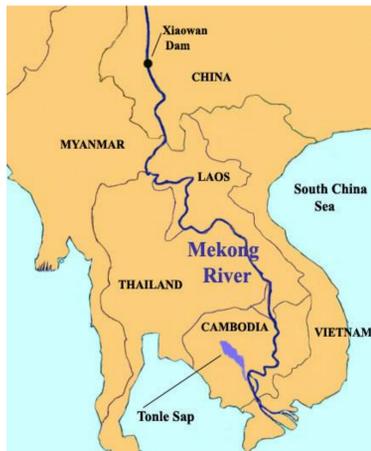


Use Water-Energy- Food Nexus to Combat Climate Change and Promote Sustainable Development in Mekong River Basin

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INTRODUCTION



Source: Environmental 360 of Yale University

Mekong River Basin is one of the most significant rivers in South East Asia. It is the engine of regional development due to its critical food production, water availability/consumption and energy production. Local communities and regional economies rely heavily on the Mekong for fish and rice production. Nevertheless, Laos, Cambodia, and Myanmar remain some of the world's most impoverished places. However, the regional security and development is significantly threatened by climate change, environment-water degradation, diminished / vulnerable agricultural production. Moreover, the dramatic increase in dam building in the River adds significant additional stress.



Photo credit: Man Yang, 2015

Nowadays, population growth, depletion of natural resources and increasingly degraded environment all make the agriculture and food security more crucial than ever, as these are increasingly threatening the achievement of Sustainable Development Goals (SDGs) and as food security has been deeply embedded in every aspect of the development of Mekong region.

RESEARCH DISCRIPTION

Research Objective: Use Water-Energy- Food Nexus to combat climate change and promote sustainable Development in Mekong River Basin.

Project Hypothesis: By incorporating the Water-Food-Energy nexus system approach, to examine the regional water, energy and food risks of three major countries in Mekong region, to evaluate the relevant data and make the vulnerability assessment on each section, and provide risk analysis and make future policy recommendations.

Project Boundaries: This project will geographically focused on three countries of Mekong River: Cambodia, Vietnam and Laos.

The Vulnerability Assessment Index : Will be used for each city to: analyze its water, energy and food interactions, determine its vulnerability to threats, and provide suggestions on future actions it may take to improve its stability from nexus perspective.

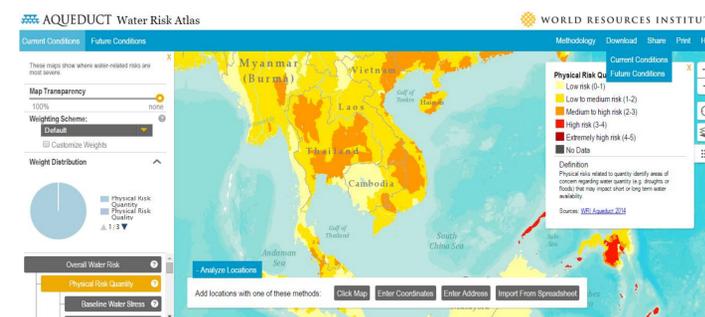
The Synergies: To promoting the sustainable development in the Mekong region. Climate change impact on water change, change risks that impact energy and food security, on the other hand, tradeoffs of energy generation of hydropower infrastructure to satisfy energy demand versus water and food security.

RESEARCH CONTENT

The **Vulnerability Assessment Index** will be used for each city to: analyze its water, energy and food interactions, determine its vulnerability to threats, and provide suggestions on future actions it may take to improve its stability from nexus perspective.

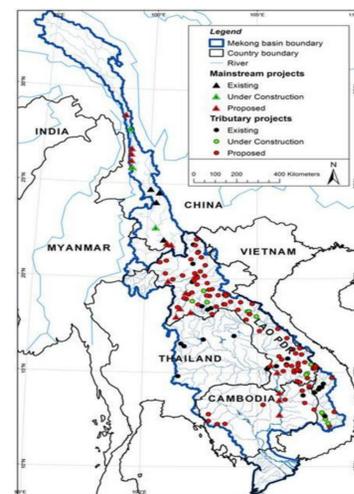
This research examine the major risks of Mekong River Basin and in case study will use Vietnam as a example to examine and analysis each risks-water risks, food risk and energy risk, and conduct the score analysis.

Water Risks



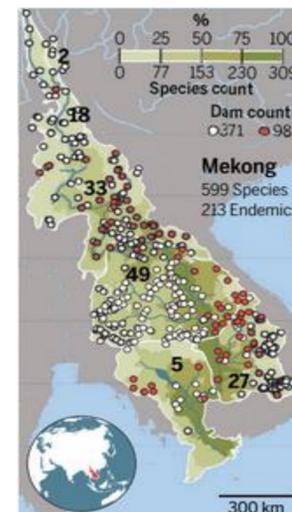
Source: World Resources Institute

Energy Risk: Hydropower Development in River Mekong



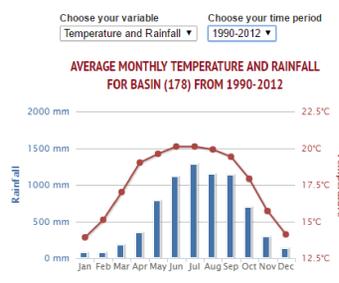
Map of the Mekong Basin showing some of the hydropower projects at various stages of development (Map design: www.mekongflows.org - Mekong Flows team, University of Canterbury. Data source: Mekong River Commission)

Food Risk: Fish Species and Quantity Decrease

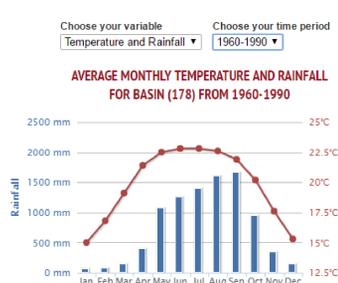


Graph Source: Winemiller, K. O., Balancing hydropower and biodiversity in the Amazon, Congo, and Mekong

Impact of Climate Change on Temperature and Precipitation of Mekong River Basin



Source: World Bank Climate Change portal,



RESEARCH RESULTS & CONCLUSION

The **Vulnerability Assessment Index(VI)** will be used to analysis country's vulnerability for this Water, Food and Energy Security under the threats of climate change.

Here will use Country of Vietnam as example to illustrate the **vulnerability assessment index and the index score system.**

Example: Vulnerability assessment country - Vietnam	Data	Total scale	V score card score of 4	Sector	Risk Level
Indicators					
1 Renewable in total Energy output	29.1	100	1.16	Energy	moderate
2 Energy Intensity of Agricultrual sector	0.58	1	2.32	Energy	medium
3 Water risk index under the climate change	2.3	4	2.3	Water	medium
4 Dam number account for all number of hydropower in that region	173 Among 1831 (whole)	100	3.64	Water	High
5 Fish Resource depletion due to the hydropower infasturcture	42	100	1.68	Food	moderate
6 The percentatge of Agricultrual Land available	35	100	1.4	Food	moderate
7 Prevalence of undermourishment (% of population)	12.9	100	0.51	Food	LOW
8 percentage of unused arable land	43.27	100	1.73	Food	Moderate
Risk level:	0-1 Low 1-2 Moderate 2-3 Medium 3-4 High				

Date Source: World Bank, Asia Development Bank, World Resources Institute, Mekong River Commission, International Rivers

As the risk analysis showed, Vietnam will undergoing high risks of the booming of hydropower infrastructure. Therefore, technologies and polices that can reduce the water assumption and energy, enhancing its technology and efficiency during the agriculture production activities are needed to combat future climate related water disaster.

Country Cambodia, Laos will conduct the same risk analysis to evaluate its vulnerability of each factors and make plans and recommendations of its development plan.

RESEARCH IMPLICATION

The vulnerability models and scenarios to examine water, food and energy risks of Mekong country and the vulnerability index could helps policy institutions in developing science based water management and development policy of Mekong region. This research could provide information on strategies of tackling the climate change threats, balance the trade off of hydropower developing for satisfy energy demand with the local water and food security. This vulnerability index could contribute in water resources analysis, examine tradeoff and alternatives of food production, water use& consumption and energy impact , make plans to enhance productivity and efficiency during agriculture activities.

Complicated issue need multi-interdisciplinary and holistic approach! Examine linkages of between water, food and energy is the key to sustainable development of riparian countries of Mekong River Basin.

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THANK YOU !