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For sustainable development

Approach and Methodology for Technical Review of the Pak Beng Hydropower Project

- Hydrology and Hydraulics -
- Sediment Transport and River Morphology -

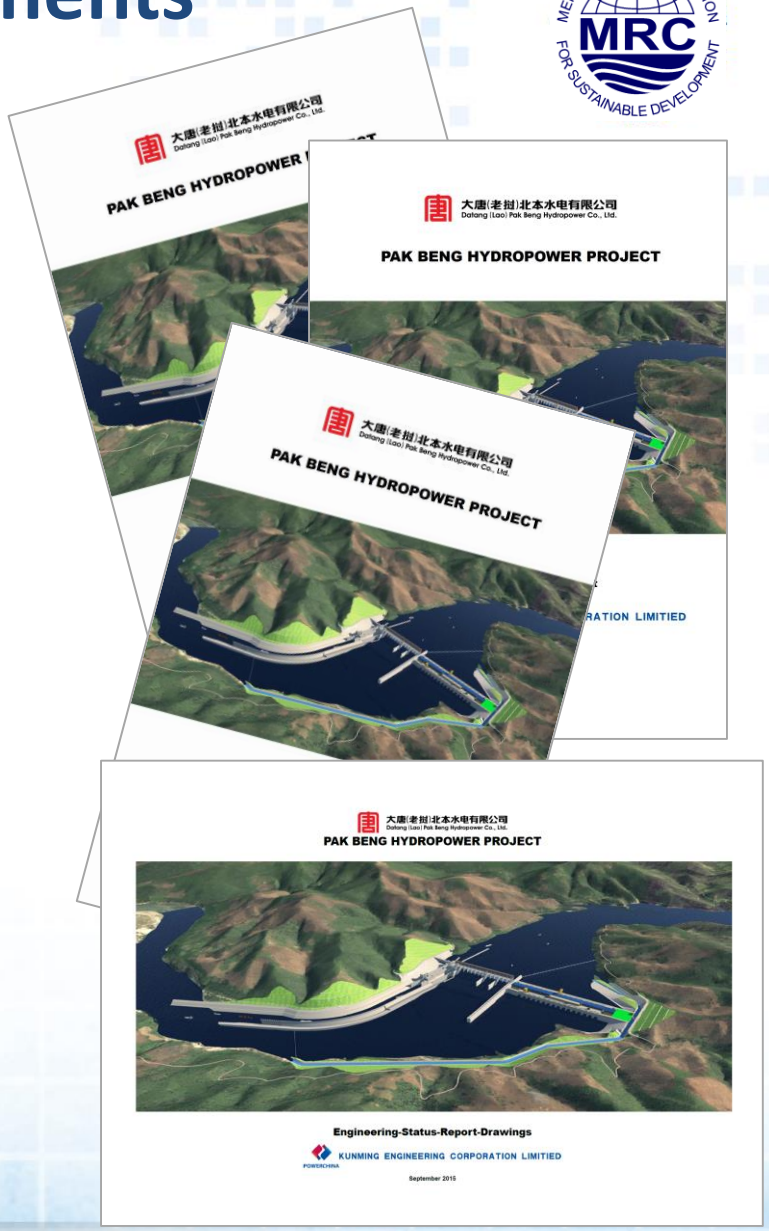
Regional Stakeholder Forum on the Council Study and the Pak Beng Hydropower Project
22-23 February 2017
Luang Prabang, Lao PDR

Overview of submitted documents

12 of 20 submitted documents cover:

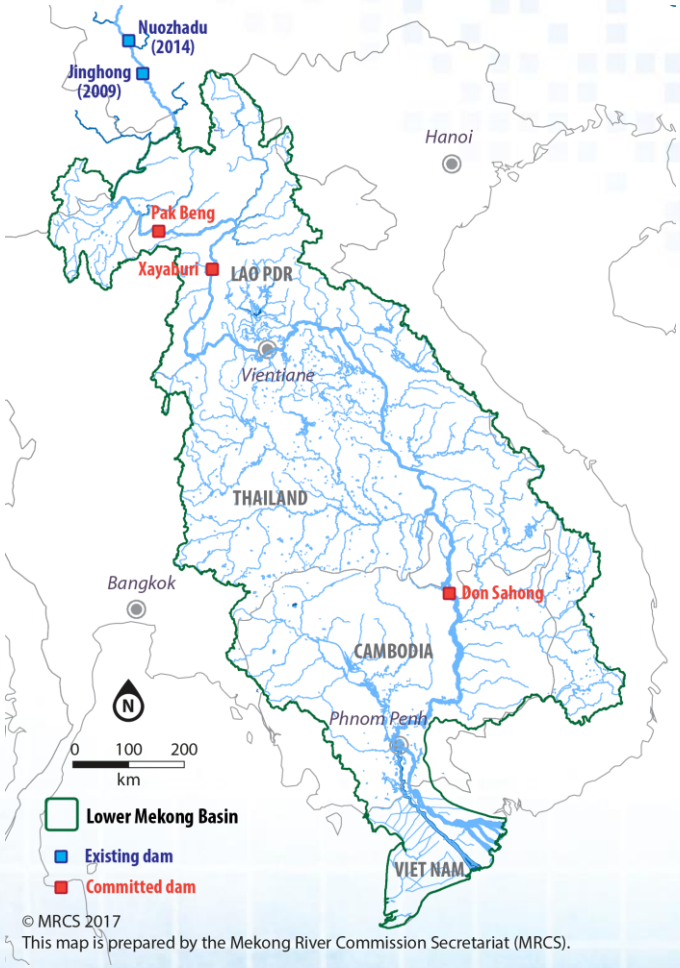
- Engineering components and its drawings
- Hydrologic and sediment data sampling
- Automatic Hydrologic data collection
- Sediment management and monitoring
- Physical model
- Numerical simulation
- Hydrodynamic characteristics

These documents contain **primary** and **secondary hydrologic/sediment data**, design **concept**, **methodology**, and **analysis/modelling results** in format of **photos**, **maps**, **tables** and **figures**.



Potential changes based on recognized characteristics of the Mekong River

- **Understanding** the **nature of the river** channel in the considered region and basin-wide context (floodplain, wetland, deep pool,…)
- **Records** of relevant **gauging stations** upstream/downstream of project, providing relevant knowledge on historic natural seasonal and daily variations of the Mekong mainstream
- Distribution of **bedrock**/**alluvial**/**composite channels** in the mainstem and tributaries potentially affected by proposed development
- Distribution of **availability** of data on **discharge**, **suspended**/**bed load** and **bed materials** based on the results of the Discharge and Sediment Monitoring Project (DSMP)

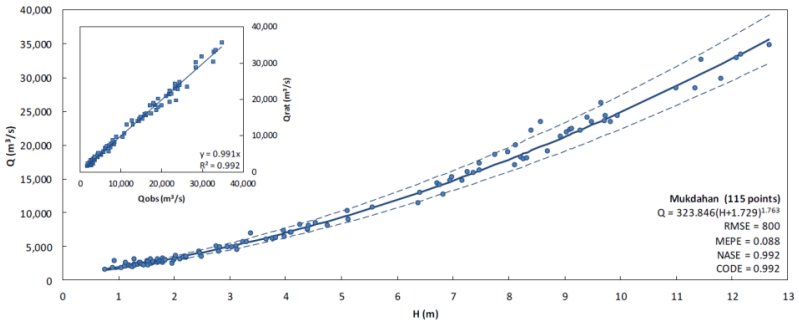


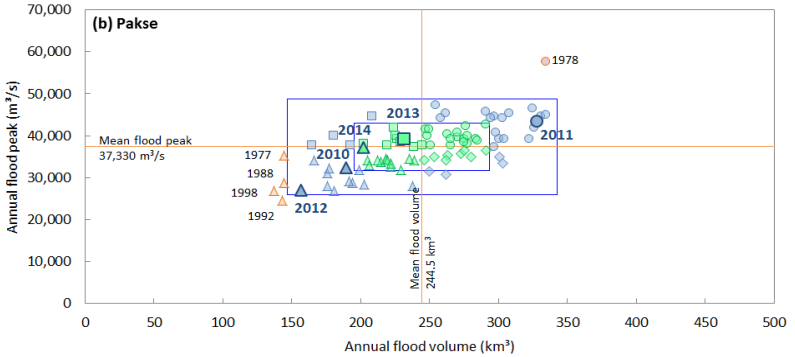
Relevant sources for information

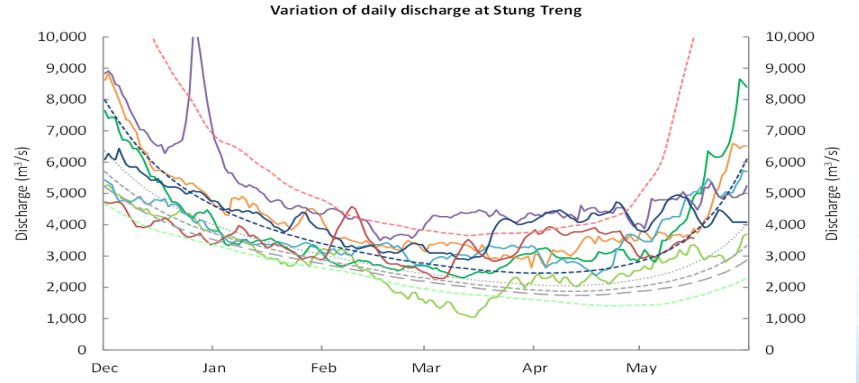
- **Preliminary Design Guidance** for Proposed Mainstream Dams in the Mekong River (**PDG**)
- Guidelines for Hydropower Environmental **Impact Mitigation and Risk Management** in the Lower Mekong Mainstream and Tributaries (Interim Reports)
- Ongoing results of the MRC **Council Study**
- PNPCA process for **Xayaburi** dam project
- Procedures for the Maintenance of Flows on Mainstream – **PMFM**
- Information available from other **relevant hydropower projects** (Nam Theun 2, Nam Ou, …)
- Expert opinion from other **hydrologists**, **sedimentologists**, **geomorphologists** and **hydropower engineers**

Reviewed parameters for Hydrology and Hydraulics

- **Hydrological regimes** upstream and downstream of the project site
- **Seasonality** of the flow (wet season, dry season, timing, …)
- **Water levels** and **discharge** at relevant hydrological stations upstream and downstream
- **Inflows** from tributaries/catchments
- **Flow conditions** in the channel, deep pools and bank zones
- Relevant hydro indicators required for evaluations for **other themes** (ecology, sediment, navigation, …)

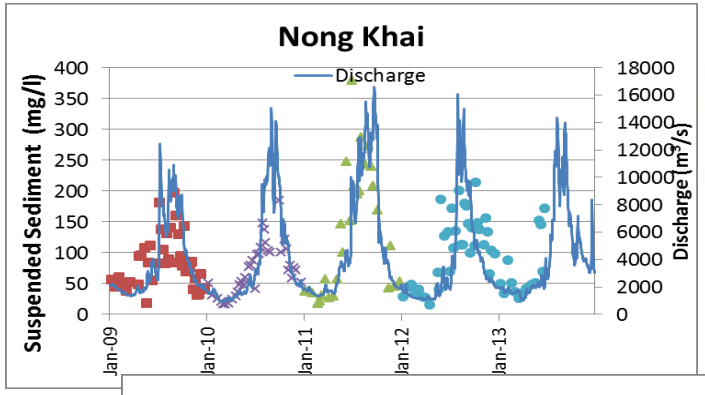


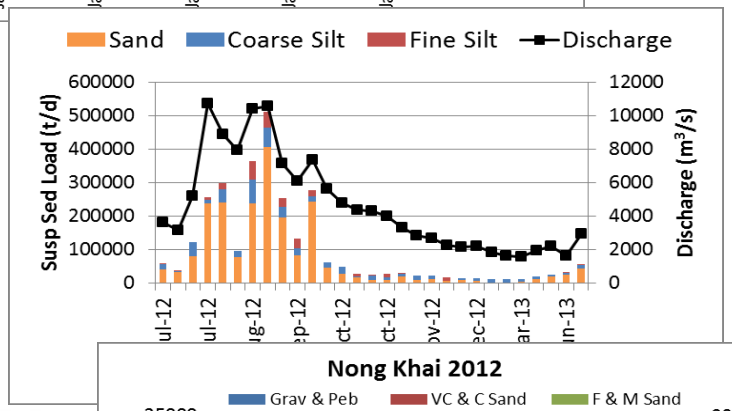


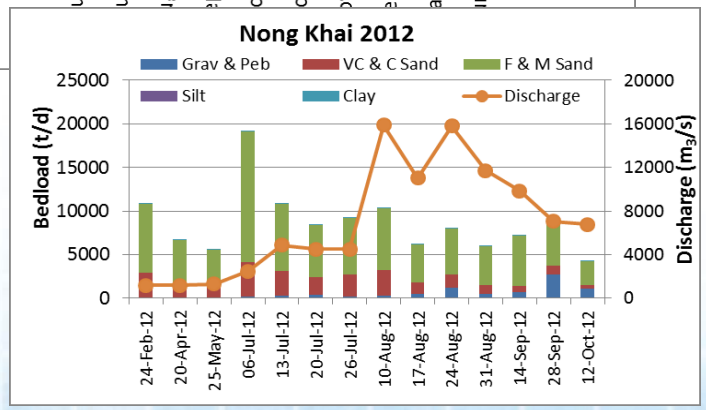


Reviewed parameters for Sediment Transport and River Morphology

- **Sediment loads**: suspended and bedload
- **Sediment grain-size distribution**: Suspended load, bedload, bed materials
- **Seasonality** of sediment transport: Dry season, wet season
- **Sediment characteristics**: Grain-size of suspended/bedload sediment in wet/dry season
- **Existing hydrologic information** where relevant to sediment transport







Methodology (1 of 4)

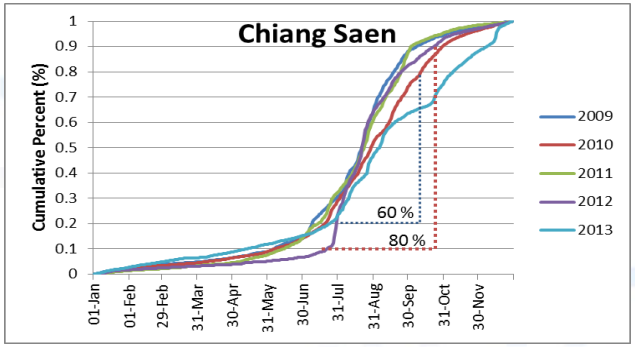
- **STEP 1** – **Comparison of the baseline information** presented in the Pak Beng Hydropower Project proposal with available information (*potential causes if differences are found*)

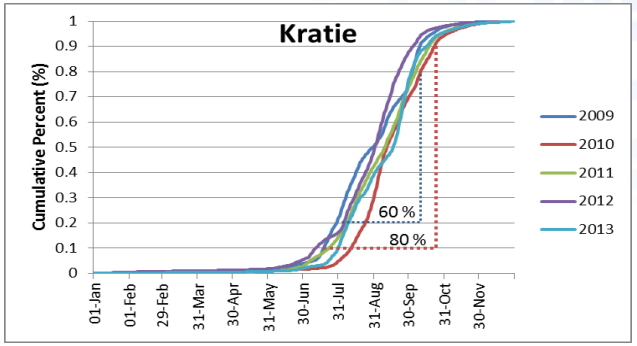
- **STEP 2 – Review of the proposed mitigation and management** components with respect to the **MRC Preliminary Design Guidance** for Proposed Mainstream Dams in LMB.
  - **Hydrology/Hydraulics**: ramping rate, hydro peaking, timing and duration of low and high flows, smoother hydrograph, …
  - **Sediment/Morphology**: reservoir sedimentation, sediment starvation downstream, strategies to maintain reservoir capacity, and sediment management and mitigation strategies, …

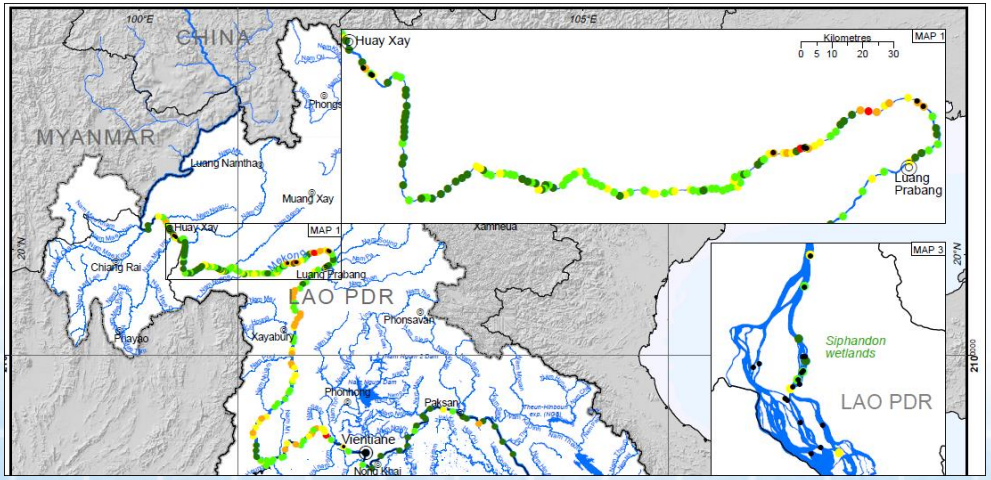
Methodology (2 of 4)

- **STEP 3 – Review of the dam design and proposed management and mitigation** measures to ensure the passage of flows/sediments through the impoundment and preservation of **important seasonal patterns**

- **STEP 4 – Evaluation of the potential residual impacts** (taking mitigation measures into consideration)







- **Hydrology/Hydraulics**: changes in water level/discharge or flow regimes

- **Sediment/Morphology**: changes to sediment transport/deposition/erosion upstream/downstream of impoundment considering potential impact on geomorphic features (river channel, deep pools or wet lands)

Methodology (3 of 4)

- **STEP 5 – Evaluation of the proposed hydrological/sediment monitoring programme** to ensure that it has the capacity to identify and quantify potential impacts
  - Compare with **international best practice** and **scientific monitoring technique**
  - Evaluate whether the **spatial/temporal scales** of proposed monitoring are adequate

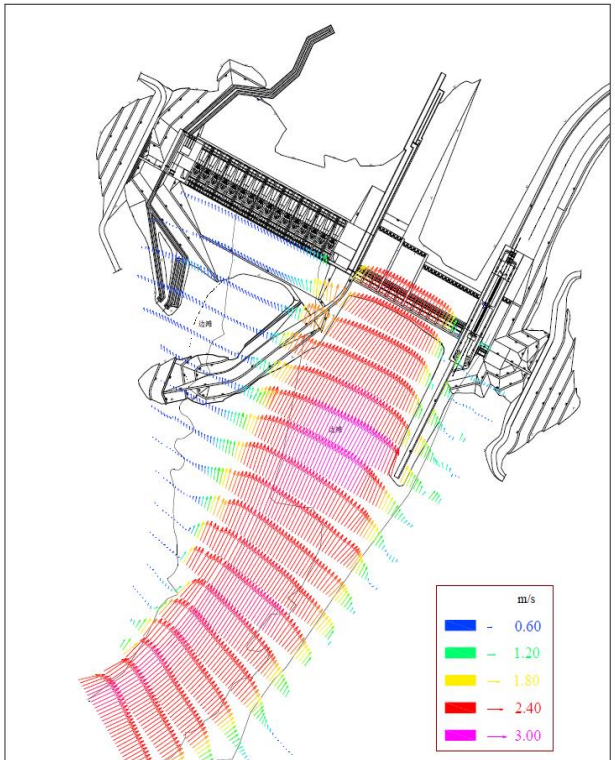
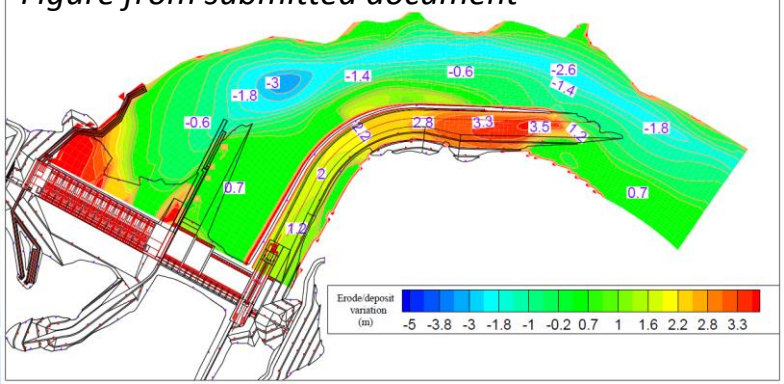


Figure from submitted document

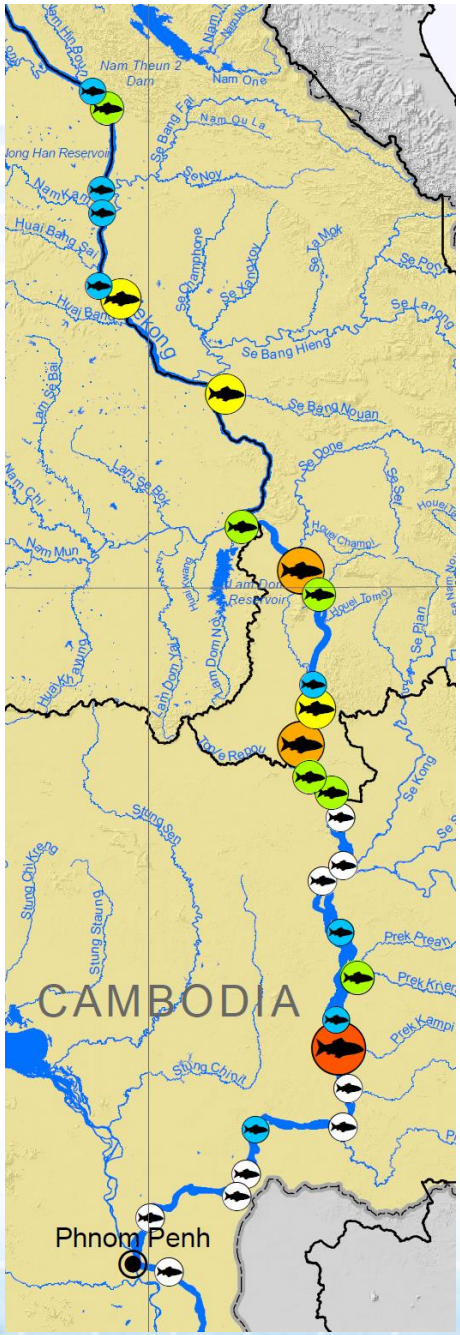
- **STEP 6 – Evaluation of proposed management measures in response to changes** detected through the monitoring programme (using mitigation guideline study results). If applicable, additional recommendations to maximise the potential for maintenance of the flow/sediment balance

Figure from submitted document



Methodology (4 of 4)

- **STEP 7 – Integration of the findings with the findings of environment and fisheries** evaluation to provide an indication of how physical changes to the river channel, deep pools, wetlands and other specific conditions may affect fisheries (e.g. Council Study or mitigation guideline study)
- **STEP 8 – Assessment of the proposed project in a basin-wide context**, including a comparison of the impacts associated with Pak Beng Hydropower as a 'stand-alone' project to the cumulative impacts of the other mainstream and tributary dams existing/planned in the Mekong Basin
- **STEP 9 – Knowledge gaps** to be identified throughout the assessment process; recommending appropriate monitoring approaches and strategies to fill the gaps



Thank you!