SUPPLY CHAIN AND SUSTAINABILITY RESEARCH: SCSR
VOL.3, NO.4; OCT. – DEC.; 2024, ISSN 2822-0412 (Online)

Climate Change, Natural Disasters, and Sustainable Water Resources Management in the Lancang-Mekong River Basin

Ya-Ping Chang*
Cheng-Yi Kuo**

Received: November 9, 2024 / Revised: February 24, 2025 / Accepted: February 25, 2025

Abstract

The Lancang-Mekong River Basin stands as the largest river basin in Southeast Asia, spanning across riparian states including China, Laos, Myanmar, Thailand, Cambodia, and Vietnam. In light of this significance, the Third Lancang-Mekong Cooperation Leaders' Meeting took place on August 24, 2020, aiming to foster consensus among these nations. However, despite such agreements, the region continues to face various disasters, including droughts, floods, and dam collapses, resulting in substantial damages.

This research endeavours to investigate the historical context of the Lancang-Mekong River Basin, focusing on water resources management within the area. By employing the perspectives of information sharing and coexist environment theory, the study aims to shed light on effective strategies for addressing these challenges. Through an examination of past practices, this research seeks to provide valuable insights into managing water resources in the Lancang-Mekong River Basin, promoting sustainable development and fostering cooperation among the riparian states.

Keywords: The Lancang-Mekong Cooperation (LMC), Mekong River Commission (MRC), Water Resources Management, Information Sharing, Coexist Environment Theory

*Department and Graduate School of Tourism Management, Chinese Culture University, E-mail: zyp5@ulive.pccu.edu.tw
**Corresponding, Department of Leisure and Recreation Management, Chihlee University of Technology, Taiwan.
E-mail: ian780303@gmail.com

The current issue and full text archive of this journal is available on Supply Chain and Sustainability Research at:
https://so08.tci-thaijo.org/index.php/SCSR/index

Introduction

The Mekong River, spanning 4,350 km, stands as the 12th longest river in the world, the seventh longest in Asia, and the longest in Southeast Asia. Originating from the Tibet-Qinghai plateau, the upstream portion known as Lancang flows through Qinghai, Tibet, and Yunnan provinces in China. The lower Mekong traverses Thailand, Laos, Myanmar, Cambodia, and Vietnam before flowing into the South China Sea (Ouyang, 2016). Supporting a population of 60 million, the lower Mekong basin has experienced a decline in water levels since 2019, with two consecutive years of record-breaking droughts reaching the lowest levels in the past 50 years. This has had detrimental effects on fishery and agricultural activities (The News Lens, 2020). A U.S. study reveals that while the headwaters of the basin received above-average rainfall from May to October 2019, areas in Laos and Thailand experienced below-average rainfall, particularly Thailand suffering from severe drought (Basist & Williams, 2020). There is ongoing debate regarding the impact of China's construction of 11 dams in the upper Mekong River basin, which retain water and potentially reduce water levels downstream by two-thirds. The Chinese government argues that the drought may be caused by reduced rainfall. However, criticism has arisen due to China sharing limited data with the six riparian countries, prompting the Thai government to request more information. In August 2020, a virtual summit for the Lancang-Mekong Cooperation (LMC) was held in response to the second consecutive year of record-low water levels in the Mekong River. The Mekong River Commission (MRC) emphasized the need for China to provide more data (Hung, 2020; Reuters, 2020).

A report from the U.S. think tank, Stimson Center, suggests that during a six-month period in 2019, rainfall exceeded the average, but China's dam operations resulted in more water being held back. Conversely, countries in the lower basin experienced severe drought conditions. It is argued that if China's dams did not restrict the flow, the Mekong River along the Thai-Laos border would have experienced above-average flows from April 2019 to the present (Eyler & Weatherby, 2020). These tensions stemming from different perspectives warrant examination. It is essential to explore whether upstream countries have influenced the damages and changes in average flows. Furthermore, the adoption of information sharing and coexist environment theory is crucial. Campbell asserts that direct human impacts on hydrology include irrigation, while indirect effects involve dams and land use. Although there have been speculations, further investigation is required to gather more evidence (Campbell, 2009). Based on Campbell's statement, the research seeks to address the following questions:

What are the recent evidences of direct and indirect human impacts on the Lancang-Mekong River Basin? The paper aims to explore the evidence of these impacts on the area in light of the changing ecological environment.

What are the opportunities for water resources management along the Lancang-Mekong River Basin? Through an information sharing approach, the paper will examine how sharing information can lead to improved

methods of water resources management.

What considerations are given to water resources management in the Lancang-Mekong River Basin? Using a coexist environment perspective, the paper seeks to understand whether this perspective has influenced decision-making processes.

Literature Review

The Lancang-Mekong Cooperation (LMC)

The Lancang-Mekong Cooperation (LMC) was established in 2012, primarily driven by Thailand's initiative to develop the Lancang-Mekong region. Subsequently, China launched economic and diplomatic policies towards the LMC. In 2016, the LMC Leaders' Meeting took place, and the Sanya Declaration was announced, emphasizing cross-border cooperation in areas such as the economy and water resources. In 2018, China advocated for increased water cooperation, particularly in managing drought and flood situations (Grunwald, 2020). However, China's emphasis on the "Mekong Spirit" of water cooperation has faced criticism.

Information Sharing Approach Inform

As highlighted by Rafaeli and Raban, information sharing is defined as "the act of providing a helpful answer to a request for information" (Rafaeli & Raban, 2005). The nature of information is not clearly classified as solely private or public good. It can possess characteristics of both, leading to different ownership options and external influences that can either facilitate or hinder sharing. It is important to note that information-sharing issues cannot be solely attributed to "free riding". Regardless of whether information is intended for public or private benefit, the approach to information sharing significantly impacts the underlying issues.

Coexist Environment Theory

Godoy (2019) emphasizes that the core objective of coexistence theory is to establish mechanisms that prevent exclusion and encourage interaction and sharing among various entities. Since the 1950s and 1960s, the concept of coexistence has extended beyond biology and found applications in anthropology, sociology, economics, management, architecture, and political science. It is evident that the relevance of coexistence theory extends to environmental contexts, particularly in exploring the impact of water resources management on basin regions. This paper employs an information sharing approach and adopts coexist environment theory as a theoretical model to investigate water resources management in the Lancang-Mekong River Basin. Through these theoretical approaches, the research aims to comprehend the mechanisms through which information is shared and to analyze how the concepts of coexisting environment have influenced the ecological dynamics of the basin.

The current issue and full text archive of this journal is available on Supply Chain and Sustainability Research at:
https://so08.tci-thaijo.org/index.php/SCSR/index

Research Methodology

Documentary analysis is a systematic procedure used to review and analyze various types of documents, including books, diaries, journals, newspapers, and both printed and electronic materials. It is a researcher's intervention-free process that employs a systematic approach to evaluate the content of these documents (Bowen, 2009). In this research, the documentary analysis method was adopted to assess the evidence related to hydrology, encompassing direct and indirect human impacts, as well as the influences of international agreements on water resources management.

According to Ouyang (2016), the capitals of Laos and Cambodia are situated along the Mekong River, and the rice production of Thailand and Vietnam heavily relies on this vital waterway. The Mekong River basin is known for its abundant water resources, with an average water flow of 475 billion cubic meters, ranking it first in Southeast Asia. Campbell (2009) notes that the development of water resource management is significantly influenced by hydropower, specifically "the shift of water from the wet to the dry season via reservoir storage." However, this practice can lead to various challenges, including drought, river destruction, ecological changes in the water, and even dam collapse.

Results and Discussion

Drought

According to Ouyang (2016), the water resources of the Mekong River primarily come from rainfall and the melting of snow in the mountains. Beech (2020) highlights that while the water level in China was above average in 2019, lower stream countries experienced severe drought conditions. In some areas, the water levels dropped to the extent that riverbeds cracked and became exposed. For instance, in the Chiang Saen district of northern Thailand, the water level reached a historically low point. A study indicates that the construction of dams in China has resulted in the blocking of over 125 meters of water resources.

River Destruction

According to Xiao (2020), in December 2017, the Thai government announced that the Chinese government agreed to halt blasting activities. However, the blasting has resulted in significant changes to the ecological environment, and the construction of dams has impacted water resources and fishery activities. The evidence suggests that the river's ecology has been adversely affected by these activities.

Water Ecological Changes

Due to the alterations in water ecology, farmers in Chiang Rai, Thailand, have been compelled to relocate their farms to higher ground to prevent unnatural flooding. This displacement has had an impact on agricultural production, particularly the cultivation of bean sprouts. The diminishing number of bean sprout fields has been a cause for concern (BBC, 2018). Biologists have expressed apprehension about the ecological changes and their

The current issue and full text archive of this journal is available on Supply Chain and Sustainability Research at:
https://so08.tci-thaijo.org/index.php/SCSR/index

effects on plants, birds, and aquatic animals.

Dam Collapse

The catastrophic collapse of Saddle Dam D in Laos in 2018 has had a profound impact on the region. On 23rd July, approximately 500 million cubic meters of water was unleashed, resulting in a devastating flood. The consequences were severe, with at least seven villages sustaining damage, over 20 casualties, hundreds of people reported missing, 7,000 individuals forced to evacuate, and 14 bridges destroyed. Recognizing the gravity of the situation, the Laos government declared the affected area a national emergency disaster zone (Inclusive Development International, 2025)

Table 1 The Collapse of Saddle Dam D in Laos

July	22nd	21:00	Engineers found more than 10 cracks in Saddle Dam D, and the Laos authorities notified populations downstream to evacuate. However, heavy rain damaged the road, and the repair team cannot fix the cracks.
July	23rd	03:00	Released water from the main dam to lower the water level.
July	23rd	12:00	Dam problems were not controlled, and the Laos government evacuated downstream residents.
July	23rd	20:00	Dam collapsed and flooded villages downstream with about 500 million cubic meters of water.
July	24th	09:30	At least seven villages were flooded, more than 20 people killed, hundreds missing, about 7,000 evacuated, and 14 bridges destroyed.
July	26th		The South Korean government sent rescue team to help.

The Change of Lancang-Mekong River Basin

Satellite data analysis has revealed a significant disparity in the surface humidity levels between Yunnan Province in China and Thailand and Laos from May to October 2019. While the humidity levels in Yunnan Province remained above average, the water levels in Thailand and Laos were three meters lower. This discrepancy suggests that water was not adequately released to downstream countries, even during the monsoon season (Reuters, 2020). The data further highlights that although the source of the Mekong River, the Tibet-Qinghai plateau, did not experience drought conditions, downstream countries such as Cambodia and Thailand suffered from a severe lack of water resources (Wu, 2020).

Analysis of Diverse Schemes-Environmental Protect Agreement

In response to the ecological changes and damages occurring along the Lancong-Mekong River, riparian countries including China, Laos, Myanmar, Thailand, Cambodia, and Vietnam have established environmental protection agreements to ensure sustainability (see Table 2).

The current issue and full text archive of this journal is available on Supply Chain and Sustainability Research at:
https://so08.tci-thaijo.org/index.php/SCSR/index

Table 2 The Environmental Protect Agreement

1992	The Greater Mekong Sub-Region Initiative included China, Myanmar, Laos, Thailand, Cambodia and Vietnam.
1994	China, Laos, Myanmar and Thailand signed the agreement on waterway transportation in Mekong River.
2002	The government of Thailand approved environmental evaluation on waterway transportation.
2002-2003	China launched a blasting program along the Mekong River from Yunnan province to the border of Lao and Myanmar.
2003	The project was suspended by Thai cabinet due to local people and environmental groups against it.
2016	China launched the Lancang-Mekong Cooperation (members including Cambodia, China, Laos, Myanmar, Thailand, and Vietnam).
2017	Chinese vessels surveyed 15 rapids covering a 96-kilometer stretch of Mekong River along Thai border
2018	China advocated for increasing water cooperation, such as managing drought and flood
2019	The report on Lancang- Mekong Cooperation Development was announced
2020	The Third Lancang- Mekong Cooperation Leaders' Meeting

Lancang-Mekong Cooperation (LMC)

The Lancang-Mekong Cooperation (LMC) was initiated by the Chinese government in 2016 as an inter-governmental organization focused on water cooperation (Grunwald, 2020). While the LMC may not address all the challenges, it aims to foster trust among stakeholders and facilitate the resolution of certain issues.

Thai-Lao Cooperation

Thailand and Laos have established a cooperative agreement regarding the sharing of rainfall, drainage, and hydrological monitoring data along the Mekong River. Both countries have jointly developed the Xayaburi Reservoir Management Plan, which aims to analyze the water flow from the Mekong River into Thailand's northeastern region, with the goal of mitigating the risks of embankment overflow and flooding. This collaboration encompasses various aspects, including the management of the Xayaburi hydropower project, the sharing of water information, notification systems for water storage and flow, as well as emergency and safety management for the Xayaburi hydropower station (Medium,2020)

Strategy of Water Resources Management

It has been observed that the construction of numerous upstream dams for hydropower generation has resulted in adverse consequences for residents living downstream. Concerns have been raised regarding the exclusion of these residents, who rely on the water resources of the Mekong River, from the agreements made

between countries (Wu, 2020). The situation calls for authorities to consider the broader implications and exercise careful judgment with a deep understanding of the issue. Currently, there is a lack of effective constraints on natural resource management and authority. It is suggested that the international community collectively address this issue and establish comprehensive regulations among the countries along the Mekong River (BBC, 2015).

International Law Against Upstream Dam Construction

According to (Tsai, M., 2020), upstream parties such as China and Laos are not signatories to the Convention on the Law of the Non-Navigational Uses of International Watercourses or the Mekong River Agreement. This implies that prior consultation with downstream parties is not mandatory before constructing dams. However, it is argued that even non-contracting countries are still bound by international law. The obligations of upstream countries include the principles of 'reasonable and equitable use,' 'prevention of harm to other countries,' and 'protection of the ecosystem.' Moreover, the obligations to notify, consult, cooperate, and provide information are emphasized. Tsai, M (2020) contends that even though China is not a signatory, these obligations still apply. Specifically, the construction of the Sambor Dam in China has impacted 19,000 people, fish populations, and the ecosystem of the Mekong Delta.

Environmental Monitoring Data Transparency and Sharing

The Mekong Dam Monitor is an open-source online platform that utilizes remote sensing, satellite imagery, and GIS analysis to provide near-real-time monitoring of dams and environmental impacts in the Mekong basin (STIMSON, 2021). This platform plays a crucial role in monitoring the hydrology of the Mekong Basin and revealing water flow patterns. Water diplomacy serves as a political tool to promote equity, sustainability, peace, and cooperation. The adoption of a multi-track water diplomacy approach allows for an examination of water cooperation among riparian countries (Grunwald, 2020).

The transparency of environmental monitoring data and information sharing has significantly contributed to the understanding of water flow in the region, leading to improvements in water resources management. This increased transparency has also influenced the way riparian countries consider and address the coexistence of their environments. Consequently, nations are adopting a shared approach to managing water resources and promoting coexistence among themselves.

Conclusion

The research has focused on studying the evidence of water resources management in the Lancang-Mekong River Basin and investigating the direct and indirect human impacts on the area in recent years. The findings have revealed significant indirect human impacts on the basin. Despite the advocacy of environmental

protection agreements by riparian states, the effectiveness of these measures in safeguarding the environment has not been fully realized. Based on the evidence from water resources management, it is recommended that information sharing and the adoption of a coexist environment perspective are essential for achieving sustainable environmental management in the region.

References

Basist. A., & Williams, C. (2020). *Mekong River Wetness Anomalies in the 2019 Monsoon Season*. Eyes on Earth.

BBC. (2018). China's Geopolitical Power and the Mekong Ecological Holocaust. *BBC Chinese Version*, 14. August.

BBC (2015). Climate Change: Mekong Delta heads for troubled waters. Retrieved date: 24/02/2025. Website: https://www.bbc.com/news/science-environment-34407061.

Beech, H. (2020). China Builds Dams to Restrict the Flow of. the Upper Mekong River, Causing Drought in Many Countries Downstream. *New York Times Chinese Version*, 14. April.

Bowen, G. (2009). Document Analysis as a Qualitative Research Method. *Qual. Res. J., l9* (2), 27.

Campbell, I. (Ed). (2009). The Mekong Biophysical environment of an International River Basin. Elsevier.

Godoy, O. (2019). Coexistence theory as a tool to understand biological invasions in species interaction networks: Implications for the study of novel ecosystems. *Functional Ecology, 33*(7), 1190-1201.

Grunwald, R. (2020). Lancang Mekong Cooperation: Present and Future of the Mekong River Basin. Journal for Political Science, Modern History, INT. REL., *Secur Stud*, 23 (2), 69.

Hung, T. (2020). The Latest Research shows that the Dam Construction of China in Mekong River Basin has influenced 60 million population lack of water. *Newtalk,* 14. April.

Inclusive Development International (2025). Laos: Demanding accountability for deadly dam collapse. Retrieved date: 24/02/2025. Website: https://www.inclusivedevelopment.net/cases/laos-xe-pian-xe-namnoy-dam-collapse/

Medium (2020). Malawi's 350MW Hydropower Project Reaches Major Milestones in 2019. Retrieved date: 24/02/2025. Website: https://medium.com/power-africa/malawis-350mw-hydropower-project-reaches-major-milestones-in-2019-4f19ea7973f2

Ouyang, S. (2016). Vietnam Requests China for Releasing. Water from Dam? The Situation in Lancang (Mekong) River Basin. *KKnews*, 16. March.

Peninsula. The water level of lower Mekong river reached the lowest level in the past 50 years. The News Lens, 15. April.

Rafaeli, S. & Raban, D. (2005). Information Sharing Online: A research challenge. Int. J. Knowl. and learn., 1 Nos.1/2, 62.

Reuters. (2020). Chinese dams held back Mekong waters during drought, study finds. Retrieved date: 24/02/2025. Website: https://www.reuters.com/article/world/chinese-dams-held-back-mekong-waters-during-drought-study-finds-idUSKCN21V0U1/

Stimson. (2021). *Mekong Dam Monitor*. Stimson.

The News Lens. (2020). The Dam Construction of China occurs drought in Indochina.

Tiezzi, S. (2020). China, Southeast Asia Leaders Meet to Discuss the Mekong's Plight. The Diplomat, 25. August.

Tsai, M. (2020). Dam, dam, dam! Then the Mekong River Disappears? Discussion about 'International Water Law'. Crossing, 19 June.

Wu, W. (2020). China Control Upstream Mekong River and. Drought Downstream Countries. Epoch time, 15. April.

Xiao, C. (2020). Neighbors in Southeast Asia are Ignored: Building Dams causing water shortage and droughts in downstream countries. Musou, 23. April.