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Approach and Methodology for Assessment of the Pak Lay Hydropower Project

Fisheries and Environment

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Contents of Presentation

I. Overview of Submitted Documents:

II. Approach and Methodology for The Technical Review:

1. Fisheries and Fish Passage

2. Water Quality and Aquatic Ecology

Review of Submitted Documents

This Overview is mainly based on review of the following submitted reports:

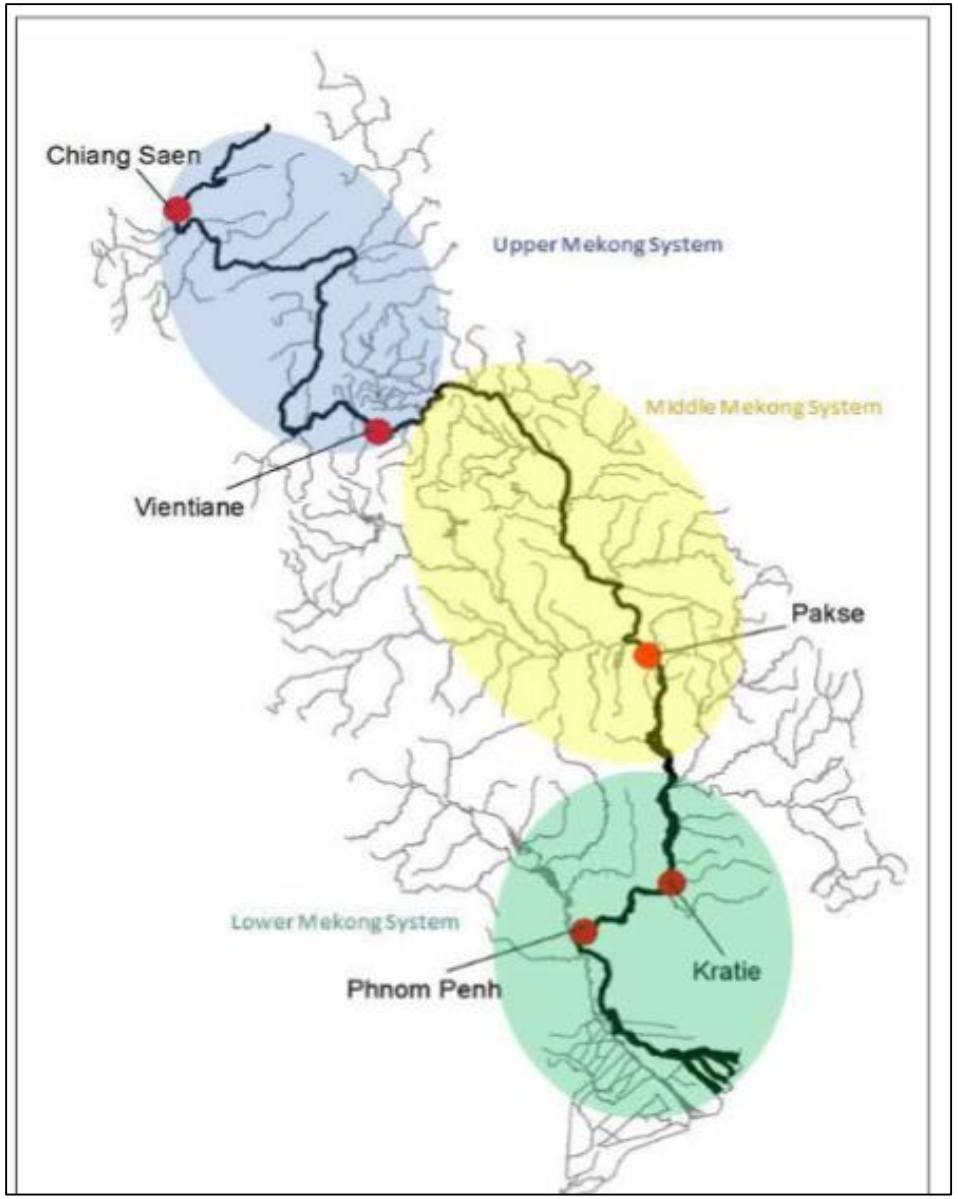
1. Environment Impact Assessment (EIA);
2. Environment management and monitoring plan (EMMP);
3. Transboundary environment and social impact assessment and cumulative impact assessment (TbESIA & CIA);
4. The two annexes: (1) Pak Lay hydrology, and (2) Pak Lay project layout and main structure, including the fish passage facilities;
5. An external review by CNR (Makrakis and Fontes 2017).

Fisheries and Fish Passage

Overview of Submitted Documents - Fisheries

- PLHPP lies in Zone 1 of the Mekong's Ecological Reach, or in **Upper Mekong Fish Migration System,** where **200 fish species** recorded in MRC's fish abundance and diversity monitoring;

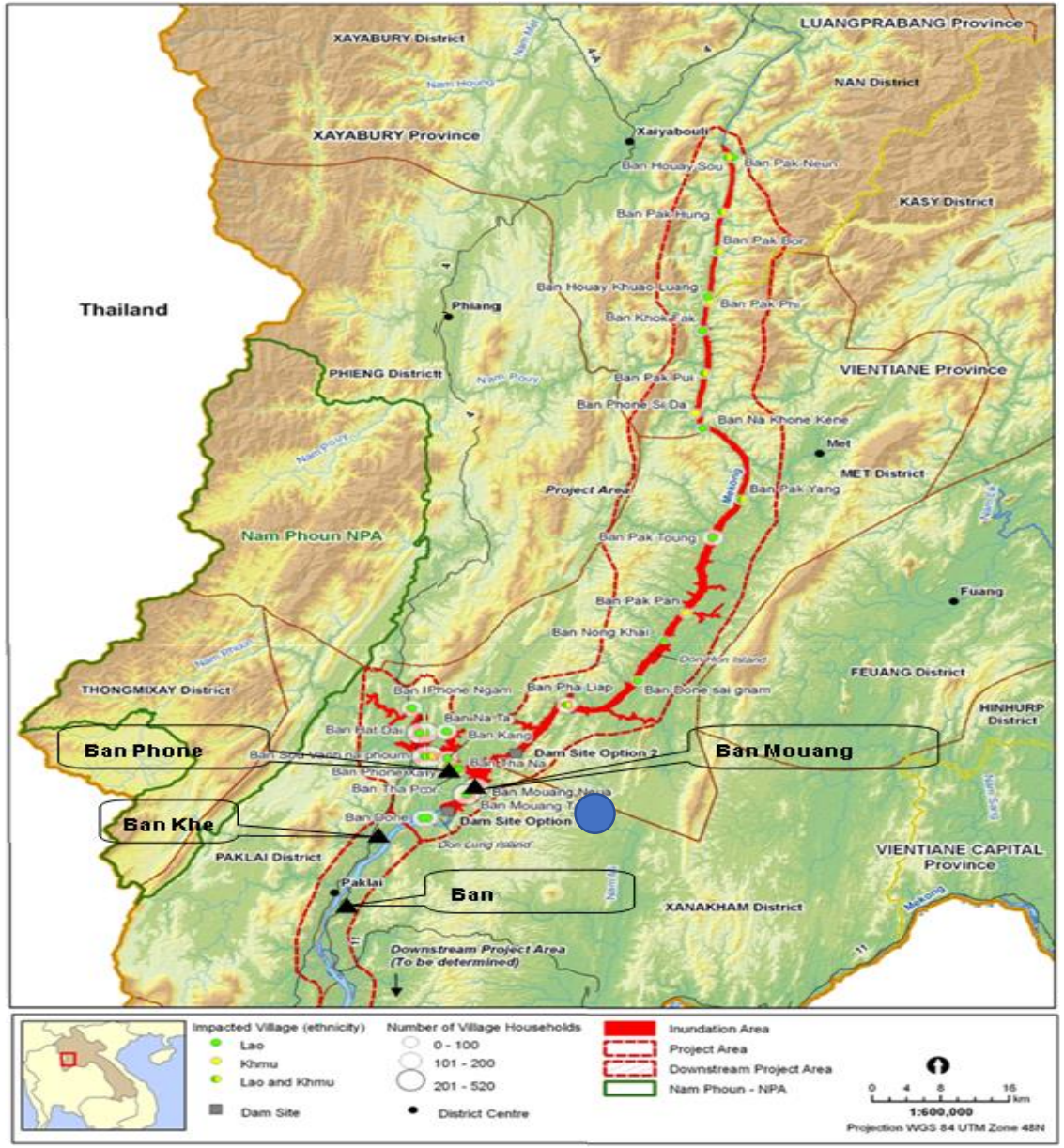
- **280 fish species** documented by the MRC Council Study (2017);



Overview of Submitted Documents - Fisheries

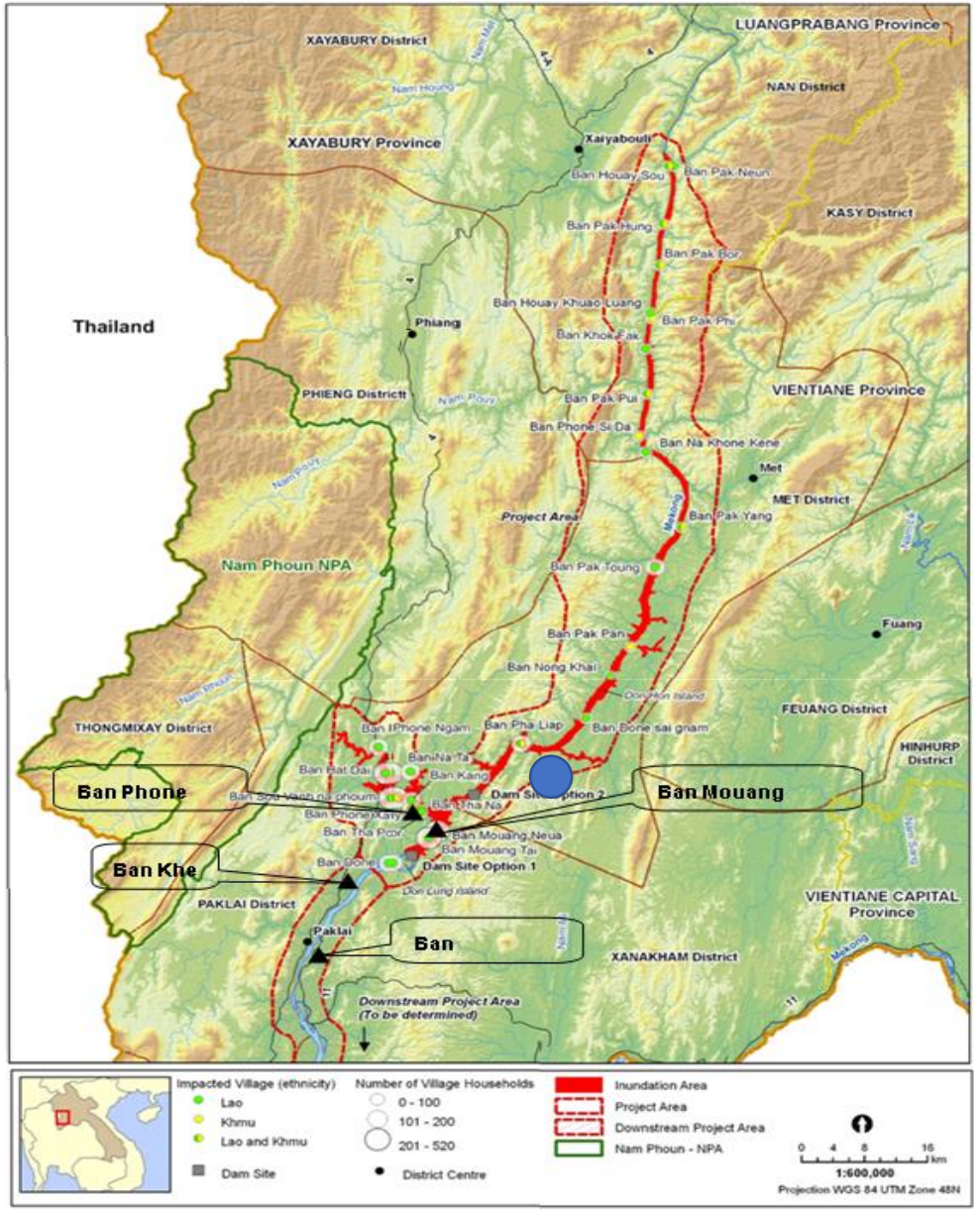
- In December 2011, initial field surveys designed for investigating fish species diversity upstream and downstream of **Dam Site Option 1.**

- About **100 fish species**, two species critically endangered, three endangered, and seven vulnerable species.



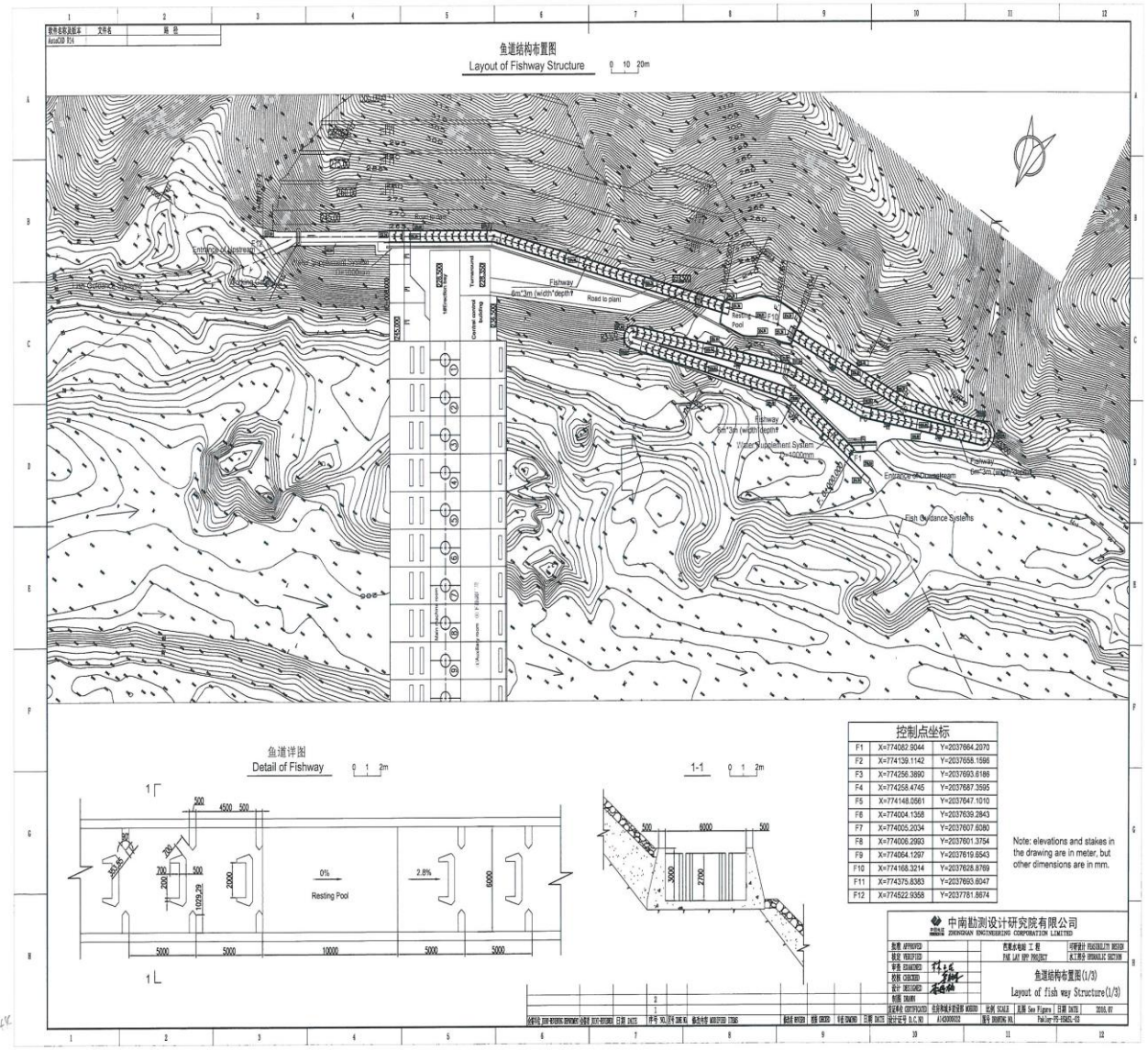
Overview of Submitted Documents - Fisheries

- Then (year?), another study on fish species diversity and fishing activities was conducted around **Dam Site Option 2**, where the Pak Lay dam to be built;
- The dry (03-06 February, 4 days) and wet (13-16 September, 4 days) seasons;
- **Two methods**: (1) fish sampling at seven sampling stations located in the Mekong River and the Nam Xong confluence with the Mekong River; and (2) field interviews with local people;
- A total of **56 fish species** collected, including two exotic fish species; and
- The study results show that **fishing is not the main occupation** around the dame site.



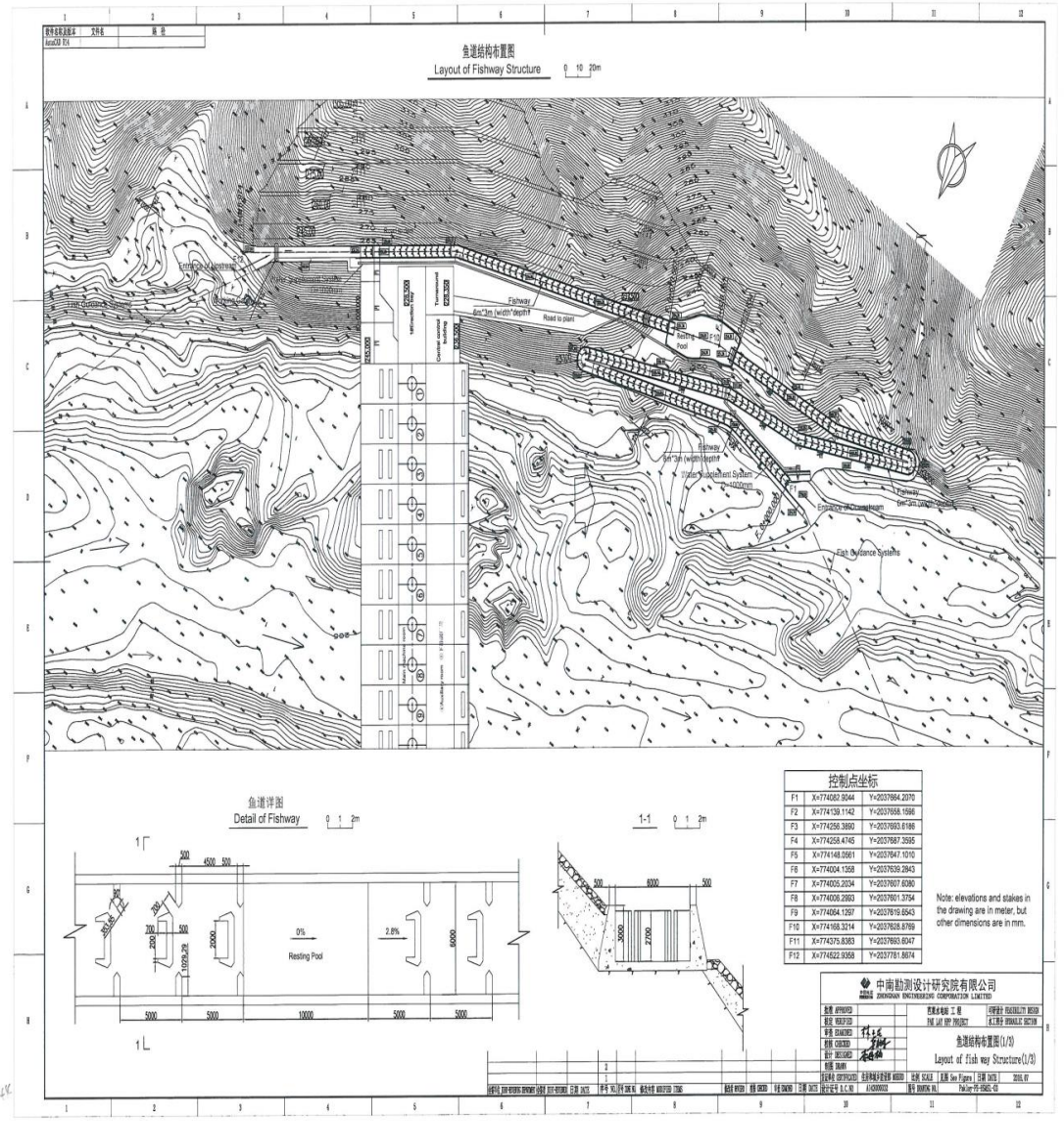
Overview of Submitted Documents – Fish Passage Design

- Building a **vertical-slot** (dual) **upstream fishpass**, with a total length of **1,017 m,** a width of **6m,** a depth of **2.5 m,** and a slope of **2.1 m**;
- Entrance is **250 m** downstream to the PLHPP tailwater canal;
- Flow in fishpass is **3.7 m³/s** for passage and **4.7 m³/s** for attraction;



Overview of Submitted Documents – Fish Passage Design

- Large resting pool, with a length of **56 m**, a width of **23 m**, a depth of **3-4.5 m,** and a velocity of **0.25m/s-** fish can rest;
- Upstream passage also suggested through the **spillway gate** in floods; and
- For **downstream fish migration,** A “guidance” system is proposed to divert fish away from the turbines and into the fishpass.



Overview of the external review report by CNR: Fisheries and fish passage

The information available on **the fisheries and fish pass facilities are insufficient** for a **conclusive assessment**. The review report provides the following recommendations:

1. **More fish sampling** to assess **fish diversity**;
2. Sampling of drifting **fish eggs** and **larvae** to determine spawning and nursery habitats;
3. More information about different **fish guilds** occurring in the project area and identify **target fish species;**
4. A better description of **long-distance migratory fish species** and how they will be affected;
5. What **critical habitats** above and below the dam site are and what the **actual risks** to populations of migratory fish are;

Overview of the external review report by CNR: Fisheries and fish passage

7. Information on **biological and hydrological requirements** for **fish species** concerned, **flow of operation** and **adequate flow to attract fish**;

8. More Information on **fish-friendly turbines and spillway design** to minimise fish injury and entrapment;

9. A reduced model of the fishway and swimming performance tests of the target fish species;

10. An **eco-hydraulics** and **hydrobiology laboratory** which may be one of the keys to success for the fish passage projects;

11. A comprehensive **monitoring programme** during the concession period; and

12. Use of **international experts** and professionals with skills in fish biology and ecology to assist in the design and implementation of the monitoring programme.

Approach and Methodology for the Technical Review

1. **Gather all available data** from the MRC, LNMC and Developer as well as line agencies.

2. **Visit the Pak Lay dam site** and have detailed discussions with the Developer's scientists and engineers on fish management matters and the proposed fishpass design.

3. Further **in-depth assessment** of fish passage design including:
   - *Assessment of the **fish migration behaviour** and requirements of the **main target fish guilds**;*
   - *Assessment of the **likely effectiveness** of the proposed fishpass and **linkages** to fish passage at Pak Beng and Xayaburi HPP;*

Approach and Methodology for the Technical Review

- *Assessment of the **potential impacts** of the PLHPP on trans-boundary fish stocks under the "no mitigation" situation; and*
- *Assessment of the proposed fisheries **monitoring programme** and **adaptive management** approach.*

4. Propose further conditions to be considered by the JC to ensure the **risks** are minimized and **adaptive strategies** put in place.

Water Quality (WQ) and Aquatic Ecology (AE)

Overview of Submitted Documents – Water Quality

- **Literature** search and **field sampling** and **laboratory** analysis;
- Seven stations in the Mekong River and the Nam Xong confluence with the Mekong, upstream and downstream of the PHPP site- **No map**;
- 4 days in the dry season (03-06 February)- **No year**;
- 4 days in the rainy season (13-16 September)- **No year**;
- **Methods** of sampling, handling, preservation and the analysis performed by using the Lao standard methods for the examination of water and wastewater.

1. ***Temperature***
2. ***Transparency***
3. ***Turbidity***
4. ***Total Suspended Solids***
5. ***Total Dissolved Solids***
6. ***pH***
7. ***Total Hardness***
8. ***Dissolved Oxygen***
9. ***Chemical Oxygen Demand***
10. ***Biological Oxygen Demand***
11. ***Nitrate***
12. ***Ammonia***
13. ***Total Phosphate***
14. ***Total Cromium***
15. ***Nickle***
16. ***Iron***
17. ***Manganese***
18. ***Lead***

Overview of Submitted Documents – Water Quality

- Results: surface water quality in Mekong mainstream from the project area of Ban and from upstream to downstream area at PakLay town are **good**;
- **No heavy metal** contents over acceptable limits;
- The surface water quality of the Mekong River from the seven sampling sites in the project area are also **good;**
- It is **suitable** for **irrigation** supply, **aquatic biota**, and **human** consumption after a normal treatment process.

1. ***Temperature***
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Overview of Submitted Documents – Aquatic Ecology

- **Methods:** (1) *Secondary data and literature review; and (2) Field sampling and observation;*
- (1) **Plankton** - *phytoplankton and zooplankton, (2)* ***aquatic plants****, (3)* ***benthic invertebrate*** *and (4)* ***fish*** *at seven stations up and downstream of the PLHPP site*;
- During the dry season (4 days in Feb) and the wet season (4 days in Sept);
- **Phytoplankton - Diatom,** dominant and high diversity;
- **Zooplankton - Protozoan,** low diversity and low density;
- **Aquatic plants**: Only aquatic weeds mentioned in the study;
- **Benthic invertebrates**: Low in species diversity and not abundant
- **Fish:** 56 species found in both the dry and wet seasons, and the most abundant area of fish is upstream of the PLHPP site.

Overview of Review Report by CNR: QW and AE

- A run-of-river hydropower project, **reservoir inflows and outflows are similar**, but that the **timing of flood pulses** may be affected, which will impact the **aquatic ecosystem**.
- **Cumulative effects** from the PLHPP and other hydropower projects along the Mekong River, will be felt downstream in **Cambodia, down to the Tonle Sap and even down to the delta in Viet Nam**.
- Monitoring of water quality not only the physical and chemical parameters, but also some biological parameters such as **macroinvertebrates, phytoplankton, zooplankton, macrophytes, and fish**, in order to fully attend the issues of the **MRC PDG**.
- A proposed basic scope for a **water quality monitoring programme** and a description of **environmental flows** and management.

Approach and Methodology for the Technical Review

1. Gather all **available data** from the MRC, LNMC and Developer as well as line agencies.

2. **Visit the Pak Lay dam site** and have detailed discussions with the Developer's scientists and engineers on water quality and ecological health management matters and the proposed environment flows assessment.

3. The following areas will further be assessed:

   - *Confirm adequacy of **water quality management** during construction; including **measures** proposed to avoid, minimize or mitigate the impacts; and*
   - *Consider **other mitigation options** be considered if required;*

Approach and Methodology for the Technical Review

4. Assess the **EMMP adequacy** in regard to water quality and aquatic ecology; in line with accepted international good practices and standards;
5. Assess whether the **impacts of reduced flows** and **water level fluctuation** of 0.5-1 m per day are expected, and whether this will result in diurnal **hydropeaking** for power generation;
6. Propose proper **impact mitigation measures** for sediment retention and river starvation downstream; and
7. Propose further conditions to be considered by the JC to ensure the **risks** are minimized and adaptive strategies put in place.


Thank you