

The 6th Regional Stakeholder Forum

Second Regional Information Sharing on Pak Lay Prior Consultation Process

17 January 2019

Luang Prabang, Lao PDR



Second Draft Technical Review on Water Quality, Aquatic Ecosystem Health and Environmental Flow

Dr. So Nam, Chief Environmental Management Officer, MRC Secretariat



Key Comments from 1st Regional Stakeholder Forum

1. The cascade dams make change to the **river ecosystem (i.e. water quality, habitats and biodiversity)** both up and downstream.
 - ✓ **The above issue** has been properly addressed in this draft TRR in the following slides.

Baseline Status in Upper LMB (1)

1. **Review** of water quality and aquatic ecological health in LMB

Largely refers to downstream in Cambodia and Vietnamese Delta.

2. **WQ monitoring** information collected by developer

Full range of WQ parameters

Sampling 4 days in the dry season (03-06 Feb) and 4 days in the rainy season (13-16 Sept) at

7 stations up and downstream PLHPP site

Surface water quality at and around PLHPP site is good



Baseline Status in Upper LMB (2)

1. **Aquatic ecological surveys** in the dry (February) and rainy seasons (September) at 7 locations in project area.
2. **Sampling** restricted to basic plankton net trawling (59 μm mesh), Eckmann grabs for benthic invertebrates
3. Little mention of **impacts on other aquatic organisms** reliant on the annual flood cycle and natural variation (e.g. amphibians, reptiles and birds)

Phytoplankton- Diatom: high diversity and abundant

Zooplankton- Protozoan: low diversity and abundant

Benthic macroinvertebrate: Low diversity and abundant

Baseline status in Upper LMB

1. **Overall sampling frame and description of WQ and biota highly superficial** and limited number of samples precludes any definitive assessment of the current baseline status.
2. No **target criteria** for monitoring and identifying **water quality and ecological health issues**;
3. **No analysis of value of habitats that will be lost**, or potential impacts on wider LMB ecosystem
4. **No budget estimates** for monitoring programmes presented. Not specified whether monitoring costs will be covered by the developer.

Current monitoring carried out by PLHPP considered inadequate for impact assessment

Transboundary and environment flows assessment (1)

1. EIA report indicates flow releases will follow **natural flows** cycles;
2. But indications of hydrological cycle will be modified:
 - **Seasonal flood peaks** reduced and delayed which could impact on fish migration and spawning;
 - Operation of turbines appears to cause daily water level **fluctuations of 0.5-1 m per day** suggesting diurnal hydropeaking
 - Possible **impacts** on river hydro-morphological processes, erosion and bank stability and natural habitats such as riverine wetlands and fish habitats, and related livelihood aspects.

Transboundary effects, especially the impacts in the productivity floodplain reaches of Laos, Thailand, Cambodia and Delta not explored

Transboundary and environment flows assessment (2)

3. No discussion about **flow changes** resulting from the location of PLHPP in the cascade
4. **Environmental flows** are not addressed
5. Comments from the CNR independent consultant report (Makrakis and Fontes 2017) suggests **environmental flows** will be developed after the compliance assessment and before impoundment
6. ESIA suggests **Environmental Flows Assessment (EFA)** will form part of the power production business case

Information on e-flows needs to be provided at the design stage.

Empirical methods, e.g. DRIFT used for the MRC Council Study, should be used to set environment flows

Conclusions

- **No modelling** of likely impacts on aquatic habitats, and thus aquatic biota - including in downstream reaches.
 - **Water quality issues** during the construction period largely managed through good practice.
 - Water quality during operation managed through vegetation management in reservoir.
- **Monitoring programmes, with sufficient budget, need to be designed to assess impacts**
- **The MRC Water Quality Monitoring Network and Ecological Health Monitoring Network should be interrogated to provide the general trends and status of the water quality and ecological health**

Alignment with PDG

- Documents provided only **partial alignment** with PDG
 - Addressing **Water Quality problems** seems acceptable but needs more attention to monitoring
 - Addressing **potential flow alteration** and impact on ecology less clear
 - Potential **loss of habitat** not been effectively addressed.
 - **No specific provisions** to avoid, minimise or mitigate against the loss of critically endangered or endangered species, or to monitor these impacts

Many comments of the independent reviewer (i.e. CNR) do not seem to have been addressed in the submitted documents.

Key recommendations

- **Programme** for integrated monitoring of water quality, flows and habitats and aquatic ecology, coupled with in- depth studies into the fisheries of the region need to be designed and implemented (i.e. JEM).
- **Full EIA**, based on in-depth studies, needed before any decisions on impacts can be made – currently PNPCA is **scoping analysis**
- **Relationships** between impact of PLHPP and other dams requires full assessment
- Assessment of long-distance **transboundary impacts** of modified flows and sediments on change in habitat, productivity and aquatic ecology required

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Second Draft Technical Review on Fish Passage and Fisheries Ecology

Dr. So Nam, Chief Environmental Management Officer, MRC Secretariat



Key comments from 1st Regional Stakeholder Forum

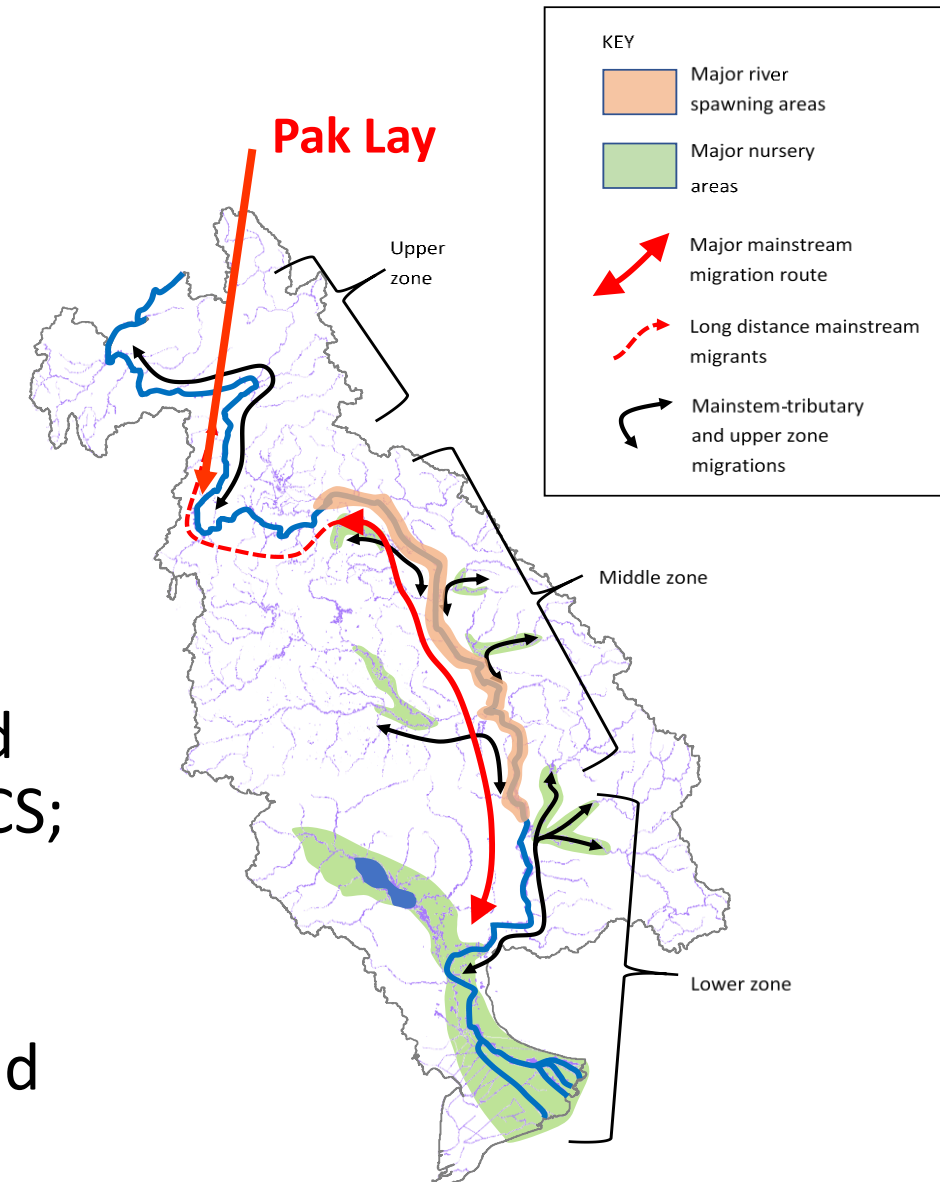
1. **Comprehensive fish sampling** and fisheries field surveys needed to collect good baseline information and data on fish species diversity and their fisheries for fish and fisheries impact assessment, fish passage design and fish monitoring before and during construction and operation;
2. Assurance of **long term survival rate of migratory fish species**, especially transboundary migratory fish;
3. **Effective fish passage** for both phases: dam construction and operation (basically similar to the natural river channel) required for long term fish population viability-adequate dimension to accommodate huge fish biomass migrating upstream, should be **compactable with Xayaburi fishway design**;
4. Encourage PLHPP developer consider the **protection of endangered fish species**, including local fish species, through aquaculture, breeding and restocking programme; and
5. **Transboundary fisheries impact assessment** required.

✓ The above five key issues have been properly addressed in the following slides of this TRR.

Fisheries in the Mekong Basin

Fisheries monitoring and baseline conditions (1)

- 1. Review of fisheries** in the LMB provided based on literature, but does not make use of information provided in the MRC Council Study or the MRC fisheries database;
- 2. PLHPP** lies in Zone 1 of the Mekong's Ecological Reach, or in **upper fish migration system** where **> 200 species** recorded in MRC's fish abundance and diversity monitoring and **280 species** by the MRC CS;
- 3. Limited baseline monitoring** of both primary and secondary fisheries data at **seven sampling locations** for a few days **once** in each of the dry and flood seasons; **56 fish species** recorded from field surveys;



Fisheries in the Mekong Basin

Fisheries monitoring and baseline conditions (2)

4. Fisheries monitoring programme lacks sufficient detail and does not appear include assessments of the **efficacy of the fish passage**;
5. No study of **drift of fish larvae** and juveniles reported;
6. Concluded that **fisheries not important** in region around PLHPP thus effect of the dam on the fishing communities limited;
7. Budget for overall EMMP provided (i.e. **US\$22,815,000** or approx. **1%** of the total investment), but no indication of how the **fisheries monitoring costs** will be covered;
8. Mitigation measures proposed largely **aquaculture and stock enhancement (hatchery)** (which has a different equitable distribution of benefits) and adjustment of fishing gears.
9. **The developer has noted a robust fishery monitoring system has been considered in the design period of PLHPP – but no details provided.**

Main Findings - Fish Passage

Two components to fish passage:

1. **Attraction** (fish need to find the entrance)

2. **Passage** (fish need to swim through channel)



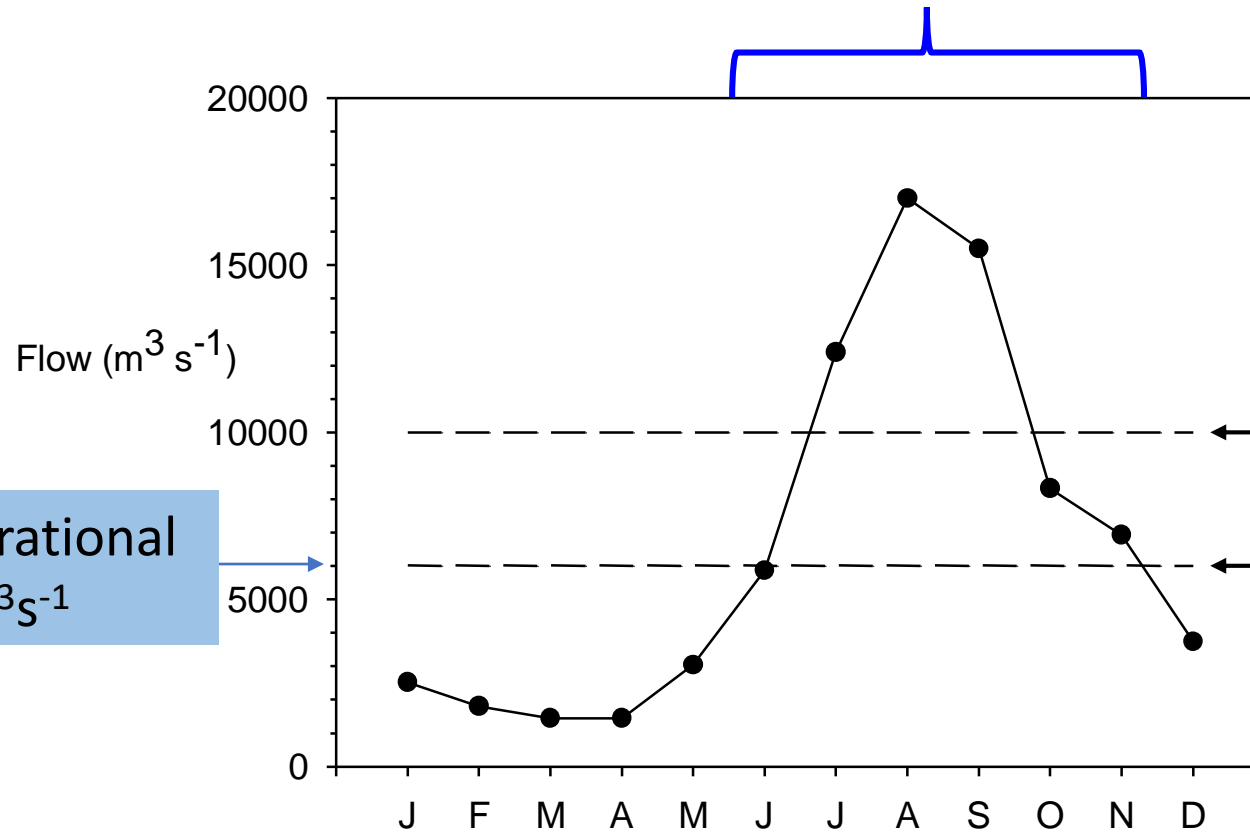
Designed for the
fish migration flows

Main Findings - Fish Passage

Flow & migration

Potential spillway operation during flow peaks: June – November

Spillway operational over $6100 \text{ m}^3\text{s}^{-1}$



Maximum Operating Flow: Xayaburi Fishpass

Maximum Operating Flow: Pak Lay Fishpass

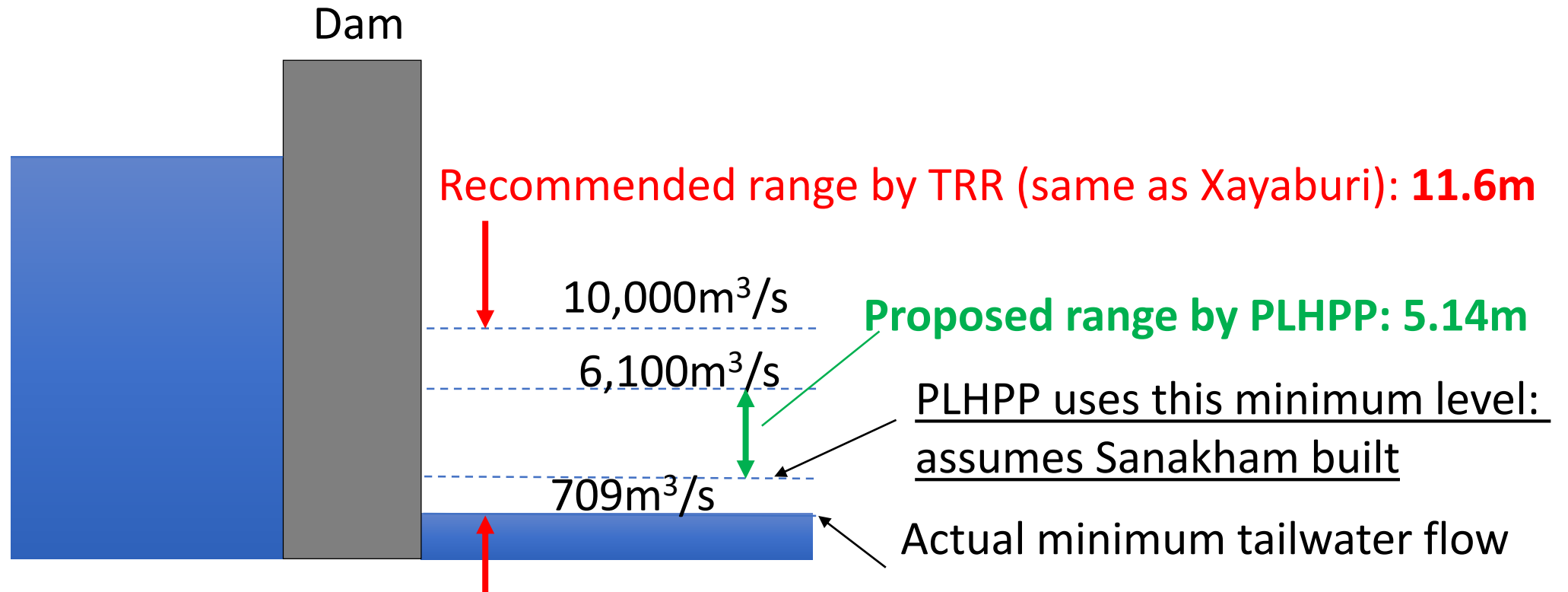
Likely season of upstream migration

Likely season of downstream migration

Main Findings - Fish Passage

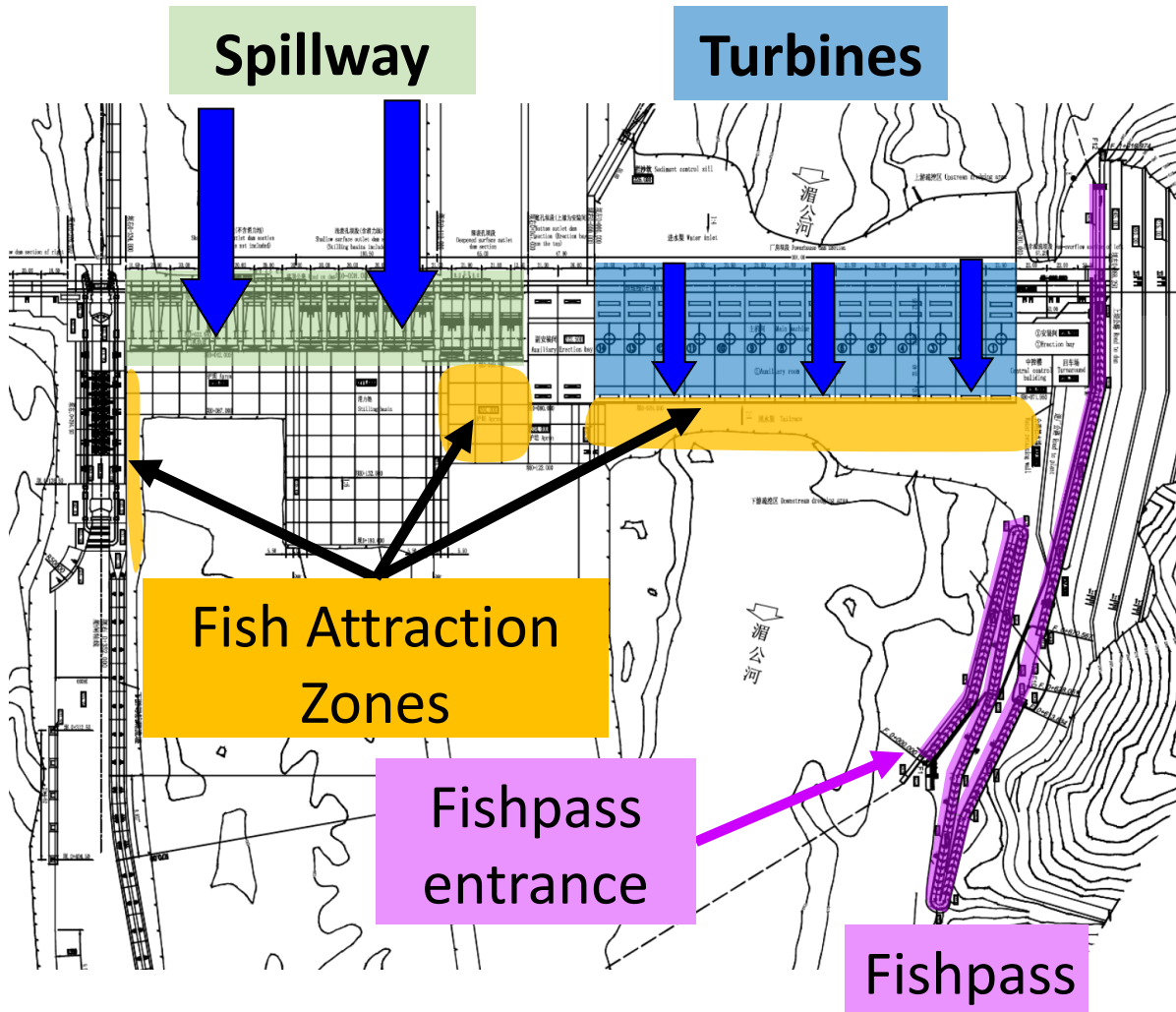
Flow & migration

- Practical flow range for upstream fish passage design:
Minimum flows (709 m³/s) to 10,000 m³/s (to match Xayaburi)



Main Findings - Fish Passage

Upstream Fishpass - PLHPP Proposal



Main Issues

1. Entrance too far downstream:
 - require entrances at powerhouse and spillway
2. Discharge **0.3%** of low river flows:
 - Pak Lay: 8.5 m³/s
 - Needs to be **10%**
 - Xayaburi: 40 m³/s fishpass

Main Findings - Fish Passage

Upstream Fishpass - PLHPP Proposal



- Dual-slot design proposed
 - Has potential in Mekong
- BUT proposed design:
1. Turbulence too high
 2. Water velocity too high
 3. Depth shallow
 4. Pools small
- Re-design required

Main Findings - Fish Passage

Proposed Upstream Fishpass recommendations

General

1. Requires compatible function with Xayaburi
2. Requires review of design options

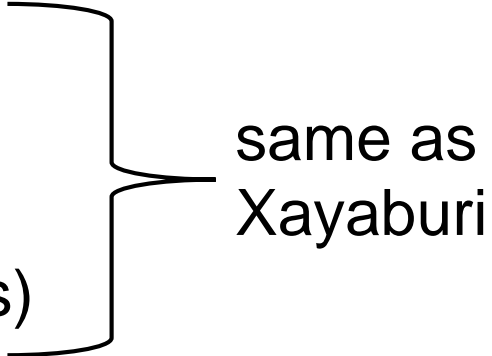
Specific

1. Fishway entrance:
 - relocate to powerhouse and spillway
 - do physical modelling in hydraulics laboratory
 - (same at Xayaburi)

Main Findings - Fish Passage

Proposed Upstream Fishpass recommendations

2. Fishpass Design

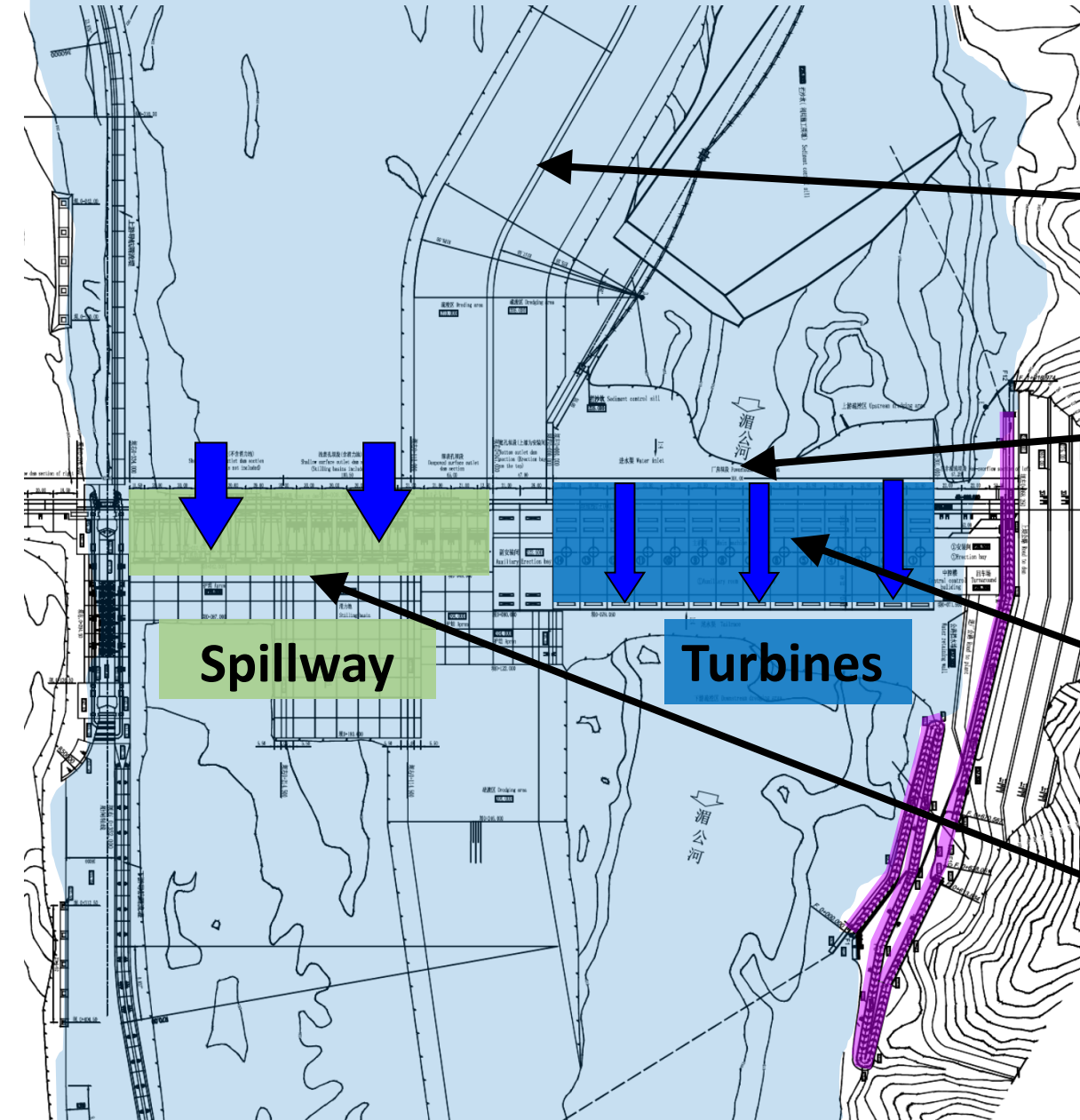
- increase flow to 40 m³/s
 - Increase attraction flow to 200 m³/s
 - Increase tailwater range to 11.6 m (10,000 m³/s)
 - Re-design gradient and pools; reduce turbulence & water velocity
- 
- same as
Xayaburi

Main Findings - Fish Passage

Downstream Fish Passage

1. Larval drift through the reservoir unknown: 2,000-6,000 m³/s.
2. Trash screen design unknown: high risk of impinging fish.
3. Turbine design unknown: high risk of blade strike, pressure and shear impacts.
4. Gate design undershot: high risk for fish

Recommendations:
more information; change gate design



Main Findings - Fish Passage

CNR Review (Makrakis and Fonte Jnr 2017)

- Independent review of design
- Identified many similar issues, such as entrance location and discharge
- However, did not identify or make recommendations on
 - i) Fishpass channel design (pool size, depth, turbulence)
 - ii) Downstream passage issues (e.g. gate design)
- The review concludes:

“nearly fully compliant with MRC guidelines and international standards”
and “remaining issues will be easily addressed by the Developer”.

This is incorrect:

- It is not compliant at present
- The fish passage component of the project needs a re-design

Transboundary Fisheries Impact and Risk Assessment

1. No comprehensive **transboundary fisheries** risk and impact assessment provided;
2. Trans-boundary fisheries impact assessment should include impacts on **fish and fisher communities** both upstream in Lao PDR and Thailand and downstream in Lao PDR, Thailand, Cambodia, and Viet Nam;
3. Overall **economic value** of transboundary migratory fish species needs to be assessed;
4. **Cumulative impacts** on aquatic communities, e.g. biodiversity need to be more clearly addressed;
5. Potential **cumulative impacts** associated with **Xayaburi** and **Pak Beng** Hydropower Projects need to be assessed;

Monitoring

- ⇒ **Insufficient information** on monitoring before, during & after construction
 - ⇒ does not address **downstream passage** success and fish survival through reservoir, spillways and turbines
- ⇒ **Underfunded**
- ⇒ Many issues not covered, especially **social and economic impacts** and livelihoods analyses.

Fish Passage and Fisheries Ecology – monitoring and mitigation

Mitigation

- **Proposed measures weak** and only relate to management of fish production in reservoir
 - ⇒ Aquaculture
 - ⇒ stocking
- **No measures to compensate** for lost wild fish production, especially for rural poor who will not be able to take up fish farming
- No indication is given what **fisheries personnel** provided to support fisheries and aquaculture development
- **Stocking measures** are not considered adequate because of impoundment hydrology and impacts of stocking exotic/invasive species

Alignment with PDG

1. In general, the information provided at this feasibility stage is **fairly good**,
2. Proposed project **conforms** to some paragraphs of PDG, but in many cases **insufficient data and information** provided to fulfil MRC PDG fully (See Annex 4);
3. Several other areas where the PLHPP **does not**, at this stage, fully **conform to the PDG** (See Annex 4); **Many comments** of the independent reviewer (i.e. CNR) do not seem to have been addressed in the submitted documents.

Key recommendations

1. Fish passage

- Proposed Fish Passage - very **high risk**.
- **Most migrating fish** will be blocked from migrating upstream.
- **Major impacts** of fish passing downstream.
- **Significant transboundary impacts** on migratory fish populations likely.
- Recommendations in this review greatly reduces risks but will significantly **increase cost**.
- The present budget for fish passage is **US\$8.59 million**, which is **0.4%** of total project cost.
- The low figure reflects that the fish passage solution is **significantly under-designed**
- An effective fish passage solution would likely be closer to **10% of the project cost**
- Modify and use **navigation locks** to pass fish up and downstream, especially during the second phase of dam construction

Key recommendations

2. Full fish ecology and fisheries impact assessment required:

- To fill gaps about fish ecology and fisheries and loss of biodiversity in relation to dam operation
- Transboundary and cumulative impact assessments on fisheries required as information is too generic at present – need to be specific to PLHPP.

3. Programme for fish management and monitoring required:

- Social and economic livelihoods impact analysis
- Develop detailed monitoring and mitigation programme, especially to mitigate or compensate for loss of fish and fisheries
- Detailed budget for monitoring and mitigation
- Develop sustainable fishery management system



Thank you

