16 ↑ | 7.40 | → 7.43 | ↑ 7.60 | ↑7.73 | ↑ 7.82 | ↑ 7.90 | 10.50 | 12.00 | ↑ 0.50 | 0.50 | 2.60 | 4.10 |
| Phnom Penh Port | nr | 0.070 | 5.93 ↑ | 6.15 | ↑ 6.22 | ↑ 6.40 | ↑6.52 | ↑ 6.61 | ↑ 6.69 | 9.50 | 11.00 | ↑ 0.54 | 0.54 | 2.81 | 4.31 |
| Koh Khel | 0.0 | -1.000 | 6.42 ↑ | 6.55 | ↑ 6.64 | ↑ 6.71 | ↑6.76 | ↑ 6.81 | ↑ 6.85 | 7.90 | 8.40 | ↑ 0.30 | 0.30 | 1.05 | 1.55 |
| Neak Luong | 0.0 | -0.330 | 5.01 ↑ | 5.14 | ↑ 5.27 | ↑ 5.38 | ↑5.45 | ↑ 5.51 | ↑ 5.56 | 7.50 | 8.00 | ↑ 0.42 | 0.42 | 1.94 | 2.44 |
| Prek Kdam | 8.3 | 0.080 | 6.22 ↑ | 6.38 | ↑ 6.53 | ↑ 6.61 | ↑6.71 | ↑ 6.80 | ↑ 6.87 | 9.50 | 10.00 | ↑ 0.49 | 0.49 | 2.63 | 3.13 |
| Tan Chau | nr | 0.000 | 2.39 ↑ | 2.52 | ↑ 2.61 | → 2.62 | ↑2.70 | ↑ 2.77 | ↑ 2.83 | 3.50 | 4.50 | ↑ 0.31 | 0.31 | 0.67 | 1.67 |
| Chau Doc | 0.0 | 0.000 | 2.30 ↑ | 2.41 | → 2.42 | ↑ 2.45 | →2.48 | ↑ 2.55 | ↑ 2.60 | 3.00 | 4.00 | ↑ 0.19 | 0.19 | 0.40 | 1.40 |

### WATER LEVEL FORECASTING DEFINITIONS

| | |
|---|---|
| ↑ | Rising water level. |
| → | Stable water level: stable water level is defined as a daily change of less than 10cm from Chaing Saen to Savannakhet; less than 5cm at Pakse and Stung Treng; and no more than 3cm from Kratie downstream. |
| ↓ | Falling water level. |
| X | No data available. |
| Alarm stage | Alarm stage is when the water level ranges between alarm and flood levels. |
| Flood stage | Flood stage is when the flood level exceeds. A flood level is determined by member countries. |

### NOTES

- On **16 September**, Water levels at the upper stretch of the LMB have decreased. **Chiang Khan** and **Nakhon Phanom** are at **ALARM LEVELS**. **Vientiane** and **Nongkhai** stations are still above **FLOOD LEVELS**. At **Paksane**, and **Pakse**, minimum **distance to alarm level** is **0.12 m**, and **0.20 m**, respectively.
- For **17-21 September**, moderate to heavy rain is expected in some areas in the central part of the Lower Mekong Basin. Particularly, heavy rain is likely to occur in certain areas in Cambodia during this period.
- For **17-21 September**, **Chiang Khan** and **Vientiane** stations are expected to be in **normal condition** on **19 September**, while **Nongkhai** is likely staying below **Flood Level** on **19 September**. **Nakhon Phanom** is expected to reach **FLOOD LEVEL** on **18 September**, while **Paksane** and **Pakse** stations are expected to reach **ALARM LEVELS** on **17 September** (tomorrow).
- For **17-21 September**, the minimum distance to **flood level** at Paksane, and Pakse stations are expected to be **0.81 m**, and **0.08 m** on **17**, and **19 September**, respectively.

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http://www.mrcmekong.org/
http://ffw.mrcmekong.org/bulletin_wet.php
http://ffw.mrcmekong.org/reportflood.php
https://pmfm.mrcmekong.org/

## 6.3 Flash Flood Information

With the predicted rainfall for the coming week, flash floods might be detected in some areas in the LMB. Local heavy rain in a short period of time is possible with unpredictable short flash floods.

Further detailed information on Flash Flood Guidance Information, as well as its explanation, is available for download here.

## 6.4 Drought forecast

There are several climate-prediction models with different scenarios in the upcoming months. The MRC's DFEWS adopts the global scale of North America Multi-Model Ensemble (NMME) for the seasonal outlook of rainfall.

**Figure 13** below shows the monthly forecasts of combined drought indicator from October to Deccember 2024 over the LMB area.

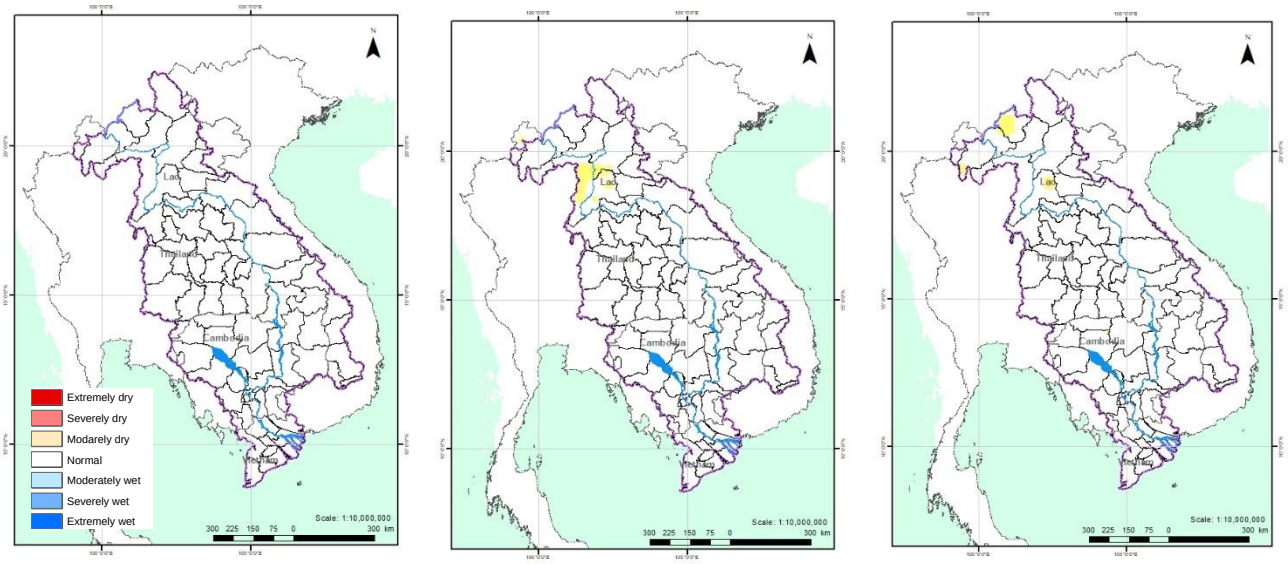



**Figure 14. Monthly forecasts of combined drought indicator for a) October, b) November and c) December 2024.**

Figure 14 illustrates the monthly drought forecast for the upcoming three months using the Combined Drought Indicator (CDI). The forecast indicates that no significant drought conditions are expected across the entire LMB during this period. However, in November 2024, the upper part of the LMB, including Xayabouly province, is anticipated to experience moderate drought conditions; and in December, Luang Namtha province, is anticipated to experience moderate drought conditions.

# 7 Summary and Possible Implications

## 7.1. Rainfall and its forecast

In the period of 10 – 16 September 2024, light to very heavy rainfall has been observed over the LMB. Especially, heavy to very heavy rain occurred in some areas in Chiang Saen, Nong Khai, Muong Kao, Paksane, Nakhon Phanom, Thakhek, Pursat, Kratie, Svay Chrea, Sekong, Sesan.

From 17 – 23 September 2024, moderate to heavy rain is expected in some areas in the central and lower part of the Lower Mekong Basin. Particularly, 20 – 21 September, heavy to very heavy rain is likely to occur in some areas of the central part of Lao PDR.

## 7.2. Water level and its forecast

At 22 key monitoring stations along the Mekong mainstream from 10 – 16 September 2024, water levels in all stations significantly increased, particularly at the upper stretch of the LMB. At Chiang Saen, Luang Prabang, Chiang Khan, Vientiane and Nongkhai, water level increased approximately 5 meters with few days. This caused those stations except for Chiang Saen to reach flood levels for few days. The total accumulated volume of the reverse flow to Tonle Sap Lake remains 18.28 $Km^3$.

In the period of 17 – 21 September 2024, water levels at upstream stations along Mekong mainstream from are likely expected to drop and return to normal conditions. From Nakhon Phanom downward, water levels are expected to significantly rise. However, it is expected that those station are likely still in normal conditions, which do not reach alarm and flood levels.

## 7.3. Flash flood and its trends

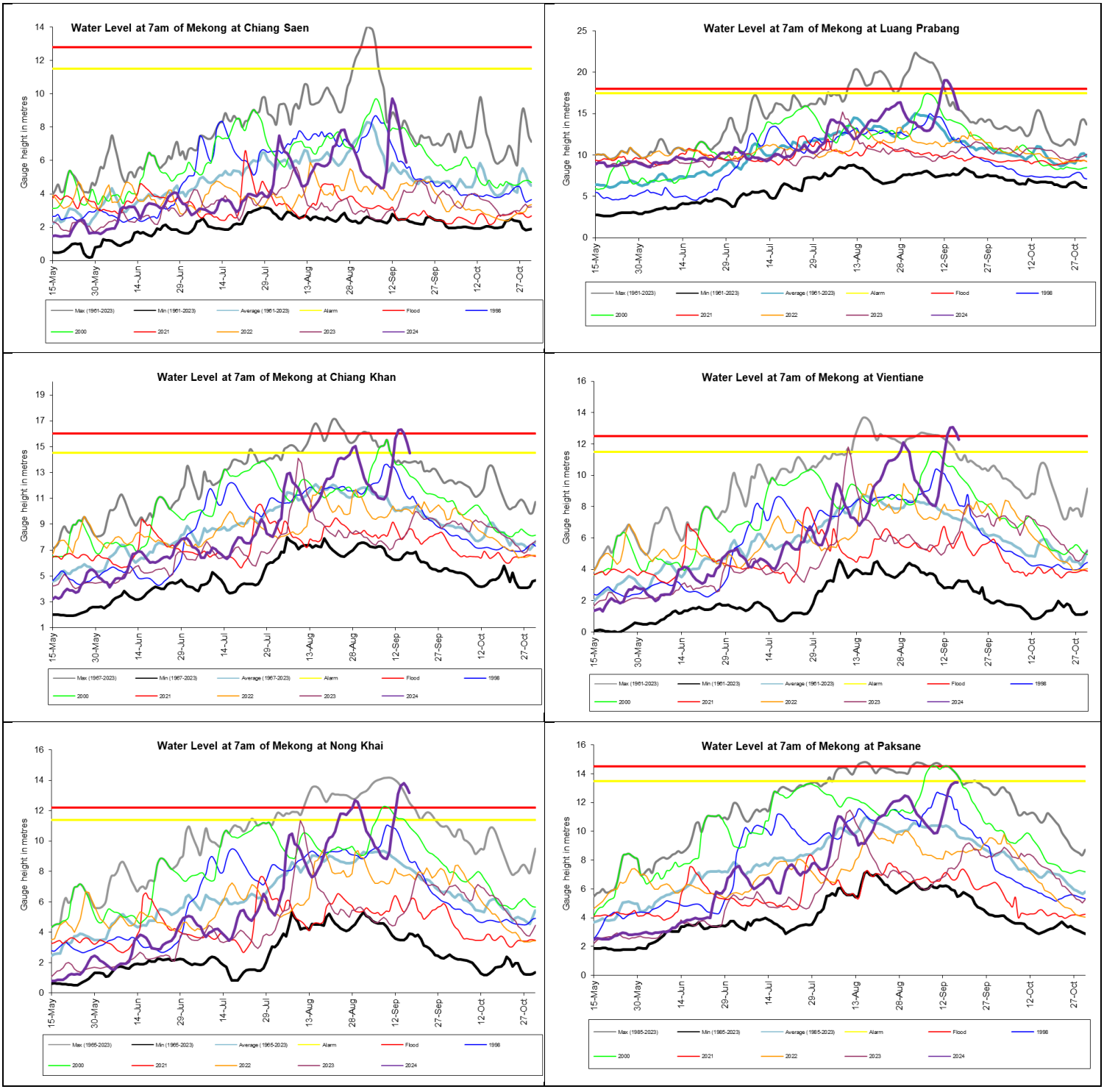
With the predicted of rainfall for the coming week as mentioned earlier in part 2, the flash flood guidance at a low to high level will likely be detected in some areas of the LMB.

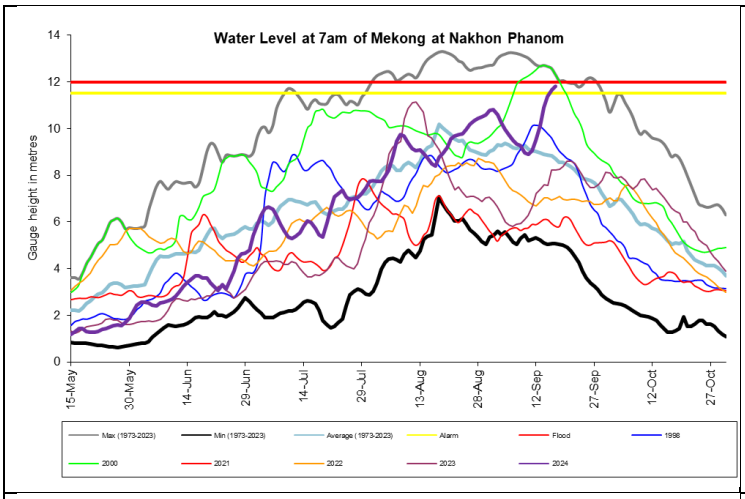
## 7.4. Drought condition and its forecast

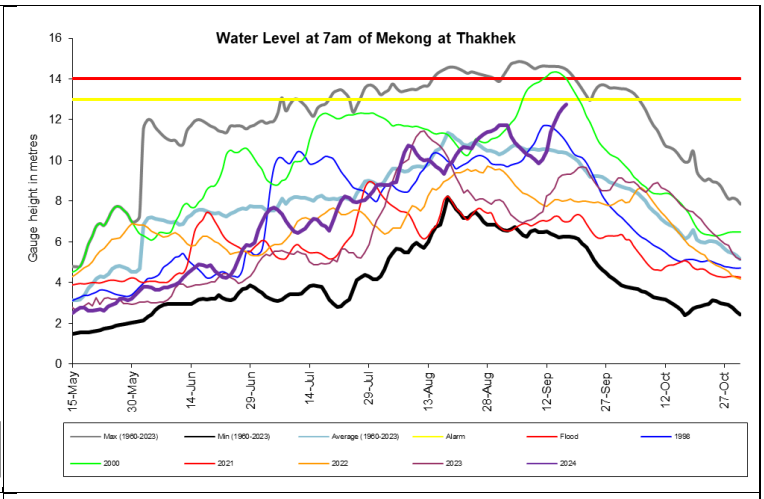
From 10 - 16 September 2024, the LMB is experiencing moderate and severe droughts in some areas of the central and lower part. Severe drought occurs in some areas of the eastern part of Borikhamxai and Khammouan (Lao PDR); Battamabang, Banteay Meanchey, and Mondulkiri (Cambodia).
From 17 - 23 September 2024, the LMB is likely at normal conditions. No drought is forecasted for the whole region.
From October to Deccember 2024, The forecast indicates that no significant drought conditions are expected across the entire LMB during this period. However, in November

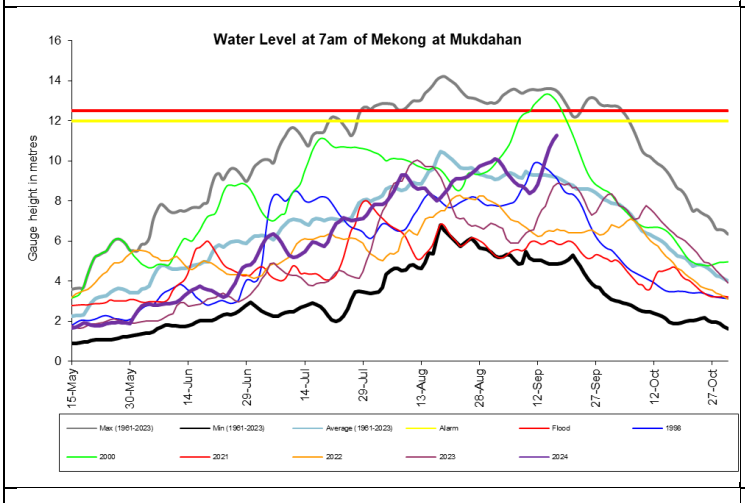
2024, the upper part of the LMB, including Xayabouly province, is anticipated to experience moderate drought conditions; and in December, Luang Namtha province, is anticipated to experience moderate drought conditions.

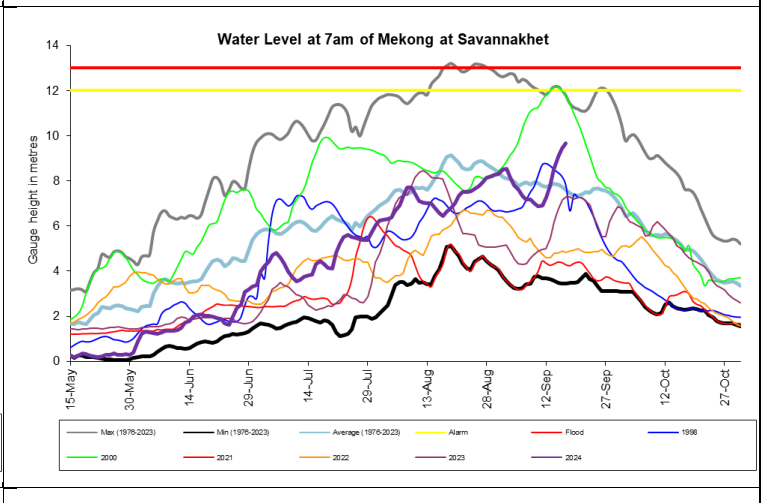
## Annex A: Weekly water level monitoring at the 22 key stations

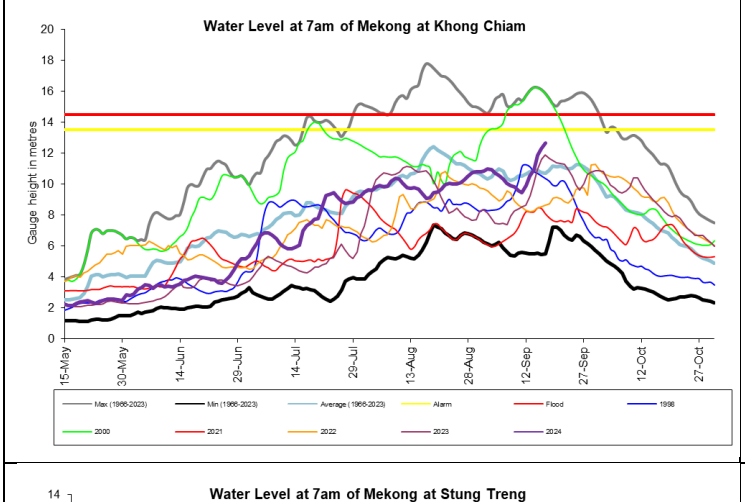


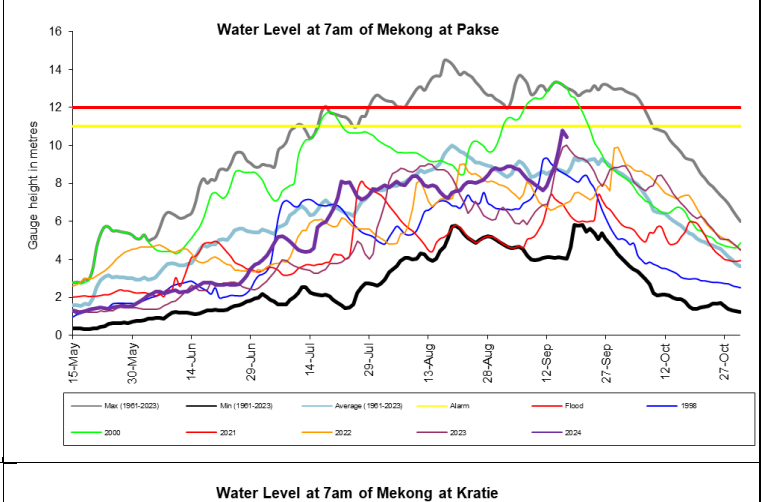

Water Level at 7am of Mekong at Nakhon Phanom
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1973-2023)
Min (1973-2023)
Average (1973-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

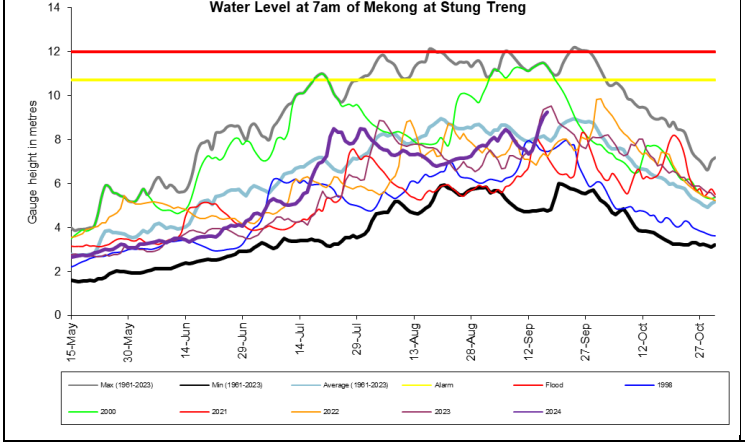

Water Level at 7am of Mekong at Thakhek
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1960-2023)
Min (1960-2023)
Average (1960-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

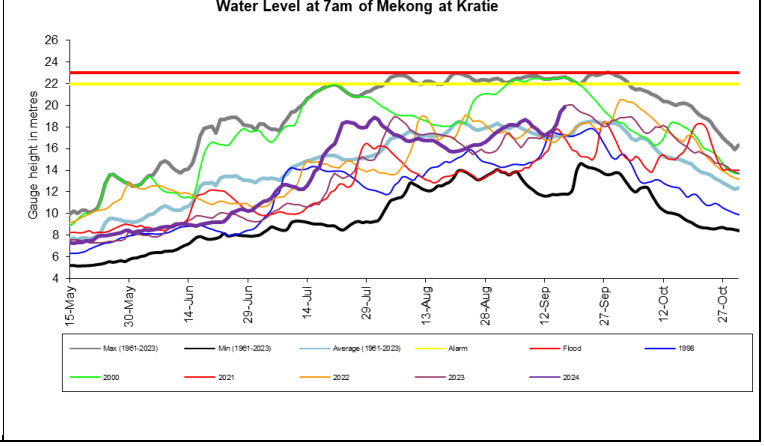

Water Level at 7am of Mekong at Mukdahan
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

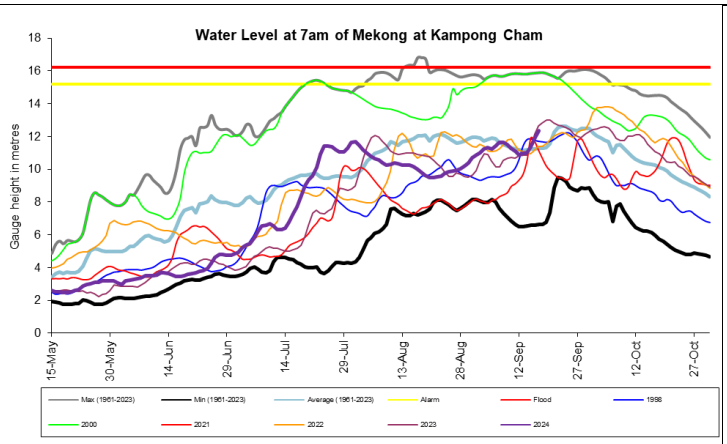

Water Level at 7am of Mekong at Savannakhet
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1976-2023)
Min (1976-2023)
Average (1976-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

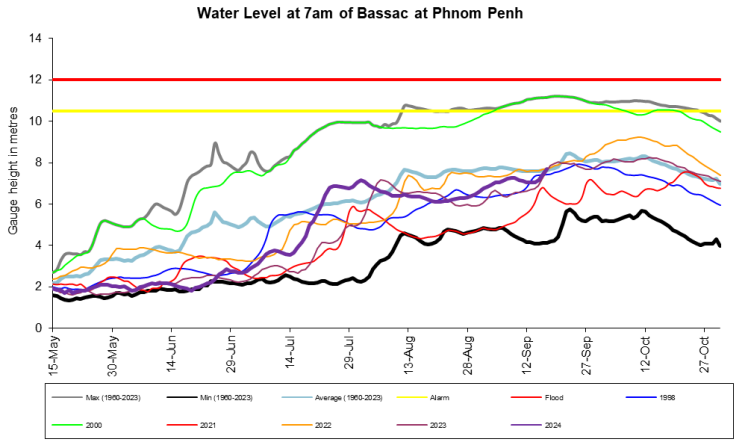

Water Level at 7am of Mekong at Khong Chiam
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1966-2023)
Min (1966-2023)
Average (1966-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

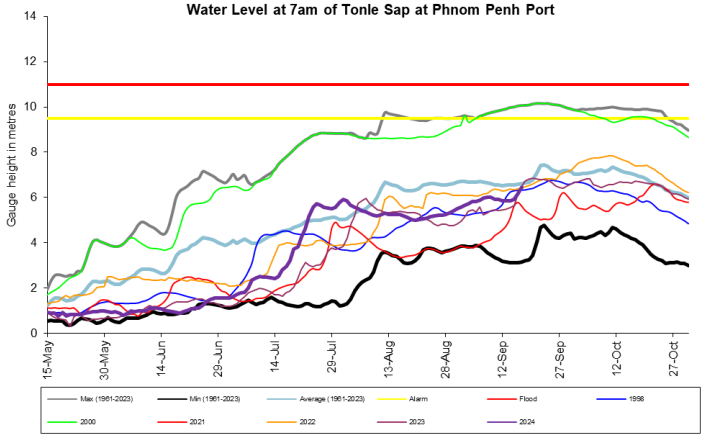

Water Level at 7am of Mekong at Pakse
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

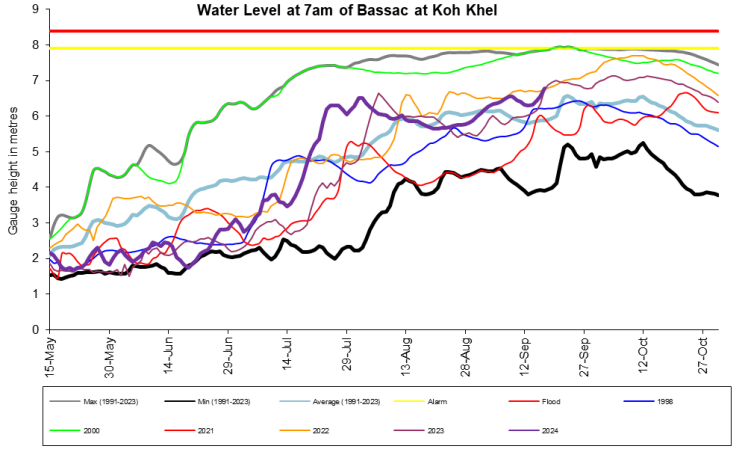

Water Level at 7am of Mekong at Stung Treng
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

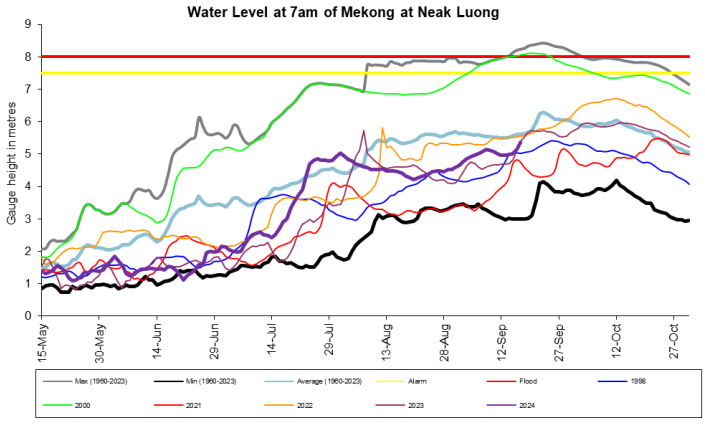

Water Level at 7am of Mekong at Kratie
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

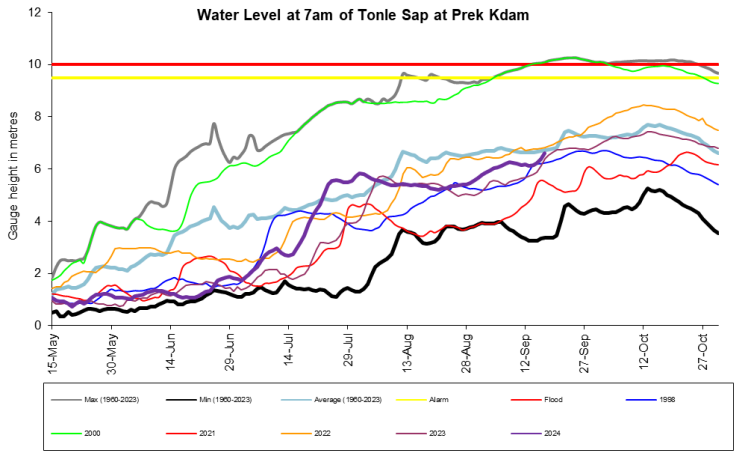

Water Level at 7am of Mekong at Kampong Cham
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

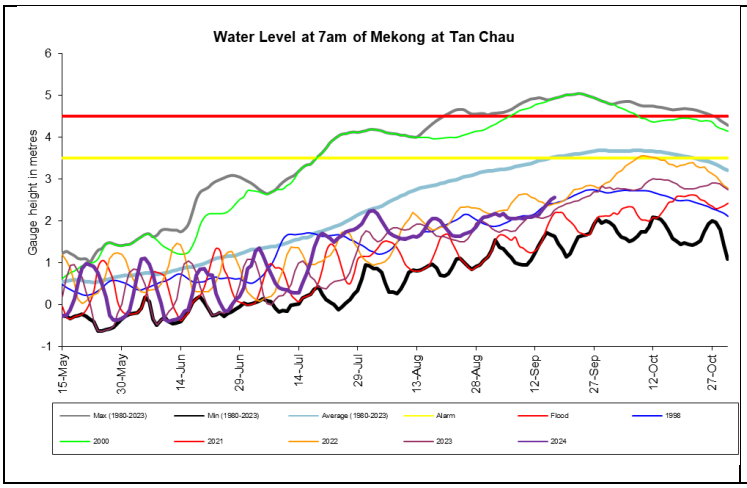

Water Level at 7am of Bassac at Phnom Penh
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1960-2023)
Min (1960-2023)
Average (1960-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

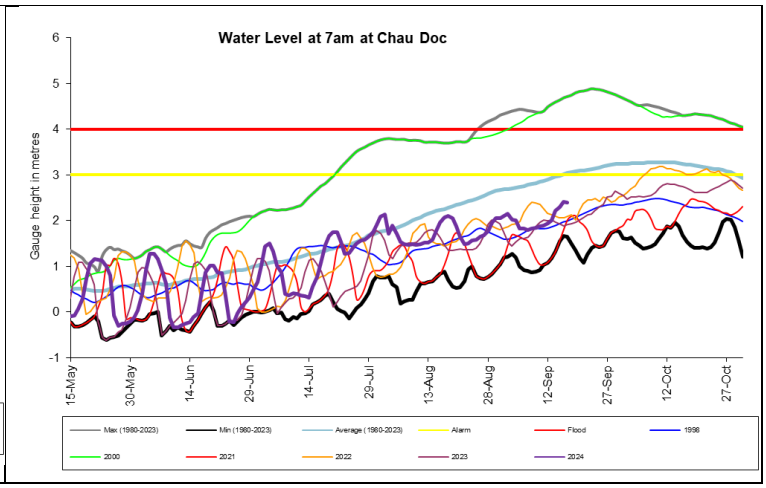

Water Level at 7am of Tonle Sap at Phnom Penh Port
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1961-2023)
Min (1961-2023)
Average (1961-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024


Water Level at 7am of Bassac at Koh Khel
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1991-2023)
Min (1991-2023)
Average (1991-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024


Water Level at 7am of Mekong at Neak Luong
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1960-2023)
Min (1960-2023)
Average (1960-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024


Water Level at 7am of Tonle Sap at Prek Kdam
Gauge height in metres
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1960-2023)
Min (1960-2023)
Average (1960-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024


Water Level at 7am of Mekong at Tan Chau
Gauge height in metres
6
5
4
3
2
1
0
-1
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1980-2023)
Min (1980-2023)
Average (1980-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024


Water Level at 7am at Chau Doc
Gauge height in metres
6
5
4
3
2
1
0
-1
15-May
30-May
14-Jun
29-Jun
14-Jul
29-Jul
13-Aug
28-Aug
12-Sep
27-Sep
12-Oct
27-Oct
Max (1980-2023)
Min (1980-2023)
Average (1980-2023)
Alarm
Flood
1998
2000
2021
2022
2023
2024

# Annex B: Tables for weekly updated water levels and rainfall at the Key Stations

Table A1: Weekly observed water levels

| 2024 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-09-2024 | 535.65 | 5.52 | 15.72 | 12.62 | 8.68 | 9.28 | 9.90 | 8.91 | 9.85 | 8.36 | 6.86 | 9.61 | 7.78 | 7.59 | 17.81 | 11.30 | 7.16 | 5.93 | 6.45 | 5.08 | 6.21 | 2.09 | 1.87 |
| 11-09-2024 | 535.62 | 8.73 | 17.50 | 13.76 | 10.07 | 10.72 | 10.43 | 9.05 | 10.03 | 8.52 | 6.92 | 9.45 | 7.62 | 7.57 | 17.44 | 11.10 | 7.10 | 5.92 | 6.40 | 5.02 | 6.16 | 2.09 | 1.89 |
| 12-09-2024 | 535.58 | 9.71 | 19.00 | 15.61 | 11.34 | 11.85 | 11.15 | 9.49 | 10.46 | 8.82 | 7.26 | 9.91 | 7.86 | 7.34 | 17.24 | 10.90 | 7.04 | 5.85 | 6.32 | 4.97 | 6.17 | 2.12 | 1.94 |
| 13-09-2024 | 535.54 | 9.33 | 19.02 | 16.29 | 12.57 | 13.10 | 12.10 | 10.11 | 11.40 | 9.37 | 7.77 | 10.50 | 8.40 | 7.51 | 17.44 | 10.96 | 7.05 | 5.84 | 6.31 | 4.96 | 6.12 | 2.15 | 2.01 |
| 14-09-2024 | 535.49 | 8.39 | 18.58 | 16.32 | 13.04 | 13.65 | 12.91 | 10.90 | 11.84 | 10.08 | 8.51 | 10.95 | 8.95 | 7.98 | 17.72 | 11.00 | 7.05 | 5.84 | 6.33 | 4.99 | 6.14 | 2.29 | 2.21 |
| 15-09-2024 | 535.47 | 7.48 | 17.71 | 16.02 | 13.07 | 13.82 | 13.24 | 11.38 | 12.32 | 10.66 | 9.07 | 11.85 | 9.78 | 8.59 | 18.27 | 11.36 | 7.16 | 5.93 | 6.42 | 5.01 | 6.22 | 2.39 | 2.30 |
| 16-09-2024 | 535.32 | 6.51 | 16.57 | 15.30 | 12.72 | 13.58 | 13.38 | 11.65 | 12.57 | 11.01 | 9.42 | 12.30 | 10.80 | 9.06 | 19.34 | 11.86 | 7.40 | 6.15 | 6.55 | 5.14 | 6.38 | 2.52 | 2.41 |
| Flood level | | 12.80 | 18.00 | 16.00 | 12.50 | 12.00 | 14.50 | 12.50 | 14.00 | 12.50 | 13.00 | 14.50 | 12.00 | 12.00 | 23.00 | 16.20 | 12.00 | 11.00 | 7.90 | 8.00 | 10.00 | 4.50 | 4.00 |

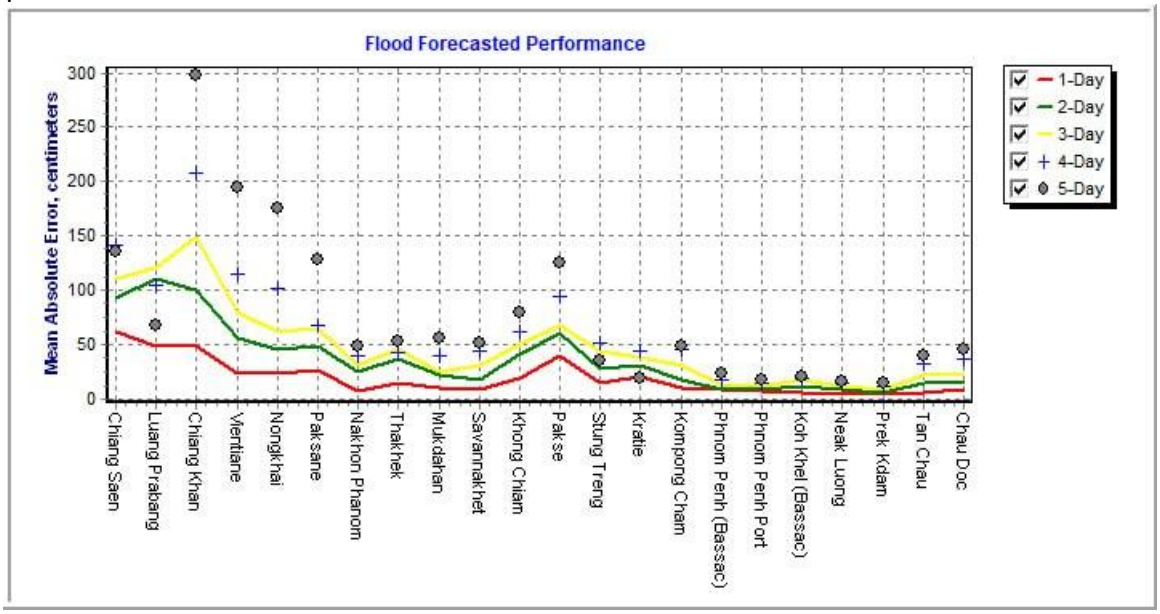
Table A2: Weekly observed rainfall

| 2024 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-09-2024 | 45 | 111 | 9.4 | 0.5 | 3.4 | 13.6 | 55.5 | 5.5 | 4.2 | 2.4 | 1.8 | 0.5 | 7.6 | 2 | 6.9 | 0 | 0 | | 5.8 | 40.7 | 8.3 | 0 | 0 |
| 11-09-2024 | 57 | 34 | 61.8 | 0 | 36.4 | 22.8 | 54.5 | 44.9 | 34.4 | 21.2 | 21.4 | 21.5 | 12.2 | 52.5 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 |
| 12-09-2024 | 15.5 | 13.1 | 0 | 21 | 30.6 | 50.7 | 3 | 14.4 | 0 | 18.4 | 31.4 | 6 | 0 | 0 | 16.2 | 0 | 36 | | 26 | 29.7 | 19.4 | 0.6 | 0.4 |
| 13-09-2024 | 1 | 2 | 30.8 | 0 | 7.4 | 10 | 135 | 38.8 | 27 | 2.2 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | | 0 | 0.2 | 47.3 | 0 | 1.1 |
| 14-09-2024 | 0.5 | 0.8 | 10 | 16 | 70.3 | 157 | 4.2 | 14.2 | 10.5 | 22 | 6.8 | 0.9 | 65 | 160 | 26 | 14.5 | 3 | | 50 | 33.8 | 6.2 | 0 | 0 |
| 15-09-2024 | 0 | 94.5 | 0 | 0 | 32 | 1.8 | 0 | 35.5 | 37.5 | 18.7 | 35.8 | 12.5 | 55 | 42 | 38.5 | 4 | 0 | | 0 | 0 | 0 | 0 | 0 |
| 16-09-2024 | 0 | 0 | 0 | 0.8 | 27 | 31.1 | 20.1 | 0 | 0.1 | 32.5 | 10.8 | 2 | 1.6 | 4 | 52.4 | 7.5 | 0.3 | | 0 | 0 | 8.3 | 0 | 0 |
| **Sum** | 119.0 | 255.5 | 112.0 | 38.3 | 207.1 | 286.5 | 272.3 | 153.3 | 113.7 | 117.4 | 108.0 | 43.4 | 141.4 | 271.5 | 140.0 | 26.0 | 39.3 | 0.0 | 81.8 | 104.4 | 89.5 | 0.6 | 1.5 |

# Annex C: Performance of the weekly flood forecasting

"Accuracy" here refers to the state where data recorded in the MRC's Mekong River Flood Forecasting System are cleaned and verified.

The adjustment of flood forecasting outcomes from the flood forecasting system requires flood forecasters to have extensive knowledge in hydrology and statistical modelling for estimating the relationships between stations upstream and downstream in the Mekong River Basin. Flood forecasting performance presented in the graph below shows the average flood forecasting accuracy at each key station along the Mekong mainstream from 10 to 16 September 2024.




The forecasting values from 10 to 16 September 2024 show that the overall accuracy is fair for a four-day to five-day forecast in lead time (less than 250 cm) for all forecasting stations except for Chaing Khan station.

**Note:** The higher percentage of flood forecasting accuracy is due to several key factors as follows:

- Missing rainfall in Cambodia (DOM) data and data input are not sufficient to be used for inputting into the flood forecasting model system.
- Chiang Saen station is influencing by hydropower upstream operation from China.
- Luang Prabang to Chiang Khan and Paksane to Stung Treng to Kratie have been influenced by hydropower operations upstream, tributaries inflows.
- The influence of heavy rainfall caused by storms and hydropower operations from upstream, tributaries inflows and the lower part of the Mekong floodplain, including the 3S (Stung Treng and Kratie).
- Fluctuations of the water levels at Tan Chau and Chau Doc stations were due to daily tidal effects of the sea in the Mekong Delta.
- Satellite rainfall data were not representative of the actual rainfall at ground stations in some areas of the Mekong region.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