Findings from the MRC-LMC Joint Study – Phase 1

Changing patterns of hydrological conditions of the Lancang-Mekong Basin and adaptation strategies
What is the Joint Study?

• Floods
• Droughts
• Critical and variable flows

Public, media… pointing to different sources

Different studies
• Using only satellite
• Using monitoring/ground data
• Gap in data/information

• LMC Water Center
• MRC
• Stakeholders

Joint Study
Objectives

Provide a better understanding on changing patterns of hydrological conditions

Provide adaptation strategies for hydrological changes

Advise all the riparian countries of potential measures to mitigate basin-wide flood and drought risks
Highlights of the Joint Study

Component 1
- Historical changes in the hydrological conditions
- Causes of these changes

Component 2
Future trends of the hydrological conditions under climate change and water resources development

Component 3
Adaptation strategies for the changing hydrological conditions for sustainable management and development of the LMRB

PHASE 1 (2022)

PHASE 02 (2023-2024)

Hydrological characteristics: Natural runoff composition, Flood and drought, Reverse flow to the Tonle Sap Lake.
Key findings in Phase 1

Changes to the spatiotemporal distribution of streamflow

- **Changing Year:** Significant streamflow changes occurred from 1980 to 2020, with 2009 as a changing year.
- **Spatiotemporal Changes:** changes observed in streamflow distribution across the Lancang-Mekong River Basin (LMRB) and Tonle Sap Lake flood pulse.

- **Annual Flow Decline:** Mainstream annual flow decreased from 2010 to 2020, likely due to drier climate conditions.
- **Seasonal Patterns Persist:** LMR flows maintain distinct seasons, with dry season flows increasing and wet season flows decreasing due to basin development.
Key findings in Phase 1

Drought frequency, duration, and severity

- **Frequency**: Lower part of the Lancang, upper Mekong, and the middle areas of Cambodia show trends towards more frequent and more severe drought frequencies when compared with the 2000-2009 period.

- **Duration**: Mild, severe and exceptional drought durations tend to have longer durations over large areas of the basin.

- **Severity**: Intensity of exceptional droughts decreased in the lower Lancang Basin and the upper Mekong.
Key findings in Phase 1

Changes in flood pulse of Tonle Sap Lake
- Total volume and duration of the reverse flow to the Tonle Sap Lake have considerably decreased.
- Recent meteorological drought conditions of 2016 and 2019–2020 as one of the main causes of the changes.

What caused the differences in the 2000-2009 and 2010-2020 flows?
- Reduced wet season rainfall (which reduced the flows in the lower Mekong mainstream)
- Increased storage and water withdrawal in the whole basin.
In a nutshell...

• **Understanding Hydrological Changes:** Six riparian countries now comprehend hydrological change resulting from climate change and human activities.

• **Common Understanding:** Changes in annual, seasonal, and monthly flows.

• **Drivers:**
  - Natural elements (*precipitation, evaporation, soil, landform*) and
  - Human activities (*infrastructure, management, land use*).

• **Complex Interaction:** These factors interact, influencing water quantity, timing, and distribution.
Limitation of the Joint Study

- **Data limitations**: Lack of hydro-meteorological data, reservoir characteristics, operations, actual operating rules and reservoir filling, storage levels and inflow/outflow, updated domestic/industrial water supply etc.

- **Model limitations**: Limited full integration of hydrological and water system models and lack of necessary data results in low model performance.

- **Results limitations**:
  - Focus on average monthly and seasonal flow, not daily and sub-daily water level fluctuation.
  - Lack of data and the above biases may result in uncertainties in the detection of hydrological pattern variations, distinguishing between influences of climate change and human activities.
Field trip to Chiang Saen

- Local community stakeholders in Chiang Saen express concerns about changes to the flood season and dry season, water level fluctuations, and sediment supply in the Mekong River.

- Chiang Rai University's teacher highlights the impact of flow and land use changes on local livelihoods and culture and expresses interest in climate change adaptation knowledge transfer and student exchange programs.

- Community fisheries and villagers are adapting to significant reductions in fish production due to recent droughts.
Field trip to Hydro-Langcang & Nuozhadu

- Short Visit to Huaneng Lancang River Hydropower Control Room (Kunming)
- Nuozhadu HPP (Pu’er): 5th of eight cascades in the lower reach of Langcang River; with the biggest installed capacity and storage
- Initial visit – further working exchanges planned
Short-term recommendations

Enhanced data and information sharing

Near real-time data sharing

✓ Near real-time sharing of storage levels and hydropower operations will also be critical to support operational models and adaptive management of the basin.

Long historical data sharing

✓ More information and data on tidal changes, water and land use, and groundwater level in the past 40 years or even longer in the Mekong Delta is also critical for scientific research with a basin-wide perspective.

Effective notification of storage release

✓ It is encouraged to explore and improve the better and more effective notification of storage releases and restrictions, and both LMC and MRC are ideal mechanisms to enhance notification of unusual releases and restrictions.
## Medium-term recommendations

### Coordinated management of water resources
- Jointly formulate action plans and strategies.
- LMC water cooperation’s Five-year Action Plan (2023–2027)
- MRC’s Basin Development Strategy (2021–2030)
- Associated adaptive management plan provides the opportunity to advance this.

### Comprehensive flood and drought management strategy
- Formulated based on the Prevention, Protection, and Preparedness (3-P) principles to cope with the impacts of climate changes mitigated by either structural or non-structural measures.

### More joint studies
- Sediment movement/transport, salinity intrusion, ecological conservation, recovery of reverse flow of the Tonle Sap Lake, etc., which needs additional joint studies.

### More capacity building plan
- Educated water and related policy makers, managers, engineers and scientists.
- Formulated that addresses the knowledge, understanding and capacity gaps for all aspects of water resources management including formal (post-graduate and diploma) courses as well as informal training courses.
Special Joint Meeting of JWG and JC
Way forward for the Joint Study Phase 2

- Short-Term Water Levels Fluctuation
- Stakeholder Engagement
- Model Refinement
- Quantifying Changes
- Expanded Coverage

✓ Joint Expert Group (JEGDMF) to be established and Joint Lancang-Mekong Survey (JLMS) will be carried out along the way of the implementation of Joint Study Phase 2 to ensure that the implementation is JOINTLY carried out and produces a joint product such as a report.

✓ JEGDMF and JLMS include the joint discussion, review and consultation, documentation, field trip/survey, working session, and finalization of the technical report, etc.
Thank you.