Root Cause Analysis of Factors Affecting the Effectiveness of the Mekong River Commission: A 4M Theory and 5 Whys Approach

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ABSTRACT

The Mekong River is one of Southeast Asia's most important rivers, supporting ecosystem integrity, livelihoods, and the region's social and economic foundations. It also serves as a vital lifeline and plays a significant role in global food security. However, growing economic demands have made the Mekong River a major target for development, leading to intensive, unsustainable resource exploitation and environmental degradation. In response to shared challenges, the countries of the Lower Mekong Basin established the Mekong River Commission (MRC) to promote regional cooperation and sustainable water resource management. Nevertheless, challenges related to resource use and river degradation persist. Therefore, this study investigates the factors influencing MRC effectiveness through the 4M Theory—Man, Money, Material, and Management—and the 5 Whys technique to identify the root causes of these challenges and develop a plan for future improvement. The results show that prioritizing national interests over regional goals is a major underlying factor behind limited political consensus, weak cooperation, restricted information sharing, and mistrust among member states. These findings suggest that strengthening regional commitment, enhancing information sharing, and improving collaborative mechanisms are essential to increase the MRC's effectiveness and promote more sustainable management of the Mekong River.

Keywords: the Mekong River Commission/ Root Cause Analysis/ 5 Whys Technique/4M Theory/ International River Management

1. INTRODUCTION

The Mekong River is one of the world's most important transboundary river basins, ranking as the 21st-largest river basin [8]. The river supports diverse ecosystems and provides essential resources for millions of people across the region. Its fertile ecosystem is home to numerous rare and endangered species, some of which remain undiscovered. The river's year-round flow also transports nutrient-rich sediments downstream, contributing to the productivity of agricultural areas along the river. While playing a crucial role as a cultural and economic resource for rural communities, it also supports global food security. However, rising demand driven by population growth and economic development has increased pressure on the basin and heightened its vulnerability to unsustainable use, while accelerating climate change is further exacerbating the situation. MRC Annual Report 2024 [16] highlights several environmental concerns in the Mekong river, including unstable dry-season flows, declining water quality across several parameters, reduced sediment transport, wetland loss, and increased risks to wild fish populations. Moreover, on climate change, the report highlights rising temperatures, possible changes in precipitation patterns, sea-level rise in the delta, and increased risks of severe floods and droughts. As the Mekong is an international river basin, effective regional cooperation is essential to address these issues.

As part of regional cooperation, the Mekong River Commission (MRC) was established in 1995 and comprises 4 member states: Lao PDR, Thailand, Cambodia, and Viet Nam [10]. The MRC's vision is to be a world-class, financially secure international river basin organization

serving the Mekong countries to achieve the Basin Vision of "a Mekong River Basin that is economically prosperous, socially just, environmentally sound, and climate-resilient" [19]. Although China and Myanmar are not MRC member states, they have participated as MRC Dialogue Partners since 1996 and contribute to regional water-resource cooperation through information sharing and data exchange [18]. Beyond this, the MRC also engages Development Partners and Collaborative Partners through cooperation with organizations such as ASEAN, the Lancang-Mekong Water Resources Cooperation Center (LMC Water Center), the Asia Water Council (AWC), and the Southeast Asian Fisheries Development Center (SEAFDEC) [17].

Despite decades of effort, numerous studies show that the Mekong River continues to face significant environmental degradation, and the basin's biodiversity is increasingly threatened. These ongoing challenges have raised questions about the MRC's effectiveness in managing the river's resources. Previous studies have addressed a range of complex and interconnected factors, such as political interests, language barriers, and member countries' willingness to share information, which may influence one another and further complicate regional cooperation. Therefore, this study investigates the key factors contributing to challenges in MRC cooperation and identifies their root causes. To do so, the 4M Theory was applied to categorize potential causes, while the 5 Whys Technique was used to trace these causes to their root causes. The findings are expected to address existing gaps in MRC cooperation and management and serve as a basis for future development planning.

2. METHODOLOGY

This study was conducted using secondary data from published and unpublished sources, including academic literature, reports, and information available on the organization's official website, to identify potential factors affecting the MRC's effectiveness. Two complementary analytical approaches were then employed. First, the 4M Theory was applied to systematically group the identified factors. Second, the 5 Whys Technique was used to further examine and trace them to their root causes.

2.1 Analytical Framework: 4M Theory and 5 Whys Technique

2.1.1 4M Theory

The 4M Theory is a management framework applicable to both public- and private-sector organizations that categorizes the key resources required for effective organizational management into four components: Man, Money, Material, and Management. Man refers to human resources and the actors responsible for implementing organizational activities; Money refers to the financial resources required to support operations effectively and sustainably; Material encompasses the essential physical resources, equipment, machinery, and other operational resources; and Management refers to the processes and mechanisms used to coordinate these components and achieve organizational objectives [7].

Given the MRC's complexity as an international organization managing transboundary issues involving multiple stakeholders, the 4M framework enables the study to systematically examine challenges across each key dimension. It also provides a structured basis for identifying the strengths and weaknesses of MRC management, thereby offering a clearer and more comprehensive understanding of the factors that may influence its effectiveness.

2.1.2 Root Cause Analysis: The 5 Whys technique

The 5 Whys Technique is a root cause analysis approach developed by Sakichi Toyoda for the Toyota Industries Corporation [20], used to systematically trace an identified factor to its underlying causes and prevent their recurrence. This technique is recognized as a simple yet powerful problem-solving technique that can be conducted by asking the question "Why?' five times to identify the root cause [20]. However, it may take more or fewer than five times, depending on how deep or complex the cause is. Although the Five Whys technique is simple, applying it effectively requires strong determination to identify and resolve problems at their root, an accurate and complete problem statement, and answering each question without bias [20].

Although categorizing the identified factors using the 4M Theory provides a clearer picture of the challenges within each dimension, the interrelationships among these issues and the involvement of diverse factors across international, national, and individual levels make the problems more complex, and their root causes may not be immediately apparent. The Five Whys Technique is therefore suitable for this study because it enables systematic tracing of each issue to its underlying root causes and helps demonstrate interrelationships among factors across dimensions, showing how they interact and influence one another. Importantly, this analysis can indicate what should be prioritized and deserves urgent action to improve overall outcomes.

2.2 Research Procedures

2.2.1 Systematic Review Process

The study identified and collected relevant information primarily through Google searches and the MRC's official website, without imposing a specific publication date range. The reviewed sources included academic articles, books and book chapters, reports from relevant organizations, and information available on the MRC website. The review focused on Mekong management issues, including stakeholder participation, human resources, financial resources, data and information access and sharing, and institutional and organizational mechanisms relevant to MRC operations. We excluded sources unrelated to the research objectives or duplicates. The main keywords used in the search included "Mekong River Commission," "MRC," "Mekong management," and "Successes and failures in Mekong management," together with related terms identified during the review, such as "Mekong data and information sharing," and "language barriers among Mekong countries."

Academic literature provided research-based evidence, while institutional reports and information from the MRC's official website provided institutional information that may not be fully captured in academic publications. In particular, the study used information from the MRC's official website to understand the organization's history, vision, mission, partners, and alignments. In addition, the EF English Proficiency Index was used as supporting evidence when examining language barriers, which was considered under the Material dimension of the 4M framework.

The collected data were reviewed; duplicate and overlapping findings were neither removed nor grouped to avoid redundancy. The remaining factors were then organized and categorized according to the four dimensions of the 4M theory.

2.2.2 The application of 4M Theory

The 4M Theory was applied to categorize factors identified from the reviewed literature and other relevant sources into four dimensions: Man, Money, Material, and Management. Details are as follows;

2.2.2.1 Man: M1

In this study, Man includes MRC employees, the populations of MRC countries, and MRC-related state and organizational leaders and other actors involved in or influencing MRC management. The analysis focuses on how their capacities, participation, and interactions influence regional cooperation and Mekong management. Key factors identified under this dimension include differences in national interests and political priorities, which may constrain regional consensus, as well as staff shortages and high turnover, which may affect institutional continuity and the MRC's management effectiveness.

2.2.2.2 Money: M2

Money refers to the financial resources required to support MRC operations and ensure their sustainability. The MRC's income is derived primarily from contributions from Member Countries, development partners, and other sources such as interest revenue. However, these funding sources fluctuate with economic conditions, currency exchange rates, and external events such as the COVID-19 pandemic [14]. The reviewed data also indicate a growing gap between the MRC's income and expenditure, while development partner contributions have declined. Although increased contributions from Member Countries have helped offset this decline, the changing funding structure highlights financial uncertainty and the need to strengthen the MRC's long-term financial sustainability, particularly in preparation for self-financing by 2030 [12,15].

2.2.2.3 Material: M3

Material refers to the essential resources required to support MRC operations, including equipment, machines, and information. In this part, the study mainly focuses on data and information, as their availability, accessibility, quality, and sharing are essential for effective decision-making and transboundary water management. Although the four Member Countries adopted the Procedures for Data and Information Exchange and Sharing (PDIES) in 2001, data access and sharing remain challenges, particularly when information is sensitive to national interests or related to hydropower development [5,11] The MRC has also identified limitations in integrating and harmonizing data across national, regional, and global levels, highlighting the need for improved data management systems [13]. In addition, language barriers are considered under this dimension because the information shows that the MRC population's English skills are relatively low [7], affecting the accessibility and dissemination of technical information.

2.2.2.4 Management: M4

In this study, the Management dimension focuses on the mechanisms governing MRC operations, particularly Member Countries' participation and coordination in managing activities and development projects with transboundary impacts. Although the 1995 Mekong Agreement provides principles for reasonable and equitable utilization, the prevention of harmful effects, and state responsibility [10], previous studies have identified limitations in mechanisms for effectively involving affected countries in decision-making on development activities [4,5] Local voices have also received insufficient attention [22]. The reviewed literature also highlights concerns about the MRC's institutional role and authority, including uncertainty about its scope and role in regional water governance. Moreover, leadership changes may affect the MRC's strategic direction [3] potentially creating challenges for institutional continuity and unity among Member Countries.

2.2.3 The application of the 5 Whys technique

2.2.3.1 Problem Identification

According to Serrat [20], an accurate and complete problem statement is essential to use the technique effectively. At the policy-making level, a poorly defined problem may lead to

ineffective or misdirected solutions that waste limited resources such as funds, time, and human resources, while leaving the problem unsolved. In this study, the problem is identified as the ineffectiveness of MRC in managing the Mekong River. This is based on evidence showing that the river's deterioration remains at a worrying level and is likely to worsen. The problem also includes the economic and social impacts of diminishing ecosystem services and the risk of further deterioration driven by climate change.

2.2.3.2 Data Collection, Filtering, and Organizing

A documentary research approach was used to gather the causes of the problem. The data were reviewed, duplicates were removed, and the data were organized into 4 groups according to the Management 4M Theory. Each factor was assigned a corresponding symbol (Table 1).

Table 1. Potential causes of the problem

Categories	Symbols	Causes of the problem	Symbols
Man	M1	Member states prioritize their national interests.	M11
		A lack of political consensus [5] • Deliberate obstruction of political consensus [5]	M12
		Exclusion of the MRC from the hydropower debate [5]	M13
		Lack of cooperation among riparian states [1]	M14
		Shortage of staff [5,6] • High staff turnover in both the National Mekong Committees (NMCs) and the MRCS [5] • Shortage of qualified staff	M15
		Limitations in English proficiency [7]	M16
		Minimal notification of MRC by member countries [5]	M17
		Mistrust among member states and stakeholders [9].	M18
		Lack of political stability in the member state. (Lack of a democratic participation mechanism in member states) [13]	M19
Money	M2	MRC’s financial uncertainty	M21
		MRC's commitment to achieving self-financing by 2030	M22
Material	M3	Difficulty in translation	M31
		Translation of specialized technical documents is very difficult and time-consuming [5]	M32
		The scarcity of translators with both language and technical expertise [5]	M33
		Lack of data [45]	M34.1
		Lack of data in the riparian language	M34.2
		Insufficient timely information was provided to the public	M35

Table 1. Potential causes of the problem (cont.)

Categories	Symbols	Causes of the problem	Symbols
		Existing information is mainly controlled by	M36
		member states.	M37
		Inefficiencies and difficulties in data access [9].	M38.1
		Lack of a data management system	M38.2
		No unified system	M38.3
		Misinformation on media is rising [9]	M39
Management	M4	Lack of stakeholder participation mechanisms [4]	M41
		Mismanagement [4]	M42
		• Lack of a proper management system	
		• Driven solely by development goals	
		The MRC's direction is subject to frequent change [3]	M43
		Unclear scope and role	M44
		Weak and flexible enforcement	M45
		Insufficient attention is given to local voices [13]	M46
		Following the 1995 Mekong Agreement	M47

2.2.3.3 Analysis by questioning

The last and most important step is to repeatedly ask "Why?" about 5 times. Starting with the problem statement from the first step, ask "Why did this occur?", then use each answer as the question for the next round, as shown in Figure 1. Repeat the questioning process until the root cause is revealed.

Figure 1 presents the 5 Whys analysis used to trace the causes of the MRC's ineffective management of the Mekong River. Its purpose is to show, step by step, how the problem is traced from its visible symptoms to its underlying root causes. The analysis starts with the research question, "Why is the MRC's management of the Mekong River ineffective?", which is the first "Why". The answer reveals three main reasons: mismanagement (M42), weak and flexible enforcement mechanisms (M45), and a lack of cooperation among member states (M14). Each answer then becomes the basis of the next "Why" question. The number before each question indicates the round of questioning, and the letter indicates the order within that round. For example, "2a. Why is there mismanagement within the MRC (M42)?" is the first question of the second round. Because the three answers from the first round are not yet root causes, the second round consists of questions 2a, 2b, and 2c. A factor becomes a root cause when there is no point in asking "Why?" further, and it becomes the problem to address. Most of the questions stop at the 4th- 5th round; only the lack of reliable data (M34.1) splits into eight separate causes in the third round and then falls in the fifth and sixth rounds as more branches reach their root causes.

Several factors appear in more than one branch and one round, most notably the prioritization of national interests over regional goals (M11), the MRC's lack of binding legal authority (M47), and the lack of reliable data (M34.1).

Problem: The MRC's ineffective management of the Mekong River.

1. Why is the MRC's management of the Mekong River ineffective?

a. Because of mismanagement (M42),
b. Because of weak and flexible enforcement mechanisms (M45), and
c. Because of a lack of cooperation among member states (M14).

2a. Why is there mismanagement within the MRC (M42)?

a. Because of an unclear scope and role (M44), and
b. Because of a lack of reliable data (M34.1)
c. Because of the lack of effective stakeholder participation mechanisms (M41) and,
d. Because of insufficient attention given to local voices (M46).

2b. Why are the enforcement mechanisms weak and flexible (M45)?

a. Because of an unclear scope and role (M44), and
b. Because MRC is an intergovernmental organization without legally binding authority among member states (M47).

2c. Why is there a lack of cooperation among member states (M14)?

a. Because the member states prioritize national interests over regional goals (M11),
b. Because of mistrust (M18), and
c. Because the member countries lack political stability (M19).

3a. Why does the MRC have an unclear scope and role (M44)?

a. Because the MRC's direction frequently changes (M43), and
b. Because of a lack of political consensus among member states (M12).

3b. Why is there a lack of reliable data (M34.1)?

a. Because of inefficiencies and difficulties in data access (M38.1),
b. Because of a lack of data in riparian languages (M34.2),
c. Because the MRC was excluded from important meetings and debates (M13),
d. Because existing information is mainly controlled and withheld by member states (M36),
e. Because the documents submitted by member states are superficial and lack detail (M37),
f. Because minimal notification is given by member states (M17),
g. Because of misinformation disseminated through the media (M39), and
h. Because member countries have limitations in English proficiency (M16).

3c. Why doesn't the MRC have legal authority (M47)?

Because it was established as a cooperative body under the 1995 Mekong Agreement (M47).

3d. Why is there mistrust among MRC member states (M18)?

a. Because the member states prioritize national interests over regional goals (M11),

b. Because of a lack of reliable data (M34.1), and
c. Because of misinformation disseminated through the media (M39).

4a. Why does the MRC's direction frequently change (M43)?

Because the Chairmanship of the Joint Committee rotates annually based on the alphabetical listing of member countries, as stipulated in the 1995 Mekong Agreement (M47).

4b. Why is there a lack of political consensus among member states (M12)?

Because the member states prioritize national interests over regional goals (M11).

4c. Why are there inefficiencies and difficulties in data access (M38.1)?

Because no unified system exists to manage, consolidate, and synchronize data from global, regional, and national sources (M38.3).

4d. Why is there a lack of data in riparian languages (M34.2)?

a. Because of the difficulty in translation (M31), and
b. Because of the shortage of qualified staff (M15).

4e. Why was the MRC excluded from important meetings and debates (M13)?

Because the member states prioritize national interests over regional goals (M11).

4f. Why is existing information mainly controlled and withheld by member states (M36)?

Because the member states prioritize national interests over regional goals (M11).

4g. Why are the documents submitted by member states superficial and lacking in detail (M37)?

Because the member states prioritize national interests over regional goals (M11).

4h. Why is minimal notification given by member states (M17)?

Because the member states prioritize national interests over regional goals (M11).

4i. Why is there misinformation in the media (M39)?

Because timely information is not sufficiently provided to the public in the languages of riparian countries (M35).

5a. Why is there difficulty in translation (M31)?

a. Because of the scarcity of translators proficient in both local languages and technical terminology (M33),
b. Because translating specialized technical documents is inherently difficult and time-consuming (M32).

5b. Why does the MRC face a shortage of staff (M15)?

Because of the MRC's financial uncertainty (M21).

6a. Why does the MRC experience financial uncertainty (M21)?

Because the MRC aims to be self-financing and to reduce its financial dependence on its partners (M22).

Figure 1. illustrates the root causes identified using the 5-Why technique

3. RESULTS AND DISCUSSION

This study found that the Mekong River Commission's management is constrained by interconnected challenges across the 4M framework: Man, Money, Material, and Management. The analysis process used the 5 Whys technique.

The analysis identified three major causes: mismanagement (M42), weak and flexible enforcement mechanisms (M45), and a lack of cooperation among member states (M14). Tracing these further, the branches converge on four recurring root causes: (1) the prioritization of national interests over regional goals, (2) the MRC's lack of legally binding authority, (3) the lack of reliable data, and (4) financial uncertainty linked to the MRC self-financing goal.

3.1 National interests over regional goals

A major underlying factor is prioritizing national interests over regional goals (M11). This factor is associated with a lack of political consensus (M12) and cooperation among member states (M14), as well as the exclusion of the MRC from important meetings and debates (M13). It also contributes to member states withholding or controlling information (M36), submitting superficial documents with limited detail (M37), and providing minimal notification to other countries (M17). These conditions further fuel mistrust among member states (M18), making it harder to achieve effective regional cooperation and integrated management of the Mekong Basin. In addition, domestic political and economic stability influences member states' capacity to enforce international environmental cooperation (M19) [2]. In poor states, economic growth and short-term benefits are often given comparatively higher priority, leading to policies that overlook environmental protection or exacerbate ecological degradation [12]. These findings suggest that the effectiveness of MRC management depends not only on institutional arrangements but also on member states' willingness to balance national interests with regional objectives. These political factors frequently appear throughout the analysis, highlighting the importance of political context, especially for policymakers in environmental management.

3.2 Information and data

Information is another critical factor. The findings show that a lack of reliable data (M34.1) is associated with difficulties accessing information (M38.1), limited data in riparian languages (M34.2), information controlled or withheld by member states (M36), superficial documents (M37), and minimal notification (M17). The MRC's exclusion from important meetings and debates (M13) further limits its access to information. Language barriers also contribute to this problem, as translating technical documents is difficult (M31) and qualified staff and translators are limited (M15, M33). At the community level, limited information in local languages can hinder stakeholder participation (M41) and contribute to the spread of misinformation through the media (M39), thereby further increasing mistrust among stakeholders. The data problem therefore links the technical and political dimensions: states' withholding of information (M36, M37, M17) creates data gaps, which in turn fuel misinformation and mistrust (M39, M18) at both local and national levels, then weaken state cooperation (M14), and finally hinder the MRC mission to promote and coordinate sustainable management for the countries' mutual benefit.

3.3 Institutional and financial limitations

The findings also demonstrate that institutional limitations influence the MRC's ability to manage transboundary issues effectively. The MRC is an intergovernmental cooperative organization without legally binding authority among member states (M47), resulting in weak enforcement mechanisms (M45). Its unclear scope and role (M44), along with shifts in organizational direction (M43) linked to the annual rotation of the Joint Committee chairmanship under Article 16 of the 1995 Mekong Agreement [10] and a lack of political consensus (M12), further constrain its effectiveness.

Financial uncertainty (M21) also affects organizational capacity, particularly through its link to staff shortages (M15), while the MRC's move toward self-financing and its goal of reducing dependence on development partners (M22) may create additional financial challenges.

3.4 Implications for climate change resilience and future challenges faced by MRC

Climate-related pressures, such as altered rainfall patterns, increase the frequency and severity of floods and droughts and worsen salinity intrusion. To prepare, the Mekong countries need effective international cooperation to share resources, knowledge, and technology [21], especially in monitoring and building an integrated data and information network [16], underscoring the need for a stronger, more united MRC. However, the root causes identified above also shape the Mekong Basin's capacity to adapt to climate change. Prioritizing national interests (M11), the absence of binding authority (M47), and a lack of reliable shared data (M34.1) limit the MRC's ability to coordinate early warning, joint planning, and adaptive management. Leadership discontinuity (M43) and financial uncertainty (M21) further weaken long-term planning of regional climate change adaptation.

Overall, the findings show that these factors collectively hinder the MRC's effective operation. This also places each element of the MRC's vision at risk. Prioritizing national interests (M11) and lacking binding authority (M47) undermine economic prosperity through unilateral rather than shared development. In this case, the MRC's mission to achieve "countries' mutual benefit" [19] will also be impossible. Limited stakeholder participation and local-language information (M41, M46, M34.2) weaken social justice, as local communities, who depend most on the river, are the most affected. The lack of reliable, shared data (M34.1) limits environmental management and, together with leadership discontinuity (M43) and financial uncertainty. Therefore, the MRC's ineffective management should be understood as a systemic problem resulting from 4 dimensions of challenge rather than a single, separate problem.

4. CONCLUSIONS

Based on the findings and analysis of this study, the following conclusions can be drawn:

1. The MRC's ineffective management of the Mekong River results from interconnected challenges across the 4M framework, including human resources and stakeholder participation, financial uncertainty, information limitations, and institutional barriers.
2. The prioritization of national interests over regional goals is a major underlying factor contributing to limited political consensus, weak cooperation, restricted information sharing, and mistrust among member states.
3. The effectiveness of MRC management is further constrained by limited access to reliable and accessible information, and the MRC's lack of legally binding authority.
4. If left unaddressed, the root causes identified in this study will not only limit the MRC's present performance but also weaken its capacity to lead coordinated, basin-wide climate change adaptation.
5. The MRC's vision is unlikely to be realized unless these root causes are properly addressed.

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