

To cite this article: Doan Thi Quang (2025). MULTILATERAL COOPERATION ON THE DEVELOPMENT OF MEKONG RIVER WATER RESOURCE FROM 2003 TO 2023, International Journal of Education and Social Science Research (IJESSR) 8 (3): 236-252 Article No. 1076, Sub Id 1676

MULTILATERAL COOPERATION ON THE DEVELOPMENT OF MEKONG RIVER WATER RESOURCE FROM 2003 TO 2023

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DOI : <https://doi.org/10.37500/IJESSR.2025.8315>

ABSTRACT

This article explores the historical evolution and institutionalization of water resources management cooperation in the Mekong River Basin. Beginning with the formation of the Mekong Committee in 1957, the region's approach to water governance has undergone significant shifts, from fragmented, unilateral development strategies to cooperative mechanisms under the auspices of the Mekong River Commission (MRC). The article examines key milestones, including the 1995 Mekong Agreement and the introduction of the Procedures for Notification, Prior Consultation, and Agreement (PNPCA) in 2003, which formalized the cooperative framework. Additionally, it assesses the role of multilateral mechanisms and the involvement of major powers and international organizations in addressing regional water resource issues. The article argues that, despite geopolitical tensions and challenges, these developments reflect an evolving recognition of the strategic importance of water governance in the Mekong region, with implications for broader international cooperation on transboundary water management.

KEYWORDS: cooperation, Mekong, water, development

1. Cooperation Objectives

The current multilateral mechanisms for water cooperation in the Mekong River Basin, along with the diverse programs and projects being implemented, highlight that each Mekong country pursues its own priority cooperation objectives. The differences in interests regarding water and the water resources provided by the Mekong River have led to conflicts in water usage and, consequently, to differences in the water cooperation objectives of the riparian states. However, within the existing multilateral frameworks for water cooperation in the Mekong River Basin, the countries have reached a common understanding and shared objectives for water resource cooperation, with the goal of basin-wide development.

The 1995 Mekong Agreement outlined several cooperation objectives for the four member states, as follows:

- Cooperation in all areas of sustainable development, utilization, management, and protection of water and water-related resources in the Mekong River Basin, with an emphasis on optimizing multi-purpose use and mutual benefits. This includes, but is not limited to, irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation, and tourism.
- Promoting the full development of sustainable benefits while preventing wasteful use, with a focus on joint or basin-wide development projects and programs through the formulation of a basin development plan.
- Protecting the environment, natural resources, livelihoods, and aquatic conditions, ensuring ecological balance.
- Using the water resources of the Mekong River system in a fair and equitable manner.

In 2000, the Mekong-Ganga Cooperation initiative was established with the participation of India and the five Mekong countries (Cambodia, Laos, Myanmar, Thailand, and Vietnam). In the Hanoi Action Plan (2001-2007), the water cooperation objectives focused on improving water resource management and enhancing water supply systems in the region. The subsequent Mekong–Ganga Cooperation Action Plan (2019-2022) included India's commitment to supporting training and knowledge exchange in community agriculture and sustainable water resource management. Cooperation activities under this plan focus on several key areas, such as water data collection, climate change adaptation and mitigation, integrated water resource management, groundwater management, transboundary basin management, water quality monitoring, flood and drought management, and disaster risk reduction.

Mekong-Japan cooperation began in 2007 with the Japan-Mekong Partnership Program. In 2009, during the first Japan-Mekong Summit, Japan and the Mekong countries adopted the Mekong Green Growth Initiative. By 2010, the Action Plan for the Mekong Green Growth Initiative was approved. Based on the recognition of the importance of environmental measures and climate change adaptation in the Mekong region, and addressing the pressing challenges facing the region, such as deforestation, loss of biodiversity, natural disasters like major tropical storms, droughts, and floods, declining water levels in the Mekong River, and water and air pollution in urban areas, the Action Plan set out specific goals for water resource management. These goals included: Promoting capacity building and institutional development related to water resource management policy formulation in the Mekong countries; Strengthening cooperation in establishing systems for collecting and monitoring water resource management data to effectively implement flood and drought management measures; Supporting the construction and rehabilitation of irrigation facilities, improving systems, developing human resources (training engineers in water use), and establishing and managing water user associations; Promoting the introduction of water resource management methodologies; Advancing integrated water resource management approaches through the Mekong River Commission.

In 2009, the United States launched the Lower Mekong Initiative (LMI) with the goal of further enhancing cooperation in the Lower Mekong sub-region. Under the Environment and Water pillar (co-chaired by Vietnam and the United States), the cooperation aims to develop sustainable environmental management approaches and strengthen the capacity for managing shared water resources.

In 2011, the Mekong–Korea Cooperation was established with three pillars: People, Prosperity, and Peace. According to the 2021–2025 Action Plan for Mekong–Korea Cooperation, which aims to implement the Mekong–Han River Declaration, South Korea and the Mekong countries prioritize cooperation in seven key areas. Among these, water resource cooperation is a key focus under the Environment pillar. The objectives of water cooperation are to: Strengthen the sustainable management and utilization of the Mekong River's resources; Enhance the capacity for managing reservoirs, ecosystems, wetlands, and groundwater systems; Ensure equitable access to clean and sufficient water for the health, prosperity, and safety of people; Support and promote the protection and sustainable use of biodiversity, water, and forest resources in the Mekong region.

In 2016, the Mekong–Lancang Cooperation (MLC) was established, marking a new phase in water resource cooperation in the sub-region. This was the first cooperation mechanism for basin-wide water resources management that involved all riparian countries. MLC officially became a new dialogue platform between China and the Mekong countries on the sustainable management and use of the Mekong River's water resources. It promotes upstream countries to share information and publicly disclose development projects on the Mekong River. MLC also emphasizes ensuring water security and strengthening cooperation in managing transboundary rivers.

The Mekong–Lancang Cooperation Action Plan (2018–2022), approved by the six member countries, set out specific water resource cooperation goals, including: Cooperation in the sustainable management and utilization of water resources; Strengthening policy dialogue on water resources; Promoting technical cooperation and knowledge exchange on water resource management; Conducting research and analysis related to the Mekong–Lancang water resources; Protecting and developing water resources sustainably; Enhancing capacity-building for water resource management; Addressing urgent flood and drought disaster management, including flood control and drought relief in the Mekong River Basin; Sharing information on critical flood and drought situations in the Mekong–Lancang River system.

2. RESULTS OF COOPERATION

2.1. Key Achievements

*** Water Use Cooperation**

In terms of water use cooperation, the Mekong River Commission (MRC) plays a particularly important role, and from 2003 to 2023, the Commission has achieved certain milestones. First and foremost, the MRC has reached several important agreements on the use of water resources from the

Mekong River, including: The Water Use Monitoring Procedures (2003); The Notification, Prior Consultation, and Agreement Procedures (PNPCA) (2003).

From 2003 to the present, the MRC has received a total of 74 project proposals related to water use, in accordance with the Mekong Agreement and the PNPCA procedures. These include: 21 proposals for initial information; 47 proposals for notification; 6 proposals for prior consultation; No proposals have been submitted for agreement.

Among these, Cambodia submitted 15 proposals, Laos submitted 42, Thailand submitted 4, and Vietnam submitted 13. Notably, all six proposals submitted for prior consultation were from Laos, and they all pertained to hydropower projects.

The PNPCA procedures consist of three distinct processes (Notification, Prior Consultation, and Agreement) applied to water projects within the Mekong River Basin that could significantly alter the flow or water quality of the Mekong River's main course. The applicable procedure for a given project depends on three water use factors: Type of river (mainstream or tributary); Season (dry or wet season); Scope of water use (within the basin or across basins).

** Water Resource Management Cooperation:*

+ Agreements adopted:

Procedures for Water Use Monitoring (PWUM): Within the provisions of the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, the scale and extent of water use are considered among the most important factors for assessing whether a water use project or activity is equitable and reasonable. Therefore, the regular monitoring of water use is critically important for river basin management, especially in the case of international river basins.

Recognizing the importance of this requirement, in addition to establishing the key procedures for basin management as mentioned above, the Mekong River Commission (MRC) also developed the Procedures for Water Use Monitoring (PWUM). This procedure aims to facilitate the monitoring of water use within the basin, as well as inter-basin water transfers, and to enhance cooperation and mutual understanding among the riparian countries through a transparent and reliable water use monitoring system.

The PWUM, along with its technical implementation guidelines, outlines in detail the requirements for establishing a water use monitoring system under the MRC framework for the Lower Mekong Basin. The system focuses on: Monitoring water use within the basin and inter-basin water transfers; Establishing a coordinated cooperation framework between the MRC and its member countries for the implementation of the procedures.

Implementation of the PWUM has been piloted at the national level through demonstration projects. Based on the outcomes of these pilot projects, the member countries are currently considering applying the methodologies from these demonstrations to water use monitoring across the entire basin.

The PWUM defines the scale of water infrastructure projects, the roles and responsibilities of the MRC's management levels and member countries, as well as the procedures for monitoring water use. According to the PWUM, any form of water resource utilization within the Mekong River Basin—whether for intra-basin use or inter-basin water transfers—that may have significant impacts must be subject to monitoring. Member countries are required to collect and provide monitoring data, while the MRC Secretariat is tasked with consolidating this data, preparing reports, and making recommendations for more efficient water use.

The 2006 Technical Guidelines for the PWUM require the four Mekong countries to establish baseline standards for current water use within existing projects and to develop a set of indicators for monitoring water use throughout the basin. These indicators include rainfall data, water quality parameters, and types of water usage. Additionally, a separate set of indicators is mandated for monitoring inter-basin water transfers, including the location of the transfer, technical design parameters, and the volume of water transferred. The guidelines also call for the establishment of a comprehensive water use monitoring system at the MRC Secretariat, responsible for consolidating and storing the data.

Under this framework, inter-basin water transfers must be monitored daily during the dry season and at least weekly during the wet season. However, since the adoption of the PWUM and its accompanying guidelines, the level of implementation has remained limited, primarily due to challenges in enforcement. A significant obstacle has been the difficulty in capturing the cumulative impacts of numerous small-scale water users, such as individual farmers operating at the household level. Moreover, the establishment of a basin-wide water use monitoring system has been hindered by the lack of national legislation and formal water rights systems, such as licensing requirements and mandatory water use reporting obligations in the member countries.

Despite existing limitations, the MRC has supported its member countries in conducting pilot studies on water use monitoring. Each country selected a river basin to monitor under one of three categories of water use: irrigation, hydropower, or domestic consumption. Cambodia conducted its pilot study on the Pursat River, Laos on the Xedone River, Thailand on the Nam Kam River, and Vietnam on the Srepok River.

During the pilot implementation phase in 2014–2015, data from the participating countries were collected and validated using a common approach and modeling tools agreed upon by the MRC and its member states. The pilot research teams found that data on certain types of water use could be collected relatively easily, while data on other uses proved more difficult to obtain. They also reported

several limitations related to methodological approaches, indicating areas that require improvement for broader application across the basin.

Due to recent organizational restructuring within the MRC, the implementation of PWUM activities was delayed during the 2016–2017 period. A new technical working group was subsequently established to complete the pilot studies, review the collected data, methodologies, and monitoring tools, and draw lessons learned. This group also conducted a survey of an experimental methodology that is intended to be applied to water use monitoring across the entire basin. Once established, the monitoring system is expected to provide essential information to policy experts as well as water users, thereby contributing to improved water management and development planning.

In 2011, the member countries adopted the first Mekong Basin Development Strategy (BDS 2011–2015), which was based on the principles of integrated water resources management (IWRM). This was followed in 2016 by the Basin Development Strategy for 2016–2020, with a forward-looking perspective toward 2030. In 2020, the MRC Council approved the Basin Development Strategy 2021–2030 (BDS 2021–2030). For the first time, the Strategy was designed for a longer time frame of ten years, aiming to set out priority directions for basin management and development over the next decade. It also serves as a guide for the MRC's upcoming five-year Strategic Plan, as well as for the implementation plans of member countries for the two phases 2021–2025 and 2026–2030. The Strategy focuses on priority areas such as environmental sustainability, social and economic development, climate change adaptation, and enhanced cooperation. Importantly, the Strategy integrates Sustainable Development Goals (SDGs) relevant to water resources management in the basin.

Moreover, the Basin Development Strategy 2021–2030 (BDS 2021–2030) also promotes the development of joint investment projects involving two or more countries, as well as important national projects that generate domestic benefits while also creating opportunities for other areas within the basin. These include multi-purpose hydropower projects with reservoirs, transboundary conservation areas, basin management and restoration projects, wetland and riverine environment conservation projects, flood management and river regulation projects, inland waterway safety improvements, and projects utilizing new technologies such as floating solar panels on hydropower reservoirs.

In addition, BDS 2021–2030 identifies a set of priority actions to support the implementation of the Mekong River Basin Strategy and contribute to the Sustainable Development Goals (SDGs), specifically:

1. Environment: To maintain the ecological functions of the Mekong River Basin.
2. Society: To ensure access to and use of water and related resources within the basin.

3. Economy: To enhance optimal and sustainable development in the water sector and related fields.
4. Climate Change: To strengthen resilience to extreme climate risks, including floods and droughts.
5. Cooperation: To promote stronger collaboration among all countries within the basin and with other stakeholders.

The Procedure for Data and Information Exchange and Sharing: In the context of integrated water resources management (IWRM) in general, and transboundary river basin management in particular, the collection of data and information sharing has always been considered a top priority. The 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses explicitly recognizes data and information sharing as a key principle in the cooperation and management of international river basins. Similarly, the Mekong Agreement has incorporated detailed provisions regarding this critical activity.

With the objective of enhancing data and information exchange among Member States, ensuring broad access to the Mekong River Commission's (MRC) data hosted at the Secretariat, and fostering better understanding and cooperation among Member States on a constructive and mutually beneficial basis, the Procedure for Data and Information Exchange and Sharing (PDIES) has established clear channels for data transmission and access within the MRC and with external partners. The procedure also defines the methods, content, and formats for data exchange and sharing, as well as the roles and responsibilities of relevant parties to ensure the effective implementation of these activities.

This procedure has been consistently and regularly implemented by the Member States over the years. The MRC has developed a relatively comprehensive data sharing mechanism with its Member States, as well as an extensive database covering the basin's natural, socio-economic, and environmental conditions. In addition to data provided by the Member States, the MRC has consistently prioritized strengthening its hydrometeorological, water quality, fisheries, sediment, and ecological monitoring networks, including the procurement of monitoring equipment, data transmission systems, and technical training for Member States' personnel.

The MRC's database has been instrumental in supporting the Commission's cooperation programs, research activities, strategy formulation, action programs, and project implementation, as well as meeting the needs and concerns of basin communities.

Significantly, the MRC and China signed the Agreement on the Provision of Hydrological Data during the Flood Season in 2003, which was later expanded in 2008. Over the past 18 years, China has provided data on water levels and rainfall from two of its hydrological stations located in Yunnan Province, upstream of the Mekong River, during the flood season from June to October each year. However, in light of increasing drought conditions, the MRC requested that China provide year-round

hydrological data to support the analysis of low flow conditions. As a result, in 2020, China and the MRC signed a landmark agreement on year-round sharing of hydrological data, representing an important step toward enhanced cooperation in transboundary water management.

+ Key Programs and Cooperative Projects: The Mekong River Commission (MRC) has successfully implemented a number of significant cooperative programs, notably:

First, the Basin Development Plan (BDP), which was implemented in three phases from 2001 to 2015. The program contributed to enhancing the capacity of MRC Member States in basin development planning by promoting a comprehensive approach that integrates economic, social, and environmental considerations, alongside the use of support tools for assessing the impacts of different basin development scenarios. It also raised awareness about the importance of mainstreaming basin development perspectives into national and sub-regional development planning processes, while creating opportunities for Member States to share and learn from each other's experiences in legal, technical, strategic, and policy aspects.

Second, the Mekong Integrated Water Resources Management Project (MIWRMP), implemented from 2011 to 2015, reflected the MRC's role as a regional river basin organization committed to integrated water resources management (IWRM). The project aimed to balance the development needs of riparian countries with the sustainability of the Mekong River Basin. It was structured around three main components: The Regional Component, which provided a framework to support regional cooperation in IWRM implementation across the Lower Mekong Basin; The Transboundary Component, which sought to strengthen cooperation between MRC Member States in the management of transboundary water resources; The National Component, which was managed by the Member States themselves to enhance IWRM practices within their national jurisdictions.

The MIWRMP served as a cornerstone for promoting coordinated and balanced water resource development and management in the Mekong Basin, ensuring that national actions aligned with regional priorities and objectives for sustainable development.

Building upon these achievements, in 2009, the Mekong River Commission (MRC) initiated the Mekong Integrated Water Resources Management Project (Mekong IWRM Project) with the objective of completing outstanding procedures related to water use and the associated technical guidelines, while also facilitating the effective implementation of these procedures and guidelines. The MRC further promoted the practical application of integrated water resources management (IWRM) principles in planning and coordination, by encouraging the application of MRC procedures and technical tools for water use planning, data sharing, and flow monitoring.

The Mekong IWRM Project supported MRC Member States through a three-tiered approach, integrating actions at the regional (basin-wide), transboundary, and national levels. The regional

component, funded by the Government of Australia, focused on enhancing the implementation of MRC procedures and their associated technical guidelines, while also developing a modeling toolkit to support basin-wide water use planning.

The transboundary component of the project focused on fostering bilateral and multilateral cooperation between MRC Member States, with transboundary projects being facilitated through the MRC Secretariat. Under this component, five bilateral projects were developed with the objective of identifying transboundary issues in the management of water and related resources to promote sustainable development through the application of integrated water resources management (IWRM) approaches.

The national component aimed to support Member States in enhancing governance mechanisms and building technical capacity for the coordination of water planning and utilization within their national borders. The World Bank served as the primary financial provider for both the transboundary and national components.

Throughout its implementation, the project has played a significant role in supporting cross-border water resources management cooperation among MRC Member States. Notably, two joint projects between Viet Nam and Cambodia were implemented focusing on integrated water resources management in the Se San River Basin and the Mekong Delta region, respectively.

Thirdly, the MRC and its Member States jointly identified a group of five new joint transboundary projects aimed at continuing to support the Lower Mekong countries in fostering sustainable development of the Mekong River Basin through the alignment of these projects with their respective national plans.

An assessment of the cumulative impacts and risks associated with the current national water resources development plans of Member States revealed that these plans remain suboptimal from a basin-wide perspective. The assessment highlighted that existing national plans do not adequately address water security and long-term environmental needs, while also overlooking opportunities to enhance regional benefits and reduce costs.

Therefore, the proposed joint projects aim to further enhance the national water resources development plans of the Member States in order to: Ensure long-term water and environmental security; and achieve sustainable and optimal development outcomes as envisioned in the 1995 Mekong Agreement.

The implementation of these joint projects is also expected to strengthen transboundary cooperation and regional integration, generating multi-sectoral benefits in areas such as food security, energy, inland waterway transport, tourism, and flood management.

The five proposed joint projects include: Establishing navigation safety regulations between Lao PDR and Thailand; Transboundary water resources management and development between Lao PDR and Cambodia; Cooperation in transboundary flood and drought management in the border area between Thailand and Cambodia; Sustainable water resources management and development in the Sekong, Sesan, and Srepok River Basins involving Viet Nam, Lao PDR, and Cambodia; and Integrated flood management in the transboundary area between Viet Nam and Cambodia in the Mekong Delta, with the objective of ensuring water security and sustainable development.

Navigation Safety Regulations between Lao PDR and Thailand: This project will establish and support the implementation of common rules regarding pollution control, vessel inspections, port safety, and emergency response. This will improve inland waterways, waterway traffic, and environmental protection activities.

Development and Management Project, including Environmental Impact Monitoring of the Don Sahong Hydropower Project: The project aims to provide information on adaptive management measures and impact mitigation at the Don Sahong hydropower plant. It will also develop a long-term vision for the Khone Falls area and the upper Mekong region in Cambodia, while preparing and implementing projects and activities that benefit both countries; Transboundary Flood and Drought Management Cooperation Project at the Thailand-Cambodia Border (part of Sub-region 9C-9T): This project aims to enhance cross-border integrated water resources planning capacity and flood and drought forecasting, as well as related information services. It also seeks to ensure water security, including measures to mitigate floods and droughts, in order to support economic and social development in the project area; Water Resources Development and Management Project in the Sekong, Sesan, and Srepok River Basins (3S): The project aims to strengthen coordinated national investments and potentially joint investments to further improve the meteorological and hydrological systems, flood and drought forecasting, and related services. It will also focus on transboundary water management operations and the development of water resources infrastructure; Integrated Flood Management Project in the Vietnam-Cambodia Border Area in the Mekong Delta for Water Security and Sustainable Development: This project aims to prepare and implement investment measures in the Vietnam-Cambodia border area to manage flood flows and improve agriculture, while also developing an integrated flood management strategy for the Mekong Delta.

Three of the five projects are currently being implemented, namely: the project on waterway transportation between Lao PDR and Thailand, the project on water resources management between Cambodia and Laos, and the project on flood and drought management between Cambodia and Thailand.

+ Project Implementation Agreements:

While the MRC leads the cross-border cooperation during the planning phase of the joint projects, the responsibility for implementing the project activities lies with the relevant agencies in the participating countries. Cross-border coordination will be established based on existing mechanisms. A cross-border steering committee may be set up to support implementation, alongside service providers such as consulting firms and international organizations.

Throughout the project preparation process, MRC assists in reviewing the project documents. Additionally, MRC supports the appraisal of the projects set for implementation by applying MRC's procedural frameworks, especially the PNPCA (Prior Consultation Process for Joint Projects).

The planning phase for the joint projects spans from 2 to 3.5 years. Estimated costs for the planning phase are listed in the table below. The costs for preparing the next project phase and executing both infrastructure and non-infrastructure projects will be determined during the planning phase implementation.

Implementing countries	Projects	Fields	Budget estimate (USD)
Laos and Thailand	Regulations on Waterway Safety between Laos and Thailand	Waterway transportation	1.000.000
Campuchia and Laos	The Transboundary Water Resource Development and Management Project, including environmental impact monitoring of the Don Sahong Hydropower Project.	Hydropower, environment	1.500.000 100.000/year (Impact Monitoring)
Campuchia and Thailand	Transboundary Flood and Drought Management Cooperation Project in the Thailand-Cambodia Border Area – Part of Subregion 9C-9T	Flood/Drought Management	1.200.000
Campuchia, Laos and Vietnam	Sustainable Water Resource Development and Management in the Sekong, Sesan, and Srepok River Basins (3S Basin)	Hydropower, Environment, Floods and Droughts	2.610.000

Implementing countries	Projects	Fields	Budget estimate (USD)
Campuchia and Vietnam	Integrated Flood Management in the Cambodia-Vietnam Border Area in the Mekong Delta for Water Security and Sustainable Development	Flood Prevention, Agriculture	2.730.000 2.000.000 (Border Channels, Flood Drainage Paths)

The financing for the planning of joint projects is provided by development partners with relevant experience. The next steps for the implementation of infrastructure and non-infrastructure projects will be funded from national budget sources.

** Water Resource Protection Cooperation:*

The seasonal flow variations of the Mekong River are essential for the ecosystem of the basin and the livelihoods of the riparian countries. Without annual floods, fish would not be able to migrate from ponds and lakes to the floodplains for spawning. Floodwaters accumulate, facilitating irrigation during the dry season, while the sediment deposited after floods helps improve soil fertility. Floods also flush away stagnant water and pollutants. This natural flow regime is crucial for maintaining the ecosystem and livelihoods in the Mekong River, especially in the context of pressures from large-scale water use projects and climate change.

Therefore, the MRC and its member countries have established the Mainstream Flow Maintenance Procedure (PMFM), which provides regulations for maintaining minimum or maximum flow levels in the mainstream of the Mekong River and the reverse flow of the Tonle Sap River in Cambodia, which connects the main Mekong River to the Tonle Sap Lake. The reverse flow is a unique phenomenon that occurs during the flood season when the Tonle Sap River flows backward and pushes its excess water into the lake, causing its area to increase by up to six times.

Adopted in June 2006, the PMFM procedure defines technical criteria to assess the appropriateness of flow levels to ensure the maintenance of natural seasonal flows, avoiding impacts from water diversion, water releases from reservoirs, and other activities that could significantly affect the main river flow.

The objective of this Procedure is to provide an implementation framework, including technical guidelines, implementation mechanisms, directions, and information for the Mekong River Commission (MRC) and the member countries to maintain and manage the mainstream flow of the Mekong River, as stipulated in Articles 6 and 26 of the Mekong Agreement.

This procedure applies to water extraction and discharge or other routine activities by member countries that may significantly impact the mainstream flow during both the wet and dry seasons, as specified in Article 6 of the Mekong Agreement.

The PMFM Procedure requires the four member countries to compile daily flow data from 12 hydrological stations along the Mekong River and the Tonle Sap River, such as discharge levels, flow rates, and volumes. During the wet season, the data is sent to the MRC Secretariat daily for consolidation and analysis, with the daily flow status classified as "normal," "stable," "unstable," or "critical." These updates are published online on the MRC PMFM website for public reference. During the dry season, the flow data is gathered daily and sent weekly to the MRC Secretariat.

If the status is "unstable" or "critical," the MRC alerts the concerned countries to take necessary actions and provides technical support to mitigate the impact, if requested.

Poor water quality can threaten human health and ecosystems. Maintaining good water quality in the Mekong River is crucial for the communities along the river and the aquatic life of the river, as the Mekong Basin provides water and food resources for over 65 million people. To monitor and ensure water quality throughout the Mekong River Basin, the MRC and its member countries developed the Water Quality Procedure (PWQ) to ensure the maintenance of acceptable water quality in the Mekong River and its main tributaries. The PWQ Procedure and related technical guidelines establish assessment criteria for water quality management, which were approved in January 2011.

The PWQ Procedure identifies two types of actions to maintain appropriate water quality for both human and aquatic life: (1) monitoring water quality and (2) emergency response to protect the river and mitigate impacts on ecosystems and surrounding communities. The PWQ Procedure requires the four Mekong countries to regularly monitor water quality across the entire basin and prepare response mechanisms for emergency water pollution incidents such as oil spills and the discharge of hazardous waste.

Regarding water quality monitoring, the PWQ procedure and technical guidelines specify the locations and frequency of water sampling, define the assessment criteria, and identify important water quality values for human health and aquatic life. This regular water quality monitoring activity replaces the previous basin-wide monitoring system established in 1985, which relied on a network of sampling stations throughout the Mekong River Basin.

The PWQ procedure provides a scoring system for water quality. In compliance with the PWQ procedure, the four Mekong countries currently collect surface water quality samples at 48 sampling stations, including 17 stations on the main stem, five stations on the main tributary (Bassac River), and the remaining stations on other tributaries. At each station, 12 water quality parameters (temperature, pH, salinity, acidity, etc.) are analyzed monthly, and six other parameters (calcium, magnesium, sodium, etc.) are tested during the rainy season from April to October. The biochemical oxygen demand (BOD) is another parameter evaluated monthly year-round at selected stations.

After assessing the quality, samples are classified as “very good,” “good,” “normal,” “poor,” or “very poor” for human health, and similar five-level classifications are made for aquatic life. Samples are also analyzed for irrigation purposes.

These sample data are sent to the MRC Secretariat annually for verification and stored in a database accessible to the public. The MRC Secretariat produces an annual report, the "Mekong River Basin Water Quality Monitoring Report," based on data from 22 key stations on the Mekong River and the Bassac River.

Water quality classification					
Aquatic life	Very good	Good	Normal	Poor	Very poor
Human health	Very good	Good	Normal	Poor	Very poor

Over the years, the MRC has accumulated a large set of real-time water quality data for the Mekong River and its tributaries. These data enable the Mekong countries to identify any changes in water quality, allowing for prompt actions to prevent or mitigate issues, as well as easily identifying cross-border water pollution situations. The data also provides a reliable database that is highly valuable for studying the potential impacts of development projects on the Mekong River. According to annual reports, the overall water quality of the Mekong River remains good across the entire basin, except for some isolated issues in highly polluted areas, with no cross-border pollution detected so far.

The PWQ Procedure calls for a joint response when emergency pollution situations occur: To address emergency water pollution cases, the PWQ procedure requires the four Mekong countries to develop emergency plans to respond to cross-border emergencies and establish basin-wide mechanisms for coordinated action. Although there has been no cross-border pollution incident to date, the Mekong countries recognize the importance of developing unified basin-wide response measures to manage disasters effectively.

Since the approval of the PWQ procedure, the four Mekong countries have negotiated national and regional procedures to manage emergency water pollution cases and developed technical guidelines in 2016 to establish an emergency management and response system. These guidelines follow the emergency disaster response mechanisms of the Association of Southeast Asian Nations (ASEAN) and are being expanded to cover human-made disasters such as water pollution. To avoid establishing two parallel emergency response mechanisms for the basin, the MRC is seeking to collaborate with ASEAN to develop standardized regional emergency response mechanisms that meet the needs of national, regional, and cross-border water quality disaster control.

2.2. Some Assessments

** Success of water development cooperation in the Mekong basin:*

First, the Mekong River Basin water cooperation mechanisms have created forums for the basin countries to share viewpoints, visions, information, technical knowledge, and effective water resource management methods, ensuring sustainable use and protection of water resources. In addition, the Mekong River Basin water cooperation mechanisms have created regular or ad-hoc cooperation forums, mainly organized based on the actual requirements of each cooperation issue. For example, the Mekong-Lancang (MLC) Joint Working Groups meetings discuss in detail cooperative projects, implement technical assistance programs, share experiences and technologies, and coordinate activities related to water resource management.

Water cooperation forums also serve as platforms where riparian countries seek support in finance, technology, and experience in water management from partners such as financial organizations, international organizations, non-governmental organizations, and donor countries. Examples of these forums include the Mekong Development Partners Forum (MDPF), the Mekong-Lancang Science and Technology Forum, the Lower Mekong Initiative Development Partners Forum, the LMI Science and Technology Forum, the Mekong-Japan Science and Technology Forum, and the Mekong-Korea Science and Technology Forum.

It can be said that the Mekong River Basin cooperation forums play a crucial role in promoting understanding, information sharing, and cooperation among member countries as well as with international development partners. These forums ensure that decisions related to the Mekong River are made based on comprehensive, scientific information and with the consensus of all stakeholders.

Secondly, the water cooperation mechanisms have contributed to maintaining friendly relations among the riparian countries, establishing a peaceful and stable regional environment. The Mekong River Basin water cooperation has created policy dialogue forums to help the riparian countries address issues related to the use of the Mekong River's water resources, such as the Mekong-Japan Policy Dialogue Forum, the Mekong-Korea Policy Dialogue Forum, and the Mekong River Commission (MRC) Council Meetings. These water cooperation forums have provided opportunities for the riparian countries to engage in policy dialogue, negotiation, and promote cooperation in water resource management, as well as to address and resolve conflicts related to water usage between the riparian countries. As a result, they help mitigate and prevent the risks of conflicts over the use of the Mekong River's water resources. Furthermore, these policy dialogue forums also promote mutual understanding and build trust among the riparian countries, thereby contributing to the maintenance of peace, stability, and security in the region.

* *Limitations of water development cooperation in the Mekong basin:*

Firstly, the lack of consensus among the riparian countries in cooperation. The effectiveness of water cooperation in the Mekong River Basin has been limited due to conflicts of interest among the riparian countries. The benefits derived from the Mekong River's water resources vary across the riparian countries, leading to differing water usage goals to support each country's development objectives. The use of the Mekong River's water resources, as well as other water-related resources, for different purposes makes it difficult to reach common agreements on how to use, manage, and protect the river's water resources. This has resulted in cross-border impacts from these water usage activities, affecting the downstream countries of the Mekong River.

Secondly, the Mekong River water cooperation lacks a strong regional institution to regulate the behavior of the riparian countries in exploiting and using water resources. Although the Mekong River Commission (MRC) is the most important and active mechanism in water cooperation, it lacks legal authority to make binding decisions against a member country. Moreover, MRC members do not have veto power over the water projects of other member countries. As a result, Laos continues to develop hydropower dams on the main stem of the Mekong River. Furthermore, China and Myanmar are not members of MRC, meaning that MRC regulations on cooperation for managing, using, and protecting water resources do not apply to China. This allows China to continue developing hydropower plants without being bound by any legal mechanisms. In fact, China has completed 11 hydropower dams on the main stem of the Mekong River and continues to build and plan many more in the future.

Additionally, although the riparian countries of the Mekong River have reached many water cooperation agreements, most of these cooperation mechanisms lack legal binding authority or have weak monitoring systems. This leads to the implementation of water cooperation agreements being inconsistent and ineffective. The weakness and inefficiency of the Mekong River Basin water cooperation mechanisms stem from various causes. However, the fundamental reason may be territorial disputes and tense diplomatic relations, which can hinder cooperative efforts related to water resources.

In conclusion, water development cooperation in the Mekong basin has progressed and had some achievements with different multilateral mechanisms. The outcomes of Mekong water development cooperation contribute to sustainable development of the Mekong countries and the whole basin. However, the cooperation is also facing many difficulties and challenges and requires more efforts from Mekong countries to overcome.

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