HYDROPOWER DEVELOPMENT IN THE MEKONG BASIN

Perspective of a Canadian Private Environmental Consulting Company

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Outline of Presentation

› Hatfield Consultants Partnership
› Hatfield’s international project work in Mekong
› Hydropower and other development Issues
› Key implications on capture fisheries
› Future concerns

Picture of the Mekong Delta and Tonle Sap, taken from the International Space Station on January 9, 2011.
About Hatfield

› Hatfield has provided environmental services to industry and government for over 39 years

› 2200 projects completed in over 40 countries

› 75 professional staff in offices in Canada, Indonesia, Africa and business partners in Chile and Thailand

› Recipient of awards for:
  › Corporate Social Responsibility
  › International Development Services
  › Linear Development Services

› ISO 9001:2000 certified
The Mekong River Basin

Fig. 1. Hydrographic map of the Mekong basin, with indication of the Mekong River and main tributaries, and flow contribution by country (Source: MRCS).
The Mekong River Basin – (Cont’d.)
Importance of Fish in Mekong

1,300 fish species
2-2.5 Mt/year of fish production
17% of global inland fish production
Worth US$ 2 billion
27-28% of animal protein in diets of rural people in Mekong
Tonle Sap Great Lake

- Home of Angkor Complex – A world heritage site
- An estimated 4.5 million inhabitants
- Many people derive at least part of their subsistence needs or income from the wetland resources.

Source

Picture Courtesy: Sacred Sites, 2013
Tonle Sap Great Lake – (Cont’d.)

› A unique flood pulse System.
  › Dry Season Area: 2,500- 3,000 km²
  › Wet Season Area: 10,000-16,000 km²
› An ecologically important breeding ground and habitat vital to many fish species that migrate to Mekong.
Hydropower Development in Mekong

Hydropower explosion
82 existing + 179 under study
Mekong Region power grid
Mekong River mainstream dams – 8+ China, 8+ Laos
transboundary implications – esp Cambodia

Irrigation
50% increase in food prices
Hun Sen’s “White Gold”
New capital eg. Kuwait

Diversions
eg. South to North transfers in China
eg. Salween to Chao Phraya (Myanmar-Thailand)
eg. into NE Thailand (mainstream, Laos-Thailand)
Hydropower Development in Mekong – (Cont’d.)
Future: No longer free flow in most parts of the LMB.
Effects of Dams

› Alter but do not deplete water flows — remove seasonal variability and floodplain interactions
› Alter and deplete sediment and nutrient flows ➔ fisheries productivity ➔ nutrition and poverty.
› Fragment the river — barriers to migration
Effects of Dams on Fish Production

HYDROLOGY
- Water level
  (higher flood = more fish)
- Flood duration
  (longer flood = more fish)
- Flood timing
  (early flood = more fish)

FLOODPLAIN ENVIRONMENT
- Flooded vegetation
  (less trees = less fish)
- Built structures
  (more structures = less fish)

EXOTIC SPECIES
- Drives
  affects Fish stocks

MIGRATIONS
- Access to feeding and breeding areas
- Access to refuges
  (ponds, sanctuaries, deep pools)
  (better protection = more fish)

FISHING
- Number of fishers
  Impossible to control
- Fishing intensity
  Difficult to assess

FISH CATCH
- Yields
Effects of Dams on Fish Production – (Cont’d.)

Dam development will reduce the downstream sediment concentration, but will also minimize the flood pulse, alter water quality and block fish migrations. Fishery productivity resulting from these four drivers will be affected in multiple ways that cannot be related to sediments only.
Dams downstream are biologically more damaging than those upstream.
Effects of Dams on Fish Production – (Cont’d.)
What matters most for fish productivity is not sediments but nutrients. Dissolved nutrient concentration is generally low and nutrients are mostly adsorbed on sediments, which facilitates their transport.
Effects of Dams on Fish Production – (Cont’d.)

Worldfish Center, 2013
Sediment and Tonle Sap Fish Production

Yearly Catches of the “Dai” fishery (tons) and Tonle Sap Sediment Input (tons)

Dai Catch

- 1998 – 1999
- 1999 – 2000
- 2000 – 2001
- 2001 – 2002
- 2002 – 2003
- 2003 – 2004
- 2004 – 2005
- 2005 – 2006
- 2006 – 2007
- 2007 – 2008
- 2008 – 2009

Sediment Inflow

- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009

Source: Koponen et al. 2010
36% decline in [Tonle Sap] total fish biomass production if Mekong sediment input is reduced by 80% (Sarkkula and Koponen 2010 DMS Final report)
Value of Mekong’s Fisherys

Economic value of Mekong freshwater fish
US$2.1-3.8 billion at first sale
US$ 4.2 - billion on retail markets

Contribution of freshwater fish to protein inputs in people’s diet
Cambodia: 50% (81%)  Lao PDR: 38%
Thailand: 16%  Vietnam: 13%

Hortle, 2009
FAO, 2003
Freshwater fish consumption (FAO, year)
Value of Mekong’s Fisheries – (Cont’d.)

Vietnam
loss <5% of protein supply
BUT impact on coastal resources not quantified

Thailand
loss <5% of protein supply

Cambodia 35% of LMB fish production
Laos 5% of LMB fish production
Thailand 30% of LMB fish production
Vietnam 30% of LMB fish production

Cambodia

Replacement Cost?

Vietnam

Cambodia

Lao PDR

Thailand

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Worldfish Center, 2013
Building Capacity for Sustainable Hydropower in Mekong Region

- Hatfield staff are actively engaged in working with both hydro developers and regulatory authorities in Mekong Region to apply relevant sustainable hydropower decision support frameworks including:
  - Equator Principles.
  - World Commission on Dams framework for decision-making for the planning, design, appraisal, construction, operation, monitoring and decommissioning of dams.
  - Hydropower Sustainability Assessment Protocol (HSAP)
Trialing Workshop

(Trialing + Training)

› Provide participants lead time for reading the preliminary assessment report and Section 1 of HSAP;
› Present data/information collected and analyzed during the desk-study and field work; and
› Conduct group discussions.
   ➔ Consultation, trialing and knowledge transfer.
› Exchange visit of Chinese hydropower developers.
Hydropower Sustainability Assessment Protocol November 2010

Background

Assessment Tools for Project Life Cycle Stages:

Early Stage
Preparation
Implementation
Operation

Significant Project Development Decision Points:

Commence hydropower project preparation
Award of construction contracts
Project commissioning

www.hydropower.org
### Applying Broader and Inter-related Criteria

#### Protocol Topics

<table>
<thead>
<tr>
<th>INTEGRATIVE PERSPECTIVE</th>
<th>ENVIRONMENTAL PERSPECTIVE</th>
<th>SOCIAL PERSPECTIVE</th>
<th>TECHNICAL PERSPECTIVE</th>
<th>ECONOMIC &amp; FINANCIAL PERSPECTIVE</th>
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</thead>
<tbody>
<tr>
<td>• Demonstrated need &amp; strategic fit</td>
<td>• Environmental impact assessment</td>
<td>• Social impact assessment</td>
<td>• Siting &amp; design</td>
<td>• Economic viability</td>
</tr>
<tr>
<td>• Communications &amp; consultation</td>
<td>• Downstream flows</td>
<td>• Project affected communities &amp; livelihoods</td>
<td>• Hydrological resource</td>
<td>• Financial viability</td>
</tr>
<tr>
<td>• Governance</td>
<td>• Erosion &amp; sedimentation</td>
<td>• Resettlement</td>
<td>• Reservoir planning, filling and management</td>
<td>• Project benefits</td>
</tr>
<tr>
<td>• Integrated project management</td>
<td>• Water quality</td>
<td>• Indigenous peoples</td>
<td>• Infrastructure safety</td>
<td>• Procurement</td>
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<tr>
<td>• Environmental &amp; social issues management</td>
<td>• Biodiversity &amp; invasive species</td>
<td>• Cultural heritage</td>
<td>• Asset reliability &amp; efficiency</td>
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<tr>
<td></td>
<td>• Waste, noise &amp; air quality</td>
<td>• Public health</td>
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#### Scoring Criteria

- • Assessment
- • Management
- • Stakeholder engagement
- • Stakeholder support
- • Conformance and compliance
- • Outcomes

#### Cross-cutting Issues

- • Human rights
- • Climate change
- • Transboundary issues
- • Transparency
- • Gender
- • Integrated water resource management

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Lessons Learned for the Mekong River

› Not all technologies are ready to be replicated in the Mekong (sediment friendly and fish friendly???)
› Assessing impacts and developing mitigation measures for proposed hydropower development is extremely complex.
› >1,500 fish species + livelihoods of millions of people + economic and social considerations.
› **Baseline data** are lacking, especially use of fisheries resources (TEK), fish migrations, fish habitats, compensation flow requirements, reservoir fish production, etc.
› International best practices must be followed.
› Time is of the essence....
Thank you! Appreciate your comments.
For more information, contact:

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### Overview of Hydropower Development in Lower Mekong Basin

<table>
<thead>
<tr>
<th>Country</th>
<th>Existing</th>
<th>Under construction</th>
<th>Planned / proposed</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Cambodia</td>
<td>1</td>
<td>–</td>
<td>5589</td>
<td>5590</td>
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<tr>
<td>Lao PDR</td>
<td>662</td>
<td>2558</td>
<td>17,686*</td>
<td>20,906</td>
</tr>
<tr>
<td>Thailand</td>
<td>745</td>
<td>–</td>
<td>–</td>
<td>745</td>
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<tr>
<td>Viet Nam</td>
<td>1204</td>
<td>1016</td>
<td>299</td>
<td>2519</td>
</tr>
<tr>
<td>Total</td>
<td>2612</td>
<td>3574</td>
<td>23,574</td>
<td>29,760</td>
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</table>

*Lao PDR and Thailand share borders on two of the proposed mainstream dams. These projects are included under Lao PDR in this table.

Notes Slide 1 - Overview of Hydropower Development in Lower Mekong Basin
References

› Hortle, 2009.

Notes Only: