Transboundary environmental assessments in hydropower sector: Overview of lessons from outside Europe

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Workshop and Site Visit on Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) in Hydropower Development
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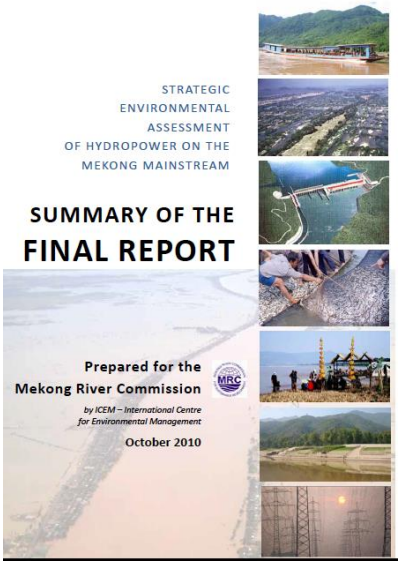
Contents

Mekong River Commission

- Ongoing development of TbEIA system
- SEA of hydropower planning on Mekong mainstream (2010)
- Preliminary Design Guidance for Proposed Mainstream Dams in the Lower Mekong Basin (2009)

SEA of hydropower planning on Mekong mainstream

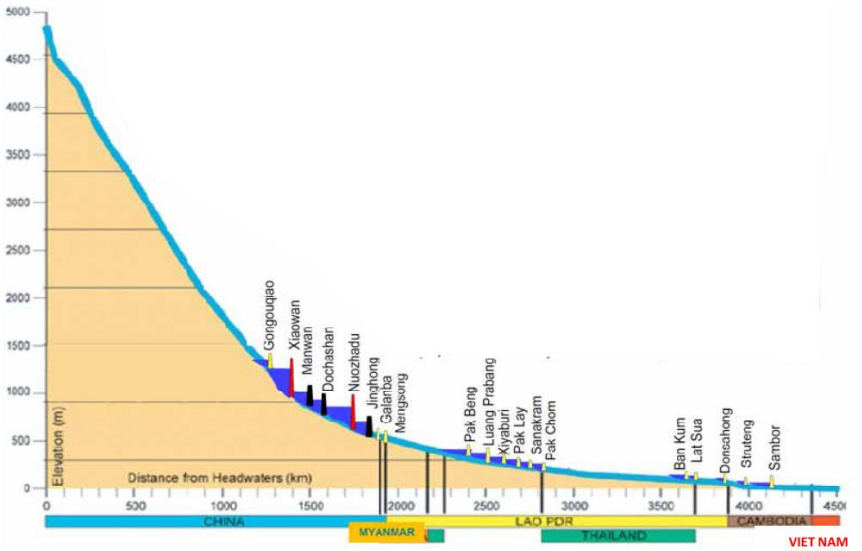


Twelve hydropower schemes on mainstream (worth USD 25 billion) + total of additional 77 dams on LMB tributaries

Notification and prior consultation required under the Mekong Agreement only one proposed mainstream project

MRC commissioned ICEM to undertake SEA

Proposed mainstream cascade



SEA

- Economic development and poverty alleviation
- Ecosystems integrity and diversity – aquatic, terrestrial, hydrological dynamics and sediment/nutrient transport.
- Fisheries and food security (including agriculture)
- Social systems - livelihoods and the living cultures of affected communities

- Based on trend analyses and consultations in all 4 countries

Economic development and poverty alleviation (1)

- Lao PDR would receive USD 2.6 billion/year
- Cambodia USD 1.2 billion/year
- HP revenues used to fund infrastructure and social development expenditures (including rural roads, health and education spending)
- Benefits and costs unevenly distributed within a society
- Risk of macro- economic imbalances due to a booming hydropower sector, particularly in Lao PDR

Previously quiet Vientianne

Economic development and poverty alleviation (2)

- 150,000ha of riverbank gardens, agricultural lands and irrigation schemes would be directly affected by the 11 projects, transmission lines and access roads
- The HP cascade on mainstream and also on tributaries (Sesan, Srepok, etc.) would reduce sediment transport by 75% - this will destabilize the river channels, floodplains and coastline of the Mekong Delta

Farming during dry season

Altering the river flow

- four distinct seasons and corresponding fluctuations in the water levels and wide range of ecological and morphological processes
- all reaches of the Mekong inundated by the mainstream reservoirs would no longer experience the ecologically important seasons
- peaking operations will change fluctuations from seasonal to daily or even hourly events

Sudden release of water on Se San

Connectivity

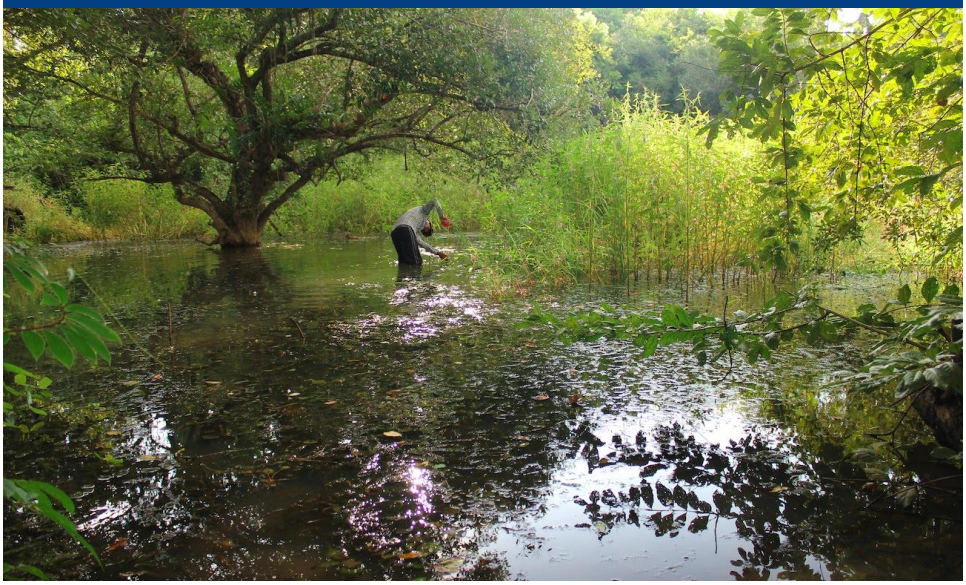
- the cascade would degrade longitudinal connectivity of Mekong and compartmentalise it into smaller and far less productive units
- More than 50 different migrant species, huge densities during migration peaks and several migration pulses per year.
- Only 3 of the 11 dams have explicitly included fish passes - none have been designed based on studies for target fish species
- At least 35% of long- distance migrant species whose migrations would be barred by dams

Mekong giant catfish

Additional changes in biodiversity

- Proliferation of generalist species that do not migrate over long distances, can breed within the body of the reservoir and do not require specialised habitats or hydrological triggers to induce spawning
- 17% of the Mekong River's wetlands would be permanently inundated by the LMB mainstream projects

Wetland ecosystem functions and services



Fisheries and food security

- 70% of affected communities dependent on local fisheries as source of protein and livelihood
- 26–42% loss in fish resources (550,000 – 880,000 tonnes/yr) – in economic terms approx. USD 476million/yr, excluding effects on the coastal and delta fisheries
- Reservoir fisheries would produce at best 10% of the lost capture fisheries production
- Intensive aquaculture produces fish for export and is not accessible to the poor.

Fishing for protein …

Social impacts

- 106,942 people will suffer direct impacts from the 12 mainstream projects, losing their homes, land and require resettlement
- Some villages would be displaced for the second, third and fourth time in 15 years.
- No long term, consistent and socially sensitive adjustment and support programs for communities affected by hydropower in place

Conclusions

- mainstream hydropower cascade is not critical to ensure healthy economic growth in the LMB region
- The alternatives to completely blocking the mainstream to produce electricity have not been adequately explored
- Partial damming of channel branches, in-stream turbines and diversions should be considered

Preliminary Design Guidance for Proposed Mainstream Dams in the Lower Mekong Basin

Contents

- Navigation
- Fish Passage on Mainstream Dams
- Sediment Transport and River Morphology
- Water Quality and Aquatic Ecology
- Safety of Dams

Fish Passage

- Fish passage facilities for both **upstream and downstream** passage must be incorporated into all dams on the mainstream to 'provide safe passage for 95% of the target species under all flow conditions'
- The maximum standard length of the target species moving upstream will vary from around 20cm to more than 100cm
- Consider multiple systems at each site, especially given the variable flow regime, large number of species and high biomass and lack of biological knowledge on behaviour of migrating species

Fish migration

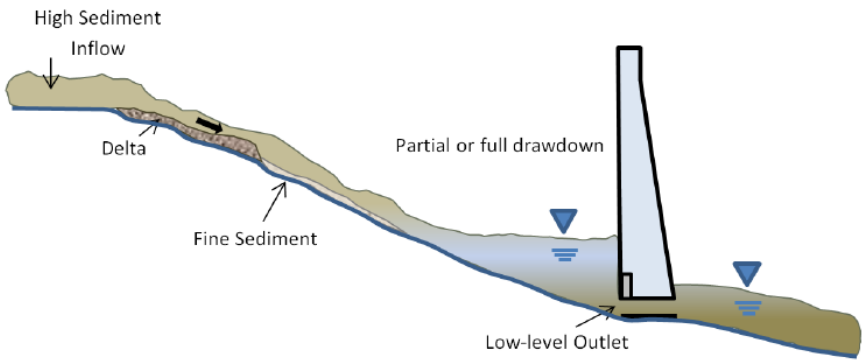
- Where fish passage rates are unlikely to be adequate to maintain viable populations, the developers must develop and propose mitigation options as one element of compensation programs for lost fisheries resources

- Specific Biological/ecological, hydrological, hydraulic and operational considerations as well as provisions for monitoring and evaluation

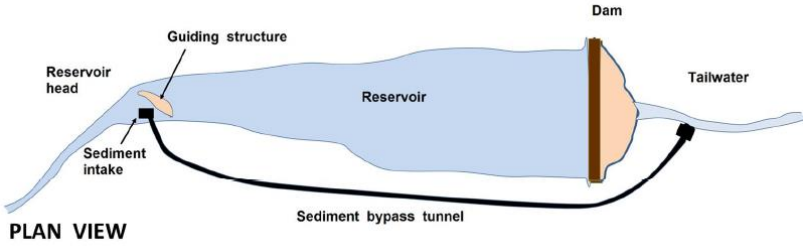
Sediment Transport and River Morphology

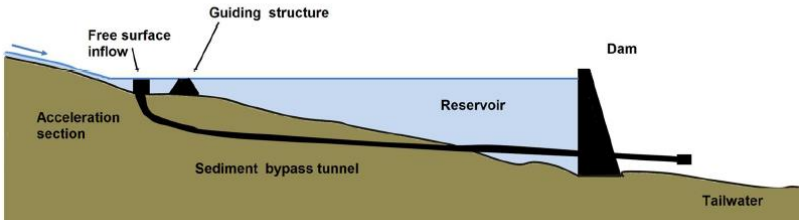
Sediment flushing

Sediment pass-through

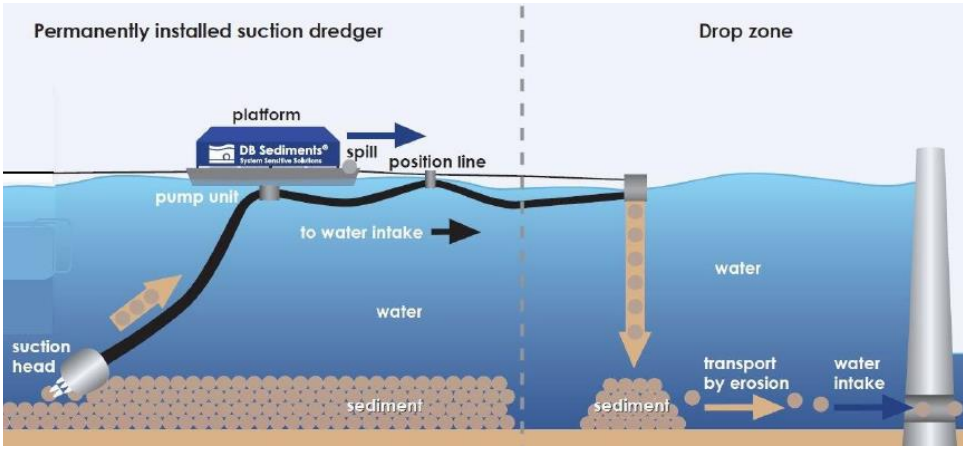


Sediment bypass





Mechanical removal



Sediment augmentation downstream of dams

- injection of sediment into the channel below the dam for redistribution by flows into natural features,
- placing gravel in sites where it is expected to provide habitat benefits immediately
- sediment concentration during water releases can kill fish and damage to spawning areas - must be controlled and monitored to prevent negative impacts on downstream ecology

Water Quality and Aquatic Ecology

- Deep storage reservoirs alter water quality (anoxic processes) and water temperature and variation which may affect fish species
- Environmental Flow Assessments to ensure downstream releases for maintenance of essential water-dependent ecosystems – not only flora and fauna + also wetlands watered by floods, ground water dependent ecosystems relying on river seepage

Flow alteration on a tributary

Thank you for attention!