

DRAFT TECHNICAL REVIEW REPORT FOR THE LUANG PRABANG HYDROPOWER PROJECT – HYDROLOGY AND HYDRAULICS

THE 9TH MRC REGIONAL STAKEHOLDER FORUM

DAY 1: THE 2ND REGIONAL INFORMATION SHARING ON PRIOR CONSULTATION FOR LUANG PRABANG HYDROPOWER PROJECT

05 FEBRUARY 2020, LUANG PRABANG, LAO PDR

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OUTLINES



Background



Main Review findings



**Public comments from 8th RSF
and MRC's address in the TRR**



Recommendations

Background

- Hydrology and hydraulics determines how infrastructure is designed and operated for hydropower production, navigation, sediment routing and environmental and social considerations. Hence it is relevant for all topics and addressed up front.

Concerns and risks

- How does the **operation** of Luang Prabang HPP contribute to changes in seasonal flows and daily fluctuations downstream?
- Did the developer use proper **methods** to quantify the physical behavior of the river, and its variability (wet/dry years, upstream dams, detailed flows near the infrastructure, etc.)
- How about the role of LPHPP in the Lao dam cascade, and its contribution to the **impacts**?

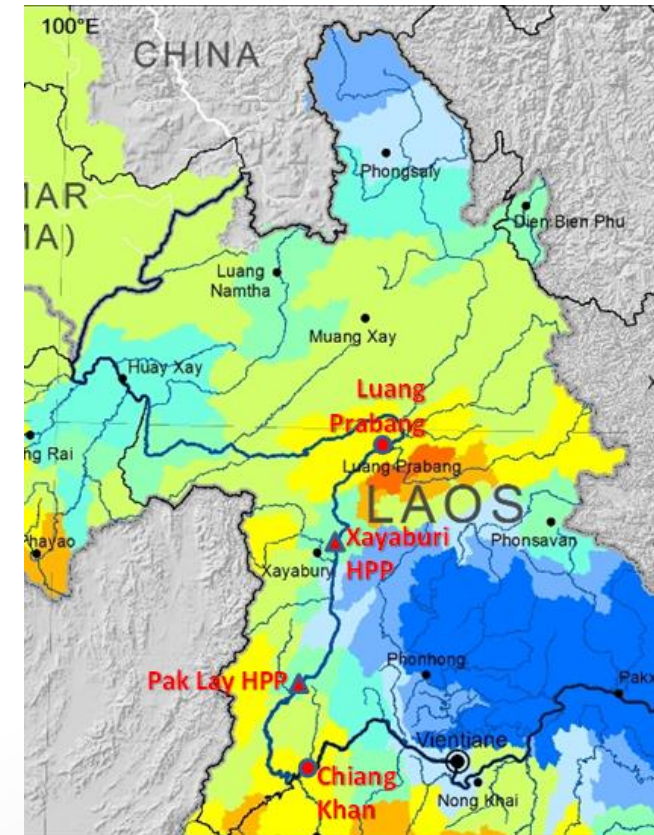
Main review findings (1): data used

Gauging station	River	Daily data	Hourly data	15 min data
Luang Prabang	Mekong	05/60–10/18		
Chiang Saen	Mekong	05/60-10/18		
Ban Xiengkok	Mekong		05/16-10/18	
Ban Tonpheung	Mekong		04/16-10/18	04/16-11/16
Pakbeng Bridge	Mekong		09/16-10/18	
Poupanouvong	Mekong		07/16-10/18	
Xayaburi d/s	Mekong			04/16-11/16
Muang Ngoy	Nam Ou	01/88-12/17		08/15-11/16
Ban Hat Nga	Nam Ou			08/15-11/16
Ban Mixay	Nam Khan	01/88-12/17		08/15-11/16
Ban Sibounhom	Nam Suang	01/87-12/14		

Quality of data and analyses should be given high priority because of their relevance to the design, operation

- Hydrological data, discharges and water levels used:
 - Historic flows and water levels of **Chiang Saen and Luang Prabang (1960-2015) stations**
 - Approximations of the **impacts on discharge for the future dam development in the upstream reaches, only considering Lancang cascade**
 - Water-level records of nearby monitoring stations in Nam Ou, Nam Khan and Mekong**
 - Remote-sensing rainfall data used for modelling
- Need to collect data at the dam site**, share the used data, and provide QA/QC information

A new hydrometric station has been installed on the left bank about 2 km downstream of the dam axis, and that water-level and discharge data is being collected



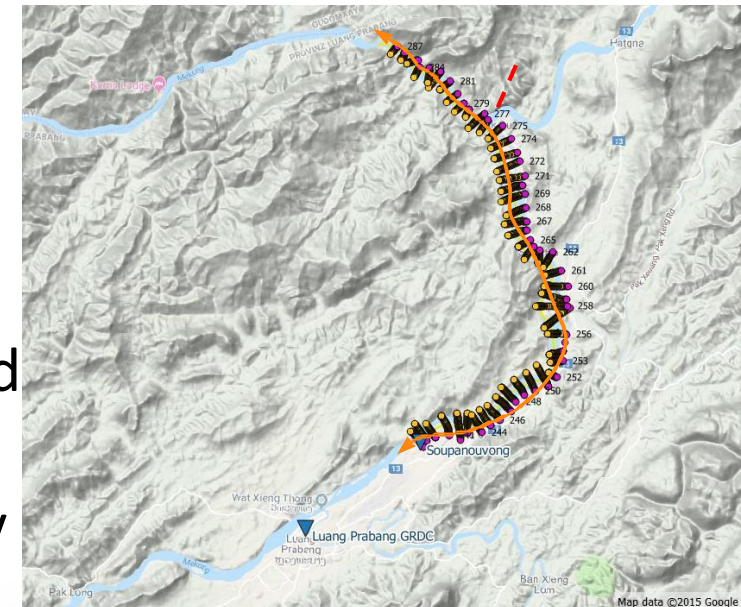
Main review findings (2): derived discharge at the dam site

- **A water-balance model** used to simulate the daily and monthly average discharges (1951-2018) using data mainly at Chiang Saen and Luang Prabang.
- The prediction included only the operations of Nuozhadu and Xiaowan HPPs, **not the impacts other tributary developments**, such as HP development in the Nam Ou cascade, Nam Tha 1 and Nah Pha HPPs in upstream tributaries and in Myanmar and the **impacts and operational rules for PB HPP** are not considered.

- **Data collected by the developer in this respect should be shared** with the MRC and the QA/QC procedures should be presented.
- The manually recorded rainfall should be used the simulation if necessary.
- **The potential impacts of both climate change and upstream hydropower development** on future hydrology and discharge at the dam site should be more addressed and forecast for the full operating life of the LPHPP.
- **Additional modelling scenarios** should be considered that include the cascade operations (main-stream dams in China and dams up- and downstream of LPHPP in Laos) and tributary dams

Main review findings (3): tailwater calculations

- **Tailwater of LPHPP obtained from numerical 1D model FLORIS**, not accounting for morphological changes and poorly calibrated (no u/s data available for proper calibration and verification of the model and the rating curve, roughness value used)
- The rating curve at Soupanouvong and consequently the resulting curve for PBHPP site, should be corrected for the impacts of operation of the Xayaburi HPP. **The backwater effect of Xayaburi HPP should be included in the curves** (water levels near Luang Prabang do not drop below 275 m). Details on the data for which the rating curve has been established should be shared for review.
- The sensitivity of the tailwater levels to changes in the alluvial deposits and flows from the Nam Ou River into the Mekong should be shown.
- **The developer should share results of model recalibration** based on recent/new measurements of levels and discharges near the dam site and between the Soupanouvong station particularly a calibration for floods.



Main review findings (4): design floods

- The flood peaks for the LPHPP are in the higher part of the range, they can be considered conservative and therefore on the safe side.

Return (yr)	10000	5000	2000	1000	500	200	100	50	20	10	5	2
P(%)	0.01	0.02	0.05	0.1	0.2	0.5	1	2	5	10	20	50
ESTIMATES FOR LPHPP												
Q_Final	33500	32100		28800	27300	25300	23800	22200	20000	18200	16200	12800
AIT CNR	30000	28400	26400	24000		20500	19000	17500	15500	14000	12500	10000
ESTIMATES FOR PBHPP												
PB PNPCA	33500	32100	30200	28500	26800	24600	22900	21100	18700	16700	14600	11300
AIT CNR	30000	28400	26400	24000		20500	19000	17500	15500	14000	12500	10000
ESTIMATES FOR THE XAYABURI HPP												
Xayab CNR	38500	36700	34200	32800		28300	26500	24500	21800	19800	17700	14500
Xayab (AIT)	45000			37100	34697		29146	26744	24076	22033	18480	

Design values of LPHPP
Design values of PBHPP
Design values of Xayaburi

- The impacts of climate change and upstream development should be included in flood frequency analysis more comprehensively
- The probability of flood volume and flood discharge should be presented jointly to determine a proper flood hydrograph

Main review findings (5): operations

- The LPHPP developers have increased the operating levels from 310 m to 312 m. The 310 m was agreed with the Government of the Lao PDR for design of the upstream Pak Beng HPP. This issue must be addressed as it has profound implications for both HPPs. * **GoL has indicated that this is presently further explored by an ongoing study, and the final decision will be taken based on the results of the study.**
- If the operating level of the LPHPP is lowered to 310 m (or any other value than 312 m), the developer should **update calculations and designs for the structures**, together with an updated financial viability assessment.
- **The developer should elaborate in more detail on the expected joint operational rules** for the spillways, power generation, reservoir levels, sediment management operations and for other environmental purposes, etc.
- **The operating rules must be updated to provide for specific environmental (flow) requirements, and the requirements coming from potential (flood) impacts at Luang Prabang World Heritage Site**

Main review findings (6): Hydrological monitoring

- The FS does **not provide information on the hydrological monitoring system** that has to be installed for operation of the scheme, and for monitoring the environmental impacts.
- The developer has indicated that **LP HPP monitoring will be connected to the existing telemetric system for the Xayaburi dam**, but with additional stations near the dam and further upstream.
- **Information on the hydrological (telemetric) monitoring system should be provided for further review** i.e. locations, equipment, monitoring frequency, approaches, etc. The system is needed for the full life cycle of the project, starting from pre-construction (from present) and continued during operation.
- **The MRC and WMO guidelines (HYCOS system) should be followed** for the technical details of the hydrometric stations and the telemetric system, as a consistent and uniform system over the entire LMB.
- The developer should **provide information on the QA/QC processes** in their monitoring programme.

Main review findings (7): Risks and Concerns

- The site of LPHPP is chosen at a location still influenced by backwater of Xayaburi. Therefore no free-flowing river section remains between the impoundments.
- The back-water effect of Xayaburi HPP defines the tailwater level at LP HPP and therefore no river section remains, that has natural flow conditions. Upstream the backwater effect of LP HPP reaches the tailwater of Pak Beng. The cascade of the three ROR plants cause lower flow velocities in the whole section.
- It has been noted by Xayaburi Dam that this backwater can worsen sedimentation.
- Knowing that the FS assessments did not include the Xayaburi backwater in the calculation of tailwaters, it is not clear how much of the backwater effect remains close to the new LP dam. It is therefore recommended to demonstrate this in the documents.
- The Mekong river reach between Pak Beng dam and Luang Prabang HPP will experience a raised water level because it will be impounded. Tributaries will experience a rise of the erosion base, with impacts upstream depending on backwater length.

Public comments from 8th RSF and MRC's address in the Draft TRR

Public comments from 8th RSF

The developer informed that **no data from China to conduct the simulation** whereas the developer focused on energy production during low flow. Data-information on model and calibration are available. Hydrological data is available in the Annex.

Flow regime maintenance is an issue, water fluctuation keeps changing, this will increase with new dam construction, together with increased erosion. **What type of maintenance is proposed?**

MRC's address in 2nd draft of TRR

The forecasts of inflows to the LPHPP are made with and without the Lancang Cascade dams. The differing MRC and Developer's results are highlighted and discussed.

For water flow maintenance, **during dam operation the water level and flow regime will be affected and impact on bank erosion and landslides.** Reduced velocity of water release can change the erosion regime.

From the developer's perspective, there will be **no hydropeaking.** It's a pure run of river dam. For the rating curve, we intend to have a constant low level. **The operating range needs a 0.5m for the operating range.** These aspects are addressed in the section on managing the cumulative impacts in the draft TRR (Section 5.4)

Public comments from 8th RSF and MRC's address in the Draft TRR

Public comments from 8th RSF

Impact on normal WL, impact from Xayaburi Dam backwater, quality of data from MRCS?

What can MRC do if there is not enough water in the Mekong for the communities?

MRC's address in 2nd draft of TRR

The backwater of Xayaburi dam reaches the LPHPP, there is no free-flowing section remaining between the impoundments.

The impacts on the backwaters of Xayaburi are dealt with in some detail (Section 3.1).

The MRC is to promote and coordinate the use of the resources in a sustainable manner. **MRC is the one that can indicate and advise the MCs on the issues based on data and research. Member countries must take actions in terms of helping and supporting their own peoples in times of critical situations.**

MRCS will continue to monitor and issue forecasting information and analysis. MRC member countries are discussing the issue and planning and implementing different measures at regional and national levels. This is part of the PMFM process.

Recommendation

- Monitoring of the water levels and flows at the dam site should be initiated as soon as possible. This could be used to validate the hydrology forecast models.
- The impacts of both climate change (increased incidence of high rainfall events) and upstream hydropower development on future hydrology and flood peaks should be more addressed more comprehensively.
- The rating curve at Soupanouvong should be corrected for the impacts of operation of the Xayaburi HPP.
- The expected joint operational rules should be elaborated in more detail for the spillways, power generation, reservoir levels, sediment management operations and for other environmental purposes, etc.
- The sensitivity of the tailwater levels to inflows and changes in the alluvial deposits due to the Nam Ou and LPHPP developments, should be assessed. The impacts of any possible changes should be determined.
- The planned additional hydraulic modelling for the full length of the impoundment should be initiated as soon as possible, and the results shared.



THANK YOU

One Mekong. One Spirit.