HYDROPOWER DEVELOPMENT IN THE MEKONG BASIN

Perspective of a Canadian Private Environmental Consulting Company

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3rd Annual Symposium of NSERC HydroNet
Montréal, Quebec
April 9th – 11th, 2013

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

ISS026E017106

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

Hatfield Offices

The Mekong River Basin

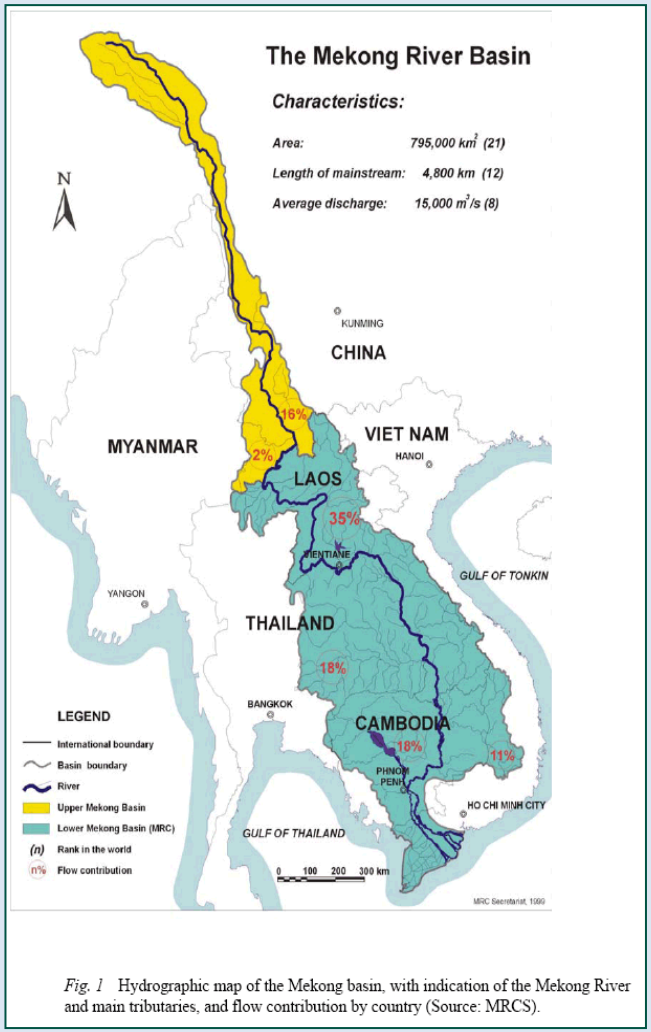
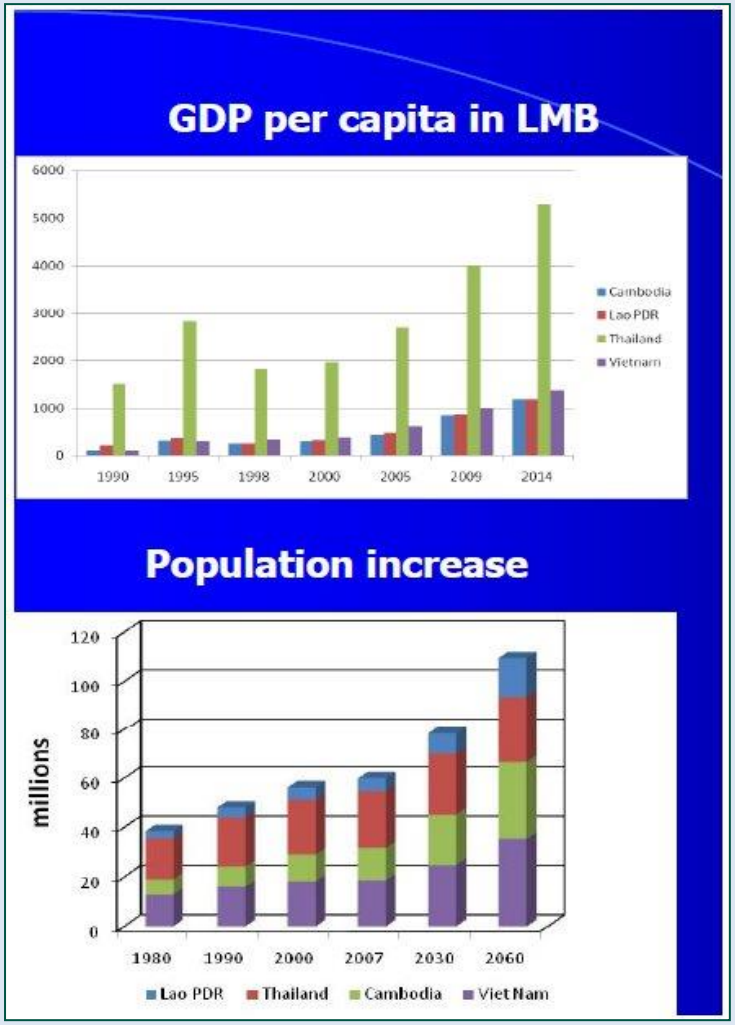
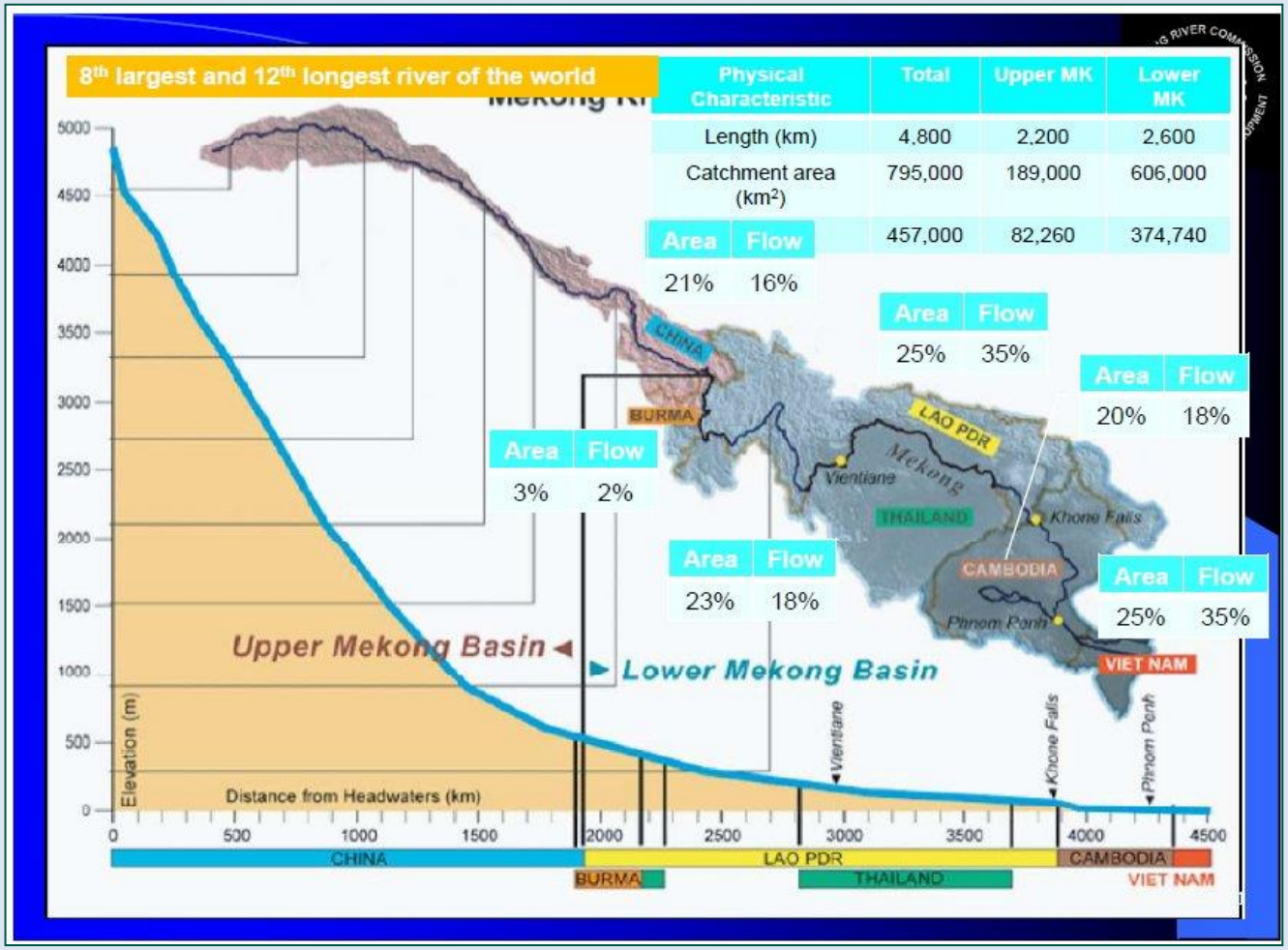
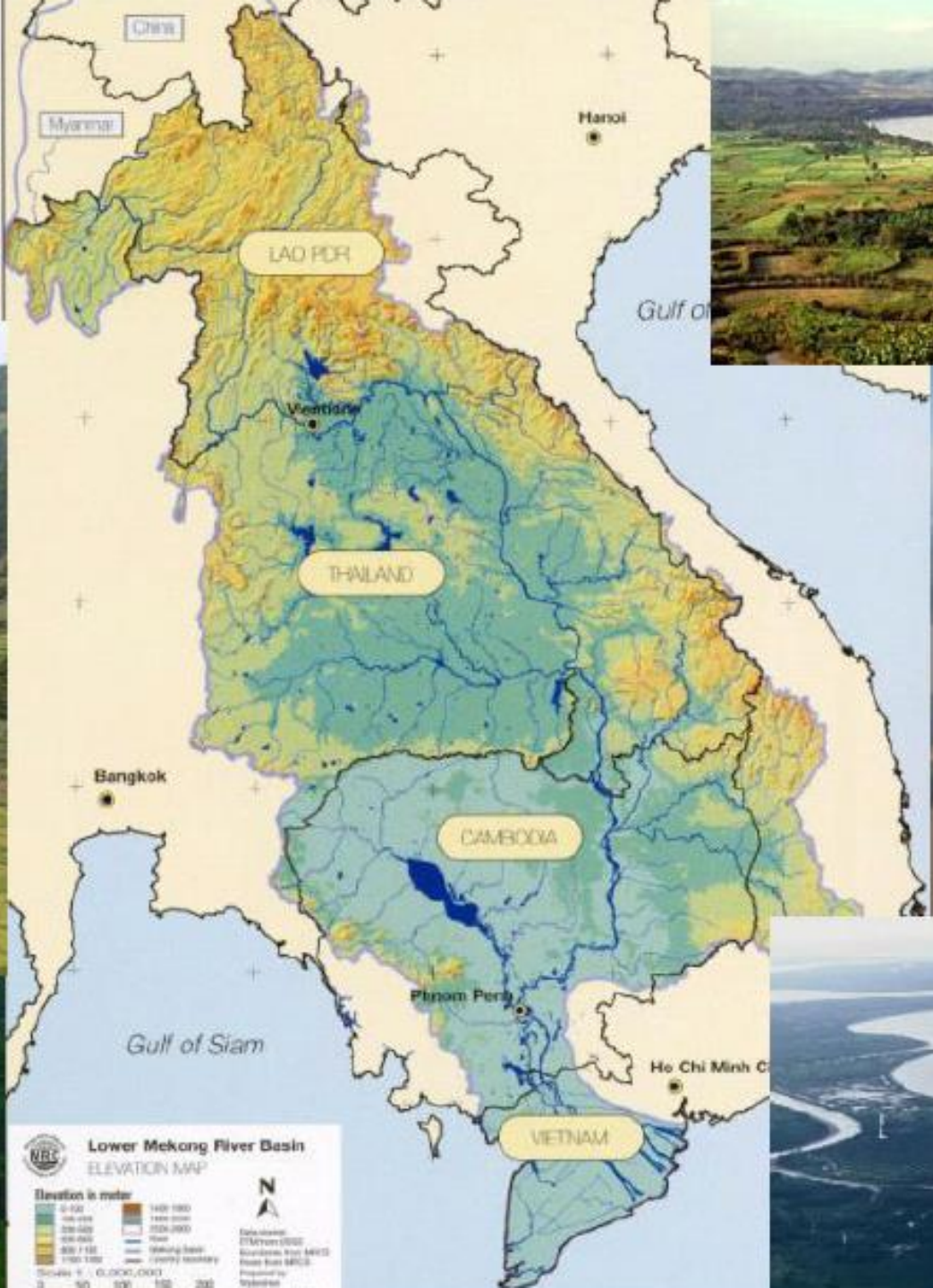


Fig. 1 Hydrographic map of the Mekong basin, with indication of the Mekong River and main tributaries, and flow contribution by country (Source: MRCS).



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

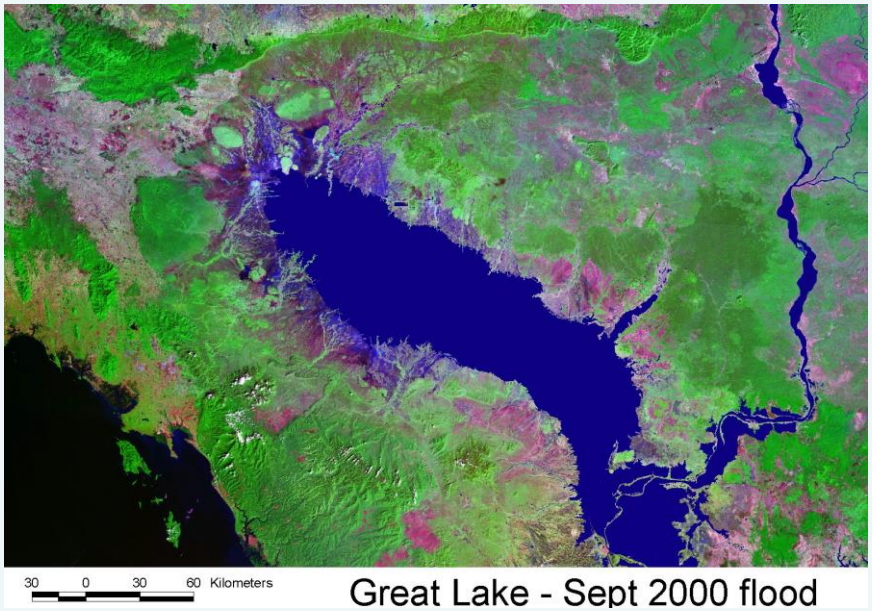
Source

- 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.

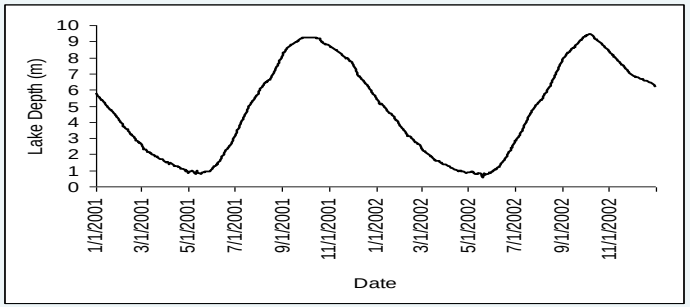
Picture Courtesy: Sacred Sites, 2013

Tonle Sap Great Lake – (Cont'd.)

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



Great Lake - Sept 2000 flood

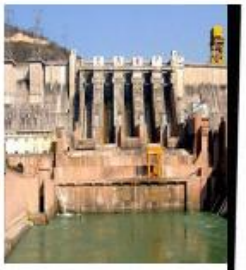


Hatfield/ CSA, 2000

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



BK Post
18 Dec 2003 RIVER DEVELOPMENT

China plans 13 dams on Salween

Activists fear adverse impact downstream

Kultida Samabuddhi
Yuthana Praiwan

More than 80 environmental, human rights and ethnic groups in Thai-

"Before making decisions on any dam projects, there should be consensus among the riparian countries on the terms of environmental and social impact assessments," the groups said in their protest letter.

"China is going to exploit the Salween, which is the last free-flowing international river in the region, like they already

Irrigation

50% increase in food prices
Hun Sen's "White Gold"
New capital eg. Kuwait

Kuwait to loan $546m for infrastructure

BY THET SAMBATH

Diversions

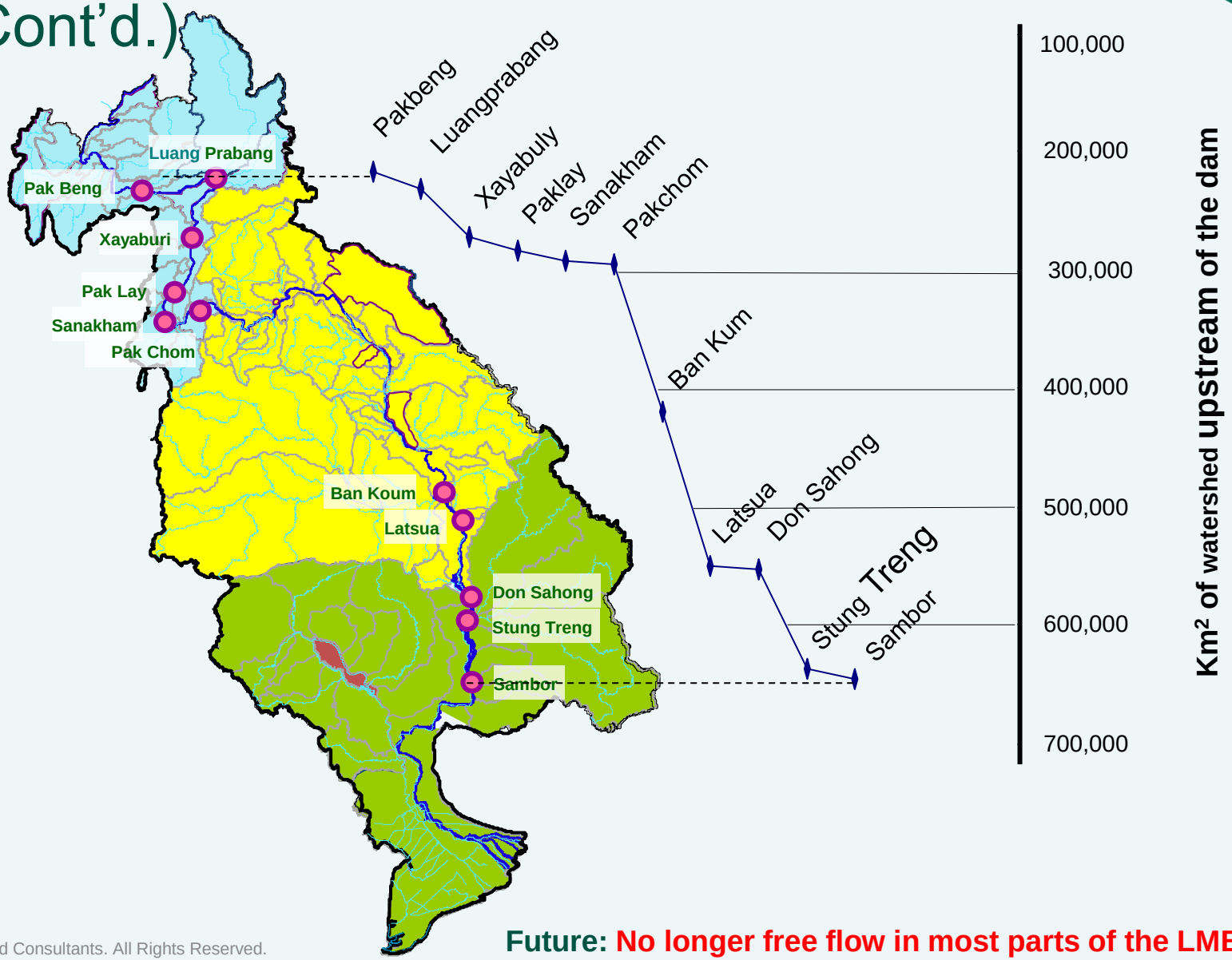
eg. South to North transfers in China
eg. Salween to Chao Phraya (Myanmar-Thailand)
eg. into NE Thailand (mainstream, Laos-Thailand)

Hydropower Development in Mekong – (Cont'd.)

Figure 1.1 Existing and planned hydropower projects in the Mekong River Basin.

MRC, 2010

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

influences

affects

Fish stocks

condition

allows

MIGRATIONS

Access to feeding and breeding areas

Access to refuges
(ponds, sanctuaries, deep pools)
(better protection = more fish)

FISH CATCH

yields

FISHING

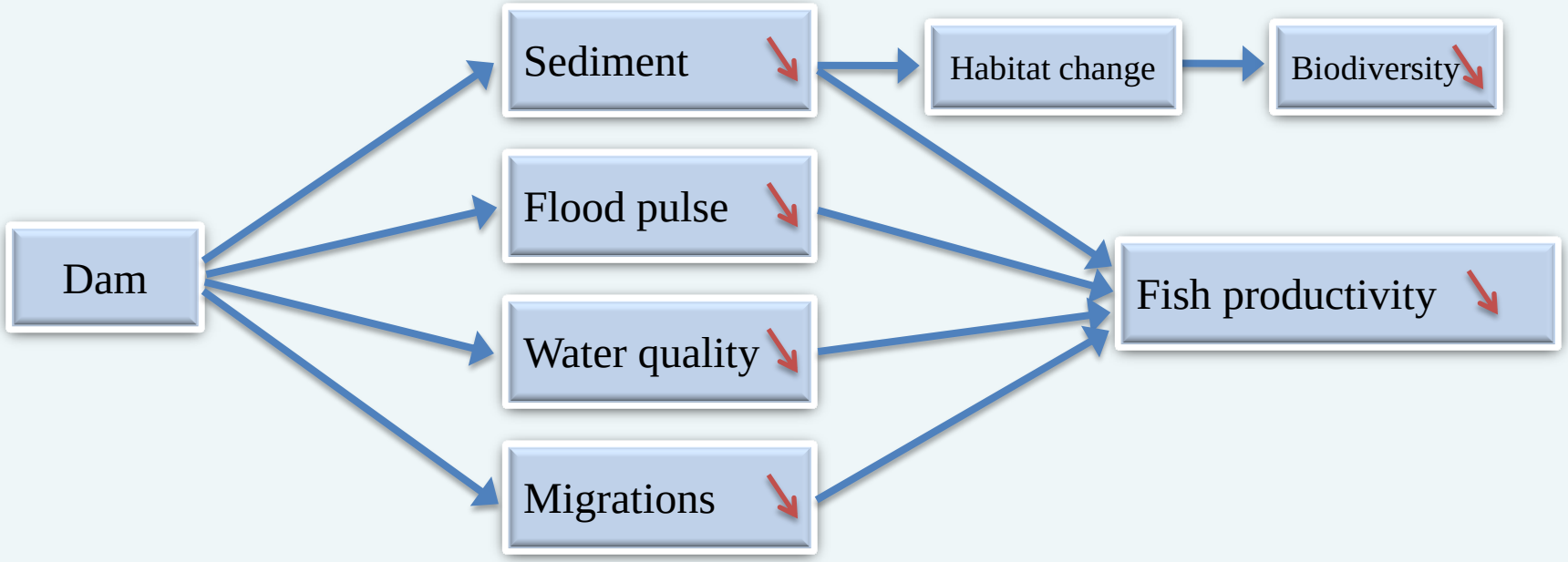
Number of fishers
Impossible to control

Fishing intensity
Difficult to assess

IFReDI, 2012

Effects of Dams on Fish Production – (Cont'd.)

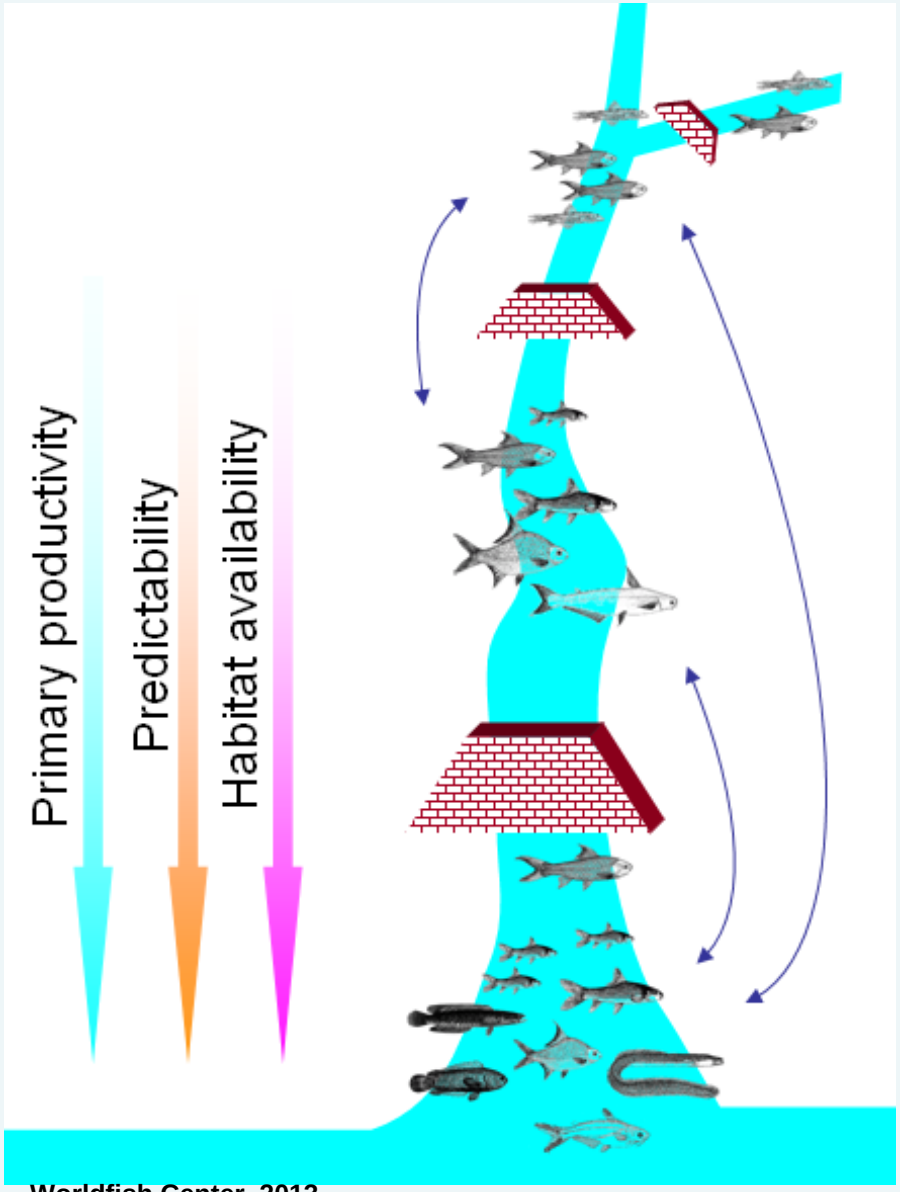
Dam development will reduce the downstream sediment concentration, but will also minimize the flood pulse, alter water quality and block fish migrations. Fishery productivity resulting from these four drivers will be affected in multiple ways that cannot be related to sediments only.



Worldfish Center, 2013

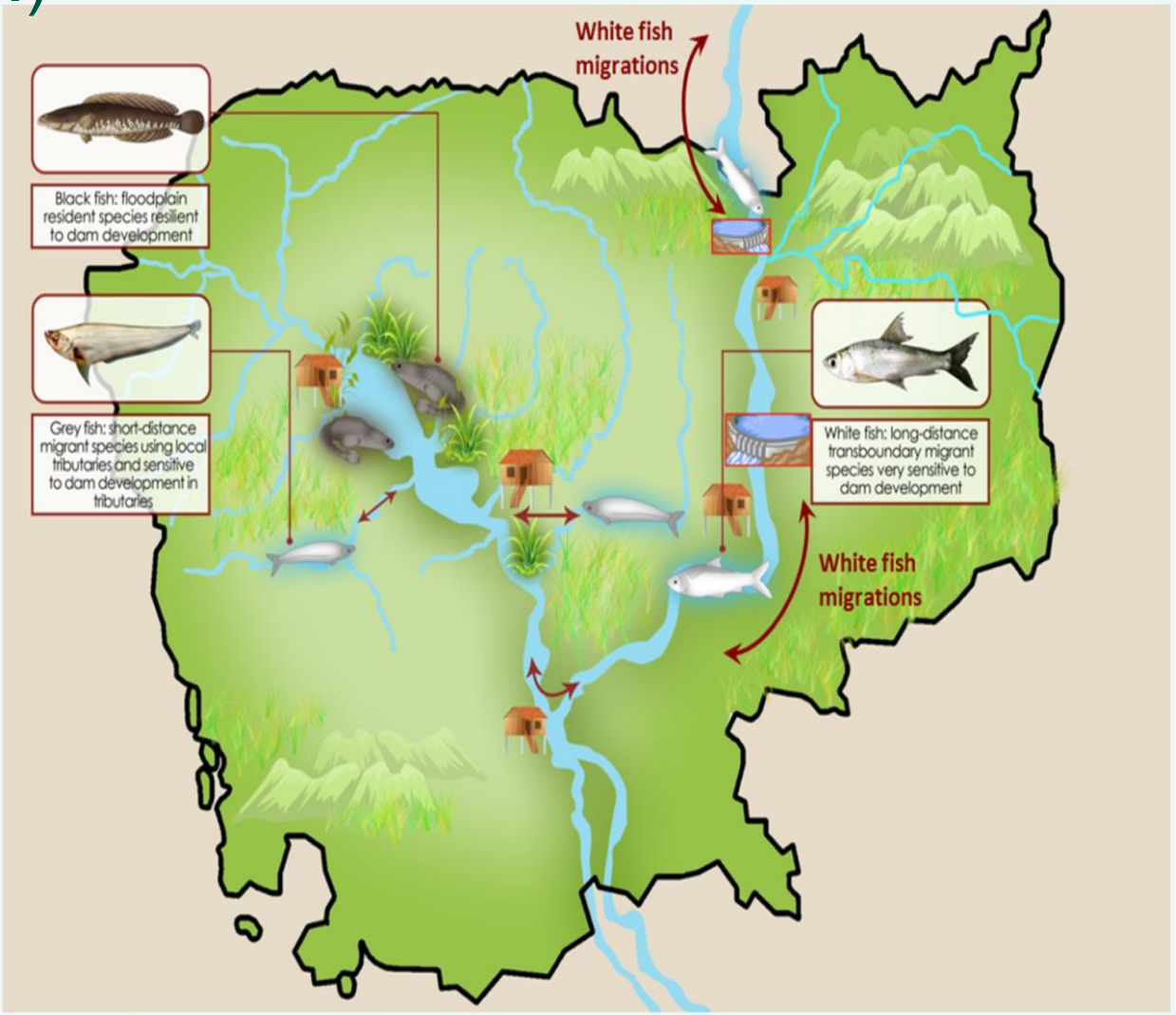
Effects of Dams on Fish Production – (Cont'd.)

Dams downstream are biologically more damaging than those upstream.



Worldfish Center, 2013

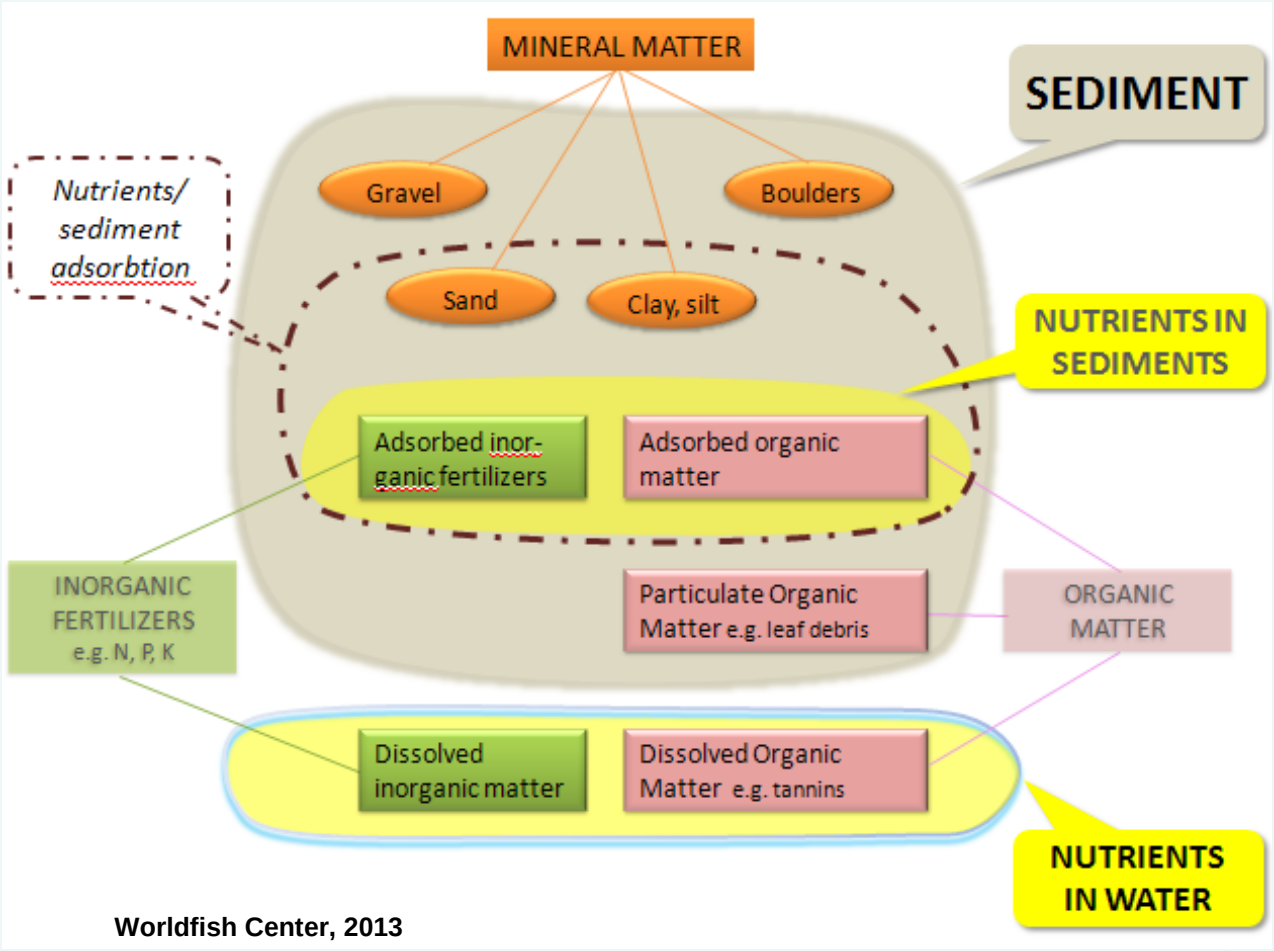
Effects of Dams on Fish Production – (Cont'd.)



IFReDI, 2012

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.



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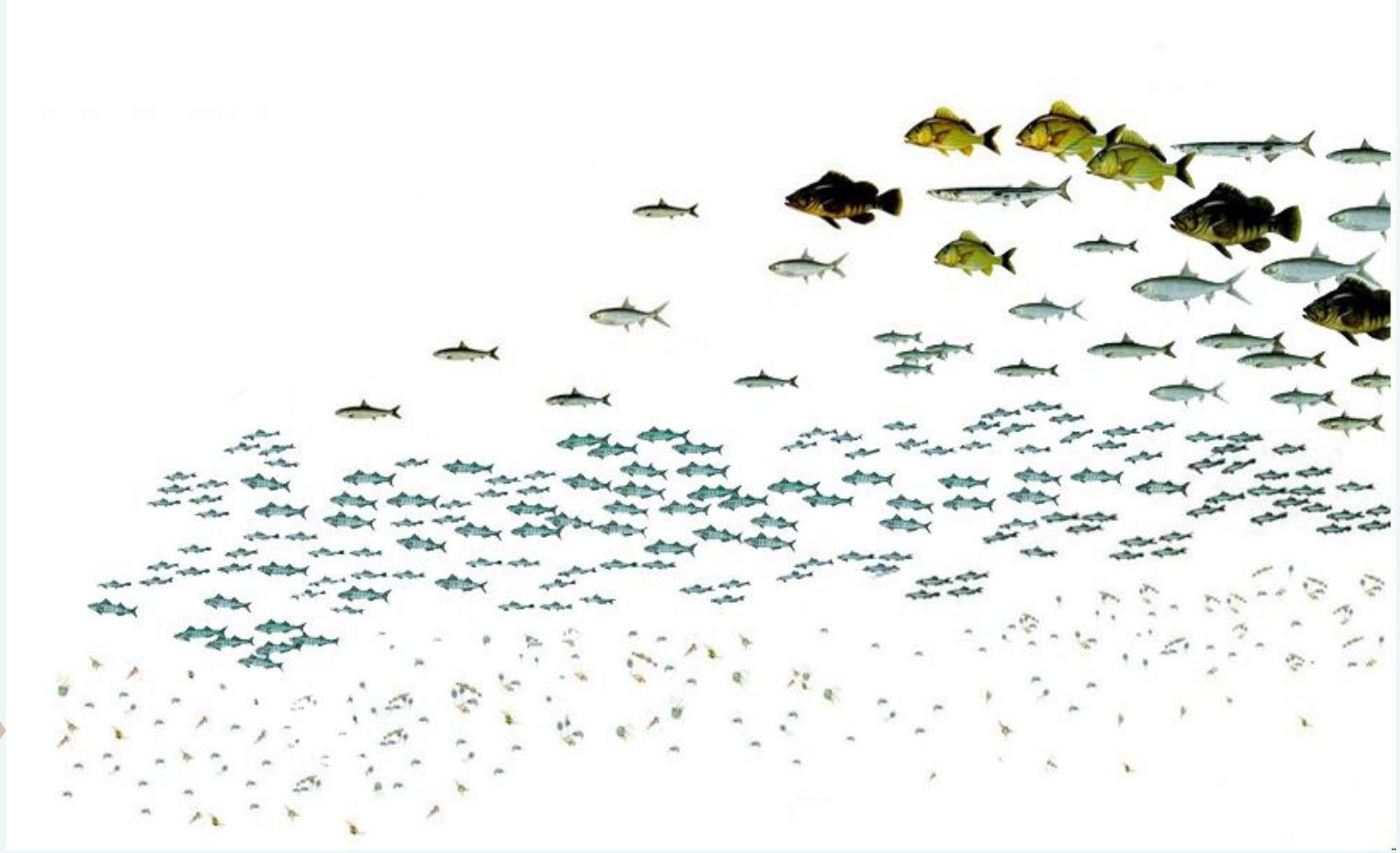
Effects of Dams on Fish Production – (Cont'd.)

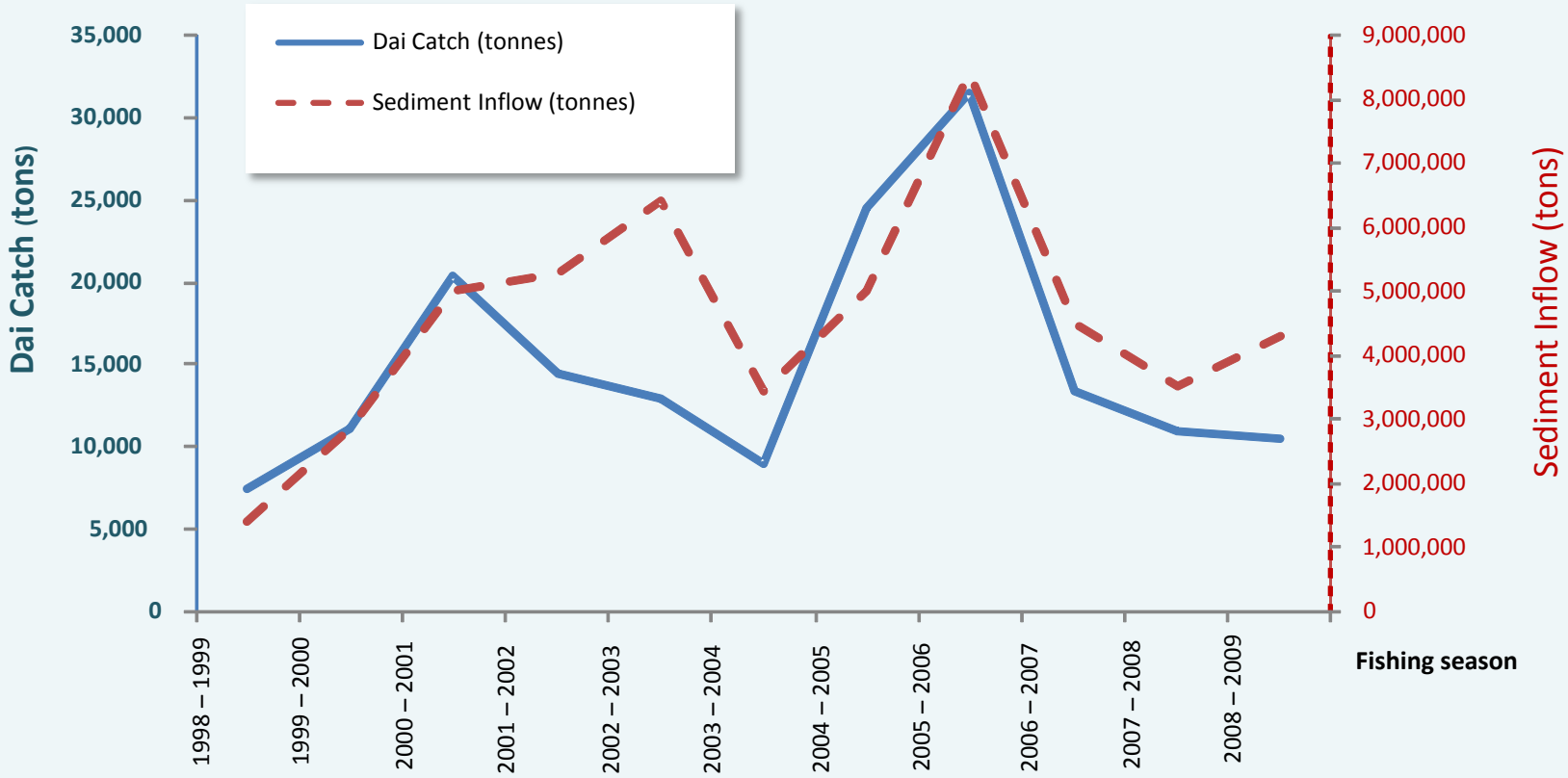
Sediment
Nutrients



Worldfish Center, 2013

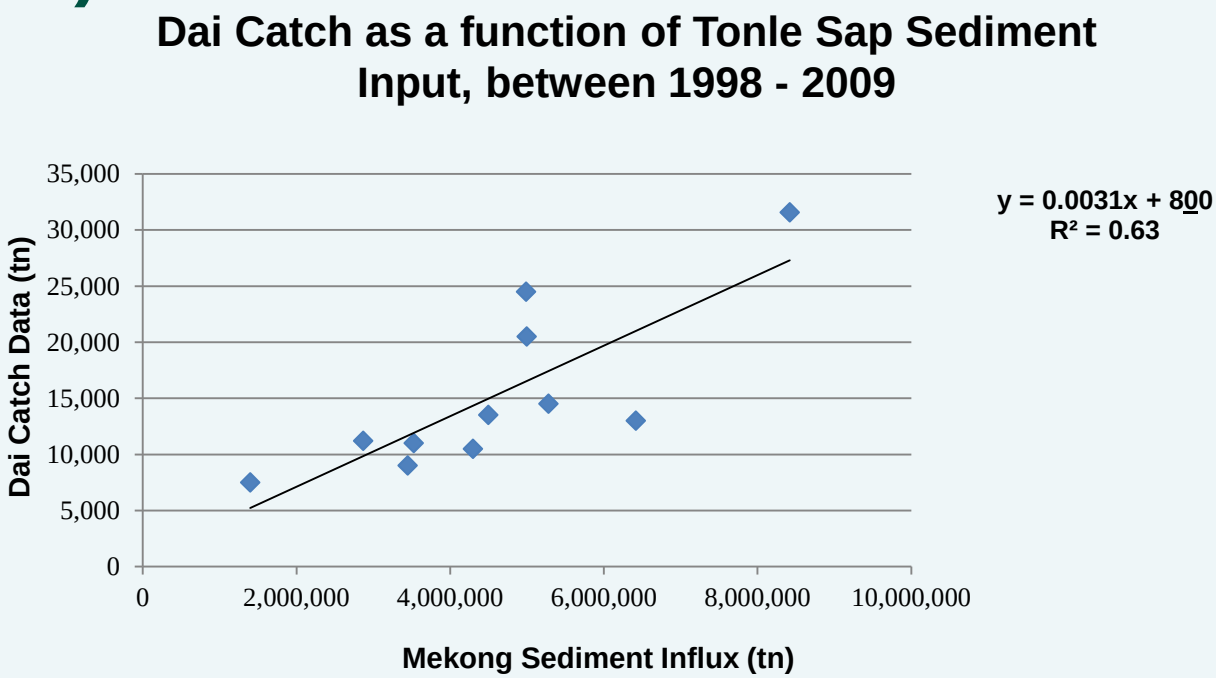
Sediment and Tonle Sap Fish Production

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



Source: Koponen et al. 2010

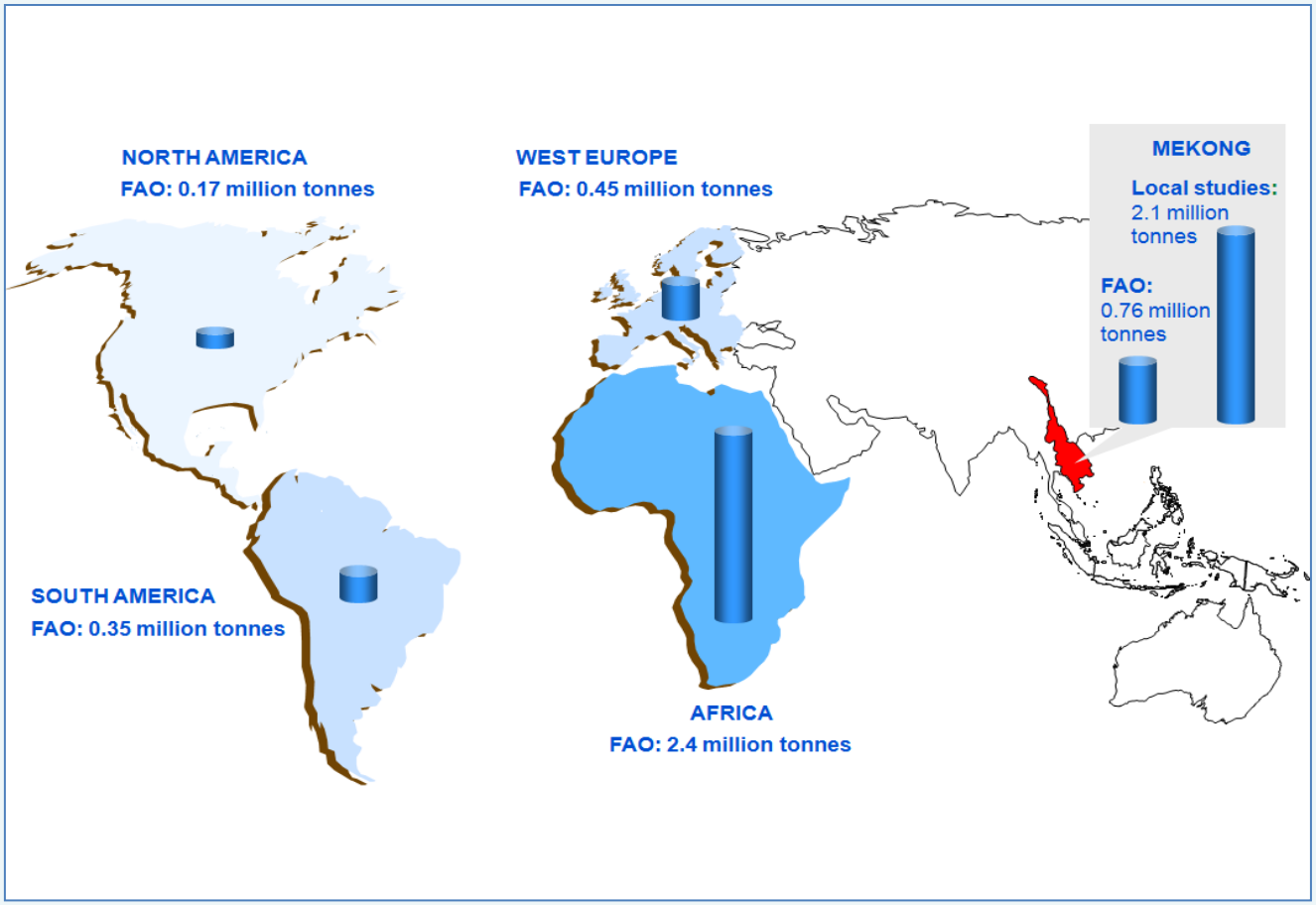
Sediment and Tonle Sap Fish Production – (Cont'd.)



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 Fisheries



Economic value of Mekong freshwater fish

US$2.1-3.8 billion at first sale
US$ 4.2 - billion on retail markets

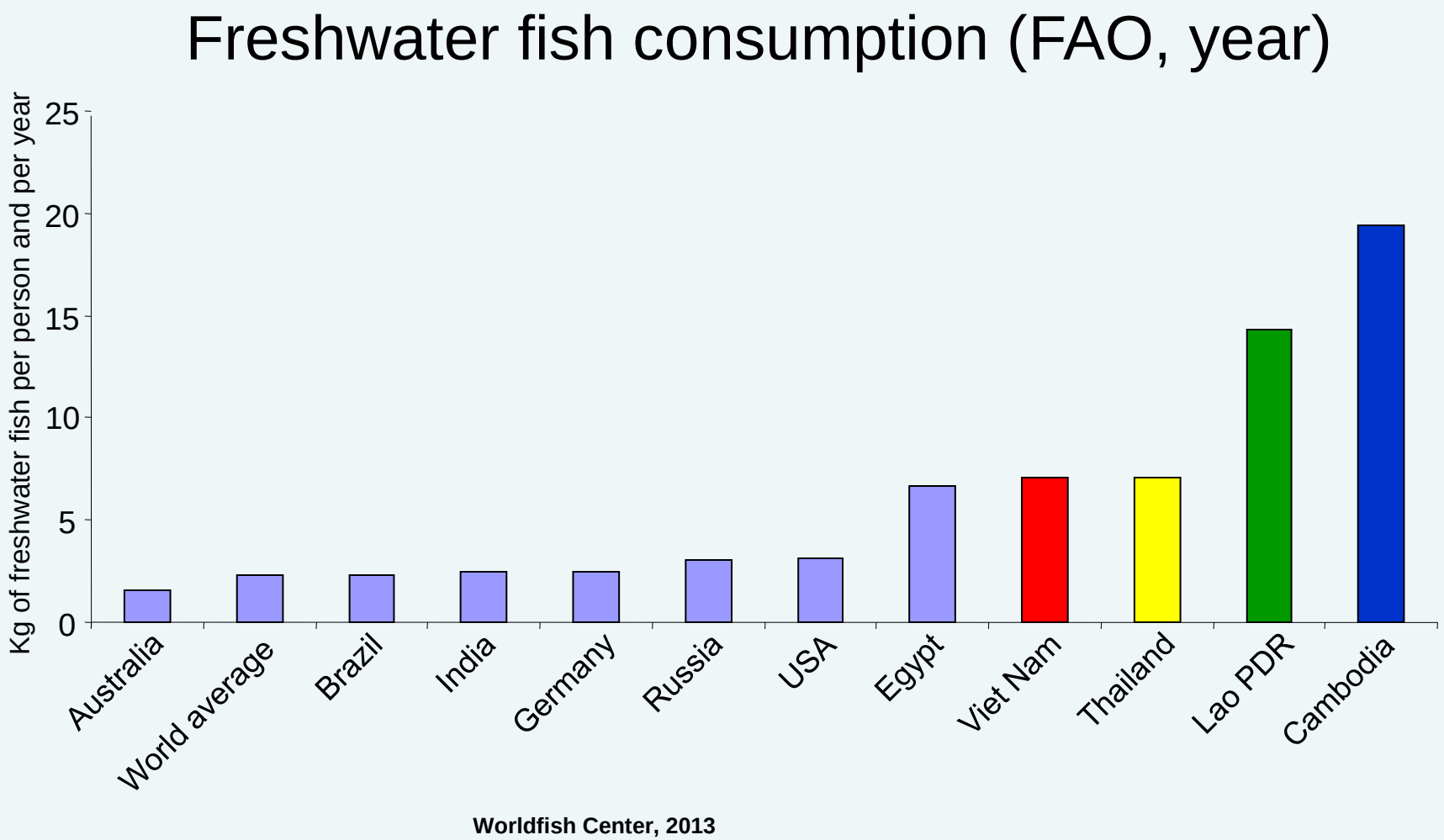
Hortle, 2009

Contribution of freshwater fish to protein inputs in people's diet

Cambodia: 50% (*81%*) Lao PDR: 38%
Thailand: 16% Vietnam: 13 %

FAO, 2003

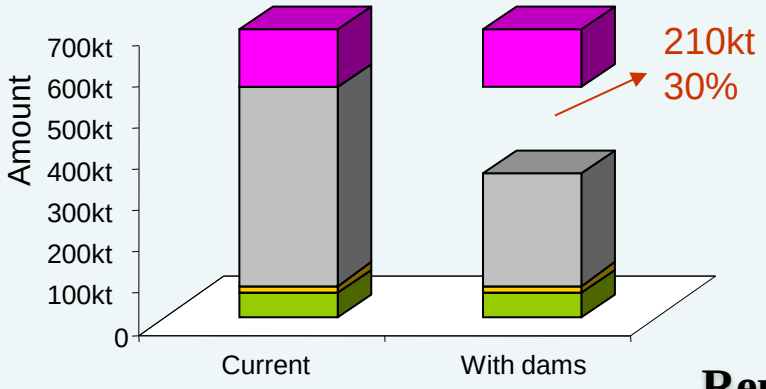
Value of Mekong's Fisheries – (Cont'd.)



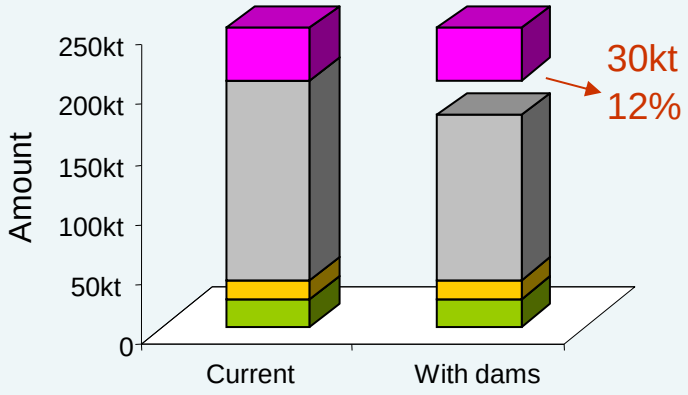
Worldfish Center, 2013

Value of Mekong's Fisheries – (Cont'd.)

Cambodia



Lao PDR



Pig meat
Freshwater fish
Chicken meat
Cattle meat

Replacement Cost?

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

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:
  - IFC Performance Standards (+World Bank Safeguard Policies).
  - 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

Hatfield CONSULTANTS

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**

Applying Broader and Inter-related Criteria

Protocol Topics

INTEGRATIVE PERSPECTIVE	ENVIRONMENTAL PERSPECTIVE	SOCIAL PERSPECTIVE	TECHNICAL PERSPECTIVE	ECONOMIC & FINANCIAL PERSPECTIVE
•Demonstrated need & strategic fit	•Environmental impact assessment	•Social impact assessment	•Siting & design	•Economic viability
•Communications & consultation	•Downstream flows	•Project affected communities & livelihoods	•Hydrological resource	•Financial viability
•Governance	•Erosion & sedimentation	•Resettlement	•Reservoir planning, filling and management	•Project benefits
•Integrated project management	•Water quality	•Indigenous peoples	•Infrastructure safety	•Procurement
•Environmental & social issues management	•Biodiversity & invasive species	•Cultural heritage	•Asset reliability & efficiency	
	•Waste, noise & air quality	•Public health		
		•Labour & working conditions		

Scoring Criteria

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

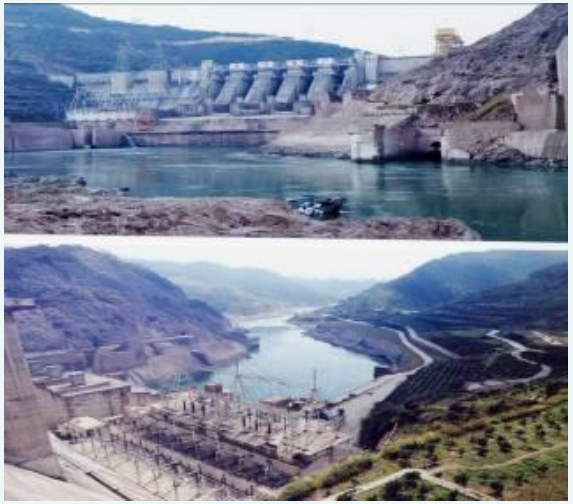
Cross-cutting Issues

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

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.



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

	Installed capacity (MW)			
Country	Existing	Under construction	Planned / proposed	Total
Cambodia	1	–	5589	5590
Lao PDR	662	2558	17,686*	20,906
Thailand	745	–	–	745
Viet Nam	1204	1016	299	2519
Total	2612	3574	23,574	29,760

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

Source: Hydropower database, Basin Development Plan, MRC (2008). The planned/ proposed and total columns includes mainstream project potential.

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References

- Koponen et al. 2010. Productivity Modeling Report 4593,page 56.
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