Water Access, Available Land Resources and Impacts on Food Production:

3-S River Hydropower Development & Tonle Sap Food Security

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Water-Food Security in Cambodia

-Assessing risk and alternatives under an altered flow regime

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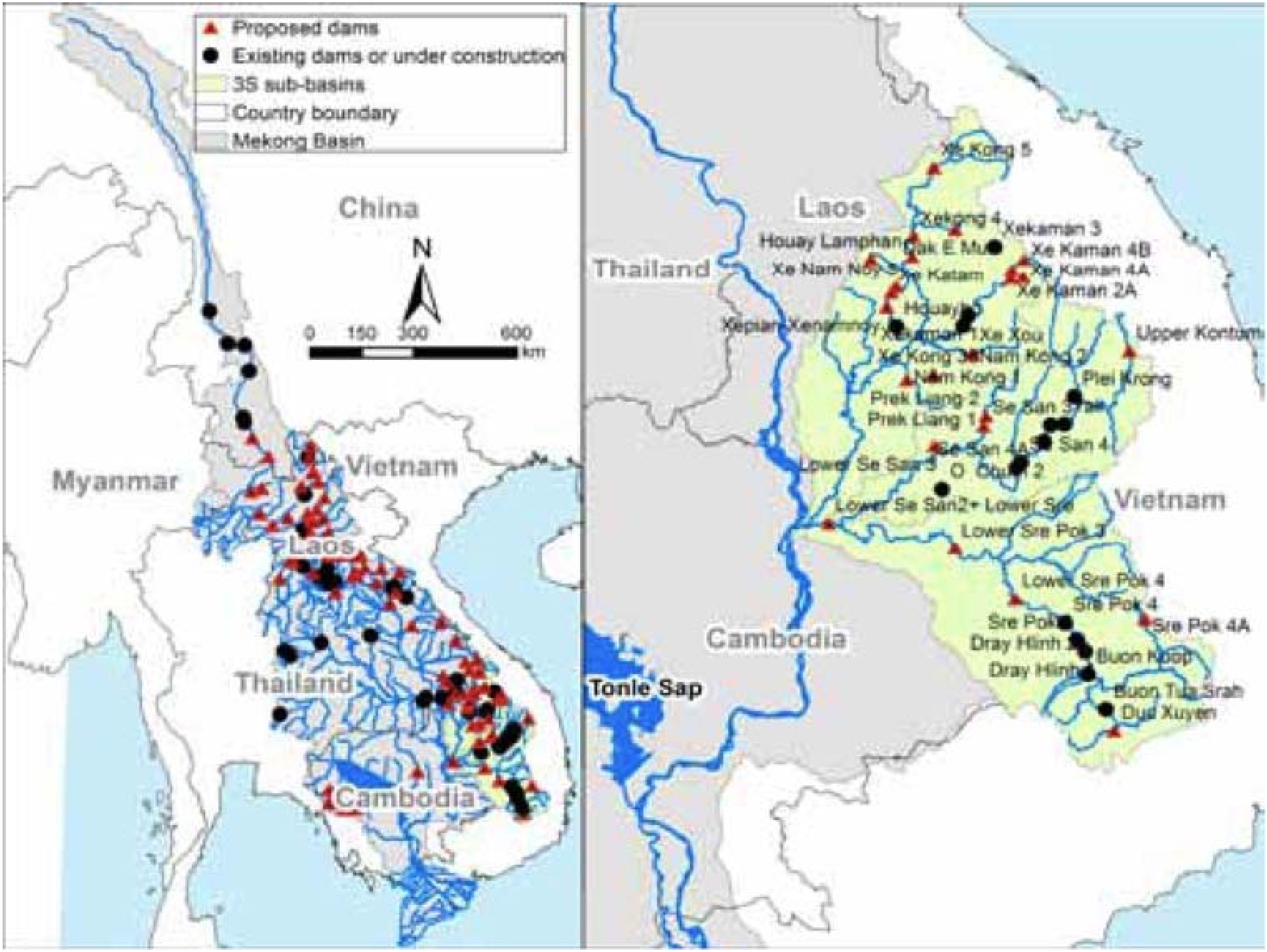
CONSERVATION INTERNATIONAL

Mekong Flows

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

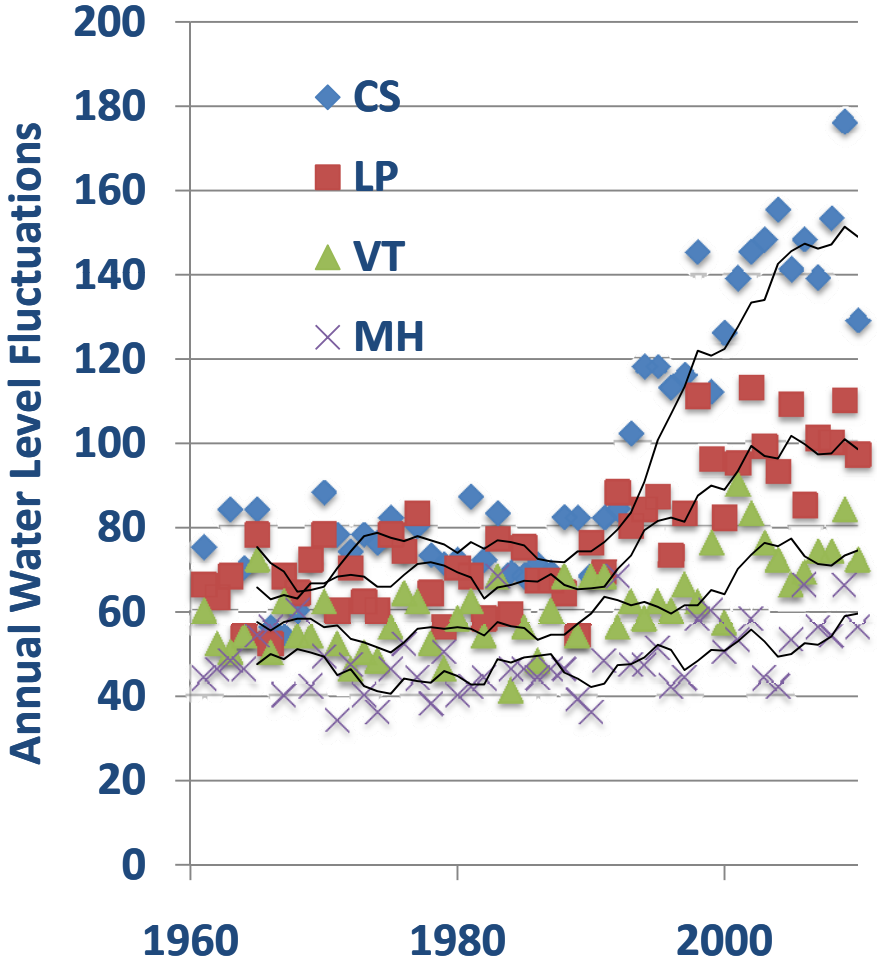
3-S Basin & Food Security Downstream

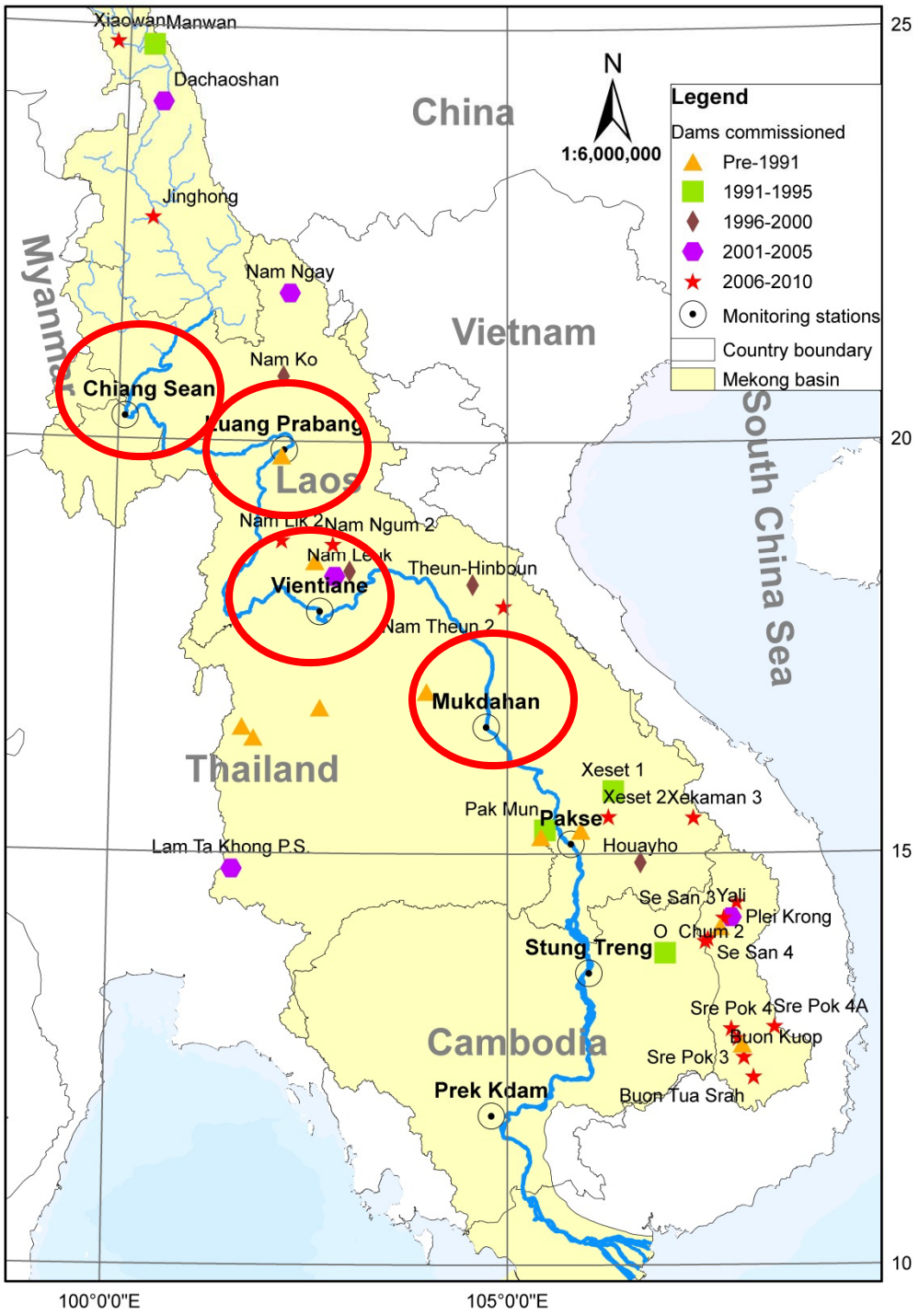
- Only 10% Mekong basin, yet more than 20% annual water volume.
- 3-S flows to Mekong 3,000 m^3/sec, dry , 4,500 m^3/sec wet seasons.
- Nearly 15% suspended sediment discharge originates in the 3-S. Key nutrient source for agriculture and fisheries.
- Most important catchment for keeping migrating fish populations.
- Trans-boundary, yet decisions in country can make a difference
- Close proximity to lower floodplains--rice and fish baskets for millions in Cambodia and Vietnam downstream.
- Valued at hundreds of millions of dollars in terms of ES- provision, regulation, supporting, cultural services.
- Ultimate test case for hydropower trade-offs in food security—critical question in SE Asia in terms of political stability and poverty alleviation.



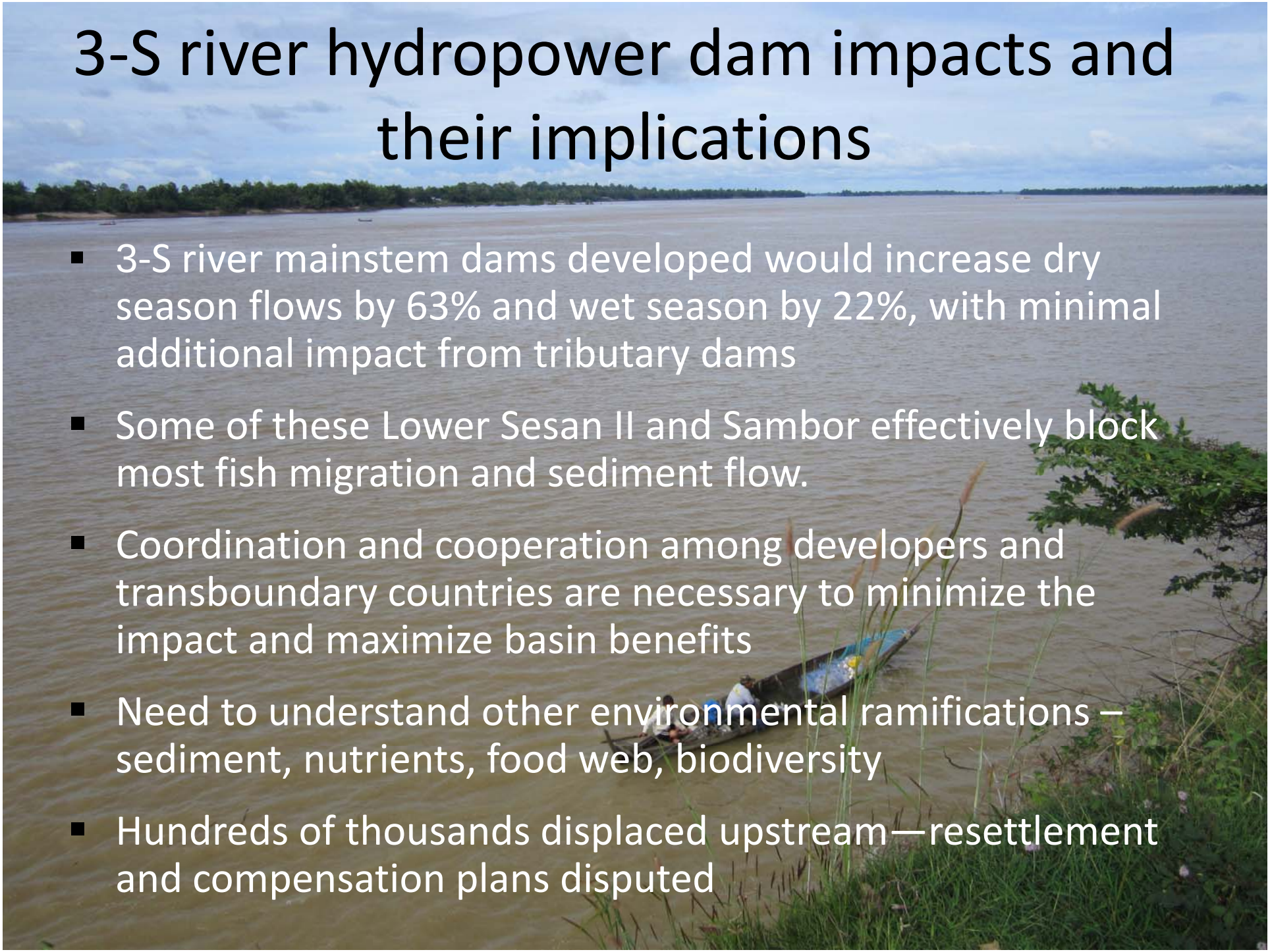
Proposed dams
Existing dams or under construction
3S sub-basins
Country boundary
Mekong Basin
China
N
0 150 300 600 km
Vietnam
Myanmar
Laos
Thailand
Cambodia
Xe Kong 5
Laos
Xekong 4
Xekaman 3
Houay Lamphan
Dak E Mue
Xe Kaman 4B
Xe Kaman 4A
Xe Kaman 2A
Thailand
Xe Nam Noy
Xe Katam
Xepian-Xenamnoy
Upper Kontum
Plei Krong
Nam Kong 1
Prek Liang 2
Prek Liang 1
Se San 4A
San 4
Vietnam
Lower Se San2+ Lower Sre
Lower Sre Pok 3
Lower Sre Pok 4
Sre Pok 4
Sre Pok 4A
Buon Kuop
Cambodia
Tonle Sap
Buon Tua Srah
Duc Xuyen

Flows have changed, but effect diminishes as you move downstream—larger dams downstream most impacting





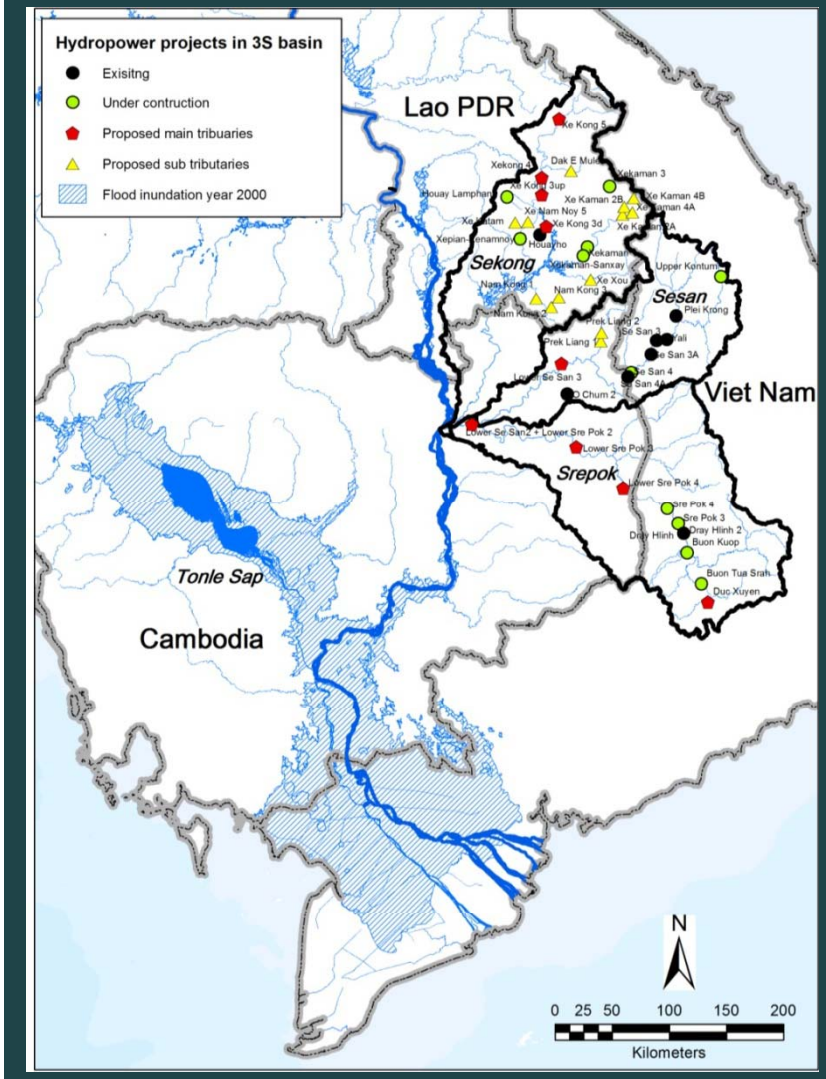
3-S river hydropower dam impacts and their implications



- 3-S river mainstem dams developed would increase dry season flows by 63% and wet season by 22%, with minimal additional impact from tributary dams
- Some of these Lower Sesan II and Sambor effectively block most fish migration and sediment flow.
- Coordination and cooperation among developers and transboundary countries are necessary to minimize the impact and maximize basin benefits
- Need to understand other environmental ramifications – sediment, nutrients, food web, biodiversity
- Hundreds of thousands displaced upstream—resettlement and compensation plans disputed

Land Use/Clearing Issues in the 3-S

What does this mean for food security for those living on the TS lake?



Tonle Sap Fisheries Important for Cambodia

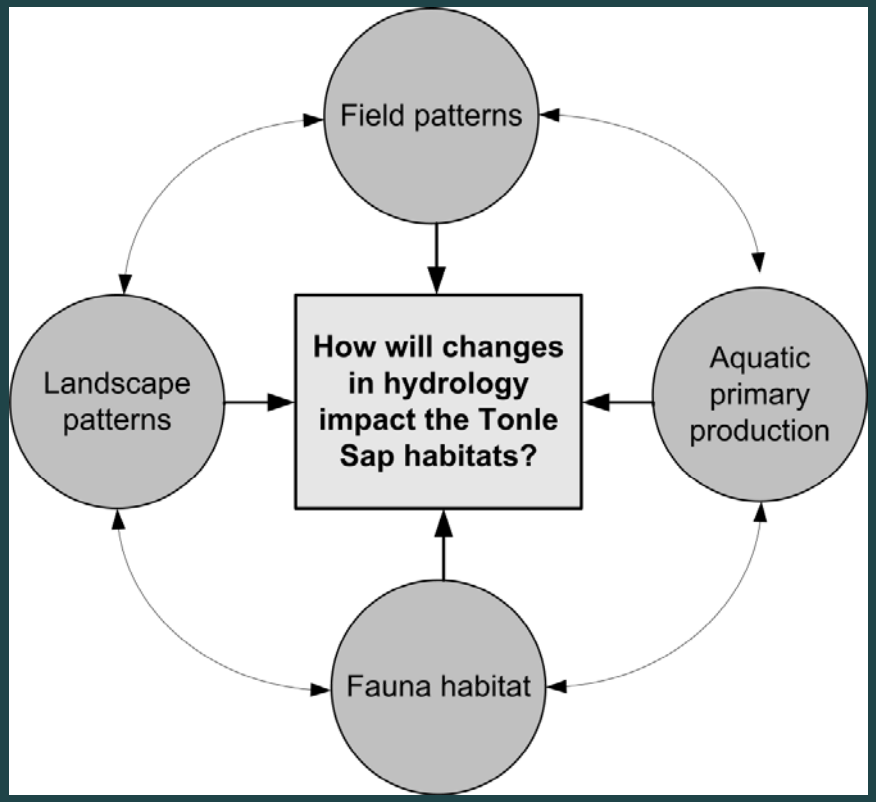
- Fourth-largest inland fishery in the world, larger than U.S. and Canada combined; 12% of GDP
- About 500,000 tonnes of fish caught annually (>55 tonnes/hour)
- 60% of entire country's protein is from inland fisheries in Cambodia
- Over 1 million people in floating villages on Tonle Sap Lake rely on fishing; another 2M in floodplain

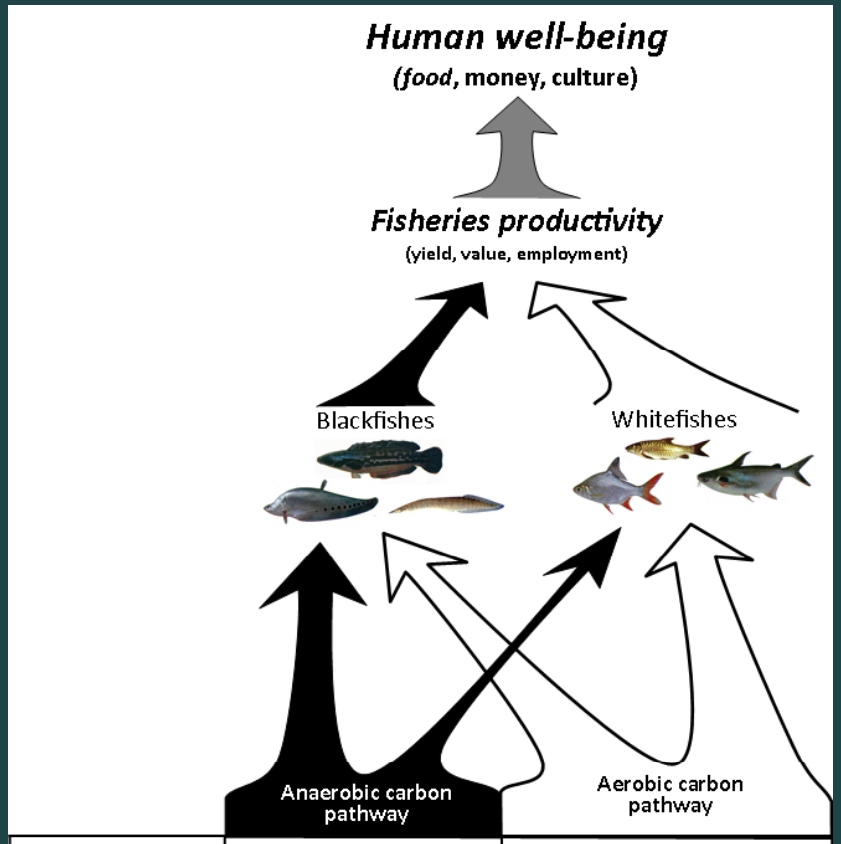
Freshwater Giants and Rare Species

Cambodia - Over 400 freshwater vertebrate species (including about 550 species of fish); over 50 species are globally threatened including Irrawaddy dolphin, giant catfish, giant stingray, turtles, crocodiles

Tonle Sap Lake - Very rich in species (over 300 kinds of fish); contains over 1/3 of Cambodia's rarest species (e.g., otters, fish eagles, fishing cats)

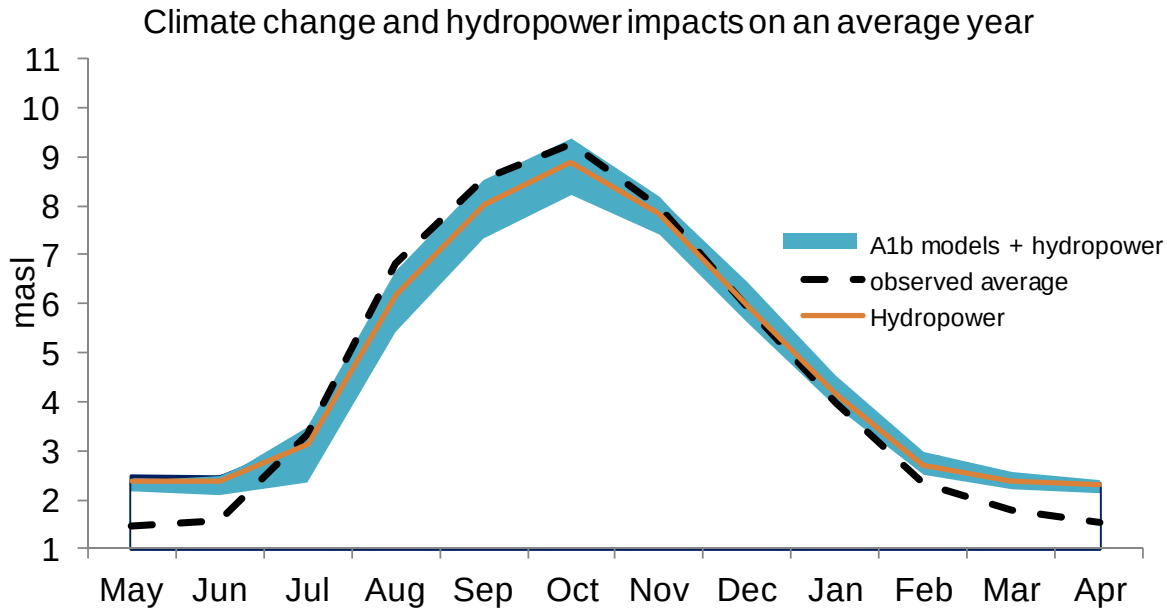
Research Overview: TS Food Security



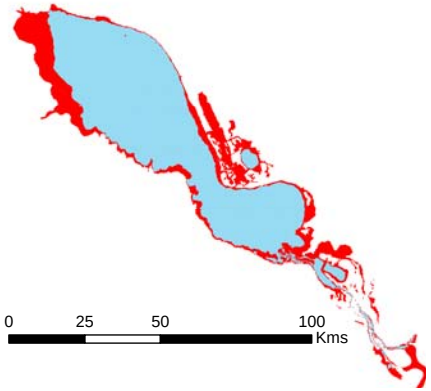


Hydroelectric dams	↓↓↓	↓
Fish sanctuaries	↑↑	↑
Climate change	↓	↓↓
Land-use change	↓↓↓	↓

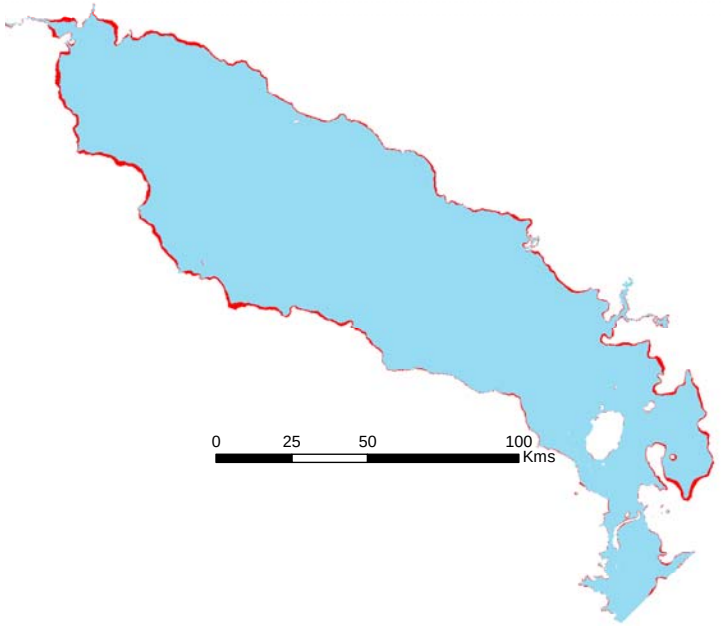
TS Hydrological Changes Expected



Flood extent changes during dry season (+30%):

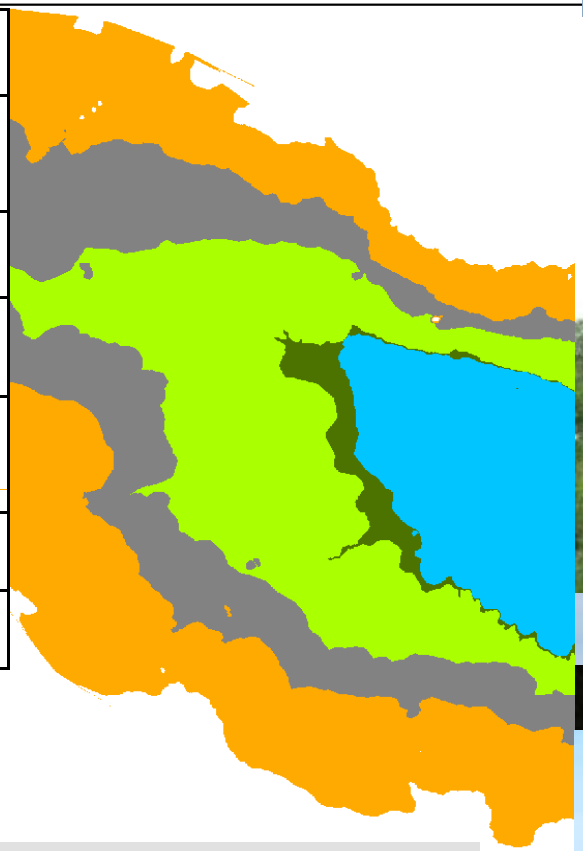


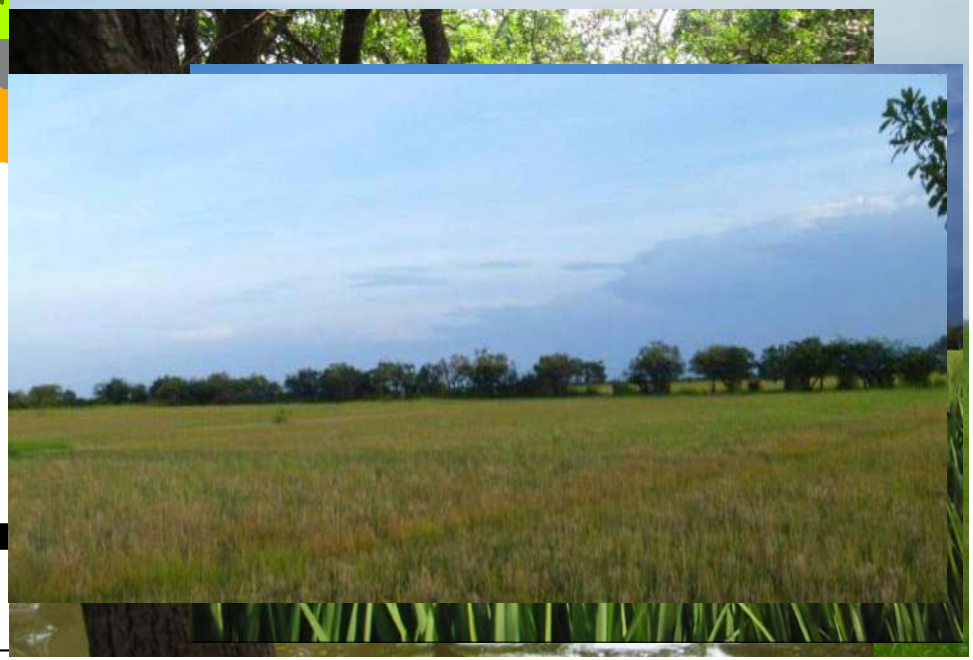
Flood extent changes during dry season (-10%):



Changes Impact Landscape Patterns

Flood duration rules (months)	
	average year
Rainfed habitats	0-1
Transitional habitats	1-5
Seasonally flooded habitats	5-8
Gallery forest	9
Open lake	10-12





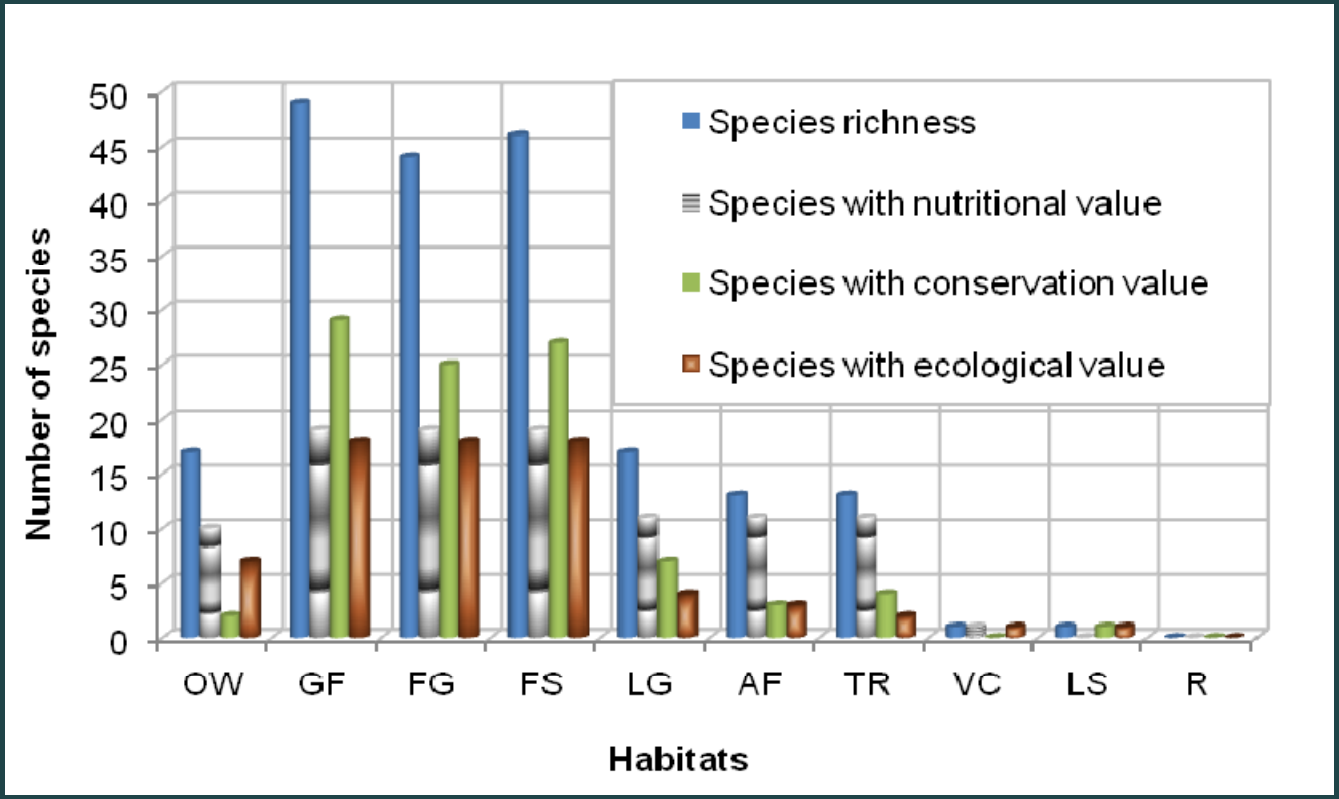
Habitat code

- Gallery Forest (GF)
- Open Water (OW)
- Rainfed habitats (RF)
- Seasonally flooded habitats (SF)
- Transitional habitats (T)

0

Which Impacts Biodiversity and Food

- Infered species information from literature
- When and where do they eat and reproduce?
- Assign habitat types where each species is likely to be during each of 4 seasons
- Link database to habitat maps



Research and Practice to Manage TS Food Security

- Basic information and data about the ecology/biology of the lake system and the larger watershed: Determine what can and cannot thrive/survive in the system. Created by scientific monitoring and applied scientific research. This includes nutrient flows (UW), basic ecology (IFReDI,Sci-Cap), and linkage to hydrology (U of Cant).

- Build capacity among government, civil society and communities: allows for more consistent capacity development for sustainable data collection, monitoring, and site implementation results (CI, IFReDI, Sci-Cap).

Research and Practice to Manage TS Food Security

- Demonstration sites: linking science lessons learned to inform selection of best practices for biodiversity protection, food security and fisheries management. Includes community fish sanctuary/protected zone management, testing fisheries management practices, conserving biodiversity, and ensuring effective site enforcement (CI). And WCS in Preak toal.
- Modeling scenarios: looking at hydro-power (U of Cant), climate change (UW, U of Cant, CI, BU), and ecosystem services (BU). Trade-offs and impacts.

Integrating information, capacity, management and modeling results to inform policy decisions, and fisheries management actions. Best practices implemented at community and national levels while also influencing regional policy.

Sharing Results and Influencing Policy: Hydropower Impacts and Alternatives

- http://cambodiahydropower.weebly.com/

Partners and Support

- Partners: Mekong River Commission
- Collaborators: M. of Environment, Aalto University, EIA Ltd Finland, Research Development International, University of Washington, Fisheries Administration, Boston University, SCI-CAP (food web modeling group)
- Funding: Critical Ecosystem Partnership Fund, MacArthur Foundation, UNDP-CCCA, and Belmont Challenge Award

Thank you for your kind attention!!

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