Transboundary Water Governance: The Impacts of Upstream Dams on the Mekong River in Cambodia

Steve K.L. Chan[1,*]

A R T I C L E I N F O

Article history:
Received: 27 August 2021
Revised: 21 Jue 2022
Accepted: 18 November 2022

Keywords:
Mekong river
River dam
Governance
Salinization
Drought

A B S T R A C T

Hydroelectric dams block rivers at their upstream and control the water flow to downstream users. Existing watershed communities, irrigation and fishery are usually sacrificed to pave the way for development. The Lancang-Mekong River originates in the Tibet Plateau of China with Himalayan glaciers being the main sources of the headwaters. Taking advantage of its high altitude, China has constructed dam cascades upstream which block the water flowing towards the Mekong River. Downstream communities in Thailand, Cambodia, and Vietnam are suffering as a result. Extreme weather is usual in recent years in the Mekong Basin. Flood and drought come almost annually to the watersheds of the Mekong River. Qualitative methods including archive research and unstructured interviews were used. Four informants as well as twenty-two farmers, fishermen and migrant workers were interviewed in Phnom Penh and Kampong Cham of Cambodia. The findings showed that farming and fishing yield was reduced as the Tonlé Sap system had been disrupted by dams on the Mekong River. Existing ways of Mekong River governance are ineffective in protecting the river ecosystem and livelihood of the basin communities downstream.

1. INTRODUCTION

The Mekong is one of the longest transboundary rivers running along the mainland of Southeast Asia. More than 50 million people live in the river basin. Similar to the other five international rivers, the Mekong River's headwater is found in the Tibetan Plateau of China where the meltwaters of Himalayan glaciers contribute to the first water flow. Lancang Jiang of China forms the upper reach of the Mekong mainstream. Six megadams have been installed on Lancang Jiang the upstream in Yunan Province of China. Five dams are planned for the downstream Mekong. These dams block rivers and redirect the water flow into reservoirs, storing up potential energy for hydroelectric power generation. Existing watershed communities, irrigation and fishery are usually sacrificed to pave the way for development. They are symbols of modernization as the electricity generated fuels industrialization and urbanization.

Climate change and alteration of the hydrology of the Mekong contribute to extreme weather. Flood and drought come almost annually to the watersheds of the Mekong River. Droughts have become severer as a consequence of climate change and the El Niño effect. But river dams intensify the situation by disturbing the water flow downstream. This paper examines the dam effects on the river ecosystem and downstream communities of the Mekong River. Their sociopolitical and socioeconomic repercussions are discussed. A media release published by the Mekong River Commission, the intergovernmental Organization of the six riparian states in February 2021 claimed that the water level was dropping continuously. The color of river water has been turned to blue-green in some sections [1]. The author visited Phnom Penh again for fieldwork in early 2020, and the water was quite blue but no longer yellow as before.

2. METHODOLOGY

This paper examines the water depletion of the Mekong River, with its water flow decline due to climate change reasons and interruption by human activities. The study aims at addressing the broad research questions of 1) What are the causes and consequences of the drought in 2019 on the Mekong River and its river basin? And 2) Is the existing Mekong management regime effective in a transboundary river? Qualitative methods were primarily employed, namely archive research and informant interviews. Archive research aimed to review situation reports of the Mekong River Commission, news and environmental NGO websites in order to record the environmental and social issues as well as the nature of the Mekong regime in connection with the Mekong River.

[1]*Department of Sociology, Keimyung University, 1095 Dalgubeol-daero, Dalseo-Gu, Daegu 42601, South Korea.*
**Corresponding author:* Steve K.L. Chan; E-mail: stevec@kmu.ac.kr.

Fieldwork was done in a fishing village at Chouy Changvar Peninsula of Phnom Penh and two villages in Kampong Cham of Cambodia. Informant interviews were used to explore the realities on the ground concerning the impacts and changes of the river. Four informants consisting labor NGO leaders and environmental NGO workers were interviewed. Twenty-two farmers, fishermen and migrant workers working there were briefly interviewed in a group. Then a shortlist of eight individuals was further interviewed intensively. Open-ended interviews were conducted, not based on any questionnaire, but the researchers had prepared a list of questions to start the discussion. This research investigated the impacts of basin communities from the perspective of environmental sociology. Existing research is divided into macro analysis at the state and international level or micro-level studies about impacts on the community and village. It was an attempt to connect both regarding the issues of a transboundary river.

3. LITERATURE REVIEW

This section reviews concepts and existing studies on transboundary river governance, including the transnational governance platform in the Greater Mekong Subregion. This paper is limited to the study of the reduction in river flow, caused by the massive construction of dams. But climate change and weather conditions cannot be ignored. As such, the latter part of this section also covers these topics as the causes of the impacts on basin communities.

3.1 Transboundary River Governance

The water system is complicated, especially for transboundary rivers. It involves the power and interests of upstream and downstream states as well as different users competing for the resource. River and basin as a whole cannot be separated from the ecosystem. But basins usually cover territories of different riparian states; joint management of a transboundary river, its tributaries and basins may lead to disputes over sovereignty. Water resource allocation and development involve different interests and stakeholders, and at the national level democratic and authoritarian states take different approaches. In an open society, civil societies and affected inhabitants in basin development projects usually have more chances to deliberate and engage. At the regional level which involves a river cutting across states, the upstream country or the water hegemon may play a dominant role [2]. Conflict and cooperation co-exist, but "effective transboundary water governance […] is rare […] in asymmetric [power] circumstance" (p. 18) [3]. The decision-making process is usually top-down, with state actors, donors, and developers occupying an influential position. In recent decades, international environmental activists and river basin organizations have been struggling to have more say regarding water allocation and basin development.

For a long period of time, the approaches to environmental resource management have been unidirectional, problem-oriented, technically intensive, and fragmented. But environmental resources, such as freshwater resources of rivers and streams are multidimensional, especially for transboundary rivers. An integrated approach was introduced, with the emphasis on comprehensiveness, interaction, stakeholder inclusion, and democracy. Hooper [4] suggests an "integrated" approach to water resources management, consisting of whole ecosystem consideration, and involving all components and the relations within the system. But "integrated" should be in the sense of being selective and focused, such that those within the catchment areas and have a stake in the system should be considered, but not all [5]. The term "Integrated water resource management" (IWRM) means "the inclusion of a full array of physical, biological, and socioeconomic variables involved in managing a region for environmental values and human use" (p. 14) [4]. The Global Water Partnership states that:

"IWRM is a process which promotes the coordinated development and management of water, land and related resources, to maximize the resultant economic and social welfare equitably without compromising the sustainability of vital ecosystems" (p. 3) [6].

In addition, Hirsch [7] states that the term "integrated" carries the meaning of treating river and basin as an integrated system, across different sectors and involving diverse stakeholders. It should be a holistic approach involving water and basin management as well as sustaining the river and associated ecosystem [8]. As such, not just the environment, but also the livelihood of human communities in the basin is concerned [9]. Social equity, environmental sustainability and economic efficiency are the bottom lines of IWRM.

Integration is also a critique of the centralized and fragmented approach in decision-making which "treats different parts of a system as if others did not exist" (p. 157) [7]. Multiple scales and levels are considered [10]. Participation and inclusive approaches are highlighted for the integrated approach [7]. Collaboration is an integral part of transboundary river governance [11] in which a deliberative engagement form of governance is encouraged [10]. Transparency, consultation, dialog, and involvement of all stakeholders are expected throughout the planning, decision-making and implementation process. The collaborative democratic sense of IWRM implies that stakeholders of the related resources and in the community should have the right to be informed, consulted, and participate in decision-making. Political and economic powers are unequal. The margins of society are usually ignored and hence vulnerable. They are not informed about these environmental projects, excluded from the public consultation, or too low-educated to understand. River basin management concerns water crisis and depletion. The former is about acute climate and weather events such as droughts, waterlogging, groundwater pollution, water pollution, and the like. The latter is more about day-to-day water issues and usage, including water quality decline, inequitable water allocation, and reduced access to water [12].

3.2 Greater Mekong Subregion Regime

Do the management of the Mekong River and basin follow the governance principles and practices as stated above? The evolution of the Greater Mekong Subregion Regime on transboundary river governance should be understood in historical and international relation contexts. The Mekong River Commission (MRC) is an intergovernmental basin organization established based on the common interests of the four lower Mekong basin countries for the joint management of the river, shared water resources, and related development issues. An intergovernmental organization should be distinguished from the European Union type of supranational institution. The latter has more authority with legal and binding power delegated by the member states to enforce certain laws and treaties. However, as described in its own terms, the MRC is “a regional facilitating and advisory body governed by water and environment ministers of the four countries” [12]. It acts more like a platform to enhance the dialog between these riparian states. Dialog is important in international politics as conflicts can be resolved and sometimes, consensus can be reached through the process. The practice of the MRC generally follows the principles and tradition of the Association of Southeast Asian Nations (ASEAN) on its non-intervention and consensus regime. Quiet diplomacy and informal decision-making ways are used [14] which are based more on personal dialogs and connections known as “network regionalism” [15]. This non-intervention and non-binding approach stem from the history of post-WWII conflict and wars in Southeast Asia. This loose model of cooperation is built up subsequently through collaboration on the platform of ASEAN. Decisions at the Commission are not binding; they are for the reference of each riparian state. The practice avoids intervening in the internal affairs of each other.

The Commission was established according to the "Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin" (Mekong Agreement) signed in 1995. However, China and Myanmar are neither member states of the Commission nor parties that have entered into the Agreement. Also, similar to other multilateral treaties and agreements among these ASEAN states, neither binding clauses exist, nor power is delegated to the Secretariat of the Commission. Most importantly, a dispute resolution mechanism is lacking from the Agreement [16]. Regardless of these shortcomings, the Mekong Commission gradually put one step forward since 2011. A-Basin Development Plan (BDP) of basin-wide development is formulated every five years. Stakeholder forums are convened during the planning process. Not just state actors and developers, but experts, academia, and NGOs are invited to engage. This is a good practice that strengthens the deliberation, engagement, and transparency in water governance. Finally, China and Myanmar are included though not on the platform of the Mekong Commission. The Asian Development Bank (ADB) initiated a Greater Mekong Subregion (GMS) program in 1992. Both the upstream and downstream states are involved. It is more realistic as China is the largest player in regard to hydropower dams both on the Lancang River and the mid-reaches of the Mekong River. The program promotes infrastructure projects and economic cooperation in basin development projects among all upstream and downstream countries, which are mainly funded by ADB and other donors.

3.3 Retreat of the Himalayan Glacier

Climate change is triggering irreversible changes to the local weather. Greenhouse gases trap heat in the atmosphere. Starting from Anthropocene, human activities after the industrial revolution have released more and more greenhouse gases. Persistent global warming of the atmosphere affects sea levels and the water cycle. As hydrology determines precipitation, less snowing reduces the accumulation of icepacks at the tops of high mountains. The gradual warming weather also intensifies the melting of the icecaps and glaciers. Glaciers represent water reserved in its solid form for rivers. Ice is stored in glaciers for years. It grows and releases water following the hydrologic cycle in different seasons to fuel the headwaters of rivers. Around 69 percent of the world’s fresh water is stored in glaciers [17].

Glaciers are not in a static condition but maintain a dynamic equilibrium. The formation of glaciers, storage of water, and release into rivers are through the metamorphic, gravitational, and melting process. The hydrological cycle brings along snow onto the tops of mountains. Layers and layers of snowpack accumulate on each other. In the meantime, the gravity of the earth pulls the snowpack down over time. The temperature reduces gradually along with the reducing attitude, and at a point exceeding the threshold, the snowpack ablates. This turning point is known as equilibrium-line altitude (ELA). Water is released to waterheads as snowpack in this zone below the ELA melting [18].

The water cycle fuels the glaciers continuously. Seasonal changes to weather lead to a difference in accumulation and ablation; hence more water flows in melting seasons, and less in dry seasons. But the supply of water to the river is sustained. The size of the glacier is determined by atmospheric temperature, monsoons, and pollution. The direct effect of global warming on the glaciers is self-explanatory. In addition, climate change also affects the water cycle in different regions. If precipitation cannot maintain the snow supply and the loss of water from melting increases, glacial retreat happens with the snowline shifting upward gradually. The glaciers will either reach a new equilibrium or disappear [18].

When talking about climate change and glacier retreat, most concerns involve the polar ice caps. Little attention has been focused on the Himalayan glaciers in Asia. It is still not clear to what extent climate change determines glacial retreat but the direction of effect is obvious in the Himalayan region. The trend of warming in the eastern Himalayas and Tibetan Plateau is clear. The increase in aerosols, which consist of desert dust and black carbon may intensify the warming [18].

Studies based on satellite imagery, topology maps, and hydro-meteorological data find that there has been a continuous retreat of glaciers in the Mount Everest Region in the past 50 years. The glacier's surface has lost about 13 percent [19]. The lower glaciers ablate quicker as the equilibrium-line attitude shifts up. The freezing level in the Mount Everest region is expected to rise 800 to 1,200 meters from 2015 to 2100 leading to "90 [percent] of the current glacierized area to melt[...]" [20].

The rapid desertification of the Tibetan Plateau does not contribute to the increase in aerosols, as "Asia's Water Tower." The hydrology brings along precipitation which feeds the waterheads of ten rivers, including the Lancang-Mekong River. Desertification reduces evapotranspiration which subsequently affects the water cycle [21]. The retreat of Himalayan glaciers and desertification reinforce each other leading to a negative cycle that results in an irreversible change to the water supply system of these rivers.

3.4 Drought & Extreme Weather

If glacial retreat reduces hydrologic storage at the waterhead, less precipitation or, more seriously, drought further decreases the flow of rivers downstream. A drought, in general, is caused by arid climates stemming from precipitation deficiency which results in atmosphere, ground, and underground water reduction for a while. It is a consequence of abnormal local weather, intensified by El Niño events, anthropogenic factors, and climate changes. When the water cycle is disturbed, water is temporarily unable to transfer from the earth's surface to the atmosphere back to the ground (or the sea). The weather becomes drier than normal.

Mega-dams block a river or divert their flow to a reservoir which may intensify drought in its lower reaches. Less flow imposes a direct effect on river riparian and wetlands leading to deforestation. The consequence is an alteration in the water cycle leading to a decrease in precipitation. Droughts happen in China and the Mekong region from time to time, such as 2005 and 2019, but the most severe was from 2015-16. But the cumulative effect of climate changes, cascades of the dam-blocked Mekong River, and local weather events have made the situation of drought worse.

There have been some reports on droughts at the upstream of the Mekong, specifically the Lancing River basin of China. But floods and droughts happen according to local weather. Extreme weather becomes normal following the changing climate. Therefore, drought is not a direct consequence of climate change. Some kinds of extreme weather have become more frequent and do not follow local weather patterns. Some places that experience usual weather events may suffer more frequent and severe weather events, namely heatwaves, heavier rainfall, extreme flooding, drought, and the like. One explanation is that warmer temperatures increase the rate of evaporation and hence reduce soil [22].

For example, during the drought in 2016 the depth of Tonlé Sap Lake fell from 1.2 and 1.5 meters in the previous year to 50 centimeters. The droughts were on and off, sometimes intensified by the El Niño. There was a severe drought three years later in 2019 which caused the water levels of the Mekong River to drop to a 100-year low and the monsoon season was delayed two months from May to July. The situation upstream of dams in China and Laos which was believed to be holding back water for electricity generation purposes worsened the situation [23].

3.5 Human Activities: Damming the Mekong

Besides climate change and natural factors, human activities contribute to the hydrologic cycle and water flow in the Lancang-Mekong River and watershed. The economic reform and open-door policy in China in the 1980s have brought along rapid growth and high electricity demand. A dam cascade has been constructed on the Lancang River and its tributaries which are the upper reaches of the Mekong River. The stability in the post-Indochina War period has also allowed population increases and industrialization in Cambodia and Vietnam. Water security in the downstream Mekong basin is gradually under challenge.

The first dam constructed on the Lancang River was the Manwan Dam, completed in 1995. The 132-meter-high megadam generates 1,500 MW of electricity which is far from enough to feed the rapid economic growth of China. A cascade of seven dams has been constructed on the river and its tributaries. Six are under construction, with 15 others planned [24]. These dam projects which are still in the planning stage are small dams at the upper reaches of the river on the Tibetan Plateau that aim at diverting more water to strengthen the megadams' power generation capacity or utilize the remaining potential energy of the mainstream near the waterhead and its tributaries.

The whole of the Lancang-Mekong River is 4,350 km long and 44 percent of it lies in the territory of China. The Lancang River at the upper reaches just contributes an average of 12 percent of the water flows into the Mekong River. Downstream countries also want to share these hydropower resources. In fact, the first hydropower dam in the region was the Ubol Ratana Dam completed in 1966 in Thailand and the Nam Ngum Dam in Lao PDR, with its first phase completed in 1971. However, very few small dams have been constructed. And even in the post-cold war and post-Indochina War period, following the practice of their predecessors, only tributary dams were built. These Riparian states still hesitated to dam the mainstream of the Mekong which is heavily relied on for fishery and irrigation [7].

At the turning point of the millennium, mainstream dams finally came to the upper reaches of the Mekong River. Before that, mainstream dams were only erected on the Lancang River of China. The Xayaburi Dam and the Don Sahong Dam in Laos started to operate in 2020. The construction work of four more dams at Pak Beng, Pak Lay, Luang Prabang, and Sanakham is about to commence [25]. The change in leadership in the Mekong River Commission who favors development over the environment gave a green signal to dam construction [7]. Laos, the “Battery of Southeast Asia” is falling deeper and deeper into a debt trap. As a landlocked country with a GDP of US$12.5 billion, it bears a construction cost of US$18 billion for the four dams. In 2020, Laos forfeited the control of its electricity to China as compensation to its unsettled loans [26]. After all, as a transboundary river, the blocking of the Mekong’s mainstream in its upper reaches, the Lancang River of China, has been the reality; seasonal hydrology is altered with more water flow in the dry season. Water level data at the Nouzhadu Dam, where the Lancang River connects to the Mekong River, show that water was held back during the drought in 2019-2020. China’s Lancang River contributes more than 40 percent of the river flow of the Mekong River [27].

“Electricity market prices are much higher in the dry season than the monsoon season, so the decision to release water during the dry season is profit-driven. To prepare for the next dry season, China’s dams must restrict flow during the monsoon season” [25].

Droughts affect the water flow along the Mekong river but the most severe impacts come from irregularity of the flow. Human control of water flow in and out of the reservoirs affects the regular seasonal schedule and hence the stability of the freshwater ecosystem. An early study comparing the historical data (1960-1990) and hydropower data (1991-2013) of the Mekong River found that alterations were greater at the downstream, delta region in Vietnam where the floodplain in Cambodia could still buffer the changes at that time. As damming continued and the schedule came into full operation in 2020, the change in water flow may alter “the hydrologic regime of the whole Mekong Basin” [28]. In fact, the drought in 2020 recorded that the rainfall from November 2020 dropped by a quarter; the situation was worsened as the outflow of the Jinghong station halved in December 2020, from 1,400 to 775 cubic meters per second according to the water level data [29]. The line chart below records the water level changes of the Mekong River at the Jinghong station near the China-Laos border (Figure 1).

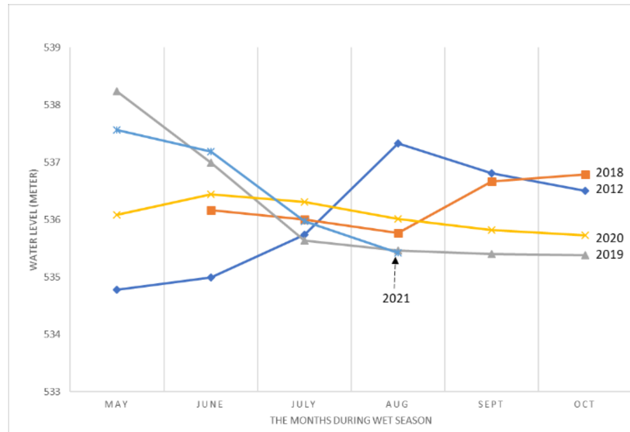

Fig. 1. Monsoon season hydrometer readings of the Jinghong Station at the Mekong River.

Source: plotted by the authors, based on the hydrometer data downloaded from the data portal of the Mekong River Commission, retrieved from https://portal.mrcmekong.org/home

The above figure shows the readings of the Mekong River in 2012 (before most of the Mekong mainstream dams started to operate, and then, 2018 to 2021. A shift of water level pattern is observed. The “normal” flow of the Mekong is shown by the 2012 curve, representing a gradual increase in the flow at the beginning of the monsoon season in May and subsequently reached the peak in August. However, the curves of 2018-2021 record an initial high flow in May but rapid drop to the minimum during August. The high-water level in August 2012 and the corresponding record recently in 2021 exhibit a big contrast. In fact, the outflow having not a steady reduction but an oscillation from low to high cycle repeatedly indicates the holding and release of water by the cascade of dams during the process of hydroelectric power generation on the China side.

4. FINDINGS

4.1 Farmers at Kampong Cham

The author visited two rural villages in Kampong Cham Province of Cambodia in 2018. A local NGO worker did the English to Khmer interpretation for the author. The author held informal group talks with farmers in each village. Almost all were migrant returnees from Thailand. After the casual chat, the author identified two farmers for the informant interviews.

One of the farmers was about 30-39 years old, a married male who had four family members, himself, his wife, father, and mother. He worked in Thailand for two years. He did spray painting in an iron factory there. He came back because his wife gave birth to their baby. He helped his parents with rice farming. It is a family-owned 3.5-hectare rice paddy, producing one crop per year. The yield is reducing year by year because of unstable weather.

"There was a drought a year ago. Sometimes the rainfall is unstable. A rice farm of 3.5 hectares should be fine to feed a small family. But we are in debt because of the instability of farming, owing 1,000,000-2,000 000 Riel (about US$246 - 492). We are lucky as we could borrow the sum of money from our relative with no interest charged. I have to work in Thailand to earn more money to pay back the household debt."

Another farmer had a similar story. She was a 38-year-old female in a four-person nuclear family with a daughter and a son. She did rice farming and also planted cucumbers. She owned a small rice paddy of half a hectare which was given to her by her mother. She was a returnee from Thailand where she had been a cleaner of rubber in a rubber factory for 3 years. She earned 300 Baht (US$9) per day. She returned to Cambodia because nobody was taking good care of her children.

"The income of farming here in Cambodia is low and unstable. People either find a wage job in a garment factory in Phnom Penh or better, work abroad in Thailand or Malaysia."

The NGO worker told the author that these were typical cases for farming in Cambodia under climate change and extreme weather.

4.2 Fishermen at Phnom Penh

The fishing village is located on Chouy Changvar Peninsula of Phnom Penh. Similarly, the author started with a group discussion with the fishermen casually to break the ice. The author then interviewed the village head and two fishermen. The trip was accompanied by a Cambodian student helper as an interpreter. An old male fisherman told the author:

"In the past 10 years, there were abundant fishes in the river. We did not worry about our livelihood. But now the fishes are reducing every year. According to my experience, I would say 10-fold in comparison to the previous yield of fishing on the river. I don't know the reason."

As the fishing yield was dropping in recent years, some fishermen sold their fishing boats and turned to other jobs, such as wage jobs in the factories, rickshaw drivers, and vending seafood on the roadside or a market. A former fisherman who quit his subsistence fishing job and became a fresh seafood vendor said:

"I used to fish also but quit five years ago already. The yield became lower and lower. Fishermen need to borrow money (usually from seafood wholesalers) at the beginning of the fishing season, to buy fuel for boat engines, repairing the boat and fishing nets, and other expenses."

He explained the dilemma of continue fishing and changing jobs:

"I think that having a boat is better than not having a boat. When I had a boat, I earned US$200-300 monthly during the fishing season."

For heavily indebted fishermen, the return on fishing was no longer enough to pay off their debts as the environment had deteriorated, some of them sold their boats and switched to other jobs to try their luck. But, they had no other working experience and they were middle aged already.

As mentioned at the beginning of this paper, the author observed the water of Mekong being blue and clean. It was a January which is supposed to be a dry season. The villagers said that the river flooded the beach which was their settlement annually during the rainy season. They had to move to the upper part of the land. When the author were there the seasonal flooding had not yet come. Besides, there was a sand dredger. The village head did not know who the vessel belonged to. But it had been operating for several months. He guessed that the river sand was for the construction works in Phnom Penh. Phnom Penh's buildings developed rapidly in the last two decades. Many high-rise buildings had been erected.

Besides this nuisance on the river, the gradual reduction in water level is detrimental to the freshwater ecosystem of the Mekong River. The village head said:

"The reduction in water level has not just affected the yield of fishing, but also the reproduction of freshwater life. The retreat of water level from riparian zones is making fishes and other river organisms lose their eggs. The riparian zone is also the nursing ground for newborn freshwater life to grow large enough to enter the river"

The main causes are irregularity and water depletion that have affected the reverse flows of the Mekong-Tonlé Sap System. The village is located at the junction of the Mekong and Tonlé Sap River, its main tributary connecting the Mekong River to the Tonlé Sap Lake. Water flows from upper-reaches down to the sea and enters Tonlé Sap lake during the rainy season. In the dry season when the flow is low, water flows back from the lake to Mekong River (via Tonlé Sap River). The fishing village head expressed his confusion and worry:

"In recent years, the reverse flow has become irregular. The river should flow towards the Tonlé Sap, filling it up, and reverse at the end of the monsoon season in late September. But it becomes unpredictable. I am not sure when the reverse will start now[…] The fishing season (dry season) runs from November each year till February. But the fishing season has also shortened in recent years."

The findings from the informant interview are essential and reflect the situation of the water level of the Mekong River and its corresponding impacts on the freshwater ecology and livelihood of basin communities. However, these daily happenings on the ground are seldom reported to the river basin management and have no way of reaching China, the upstream country which controls the outflow.

5. DISCUSSION AND CONCLUDING REMARKS

The river dams on the Lancang River and the newly completed mainstream Mekong dams, the Xayaburi Dam, and the Don Sahong Dam in Laos should play the role of direct blocking of the flow. Although the Lancang River of China contributes less than 20 percent of the overall water volume of the Mekong River, during the dry season, 40-50 percent of the flow relies on the supply from upper reaches [30]. Cumulative effects account for the weakening of the Tonlé Sap system. The Tonlé Sap Lake of Cambodia functions as a reservoir that stores up water from the Mekong River during the rainy season. The reverse flow of water during the dry season helps to stabilize the water level. Thus, the Tonlé Sap system is also essential for maintaining the freshwater ecosystem of the Mekong River. The Mekong River Commission's data showed that the disturbance matches the findings from informant interviews of this empirical study. The major reverse flows occurred in August 2020, on and off for a while, and were completed by the end of October. Also, "reverse water flow volume highly reduced by 44 percent, from the average of 43 cubic kilometers to only 18.9 cubic kilometers in 2020" (p. 9) [29].

But the river dams are the result of human activities that can be avoided. Drought itself is both a cause and a consequence of all these factors. The river dams reduce flows, release fewer sediments, and block the migration route of fish in the Mekong River and its tributaries. These changes are irreversible. They exert negative impacts on the river ecosystem and basin livelihood in the lower reaches.

Transboundary river governance is the art of combining international relations, integrated water resource management, and river basin management. It moderates the conflict between development and conservation. The outcomes are determined by the collaboration of different stakeholders, contributing to the fair allocation of water resources. The development should be fair among every party who holds a stake, including the indigenous communities which rely on the river for their subsistence.

The author observed that the Mekong River regime stems from the practice of ASEAN emphasizing consensus and non-intervention. The Mekong Agreement among riparian states does not have a binding term and arbitration mechanism. More importantly, the Mekong Commission represents only the four downstream states, without the formal participation of China although the GMS program provides a loose platform for all. As such, there exists a mismatch between the Mekong institution and its water issues. The table below illustrates the aspects of mismatch and outcomes (Table 1).

Table 1. Ineffective model of Mekong River governance

Issue	Institution	Governance & Output	Effectiveness
1. Water allocation	MRC	A loose flow regime	Medium
2. Basin development	MRC	Basin Development Plan, with the engagement of stakeholders	Medium
3a. Dam Projects (Lancang River)	Bilateral, GMS	Under the sovereignty of China, other downstream countries are not informed	Low
3b. Dam Projects (Mekong River)	MRC, GMS	Planned and resolved at bilateral or national level; non-state actors and civil society request more transparency and participation in decision-making	Low
4. Response to weather events	MRC, GMS, Bilateral	Ad-hoc water releasing from dams in China and Laos	Medium

Four aspects of water governance issues are summarized here, namely water allocation, basin development, dam projects on the Lancang River and Mekong River as well as response to weather events. First of all, water allocation is a governance issue in the Mekong. If the governance does not involve upstream dams, it will be less controversial. For example, the Council of the MRC accepted Cambodia's request that "the natural annual reversal of the Tonlé Sap River during the monsoon season should be guaranteed by the 1995 Agreement." But in general, the riparian states do not "commit to a strict regime with specified procedures to establish a flow regime" (p. 41) [31].

Both the MRC and Asian Development Bank's GMS program are involved in the basin development and dam projects. The Commission has formulated a Basin Development Plan every five years since 2002. A public forum is set up during each planning period with the engagement of all state and non-state stakeholders. The author argue that IWRM is in principle adopted but far from full practice. First of all, the MRC avoids discussing sensitive issues in the forum and keeps "silent about[,] major bilateral or national government proposals […] hydropower development on the Mekong River Mainstream" (p. 69) [10]. In fact, China regards the dams on the Lancang River as internal affairs within its sovereignty. Its decision-making excludes regional organizations and downstream states. For China's dam construction projects in Myanmar and Laos, details of these projects are restricted to bilateral scrutiny. Both the MRC and other riparian states in the lower Mekong have no way to participate, let alone NGOs and river basin communities. Lack of transparency and consultation has also contributed to the ineffectiveness of the governance in which the River Development Plan has little to achieve.

Finally, because of the response to weather events, including floods and droughts, the inequality between upstream and downstream states, state and non-state actors also results in ineffectiveness [32]. However, the MRC has a Flood Management and Mitigation Program operating in Phnom Penh, which provides monitoring and technical support on flood management in the Mekong basin. Its powerlessness is seen in the control of dam gates in upstream states. Both China and Laos operate the dam gates to release water as an ad-hoc measure. Bear in mind that these countries' prime consideration is to maximize electricity generation. They try to store up water during the rainy season and release it when the reservoir is full [28]. The damming effect on the Mekong River leads to the irregularity of water flow and the weakening of the Tonlé Sap system.

This study included both an empirical study and archive research on the ineffective water governance and basin management of the Mekong River. Upstream dams are to be blamed; climate change and weather events have intensified the situation as the top-down and statist Mekong regime is less effective in taking up the challenges. The empirical part helps provide feedback from the basin communities to fill the knowledge gap of river governance usually at the meso and macro level. But the scale of empirical research is too small and not deep enough. The exploration in this study can be the basis for further research.

ACKNOWLEDGEMENT

I am very grateful to many colleagues for their advice. I appreciate in particular, Mr. Brian Eyler and Mr. Regan Kwan of the Stimson Center for sharing the data on Lancang-Mekong River's hydrometer readings and help me to assess the data from the Mekong River Commission.

REFERENCE

[1] Mekong River Commission, MRC 2021, February 12. Mekong River drops to worrying levels some sections turning blue-green. Vientiane, Lao PDR: Mekong River Commission. Retrieved from https://www.mrcmekong.org/news-and-events/news/pr002-12022021/

[2] Sneddon, C. and Fox, C. 2007. Power, Development, and Institutional Change: Participatory Governance in the Lower Mekong Basin. World Development, 35(12), 2161–2181.

[3] Mirumachi, N. and Allan, J.A. 2007. Revisiting Transboundary Water Governance: Power, Conflict, Cooperation and the Political Economy. Paper presented at the CAIWA conference. Retrieved from http://www.newater.uni-osnabrueck.de/caiwa/data/papers%20session/F3/CAIWA-FullPaper-MirumachiAllan25Oct07submitted2.pdf

[4] Hooper, B.P. 2003. Integrated Water Resources Management and River Basin Governance. Water Resources Update 126: 12-20.

[5] Hooper, B.P., G. McDonald and B. Mitchell. 1999. Facilitating Integrated Resource and Environmental Management. Journal of Environmental Management and Planning 42 (5): 747-766.

[6] UNDP 2009. Integrated Water Resources Management in Action. World Water Assessment Programme, DHI Water Policy. UNEP-DHI Centre for Water and Environment. Retrieved from https://www.gwp.org/globalassets/global/toolbox/references/iwrm-in-action-unescounwwapunep-dhi-2009.pdf

[7] Hirsch, P. 2012. IWRM as a Participatory Governance Framework for the Mekong River Basin? In Öjendal, J., Hansson, S. and Hellberg, S. (Eds.) Politics and Development in a Transboundary Watershed: The Case of the Lower Mekong Basin. Dordrecht, Heidelberg, London and New York: Springer, 155-170.

[8] Cassar, A. 2003. Transboundary Environmental Governance: The Ebb and Flow of River Basin Organization, World Resource 2002-2004. Retrieved from file:///C:/Users/stevechankl/Downloads/Transboundary_Environmental_Governance__The_Ebb_a%20(1).pdf

[9] McNally, R. and Tognetti, S. 2002. Tackling poverty and promoting sustainable development: key lessons for integrated river basin management, Surrey: World Wide Fund, UK. Retrieved from www.wwf.org.uk

[10] Dore, J. 2010. Deliberation and Scale in Mekong Region Water Governance. Environmental Management 46(1): 60-80.

[11] Gerlak, A.K. 2015. Resistance and Reform: Transboundary River Governance in the Colorado River Delta. Review of Policy Research 32(1): 00-123.

[12] Wester, P. and Warmer, J. 2002. River Basin Management Reconsidered. In Turton, A. and Henwood, R. (Eds.) The Hydropolitcs in developing world, 61-74. Pretoria: University of Pretoria.

[13] Mekong River Commission n.d. Retrieved from http://www.mrcmekong.org/

[14] Masilamani, L. and Peterson, J. 2014, 15 October. The "ASEAN Way": The Structural Underpinnings of Constructive Engagement. Foreign Policy Journal. Retrieved from http://www.foreignpolicyjournal.com/2014/10/15/the-asean-way-the-structural-underpinnings-of-constructive-engagement/

[15] Elliott, L. 2011. ASEAN and Environmental Governance: Rethinking networked regionalism in Southeast Asia. Procedia - Social and Behavioral Sciences 14: 61-64.

[16] The Water Page n.d. Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. Retrieved from http://www.africanwater.org/mekong.htm

[17] The United States Geological Survey's Water Science School, USGS n.d. Glaciers and icecaps: Storehouses of

freshwater. Retrieved from http://water.usgs.gov/edu/earthglacier. html

[18] National Academy of Science 2012. Himalayan Glaciers: Climate Change, Water Resources, and Water Security. Washington, D.C.: National Academies Press. Retrieved from http://www.geo.uzh.ch/~chuggel/files_download/papers/nas_himalaya_glaciers_water_nap12.pdf

[19] Thakuri, S; Salerno, F. Guyennon, N.; Viviano, G.; Smiraglia, C.; D'Agata and Tartai, G. n.d. Glaciers Response to Climate Trend and Climate Variability in Mt. Everest Region (Nepal). Retrieved from http://moa.agu.org/2013/files/2013/05/Poster_AGU2013.pdf

[20] Vital, J. 2015. Most Glaciers in Mount Everest Area will disappear With Climate Change Study. The Guardian. Retrieved from http://www.theguardian.com/environment/2015/may/27/most-glaciers-in-mount-everest-area-will-disappear-with-climate-change-study

[21] Choy, A. 2015. Tibetan Plateau Turning to Desert, Says Chinese Academy of Science. The Third Pole. Retrieved from https://www.thethirdpole.net/2015/12/07/tibetan-plateau-turning-to-desert-says-chinese-academy-of-science/

[22] The National Academic of Science 2016. Attribution of Extreme Weather Events in the Context of Climate Change. Washington, DC: The National Academic Press.

[23] Lovgren, S. 2019, August 1. Mekong River at Its Lowest in 100 Years, Threatening Food Supply. National Geographic. Retrieved from https://www.nationalgeographic.com/environment/article/mekong-river-lowest-levels-100-years-food-shortages

[24] Li, B.; Yao, S.Q.; Yu, Y. and Guo, Q.Y. 2014. The Last Report on China's Rivers, Executive Summary (English Translation). China's Rivers Report. Retrieved from https://www.scribd.com/doc/211565162/The-Last-Report-on-China-s-Rivers

[25] Eyler, B. and Weatherby, C. 2020. How China Turned Off the Tap on the Mekong River. The Stimson Center. Retrieved from https://www.stimson.org/2020/new-evidence-how-china-turned-off-the-mekong-tap/

[26] Hunt, L. 2020. December 12. Laos Presses Ahead with 4 More Mekong Dams Amid Drought. Voice of America. Retrieved from https://www.voanews.com/east-asia-pacific/laos-presses-ahead-4-more-mekong-dams-amid-drought

[27] Eyler, B. 2020, April 22. Science Shows Chinese Dams Are Devastating the Mekong. Foreign Policy. Retrieved from https://foreignpolicy.com/2020/04/22/science-shows-chinese-dams-devastating-mekong-river/

[28] Dang, D.T.; Arias, M.E.; Van, P.D.T; Vries, T.T.; and Cochrane, T.A. 2015. Analysis of water level changes in the Mekong Floodplain impacted by flood prevention systems and upstream dams. E-proceedings of the 36th IAHR World Congress, 28 June - 3 July, 2015, The Hague, the Netherlands

[29] Mekong River Commission 2021. Situation Report: Hydrological Conditions in the Lower Mekong River Basin in July - December 2020. Retrieved from https://www.mrcmekong.org/assets/Publications/SitR_Hydrological-conditions-in-LMB-in-Jul-Dec-2020.pdf

[30] International Rivers 2014. World River Review 29 (4). Retrieved 2 May 2016 from https://www.scribd.com/doc/249186694/World-Rivers-Review-December-2014

[31] Backer, E.B. 2007. The Mekong River Commission: Does it work, and how does the Mekong basin's geography influence its effectiveness? Journal of Current Southeast Asian Affairs 26 (4), pp. 32–56.

[32] Chan, K.L.S. (2017). Dams on a Myanmar–Thai Transboundary River: Unequal Hydropower Exchange Model in Critical Hydropolitical Perspective. *International Journal of Development Issues*, 16 (2), pp.147-160. DOI: 10.1108/IJDI-10-2016-0062.