

# SESSION5: DROUGHT AND FLOOD PREDICTION

## MRCs/RFDMC

*THE 2019 MEKONG RESEARCH SYMPOSIUM  
16-19 DECEMBER 2019. HANOI CITY, VIETNAM*

*DR. SOTHEA KHEM, RIVER FLOOD FORECASTING SPECIALIST*

*THE MRC REGIONAL FLOOD AND DROUGHT MANAGEMENT CENTER (RFDMC)*

*TECHNICAL SUPPORT DIVISION (TD)*



# MRC-RFDMC core Functions



The MRC/RFDMC in Phnom Penh, Cambodia issues flood-drought information to MRC Member Countries and other stakeholders:

1. Daily (once/twice) flood forecasting and warning during flood season, Weekly monitoring WL in dry season, for Mekong mainstream.

2. Flash Flood Guidance (1-3-6-24 hourly updates) and Flash Flood Alerts during critical weather situations.

3. Drought forecasting and monitoring.

<http://www.mrcmekong.org/> <http://ffw.mrcmekong.org/>

## MRC FLOOD FORECASTING SYSTEM

**Forecasting Platform**

**Models**

**Data**

The Mekong River Basin (MRB) is a hydrologic conceptual rainfall routing model that enables the simulation of catchment storage and runoff response in the river and stream network. The system consists of a set of 11 USGS models, covering over 740,000 km<sup>2</sup> of the entire Mekong River Basin.

The Regional Flood Management and Mitigation Centre (RFMMC) uses several computer based models to predict and forecast areas of potential flooding in the Mekong. A new modeling system completed and tested in the 2008 and 2009 flood seasons had already proven to be significantly more accurate in Mekong Flood Forecasting than other systems. Following the 2008 and 2009 flood seasons, more refinements and improvements have been made, particularly for the Cambodian Floodplain, Chao Phraya system and the Mekong Delta.

**Mekong FFS User Interface**

**Forecast Run**

**Mekong FFS Operation (Stand Alone)**

**RFMMC Client Server system**

The client server system allows users to interact with the system via RFMMC's network, synchronizing data database with the central database (PostgreSQL) and the system and view the results on the central database on their own machines.

**RFMMC Information for Lower Mekong River Basin**

**Data Availability in the RFMMC:**  
 NOAA, IRI, and TRMM  
 GTS, RYCOG, ARIOP & RYMO  
 (River and lake rainfall & water levels)

**The additional information please contact:**  
 Regional Flood Management and Mitigation Centre  
 P.O. Box 621, # 171 National Road #1,  
 Sangkat Chhat Angkor Koen,  
 Khan Penh, Phnom Penh, Cambodia  
 Telephone: (855-23) 421-352 Fax: (855-23) 421-360  
 E-mail: floodmrc@mrcmekong.org

## MRC FLASH FLOOD GUIDANCE SYSTEM

**System for Flash Flood Alerts and Warnings**

**Basin Delineation**

**MRCFFG System Design Overview**

**FFG System User Interface**

**BACKGROUND**

The implementation of the MRC Flash Flood Guidance (MRCFFG) System for the Lower Mekong Basin is funded by the USAID Office of U.S. Foreign Disaster Assistance (USFDA), partnered with Mekong Country Inter-agency Administration (MCAIA), and Hydrologic Research Center (MRC) under the Asia Flood Network Program.

Development, implementation and testing of system models (flow correction, and moisture, flash flood guidance).

Development, implementation and testing of input procedures for acquiring satellite and/or precipitation data.

Regional and national training for operators on hydrologic basis of system components, on the use and maintenance of FFG software system, on product received, and the interpretation, use and validation of system products.

**BENEFITS OF THE SYSTEM**

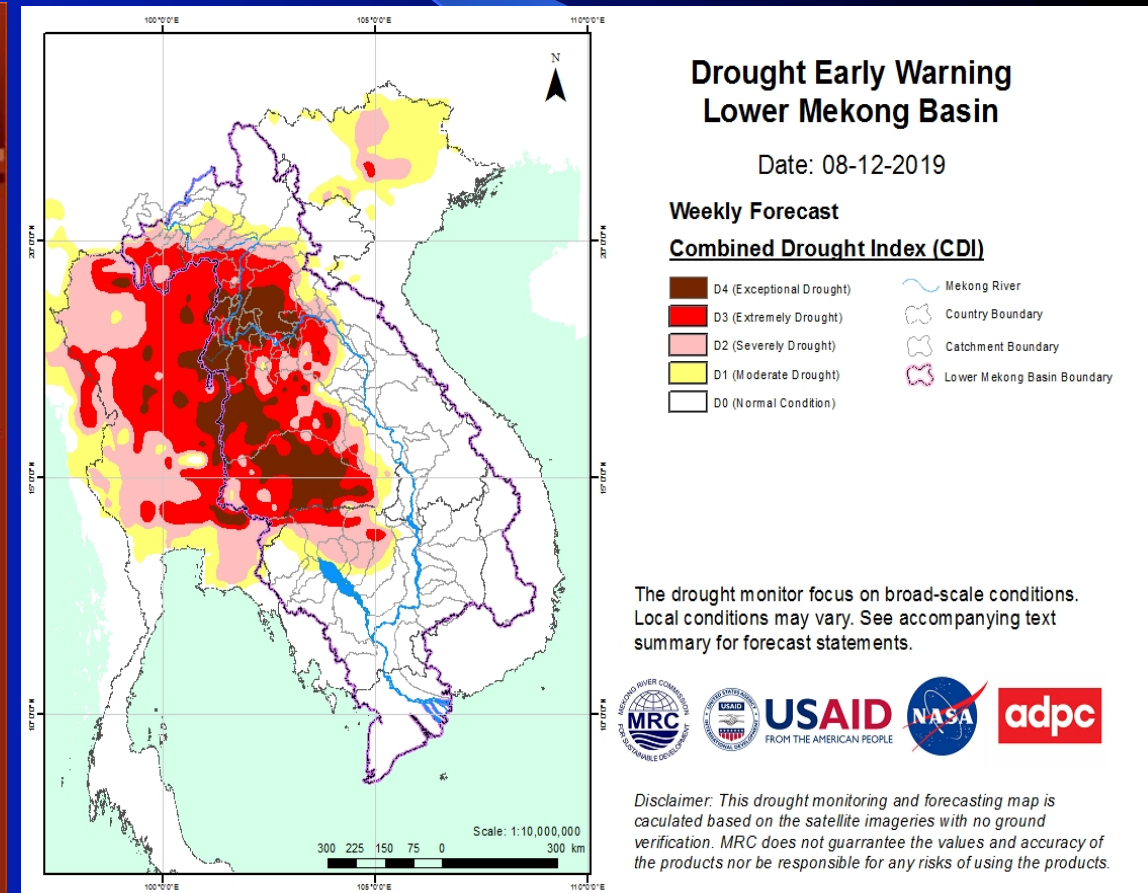
- Addressed all flash flood prone basins over large area
- Early awareness of impending local flash flood threats for all potentially vulnerable areas
- Provide rapid assessments of the potential of flash floods allowing improvement of the early warnings for the occurrence of a flash flood
- Allow for the more rapid mobilization of response agencies (rather than a system that provides detailed forecasts of the magnitude - which add uncertainty and complexity to warning development)
- Responsible national law agencies can establish criteria for issuing warnings/alerts based on flash flood guidance and flash flood threat
- System is a diagnostic tool used to indicate the likelihood of flooding of small streams over large regions
- System uses base corrected satellite based and 4-day gauge precipitation estimates and real time and moisture estimates to produce flash flood threat

**Example Regional Flash Flood Threat Product**  
 (Satellite storm on 24/09/2008)

**Example One hour Flash Flood Guidance**  
 (Satellite storm on 24/09/2008)

**Example One hour Flash Flood Guidance**  
 (Satellite storm on 24/09/2008)

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# River Flood Forecast in the mainstream

## Mekong Flood Forecasting Platform (FEWS)

1. Unified River Basin Simulation (URBS)
2. ISIS Hydrodynamic Model
3. Regression Program



URBS+ Regression

1. Chiang Saen
2. Luang Prabang
3. Chiang Khan
4. Vientiane
5. Nong Khai
6. Paksane
7. Nakhon Phanom
8. Thakhek
9. Mukdahan
10. Savannakhet
11. Khong Chiam
12. Pakse
13. Stung Treng

ISIS+Regression

14. Kratie
15. Kampong Cham
16. Phnom Penh Bassac
17. Phnom Penh Port
18. Prek Kdam
19. Koh Khel
20. Neak Leung
21. Tan Chau
22. Chau Doc

DA > 740,000 sq.km.

# Unified River Basin Simulation (URBS) for flood forecasting

## Purpose:

1. **URBS is rainfall to runoff model used for:** precipitation runoff, reservoir operation and river flood forecasting activity for the Lower Mekong Basin.
2. **Decision making:**
  - (1) Near real time forecasting for 1 to 5 days and
  - (2) Medium time forecast up to 10 days

## Model characteristics:

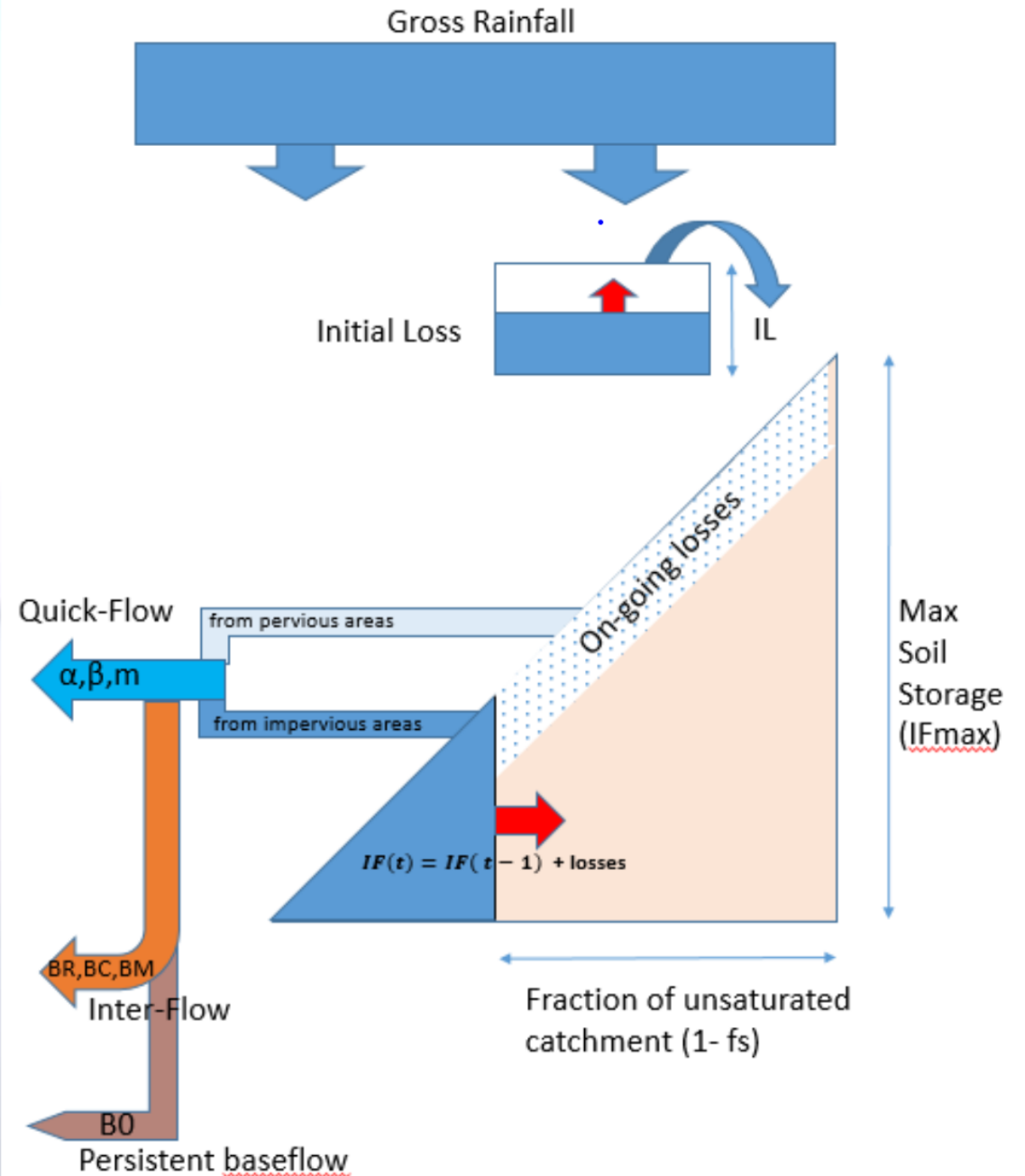
1. **Type of model:** URBS is a hydrologic modelling platform that combines [rainfall-runoff](#) modelling with [runoff-routing](#). This *model has agreed by the Mekong Member Countries (Cambodia/Laos/ Thailand/Vietnam) in using for Flood Forecasting activity*
2. **How can we view this model?**
  - **Spatially:** Semi-Distributed Model
  - **Resolution:** ex: 10 kmx 10km, applied for basin scale of the Mekong river
  - **Time period:** URBS is developing a large user base with consultants, government and Universities and international flood warning agencies (Australia/China/Mekong region..)



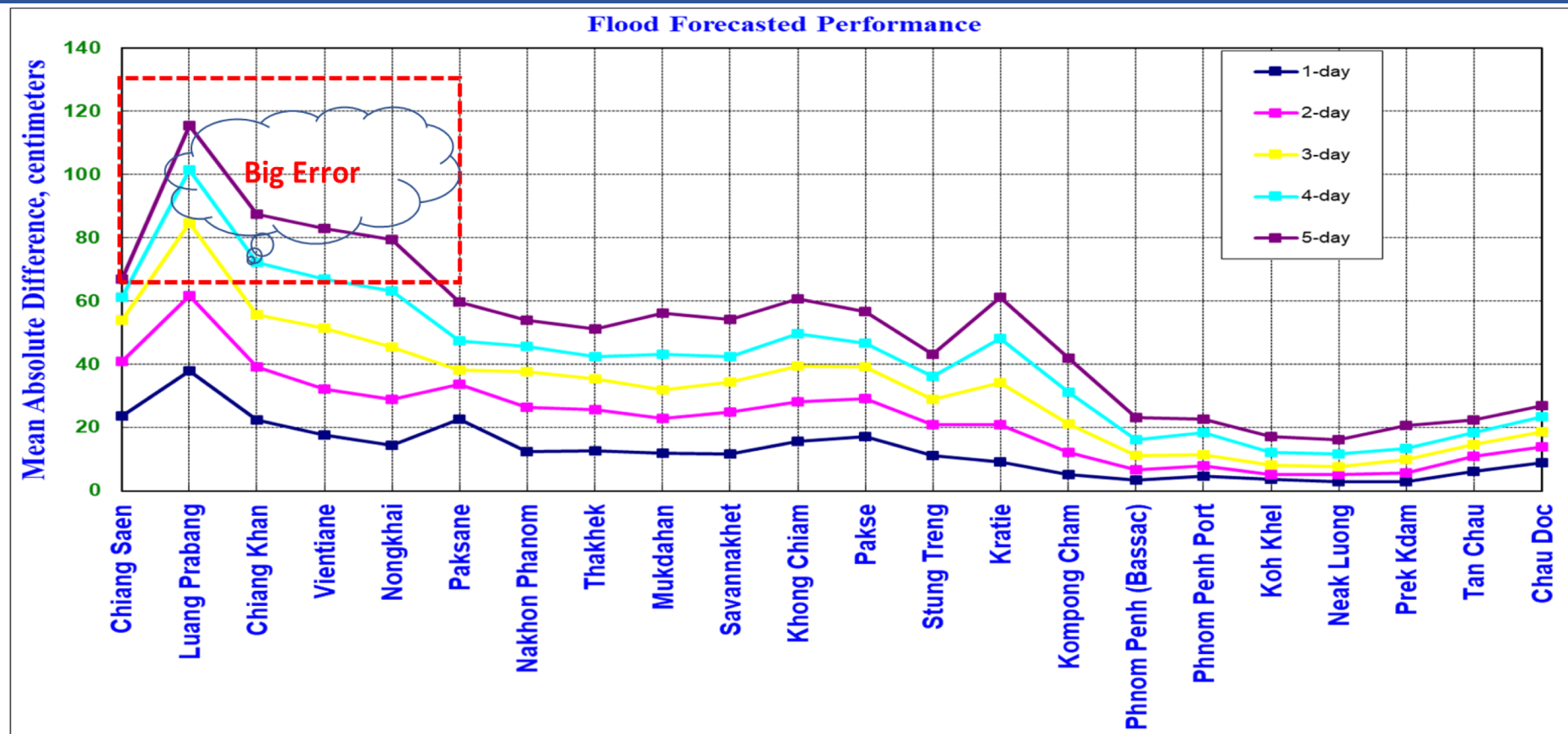
## Impact: URBS Model

Brief of Reason for using URBS:

- URBS is commonly used for operational hydrology to provide short term flow forecasting for flood warnings.
- As Semi-Distributed models have 1 rainfall input at the centroid of each sub-area.
- As Lumped models have 1 have 1 rainfall input at the centroid of whole catchment.
- Use grid based to capture rainfall distributions in both time and space



# Result and Implications




“Accuracy” describes the outcomes from the adjusted and published forecast, based on the results of the MRC Mekong Flood Forecasting System in associating with adjustment for each station by the Flood Forecaster.



# Products: Publication

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[www.mrcmekong.org](#)




## Mekong River Commission

For Sustainable Development

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**Annual Report 2018**  
[Read or download here](#)

1 2 3 4 5 II


### Mekong Flood Forecasting ( Zoom in )

No flood warning at any Mekong monitoring sites

Calendar Dates →	21	22	23	24	25	26	Calendar Dates →	21	22	23	24	25	26
Jinghong	↑	X	X	X	X	X	Pakse	↓	↓	↓	↓	↓	↓
Chiang Saen		↑			★	★	Stung Treng	↓	↓	↓	↓	↓	↑
Luang Prabang	↓	↓	↑	↑	↑	↑	Kratie	↓	↓	↓	↓	↓	↓
Chiang Khan	↑				★	★	Kompong Cham						
Vientiane	↑	↑				↑	Phnom Penh B.		↓	↓	↓	↓	↓
Nongkhai	↑	↑			★	★	Phnom Penh P.	↑	↓	↓	↓	↓	↓
Paksane	↓	↑					Koh Khel	↑	↑	↓	↓	↓	↓
Nakhon Phanom	↓	↓			★	★	Neak Luang	↑		↓	↓	↓	↓
Thakhek	↓	↓	↑				Prek Kdam	↑	↓	↓	↓	↓	↓
Mukdahan	↓	↓	↓		★	★	Tan Chau	↓	↓	↓	↓	↓	↑
Savannakhet	↓	↓	↓				Chau Doc		↓	↓	↓	↓	↑
Khong Chiam	↓	↓	↓	↓	★	★							

[Legend](#) | [Flash Flood Update](#)

### What's New




**MRC and China renew pact on water data provision and other cooperation initiatives**  
The People's Republic of China has agreed to continue sharing hydrological data with the Mekong River Commission, which will contribute to better river monitoring and flood forecasting in the Mekong countries.

### Events


**The 7th MRC Regional Stakeholder Forum**  
12 Apr 2019

**Cambodia, Thailand, Viet Nam consult stakeholders on Pak Lay hydropower project**  
21 Dec 2018

### Featured Publications



**2017 Lower Mekong Regional Water Quality Monitoring Report**

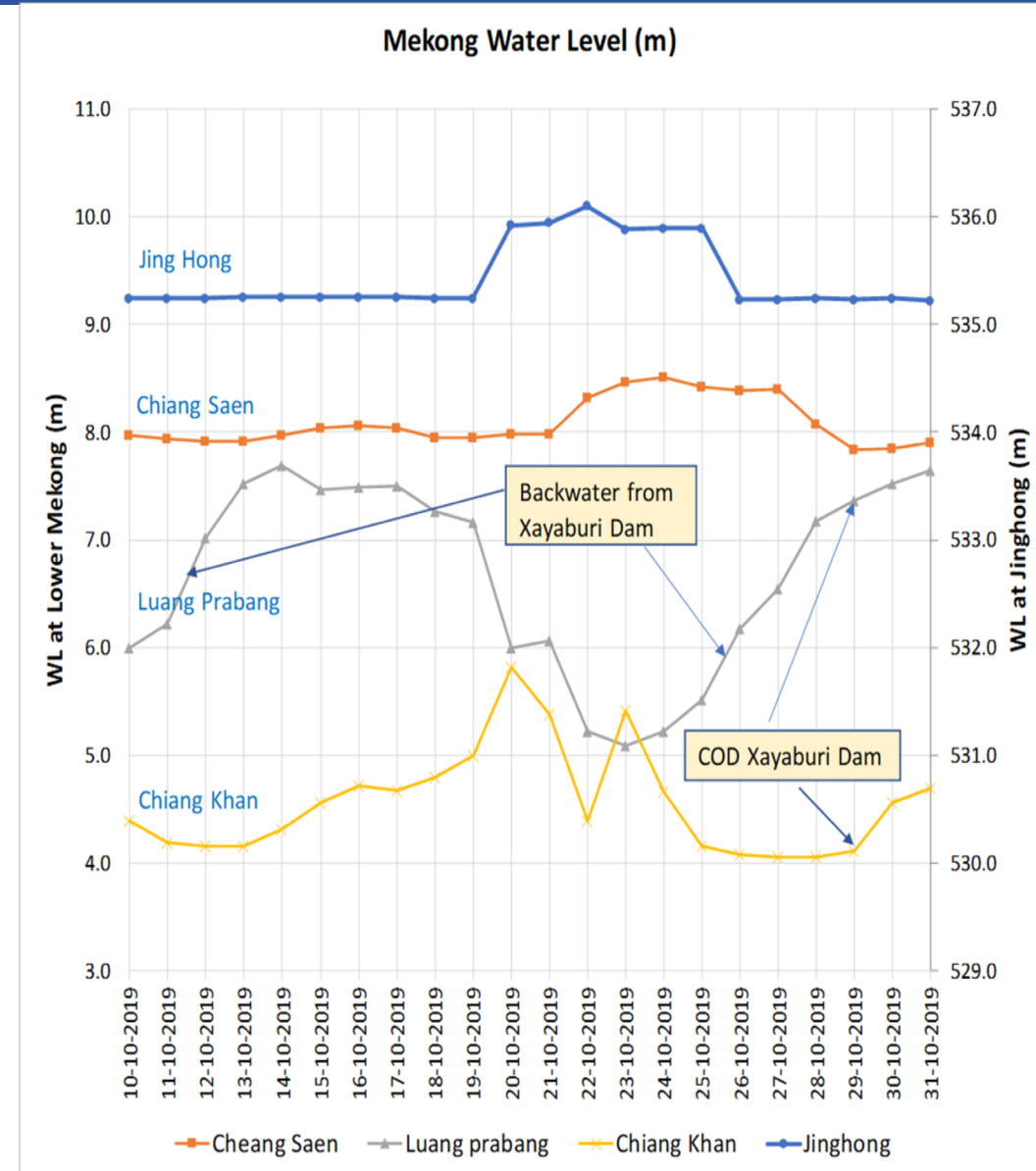


**Mekong Integrated Water Resources**



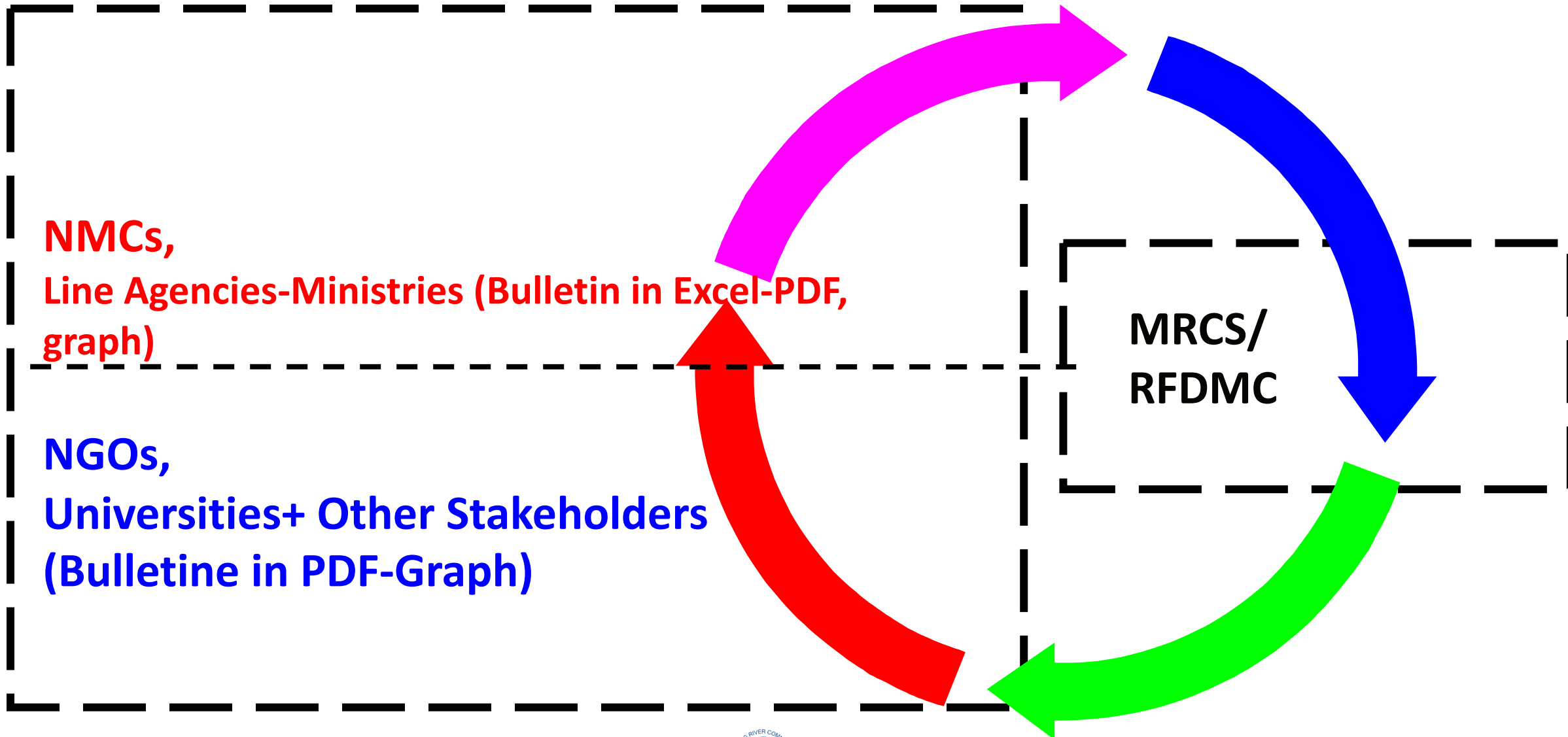
# Challenges

- ✓ The outcome of RFF was not well fit for the last 2 days (forecasted day4 and day5).
- ✓ No up to date for the rating-curve data, using in the RFF (data up to 2015)
- ✓ The fluctuation of water level due to hydropower operations (for example at Chiang Saen, Luang Prabang, Chiang Khan and Paksane). These stations are influenced by hydropower operation. It is needed for detail information of hydro-power operation (mainstream and tributaries)





# Exchanging Data and Flood Information



# Thank you



Thank  
You!