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Sustainable Water Resource Development Scenarios and Water Diplomacy in the Lower Mekong Basin: Policy Implications[*]

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Abstract: *This paper uses the current results of the Basin-wide water resource development scenario assessment of the Council Study of the Mekong River Commission Secretariat (MRCS) to analyse potentials benefits for economic development to meet the ambitious goal of the riparian states of the Lower Mekong Basin (LMB) countries for poverty reduction and, at the same time, analyse the risks of potential trans-boundary trade-off, which will require an appropriate mechanism to be in place. The scenario assessment results present both opportunities and risks associated with different levels of water resource development in the Mekong countries and the implications of the water diplomacy for both the lower and uper mekong basin. All scenarios could be broadly placed into three main categories with different timeframes and assumptions. Scenario M1 – the early development scenario – characterises baseline water resource developments in 2007; Scenario M2 – the medium-term definite future scenario – characterises existing, under-construction, and firmly-committed water related developments in 2020; and Scenario M3 – the long-term planned development scenario – characterises the planned water developments in 2040 in addition to those assigned for 2020 for implementation over the following 2 decades. The main scenarios aggregate combinations of water resource developments enabling the cumulative assessment of environmental, social, and economic effects in the Member Countries. The Scenarios will bring both economic opportunities in terms of benefits from water resource development as well as risks related to biodiversity changes, the environmental damages and losses of livelihoods, and the dependency on the natural resources of the Mekong River. Each of the scenario results presents the trans-boundary trade-off which requires appropriate skills, capacities of the LMB riparian countries, and water diplomacy to discuss and negotiate for the solutions. Finally, this paper provides some suggestions and policy implications that could be possible mechanisms and solutions for sustainable water resource development in the Mekong region.*

Keywords: Integrated Water Resource Development (IWRM), Water Resource Development Scenarios, Water Diplomacy, Sustainable Development.
JEL Classification: Q57, Q51, Q40, P41

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1. Introduction

The Mekong River basin has long been a beautiful, fertile region that is rich in resources. It is the source of many productive activities such as fishing, agriculture, hydroelectric power, transportation, and so on. Nowadays, however, the construction of dams and other projects, development and high population pressure, lack of proper management of water resources, and lack of cooperation amongst riparian countries have resulted in rising complications in water quantity and quality, biodiversity loss, and disasters such as drought and flooding. Water management in the Mekong region has, in practice, been dominated by energy and food objectives in an uncoordinated manner amongst riparian countries, leading to rapid degradation of water resources.

In July 2019, the lowest water levels in history were recorded at all monitoring stations in the mainstream, and the amount of water flow dropped by 70%–75% from the average of the same period in 2018. Moreover, the flood cycle has become irregular, severely affecting fishing, agricultural production, and people's lives. Amid these many challenges, there are opportunities in water resources management through the application of new technology in energy and agricultural production and better cooperation in water management amongst riparian countries. In fact, regional cooperation in the Mekong basin has become increasingly dynamic in recent years with the emergence of a new mechanism and the reshuffle of existing ones. Cooperation mechanisms amongst riparian countries and with external partners have provided platforms for the discussion of regional issues, including water resources management and sustainable development.

This paper identifies major challenges in water resources development, using scenarios for foreseeable water resources development and planning, and evaluates the current Integrated Water Resources Management (IWRM) tools used in the Mekong and the water resources procedures of the Mekong River Commission (MRC). The paper then reviews existing cooperation mechanisms in water resources management and explores ways to improve coordination amongst riparian countries and amongst water use activities in the region.

2. Challenges to Water Security in the Mekong River Basin

The Mekong River is the world's 12th longest river, at almost 4,763 kilometres, flowing from the Tibetan Plateau in China at an elevation of about 5,000 metres. In China, the river runs through Yunnan Province and is known as the Lancang River. After leaving China, it flows through Myanmar, the Lao People's Democratic Republic (Lao PDR), Thailand, Cambodia, and Viet Nam into the sea. In this paper, we use the name Mekong for both the upper and lower parts of the river. Throughout history, the river basin has been home to millions of people in its riparian countries. The river has been the source of food (rice, other crops, fish, etc.) and waterways for its people. Rice dominates agricultural production, at both the commercial and household levels. The Lower Mekong countries produced more than 109 million tons of paddy rice in 2017, with Viet Nam, Thailand, and Myanmar being the 5th, 6th, and 7th largest rice producers in the world, respectively. While a large percentage of this rice goes to local markets and remains within the countries, the region is also an important rice exporter. Thailand and Viet Nam are the 2nd and 3rd largest exporters in volume, and Cambodia is the 8th largest exporter (Statista, 2018). Most rice production in the region is traditional lowland cultivation, in which water is the single most important component for production and the Mekong water is truly a valuable resource.

Total catches and production from Mekong fisheries (including aquaculture) totalled about 3.9 million tonnes in 2008, of which about 2 million metric tons were from capture fisheries. Fisheries account for nearly 12% of Cambodia's gross domestic product (GDP) and contribute more to the country's economy than rice production. In the Lao PDR, the fisheries value is equivalent to 7% of the country's GDP. Although proportionally less significant to the national economy, the Mekong fishery sectors in Thailand and Viet Nam add well over $750 million to their GDP each year. Millions of people rely on subsistence fisheries for food security, and fisheries support tens of thousands of businesses – from shops and food stalls that supply fishing families to boat builders and fishing gear suppliers. Capture fisheries make the largest contribution to the Mekong's fishery sector. In 2008, production was estimated at about 1.9 million metric tons, five times more than in 2000. About 1.6 million metric tons originate in the Mekong Delta in Viet Nam. The production of inland aquaculture in Cambodia, the Lao PDR, and Thailand is also increasing, but remains less important than capture fisheries (MRC, 2018a).

The Mekong basin has considerable potential for hydropower development, serving both domestic and export markets. The Upper Mekong Basin in China has estimated

hydropower potential of nearly 30,000 megawatts (MW), equivalent to that of all five Lower Mekong Basin (LMB) countries (MRC, 2010a). Unfortunately, this distinguishing feature is also the source of complications that have arisen in the past few decades. In 1986, China started damming the Lancang, its section of the Mekong, with Manwan Dam. Since then, it has completed another 10 mega-dams on the Lancang. The northernmost of the dams is Yunnan's 990 MW Wunonglong Dam, high in the Himalayas of the Diqing Tibetan Autonomous Prefecture, which was completed in 2019. The southernmost one in Jinghong is near the lush forests of Xishuangbanna. Apart from China, the Lao PDR possesses two hydropower dams – the Xayaburi Dam and Don Sahong Dam – in the mainstream of the Mekong. Thanks to its favourable geographic position, the Lao PDR has strong hydropower potential and it considers earnings from exports of hydroelectricity as a means to leapfrog development and reduce poverty. Indeed, hydropower is a lucrative sector, and the governments and media of countries with the potential for dams promote hydropower as a source of green and clean energy, superior to dangerous or polluting coal-based energy (Yoshida, 2020). However, dams bring various challenges such as deforestation, relocating local residents, designing dams that can facilitate the flow of fish and sediment, and coordinating operations.

In fact, the Mekong River basin faces a multitude of problems, such as changes to its natural flow, severe and more frequent droughts and floods, loss of sediment, biodiversity degradation, and saltwater intrusion, which could be aggravated in the future unless appropriate solutions are applied. Alterations to the natural flow regimes of the river and streams, with increased dry season flows and decreased wet season flows, have been recorded in riparian countries, as evidenced at Chiang Saen where the Mekong enters the Lower Basin.[3] In addition, riparian countries have suffered the adverse impacts of more acute droughts. To illustrate, the 2019 drought has brought the Mekong water level across the basin to a record low since June, with a serious inflow deficit to the Mekong compared with the yearly average – lower than ever recorded since measurements began 60 years ago. Besides, floods have worsened the state of the basin, putting the livelihoods of tens of millions of people living and working along the river in jeopardy. Another critical problem is sediment reduction, which is projected to drop by as much as 67% in 2020 and 97% in 2040 in the Mekong Delta (MRC, 2018b). The sedimental poverty is likely to have detrimental effects on the agricultural productivity, geomorphology, and persistence of the delta landform (MRC, 2018b). Under the impact of natural disasters and human exploitation, the basin is undergoing substantial loss of biodiversity. According to the

[3] For further details, see Basist and Williams (2020).

WWF, the Greater Mekong Subregion (GMS) risks losing more than a third of its remaining forest cover within the next two decades (WWF, 2020). Salinity intrusion in the Lower Basin in general and the Mekong Delta in particular has occurred earlier and deeper than in the 2015–2016 dry season, the period of historic salinity which caused $646 million of damage to the delta. In fact, saltwater intrusion has been very high since December 2019 and is projected to rise with high tides (Vietnam Disaster Management Authority, 2020). It can be said that the severity is caused and exacerbated by both natural phenomena such as climate change and human activities such as the construction of dams.

The operation of upstream hydropower dams is seen as a catalyst for dramatic fluctuations in river levels and changes in the natural cycle of the river (Bainbridge and Vimonsuk, 2020). The ecosystem deterioration is also imputed to hydropower projects, as these dams prevent the migratory pathways of fish and capture sediment behind their walls. An empirical study showed that more than half of the Mekong's 165 million metric tons sediment load has been trapped by 11 mega-dams on the mainstream in China (East–West Center and The Stimson Center Southeast Asia Program, 2020). This aggravation of the Mekong spurs the active engagement of relevant stakeholders to ensure sustainable water use management, for the security and prosperity of the whole basin.

To face the above challenges, institutions governing trans-boundary water resources are crucial for achieving cooperation benefits and preventing conflicts. With the increasing challenges in the Mekong region, riparian countries have initiated or participated in various multilateral and bilateral cooperation mechanisms. The existence of these mechanisms has helped to build trust amongst countries, mitigate the risk of water conflict escalation, and contribute to progress in water resources management.

3. Brief Description of Methodology used by MRCS in Scenarios Assessment

The assessment of Basin-wide development scenarios is a stepwise approach and involved a lot of coordination amongst multidiscipline teams of hydrology, modeling, mapping, social, environmental and economic experts. To assess the opportunities and risks for each scenario, the results of hydrological changes for each scenario were performed and then picked up by the multidiscipline team to interpret the impact on social, environmental and economic impacts. The techniques involved a lot of GIS and overlay maps between the changes

of hydrology vis-à-vis the socioeconomic and environmental characteristics of the basin. Since scenarios bring both opportunities and risks, therefore, it is very important to present the aggregated picture of scenarios to decision-making level in terms of quantitative analysis, with supports of qualitative explanation of risks. Here economic approach has been used to assess the value of positive and negative impacts for each scenario. Because the scenarios involved in both current and future development, the costs and benefits of each scenario are assumed to be the best approach to deal with such complexity by presenting the opportunities and risks. Table 1, presents the selected priority indicators for Cumulative Impact Assessment (CIA) that picked by disciplinary experts in social, environmental and economic framework.

Table 1: Selected indicators for CIA assessment framework

Assessment approach	Dimensions	Strategic Indicators	
		CIA Indicator Framework	MRC Indicator Framework
Qualitative & Quantitative synthesis	Social	Well-being Employment	Living conditions and well-being Employment in MRC sectors
	Environmental	Water flow conditions in mainstream Water quality and sediment conditions in mainstream Status of environmental assets	Water flow conditions in mainstream Water quality and sediment conditions in mainstream Status of environmental assets
	Economic	Economic value of MRC sectors Contribution to national economy	Economic performance of MRC sectors Contribution to national economy
	Integrated	Resilience; Vulnerability	
Quantitative analysis	Integrated	Resource sustainability Cross-sectoral synergies Transboundary balance	
Scenario comparison	Climate change		Greenhouse gas emissions Climate change trend and extreme Adaptation to climate change

	Cooperation		Equity of benefits derived from the Mekong River system Benefits derived from cooperation Self-finance of the MRC Level of information sharing and participation

Source: MRC, 2017.

Based on this framework, the plausible scenarios (M1, M2, M3, M3CC) were assessed across three groups of indicators of social, environmental and economic field. The scope of the assessment looks into the impacts on sustainability, cross-sector effects, and on transboundary effects. The results allow a direct comparison of all the main scenarios and sub-scenarios for each of the three indicators. The combination of the quantitative results and the more qualitative synthesis shaped a more robust and consistent assessment approach. The assessment also extended to look into the climate change impacts as a result of the plausible scenarios. The study also allows the comparative analysis amongst the climate change sub-scenarios of its impacts on the range of assessment indicators in the above proposed CIA framework.

The study used both quantitative and qualitative approaches to describe the impacts of each scenario. The Delphi approach is also deployed for the expert judgment, trying to quantifying the impacts based on the knowledge and experience of the experts from the riparian countries of the Mekong.

3.1 Sustainability Index

The sustainability index was based on the subset of Sustainable Development Goals (SDG) indicators, as listed in 1. Methodologically, the index was calculated by normalising each indicator. In a first step, the selection of SDG indicators was completed with Member Countries. In a second step, the range of possible outcomes was specified for each indicator, also implemented with Member Countries. The starting values for the worst and the best situation – lower and upper bound – of each indicator were derived from global data. Once complete, disciplinary assessment results were used to calculate the state of each indicator for each scenario and then normalised within the agreed value range of possible outcomes. Each assessment indicator was assigned a sustainability value between zero (unsustainable) and one (highly sustainable). The sum over all sustainability indicators could then be compared across

scenarios and the index analysed to identify which scenarios lead to sustainability improvements or to sustainability losses.

3.2 Cross-sector impacts

Cross-sector relationships can be positive or negative. Typically, positive cross-sector relationships are referred to as synergies. This implies that investments in one sector achieve improvements in this target sector, but also trigger improvements in one or more other sectors. Negative cross-sector relationships imply trade-offs. Investments in one sector lead to improvements in the target sector, but trigger losses in other sectors. Based on this understanding, the cross-sector indicator was calculated as the value improvement or value loss for each sector by comparing across the entire set of development and sub-scenarios. For instance, the comparison of hydropower output (in economic value) in scenario M1 (water infrastructure situation in 2007) and M2 (planned water infrastructure situation for 2020) results in what is gained for the hydropower sector through the additional investment defined by the 2020 scenario. This can be calculated for all sectors based on the outputs of the macroeconomic assessment approach. Dividing the sectoral value differences leads to an important insight:

(Fisheries Sector [M2]- Fisheries Sector [M1])/(Hydropower Sector [M2]- Hydropower Sector [M1])

The proportional relationship defines how much is gained or lost in one sector (e.g. fisheries) for every dollar gained in another sector (e.g. hydropower). For example, if the macroeconomic assessment indicated that the hydropower sector output increases in the 2020 scenario by $100 million and the fisheries output decreases in the same scenario comparison by $50 million, then the result shows that for every dollar gained in hydropower about 50 cents are lost in fisheries. Comparing all sectors identifies not only synergies and trade-offs but also how synergies and trade-offs shift as investments gradually increase or shift between sectors. From a wider systems perspective, these results can guide the management of cross-sector trade-offs and the realisation of conceivable synergies.

3.3 Transboundary impacts

The transboundary impacts were calculated as the ratio of the two previous composite indicators (sustainability and cross-sector relationship) that can be attributed to the change in any of the three other countries. In other words, this indicator calculates based on (i) which

percentage of the sustainability index change is due to transboundary impacts and (ii) which percentage of cross-sector synergies/trade-offs is due to transboundary impacts.

Methodologically this was achieved in four steps. First the weight of each sector was calculated for each scenario. Second, the scenario investment was mapped to its geographic location and communities are grouped into corridor zones. Third, the two values were multiplied with each other to gain sector-country coefficients. Then, the coefficients were multiplied with (i) the sustainability index change and with (ii) the cross-sector effect. The result shows how much of the sustainability index change (comparing two scenarios) is due to transboundary effects and how much of the cross-sector synergy or the cross-sector trade-off results from investment in other Member Countries.

The vulnerabilities are linked to stressors related to environmental, social, and economic dimensions. Mekong basin communities can face a diversity of stresses depending on their location and their livelihood diversification strategy. Any changes of the value of the baseline three key indicators: (i) Environment (deforestation, loss of wetlands, intensification and increasing frequency of floods, depleting fish stocks, water quality decline, eroding riverbanks), (ii) Social (declining food security, migration pressures, public health concerns, cultural identity due to activities or landscapes), and (iii) Economic (income security based on existing livelihoods, crop prices, land title security, new livelihoods opportunities, market access conditions) will impact the wellbeing of the communities.

4. Key Results in Water Resources Development Scenarios in LMB

The current well-being of the Mekong people is relatively poor, and these millions of poor people exploit the natural resources of the Mekong Basin for their food security and livelihoods. At the same time, in response to the power demand to meet the energy consumption of Southeast Asia's emerging economy and to address the ambitious poverty reduction of the LMB, the LMB countries are looking at all possibilities – including the use of the Mekong water resources for generating income as well as poverty reduction to meet the Sustainable Development Goal (SDG) targets. The Mekong countries are seriously considering the possibility of developing hydropower because of the predicted increase in energy demand in Southeast Asia (predicted to almost double from 2015 to 2040) to meet the growing economy of southeast Asia, geopolitical dependency on oil in the Middle East, and global renewable energy trends (Han, et.al, 2019). In addition, the level of water resources development is clearly

driven by markets and the private sector while most governments consider it fit for purpose for common goals.

Now, China has completed major hydropower dams on the upper Mekong (Lancang), with a combined capacity of about 17,000 MW. A further 11 projects are under construction, with a capacity of 11,800 MW. Another 10 projects are planned in the upper basin, with a capacity of 3,800 MW. As for the LMB, the pace of hydropower development has accelerated in recent years, with growing demand for low-cost electricity to support economic development. In 2001, there were about 17 hydropower projects in operation in the LMB, with a capacity of less than 1,400 MW. From 2002 to 2015, an additional 40 hydropower projects with a capacity of 6,442 MW were commissioned. A further 14 dams with a total capacity of 3,000 MW are scheduled to be commissioned by 2020 and another 30 dams with a total capacity of around 6,653 MW are in the development process, with most having completed feasibility studies. Five mainstream dams in the LMB have been submitted to the MRC under the prior consultation process of the Procedures for Notification, Prior Consultation and Agreement (PNPCA). The 1,285 MW Xayaburi and the 260 MW Don Sahong projects have been in operation since 2019. The 912 MW Pak Beng, 770 MW Pak Lay, and 1,460 MW Luang Prabang projects completed the PNPCA prior consultation review, in 2017, 2019, and 2020 respectively, but construction has not yet started. Following from these last three PNPCA prior consultation processes, a joint action plan (JAP) has been agreed by MRC members which will be implemented to carry out measures to avoid, minimise, and mitigate negative impacts. In addition to tributary dams and the possibility of irrigation expansion, the Lower Mekong countries have about 11 proposed mainstream dams on the Mekong River and many tributaries. These developments of the upper and lower parts of the Mekong River bring both opportunities and risks, which imply social, environmental, and economic implications for the Mekong countries.

Through a series of national and regional stakeholder consultations, three main scenarios were considered and assessed for potential future planning in the LMB for the MRC Council Study. Those scenarios were (i) an early development scenario (2007) or M1 scenario, (ii) a definite future scenario (2020) or M2 scenario, and (iii) a planned development scenario (2040) or M3 scenario. Each formulated scenario has a basin-wide scope and is composed of project developments. These developments were introduced as composite changes to an assumed *reference period*, which is defined by a 24-year time series from 1985 to 2008 of hydro-meteorological data (rainfall, evaporation, boundary water levels, etc.) broadly representative of the historic natural flow conditions of the Mekong River. The historical period

was calibrated using a range of *exogenous drivers* that are not directly linked to the water infrastructure investments in the scenarios but have substantial influence on livelihoods; sustainability; and social, economic, and ecological conditions. Trends were statistically estimated for these exogenous drivers, which include population growth for each of the member countries at the level of the LMB. The combination of past hydro-meteorological data (or patterns) and trends of exogenous drivers define the M1 scenario.

Early Development Scenario (2007) – M1 Scenario

The M1 scenario aims to assess the distribution of the benefits, costs, impacts, and risks of water resources development in the Mekong Basin as of 2007. The scenario defines the state of water infrastructure development as it was in 2007 when the flow regime of the Mekong mainstream was considered to be still in a natural state, except for the influence of Chinese dam impoundments in the Upper Mekong or Lancang River. The scenario includes the infrastructure and land use/cover changes as of 2007. In addition to modelling with the decision support framework, the impact assessment of the early development scenario was based on existing observations, studies, and assessments of historical changes in land use, development of (irrigated) agriculture, flood control structures, wetland areas and biodiversity, capture fisheries, and livelihood and well-being indicators. The assessment results allowed the member countries to consider whether the benefits, impacts, and risks of new water resources development are reasonable and equitable.

Definite Future Scenario (2020) – M2 Scenario

The M2 scenario aims to assess the distribution of the benefits, costs, impacts, and risks of water resources development in the Mekong Basin in 2020. The scenario includes all existing infrastructure development of hydropower to be in place by 2020. The impacts (positive and negative) of this scenario are inevitable (but negative impacts can be mitigated).

Planned Development Scenario (2040) – M3 Scenario

The M3 scenario aims to assess the distribution of the benefits, costs, impacts, and risks of water resources development in the Mekong Basin in 2040. In addition to the development in the definite future scenario, the planned development scenario includes all water resources development that is planned in the Mekong Basin. On a timescale, the scenario covers the water resources development that would be in place by 2040 if these plans were fully implemented. The formulation of the three main sub-scenarios was considered, building from the M3 scenario, in response to key policy questions arising from the stated objectives and interest of the riparian

states as a result of climate change, the high level of irrigation development, and flood protection, in addition to what is assumed under the M3 scenario.

Given the situation described above, there has been increasing pressure from the basin countries and project developers for the provision of an integrated basin perspective against which national plans and proposed projects can be assessed to ensure an optimal balance between economic, environmental, and social outcomes in the LMB, and mutual benefits to the LMB countries. The development of such a basin perspective is beyond the responsibility of any individual country or project developer. Legally and intuitively, the role of the MRC – as agreed by the 1995 Agreement of the LMB countries – includes advising in such a challenging water resources development in the LMB. Experience elsewhere in recent years has suggested that scenarios for water resources development could be a tool for planning and strategy testing. A summary of the main scenario assessment results of the Council Study is presented below.

Key Results of Basin-wide Development Scenarios Assessment

Using the Delphi method, the sustainability scores were assessed for the three main scenarios (M1, M2, and M3CC) and their sub-scenarios by experts from LMB riparian countries. Not all sustainability indicator data are available, so only selected prioritised indicators were used amongst the economic, social, and environmental indicators. The SDG-based index[4] provides a simple approach to approximate how development investments, as defined under the various main and sub-scenarios, impact sustainability.

SDG-based Sustainability Index

Table 2 shows the sustainability level for scenario M1, the differences between the main scenario and M1, and the differences between sub-scenarios[5] and the main scenario M3 with climate change (M3CC). The results of the SDG-based sustainability index indicate a rather

[4]The sustainability index was based on the subset of SDG indicators and calculated by normalising each indicator. As a first step, the selection of SDG indicators was completed with member countries. As a second step, the range of possible outcomes was specified for each indicator, in conjunction with member countries. The starting values for the worst and the best situation – lower and upper bound – of each indicator were derived from global data. Once complete, disciplinary assessment results were used to calculate the state of each indicator for each scenario and then normalised within the agreed value range of possible outcomes. Each assessment indicator was assigned a sustainability value between zero (unsustainable) and one (highly sustainable).

[5] Three sub-scenarios for 2040 were developed to explore the interactions between water resources development and changes in climate. Comparisons between scenarios M3 and CC2, for instance, measure the effect of water resources development at the level of 2040 under a climate that is even wetter than mean projections.

low level of sustainability for Viet Nam's Mekong Delta. Another key insight is that the Lao PDR would incur the greatest loss for main scenario M2. Main scenario M3, on the other hand, would result in the same absolute loss of sustainability points for Cambodia and Viet Nam. Thailand would most likely experience the lowest reduction in sustainability across all scenarios. The sub-scenario perspective reveals that lower investment levels in hydropower would lead to more sustainable development pathways in all countries, in which the sustainability index would increase by between 1.12 points in Thailand up to 1.73 points in Cambodia. The comparison of the planned development scenario without hydropower (H1a) and the planned development scenario without mainstream hydropower (H1b) shows that this index suggests a similar impact from tributary and mainstream dams. The planned development scenario with hydropower mitigation investment (H3) indicates that substantial improvements in dam management and the implementation of mitigation measures can provide substantial gains in Cambodia. The planned development scenario with high agriculture and land use (sub-scenario ALU2) highlights that excessive agricultural expansion can lead to overall sustainability losses, as shown for Cambodia.

Table 2: Scenario Impacts on SDG-based Sustainability Indicators

	Scenarios															
	M1	M2-M1	M3-M1	M3CC-M1	ALU1-M3CC	ALU2-M3CC	CC2-M3CC	CC3-M3CC	IRR1-M3CC	IRR2-M3CC	FP1-M3CC	FP2-M3CC	FP3-M3CC	H1a-M3CC	H1b-M3CC	H3-M3CC
CAM	7.62	-1.38	-2.24	-2.27	0.31	-0.05	-0.01	-0.23	0.10	-0.07	0.18	0.07	0.33	1.73	0.79	0.20
LAO	8.27	-2.08	-2.24	-2.28	-0.07	-0.02	-0.05	-0.09	-0.06	0.03	0.01	0.01	-0.08	1.41	0.37	-0.09
THA	8.70	-1.18	-1.47	-1.51	0.02	-0.03	-0.02	-0.27	-0.05	-0.01	0.04	0.00	-0.04	1.12	0.58	-0.08
VIE	5.41	-1.22	-1.70	-1.24	0.04	-0.38	0.04	-0.17	-0.24	-0.32	-0.14	-0.29	-0.29	1.18	0.52	-0.11
LMB	29.9	-5.85	-7.63	-7.68	0.30	-0.49	-0.04	-0.76	-0.24	-0.37	0.08	-0.21	-0.08	5.44	2.27	-0.08

CAM= Cambodia, LAO= Lao PDR, THA= Thailand, VIE= Viet Nam, LMB= Lower Mekong Basin

ALU = agriculture and land use; ALU1 = planned development scenario without ALU; ALU2 = planned development scenario with high ALU; CC2 = planned development scenario with climate change (wetter climate); CC3 = planned development scenario with climate change (drier climate); FP1 = planned development scenario without flood protection; FP2 = planned development scenario with medium flood protection; FP3 = planned development scenario with high flood protection; H1a = planned development scenario without hydropower; H1b = planned development scenario without mainstream hydropower; H3 = planned development scenario with hydropower mitigation investment; IRR1 = planned development scenario without irrigation; IRR2 = planned development scenario with high irrigation; Lao PDR = Lao People's Democratic Republic; LMB = Lower Mekong Basin; M1 = early development scenario (2007); M2 = definite future scenario (2020); M3 = planned development scenario (2040); M3CC = planned development scenario with climate change (mean of warmer and wetter climate); SDG = Sustainable Development Goal.Source: MRC (2017).

Benefits and Impacts in the Lao PDR

The main scenario M2 is likely to provide very mixed outcomes for the Lao PDR. The development gains and increasing investments in infrastructure (e.g. irrigation) imply that more assets are exposed to extreme events, such as floods. The increasing risk can convert into increasing vulnerabilities if no additional protective or adaptive mechanisms are put in place. Floods are an important driver for community vulnerability. Table 3 shows the net present value (NPV) of investments in flood protection included in the relevant scenarios. The overall investment cost by the Lao PDR (M2: $23 million; M3: $99 million, M3CC: $119 million) would result in reduced exposure and thereby reduce vulnerability, and a positive NPV of $162 million for scenario M3CC. Extreme floods (1:100 years) would not be averted and would cause damages of around $144 million.

Table 3: Net Present Value (Net Gains from) for Flood Protection Investments
($ million)

Scenario	Lao PDR	Thailand	Cambodia	Viet Nam	Total
Scenario M1	3	6	541	3,061	3,611
Scenario M2	38	139	335	2,014	2,527
Scenario M3	26	411	46	1,384	1,867
Scenario M3 CC	162	1,264	337	3,791	5,554
Scenario F1	12	21	0	0	32
Scenario F2	355	2,420	189	3,858	6,821

FP1 = planned development scenario without flood protection, FP2 = planned development scenario with medium flood protection, Lao PDR = Lao People's Democratic Republic, M1 = early development scenario (2007); M2 = definite future scenario (2020); M3 = planned development scenario (2040); M3CC = planned development scenario with climate change (mean of warmer and wetter climate).
Source: MRC (2017).

Benefits and Impacts in Thailand

Thailand is likely to become a main beneficiary of the hydropower expansion planned for scenario M2. Vulnerabilities related to agricultural activities are likely to decline if irrigation expansion plans are being implemented. The NPV of investments in flood protection is nearly $1.3 billion for M3CC. The planned investments (M2: $83 million; M3: $149 million; M3CC: $178 million) would reduce flood-related vulnerabilities. Only 1:100-year events would continue to cause substantial damage, estimated at around $639 million per event.

Benefits and Impacts in Cambodia

For scenario M2, most impacts on Cambodia's community are likely to be negative. The vulnerability of communities is likely to increase substantially due to reduced food security, particularly increasing food prices. This might be partially mitigated if agricultural productivity improvements outpace population growth. However, the fisheries losses are likely to put pressure on the livelihoods of many communities in the Tonle Sap area. Adaptation strategies are likely to make outmigration necessary, which can lead to deep social problems, depending on how successful public investments will be in creating new employment opportunities. The NPV of investments in flood protection is about $337 million for M3CC. The planned investments (M2: $4 million; M3: $482 million; M3CC: $579 million) would mitigate flood-related vulnerabilities. Only 1:100-year events would continue to cause substantial damage, possibly up to $325 million per event.

Benefits and Impacts in Viet Nam

Viet Nam is likely to experience a diversity of vulnerability-related effects. Fish-related losses are likely to be substantial for M2 and M3, translating into economic losses and livelihood adaptation pressure. Some might be balanced by agricultural expansion, which would also compensate food security losses, particularly if land use change will continue diversification trends (including aquaculture and upland crops). Sediment losses are likely to demand serious investments to mitigate erosion and to maintain agricultural nutrients inputs. Importantly, these changes need to be seen in combination with the increasing vulnerability of salinity intrusion due to the sea-level rise. Floods are part of life in Viet Nam's Mekong Delta and are typically connected with a range of positive effects (e.g. sediment, nutrients) and negative impacts. While positive effects are projected to decline sharply with upstream hydropower, negative effects are likely to be mitigated by substantial investments in flood protection (M2: $36 million; M3: $1 billion; M3CC: $1.25 billion). The NPV of investments in flood protection for M3CC is about $3.8 billion, which indicates that these investments are worth considering. However, investment plans would not cover 1:100-year events, which would cause substantial damages of about $3.2 billion.

Impacts and Benefits of the Scenario with all 11 Proposed Mainstream Dams in the LMB

In addition to the scenarios developed under the Council Study, the MRC also analysed various scenarios for the proposed mainstream dams. It is very important to highlight that the benefits and impacts under the scenario considered all 11 proposed mainstream dams in the

LMB (MRC, 2009). The net economic benefits of the hydropower sector are large ($32,823 million out of the scenario's total NPV of $33,386 million). Under the 'all mainstream dams' scenario, the new irrigation expansion contributes $1,659 million of net benefits. By country, the benefits are unevenly distributed. The Lao PDR invests and benefits most, with an NPV of $22,588 million, compared with Thailand's $4,410 million NPV, Viet Nam's $4,151 million NPV, and Cambodia's $2,237 million. The 11 mainstream dams will have little effect on the flow regime created by the M1 scenario. However, the conversion of large reaches of the mainstream to a series of slow-moving waters between run-of-the-river hydropower schemes will create localised impacts for people dependent on the river system for their livelihoods. Sixty percent of the ecologically valuable river channel between Kratie and Houei Xai would change to a series of connected impoundments. Important habitats such as deep pools, rapids, and sandbars would be largely lost, resulting in severe loss of biodiversity. Some of the flagship species would be very severely impacted, even to the point of extinction. Fourteen out of the 32 environmental hotspots [6] in the LMB would be highly impacted. The 'all proposed mainstream dam' scenario could also result in significant changes in the ecology and primary productivity of the Tonle Sap system. Capture fisheries production would be severely affected in both Cambodia (37% decline) and Viet Nam (28% decline). This decline is much less in the Lao PDR (6%) and Thailand (2%). The reduction in fisheries and the creation of impoundments on vast reaches of the Mekong mainstream will have substantial negative social consequences in the affected areas, especially in Cambodia where, conservatively, the livelihoods of up to 1.2 million people would be put at risk under this scenario. Similar numbers would be affected in Viet Nam, although arguably less severely. The number of people at risk of loss of livelihood is potentially 600,000 in the Lao PDR and 470,000 in Thailand. The large reduction in capture fisheries production may be partly offset by increases in aquaculture (including paddy field and reservoir fisheries). However, increases in aquaculture are unlikely to benefit poor people, many of whom would lose their wild fishing and who have no access to land, water, or capital to fall back on.

Impacts and Benefits of the Scenario Without Two Mainstream Dams in Cambodia

This scenario contains nine mainstream dams but excludes the two dams in Cambodia (Stung Treng and Sambor) from the previous scenario. Fish migration up the Mekong into the

[6] Environmental hotspots include Ramsar sites, biosphere reserves, protected areas, important bird areas, and GMS hotspots.

Sesan, Srepok and Sekong river basin known as 3S river basin would still be possible, and the ecologically very valuable stretch between Kratie and the Cambodia–Lao PDR border would maintain its natural character. Only one of the four flagship species would be severely impacted, and the highly impacted environmental hotspots would reduce from 14 to 11. When compared with the baseline condition in 2010, fisheries losses in Cambodia would decrease from a reduction of about 37% with all mainstream dams constructed to about 18% for this scenario. There would also be a significant reduction in fish losses in Viet Nam (14%) and a small 3% reduction in fish losses above the Lao PDR–Cambodian border compared with the 'all mainstream dams' scenario. For Cambodia, if this smaller reduction in fish production is simply proportioned amongst vulnerable resource users, then the number of users affected would drop from about 1,200,000 for the 'all mainstream dams' case to about 350,000. In addition, the number of vulnerable resource users in Viet Nam would reduce by 637,000 or 50%. This scenario results in an NPV of $31,739 million, which is a drop of $1,652 million compared with the 'all mainstream dams' scenario.

Impacts and Benefits of the Scenario Without Two Thai Mainstream Dams

This scenario includes nine mainstream dams, excluding the two in Thailand. In most respects, the impacts are similar to those with all 11 mainstream dams, as the two Cambodian dams and the Don Sahong dam in the Lao PDR will already be affecting fisheries and other environmental values. The scenario has an NPV of $29,277 million compared with $33,386 million for the 'all mainstream dams' case.

5. MRC Water Resources Procedures and Implementation

The MRC was founded in 1995 by Cambodia, the Lao PDR, Thailand, and Viet Nam (MRC, 1995). The four countries have common goals of using the Mekong water resources to accelerate equitable growth for poverty reduction and to protect resources through the principles of IWRM. In 1996, China and Myanmar became MRC dialogue partners. The MRCS is the secretariat of the MRC, providing technical and administrative service to the MRC Council and Joint Committee. The Council, the highest body of the decision-making level of the MRC, where members consist of one representative from each country at the ministerial or cabinet level, meets once a year to provide policy decisions and guidance concerning the promotion, support, cooperation, and coordination of joint activities and

programmes to implement the 1995 agreement. The Joint Committee consists of one representative from each country of no less that head of department level; it is responsible for the implementation of policies and decisions of the Council, and supervises the activities of the MRCS (MRC, 1995).

The 1995 Mekong Agreement outlined the commitment of the four parties (Cambodia, the Lao PDR, Thailand, and Viet Nam) to cooperate with respect to the sustainable management and development of the LMB to the countries' mutual benefit and people's well-being. To achieve this, the parties committed to the following:

- the reasonable and equitable use of water through the Rules for Water Utilization and Inter-basin Diversion (Article 5);
- notification and prior consultation processes (Article 5);
- the maintenance of flows on the mainstream (Article 6); and
- preventing, ceasing, and taking responsibility for harmful effects (Article 7).

These commitments have subsequently been developed into five procedures supported by technical guidelines. Together, the agreement, procedures, and technical guidelines form a single treaty (Article 38) that gives effect to cooperation towards a basin vision of 'An economically prosperous, socially just and environmentally sound Mekong River Basin' (MRC, 1995). The procedures and technical guidelines are therefore the tools that enable the countries to achieve this goal. It is consequently generally recognised that the implementation of these procedures and technical guidelines forms the cornerstone of the implementation of the Mekong Agreement. However, several challenges to the routine uptake of these procedures and guidelines by the member countries remain. The procedures and their technical guidelines provide thresholds defining an acceptable level of water resources development in the basin, support the reasonable and equitable use of water, and provide mechanisms to address the potential of significant harm through pollution. The five procedures are as follows:

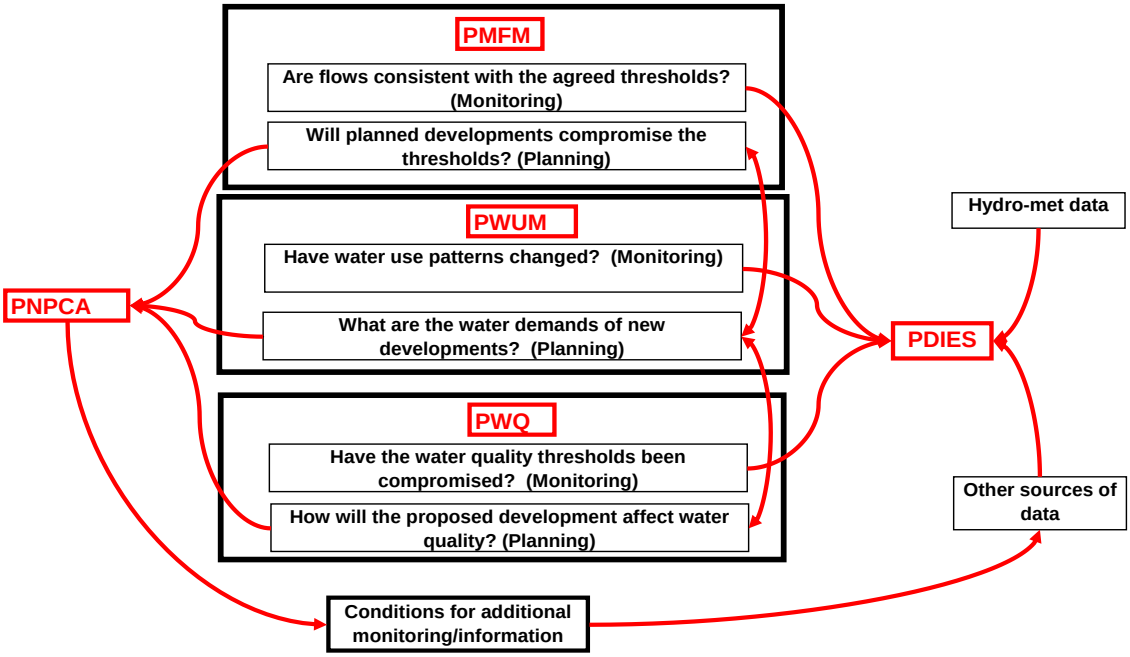
- The PNPCA provide mechanisms to assess, accommodate, and agree on the possible impacts of water resources developments.
- The Procedures for the Maintenance of Flows on the Mainstream (PMFM) provide for flow thresholds at critical points along the Mekong mainstream, ensuring sufficient water for downstream use and environmental needs.
- The Procedures for Water Use Monitoring monitor actual water use.

- The Procedures for Water Quality (PWQ) provide water quality thresholds at given points in the river system.
- The Procedures for Data Information Exchange and Sharing (PDIES) ensure that the data from these procedures are quality assured and all the member countries have easy access to these data.

Together, these procedures should provide a water use/allocation mechanism – ensuring that the water resources are used in a reasonable and equitable manner, sufficient water flows downstream to meet critical environmental needs and downstream demands, and preventing significant harm (Figure 1). For planning purposes, basin development scenarios can also be checked against the agreed flow thresholds, while the impacts of individual projects on flows can be similarly checked to support the PNPCA process. Likewise, the PWQ can be used to support the PNPCA and basin planning processes. The PNPCA process may also identify conditions associated with the project under notification or consultation. This may include special monitoring required to ensure that agreed operational regimes are put in place, or to monitor potential impacts or benefits that may be associated with the project. In these cases, monitoring may be carried out as part of the implementation of the project, and reported through the PDIES to ensure that all the member countries can access data and information.

How does the implementation of these procedures link to sustainable development, which forms the core of the 1995 Mekong Agreement? There is no clearly defined expression of how much development would be considered sustainable by all four member countries. The flow thresholds in the technical guidelines for the PMFM to some extent reflect what is considered an acceptable level of change from 'natural', while the PWQ define 'acceptable' water quality. Any elaboration of social and environmental targets would reflect what development of the basin would be considered sustainable or acceptable. However, in the absence of a complete understanding of the impacts of water resources development on the economy, social structures, and environment, 'sustainable development' is largely a socio-political construct based on the level of risk of environmental impact considered to be acceptable. This perception of risk will differ depending on who benefits and who may be impacted by any development project. Those gaining the most may be willing to accept a higher risk, while those potentially impacted by the project are likely to demand a much lower level of risk.

Figure 1: Schematic of How the Procedures Collectively Contribute to Cooperation



hydro-met = hydrological and meteorological; PDIES = Procedures for Data Information Exchange and Sharing; PMFM = Procedures for the Maintenance of Flows on the Mainstream; PNPCA = Procedures for Notification, Prior Consultation and Agreement; PWQ = Procedures for Water Quality; PWUM = Procedures for Water Use Monitoring.
Source: Kevin and Han (2013).

The implementation of the five procedures will collectively ensure the reasonable and equitable use of water, an effective PNPCA process, and the sustainable development of the LMB. A better understanding of this will not only help improve the implementation of the procedures, but will also help prevent negative impacts and conflicts. The effective and successful implementation of these five procedures and their technical guidelines will support the national and regional development objectives of the LMB countries through the basin development planning to support the economic development of the riparian countries. The implementation of procedures will also optimise and share the benefits of the regional development optimum that provides the most benefit for the most people with the minimum environmental and social harm. Importantly, the Procedures for Water Use Monitoring, PMFM, and PWQ help define the boundaries of the water development opportunities, while information on compliance to the opportunities to develop the basin is shared through the PDIES. Here, the PNPCA play an important role in examining the full spectrum of potential impacts of any proposed development project, with a view to agreement on whether it could go ahead if the impacts are minimised and benefits are large for the host country and for benefit sharing in the basin.

Nevertheless, an overarching agreement on the general level of risk the member countries may wish to accept for the basin as a whole may be possible. These risks could be expressed as procedures for establishing and monitoring environmental targets which outline an acceptable change in ecosystem functioning.[7] The role the procedures collectively play in defining and monitoring 'sustainable development' in this context is therefore important.

It is very important to note the gradual improvement of the procedures' implementation towards sustainable development through impact minimisation and consensus. For example, from the lessons learned from the PNPCA to date (MRC, 2019), the MRC is putting in place improvements to the requirements for project development before and after the construction of hydropower projects to avoid, minimise, and mitigate impacts. For the Pak Beng and Pak Lay projects, member countries had agreed a JAP which is to be implemented by the notifying country and the developer before construction. This will inform the notified member countries of actions implemented in the design or operation of the projects to address their concerns raised during the PNPCA process. In addition, the member countries have agreed to implement joint environmental monitoring of certain Mekong mainstream hydropower developments after construction, with the intention to expand this programme basin-wide. This will allow the assessment of changes to the environment after project implementation and support adaptive management of the project's mitigation measures to address residual impacts measured upstream and downstream of the projects.

6. Water Diplomacy and Cooperation in Water Management of Mekong Basin

In the Mekong River basin, there has been a proliferation of cooperative mechanisms, of which water-related issues have been of various levels of concern. Amongst them, the MRC is the niche institution whose sole focus is on sustainable management and development of the Mekong Basin's water resources. Due to the sensitivity of water governance, its level of importance in the agenda of other mechanisms varies. Water issues are also prioritised in mechanisms such as the Mekong–Lancang Cooperation (MLC), the Lower Mekong Initiative

[7]International best practice suggests that targets for water management should include assessments of how much change in ecological functioning is considered acceptable, i.e. the 'good' ecological status of the European Union Water Framework Directive, the 'sustainable diversion limits' in the Murray–Darling basin, and South Africa's river classification system.

(LMI), the GMS, Cambodia–Lao PDR–Myanmar–Viet Nam (CMLV), and the Ayeyawady–-Chao Phraya–Mekong Economic Cooperation Strategy. These mechanisms serve as platforms for conducting water diplomacy, as they fulfil the roles of norm builder, policy dialogue facilitator and coordinator, and information hub for transboundary water resources management.

High-level Policy Coordination and Consultation

Subregional cooperation mechanisms serve as forums for riparian countries to consolidate their trust and enhance dialogue to jointly tackle common challenges on the basis of harmonising the benefits of all parties. High-level meetings (including foreign minister meetings and senior official meetings) offer opportunities for countries to share national interests and international obligations. In general, high-level diplomacy at the head of state, diplomatic special envoy, and minister levels represents the highest degree of institutionalisation of cooperation. Such high-level panels are fruitful for promoting friendly relations and negotiations, speeding up and sustaining diplomatic momentum by reaching joint documents which serve as a foundation for future cooperation, setting deadlines for the completion of an existing issues, and breaking deadlocks in negotiation. In addition, high-level platforms are opportunities for countries to gather information about other countries and their leaders, clarify intentions, create awareness, generate understanding, and foster cooperation.

In the Mekong River basin, meetings institutionalised at a high level are conducted on a regular basis, serving as an official configuration for policy consultation. As water diplomacy is mainly a top–down approach, collaboration through high-level policy consultation is considered an effective channel to enhance trans-boundary water resources management.

Cooperative mechanisms are successful in establishing formal frameworks for policy coordination where riparian countries share their assessments of the current situation with respect to water security, and discuss methods to synergise their attempts to counter challenges and improve water governance. The first MRC summit was convened in 2010, at which the Hua Hin Declaration reaffirmed the member countries' commitment to implement the 1995 Mekong Agreement, recognised the socio-economic importance of the development of water and related resources, and launched the reforms of the MRC, with the goal of making the organisation financially sustainable by 2030 (MRC, 2010b). The 3rd MRC summit in 2018 issued the Siem Reap Declaration, which reiterated the primary and unique role of the MRC in cooperating on sustainable development of water and related resources in the Mekong River basin (MRC, 2018c). Ministerial meetings with the participation of senior representatives of

the ministries of foreign affairs, natural resources and environment, etc., which focus on reviewing and evaluating the annual operation of the MRC and proposing working plans in the coming years, are necessary to handle existing problems immediately, paving the way for higher-level coordination and commitment.

The GMS holds a summit every 3 years to examine how global trends are affecting the subregion, the progress that has been made in cooperation and integration, and the best strategy for moving forward in the years ahead. In light of rising demand in the food–water–energy nexus, the 6th GMS summit released a joint statement in which member states committed to strengthening their cooperation regarding the sustainable use and integrated management of natural resources (including land, water resources, and forests) through transboundary cooperation and collective efforts – to achieve food, water, and energy security in the subregion (GMS Secretariat, 2018).

The MLC, which prioritises water resources within its agenda, has created a multi-level meeting mechanism from biennial summits, annual ministerial meetings, and senior officials meetings, to specialised working groups to boost institutional capacity (Thu and Tinh, 2019). The 2nd MLC summit in Phnom Penh in 2018 adopted two important documents – the Phnom Penh Joint Declaration and the Plan of Action on the Lancang–Mekong Cooperation (2018–2022). Notably, in 2019, China hosted the first ministerial meeting of the Lancang–Mekong Water Resources Cooperation, which saw the approval of a joint statement and the signing of a memorandum of cooperation between the Lancang–Mekong Water Resources Cooperation Center and the MRC Secretariat. This has been seen as a great effort to uplift the cooperation between China and the lower Mekong countries and create synergy in regional water resources cooperation.

With regard to subregional cooperative mechanisms with external partners, the LMI, Mekong–Japan Cooperation, and Mekong–Republic of Korea Cooperation consider water security as a major focus. Their joint statements, issued at high-level conferences, often highlight the significance of water cooperation. In 2018, at the 11th LMI Ministerial Meeting, member countries approved the restructuring of the mechanism into two pillars of cooperation, of which cooperation on water, energy, food, and environment is a priority. The United States (US) also supports the Mekong Water Data Initiative to strengthen water data management and information sharing in the lower Mekong. The results of the 2018 LMI Ministerial Meeting can be seen as a sign of a more concrete US commitment in the region. Moreover, the 1st LMI Policy Dialogue (a newly established platform for LMI countries) and the Friends of the Lower Mekong (for officials up to director general level) have served as a consultative platform

concerning transboundary water management, in which participants focus on the exchange of water data and ways of employing big data technology to predict droughts and floods in the subregion (Ministry of Foreign Affairs, Thailand, 2019).

At the 11th Mekong–Japan summit, with regard to sustainable natural resources management and utilisation, Prime Minister Abe emphasised the importance of managing water resources under an open framework and stated that Japan would enhance its coordination with the MRC. The leaders also reaffirmed their efforts to strengthen the capacity and application of advanced technology in water resources management in the Mekong countries (Ministry of Foreign Affairs, Japan, 2009). In recent years, the Mekong–Republic of Korea Cooperation has been accelerated and upgraded from ministerial meeting to summit. At the 1st summit in 2019, heads of state were unanimous in boosting cooperation in environmental areas and setting up the Mekong–Korea Biodiversity Center and the Mekong–Korea Water Resources Joint Research Center to accelerate the preservation of natural resources and sustainable development in the Mekong River (Ministry of Foreign Affairs, Republic of Korea, 2019).

Although some assume that conference diplomacy cannot generate substantial efficiency, as it acts as a talk shop without any teeth and joint statements are purely formal, the aforementioned high-level meetings play a crucial role in a trust-building measure, promoting dialogue, sharing national interests and international obligations, reaching a consensus for further cooperation, and carrying out strategic planning for future water governance in the Mekong River basin. More importantly, consensus reached at high-level meetings, especially summits, reflects the highest political will of a state. It should be noted that the building of consensus is complex and subtle. In addition, some detailed cooperative plans have resulted from these senior diplomatic activities, illustrating the effectiveness of the policy consultation process.

Data Sharing

The sharing and exchange of scientific information is a prerequisite for regional water governance. From the technical perspective, data are a crucial input for water resources management and help enhance adaptative capabilities to new and changing situations. The accessibility of water resources information is of great importance for water resources management, enabling early warning in response to natural disasters such as floods and droughts (Vannarith, 2019). From the political perspective, as theorised by liberalism, information exchange, especially through multilateral institutions, is a constructive measure in

the confidence-building process amongst riparian countries, giving impetus for more effective and comprehensive international cooperation, while the reluctance to share information may hamper the long-term relationship.

In light of transboundary water resources management, the 1997 Convention on the Law of the Non-navigational Uses of International Watercourses requires data and information on hydrological and hydrogeological areas to be exchanged regularly as well as upon request (United Nations, 1997). In the Mekong River basin, where hydrological data are considered sensitive (as upstream states are inclined to limit the downstream states' access to statistics about water withdrawals) (Affeltranger, 2009), the MRC has made an important contribution by gathering and processing substantial amounts of data on the river and its basin. This action of collaboration is legalised in the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River basin, which states that 'During the wet season, intra-basin use shall be subject to notification to the Joint Committee' and 'During the dry season, intra-basin use shall be subject to prior consultation which aims at arriving at an agreement by the Joint Committee' (MRC, 1995: Chapter 3, Article 5, Point B). In addition, the agreement regulates that one function of the Joint Committee is 'to regularly obtain, update and exchange information and data necessary to implement this Agreement' (MRC, 1995: Chapter 4, Article 24, Point C). This issue was elevated in the MRC agenda by the institutionalisation and ratification of the PDIES in 2001, which required all signatories to provide information on water resources and 11 other fields. The PDIES have three key objectives: (i) operationalise the data and information exchange amongst the four MRC member countries; (ii) make available, upon request, basic data and information for public access as determined by the National Mekong Committees concerned; and (iii) promote understanding and cooperation amongst the MRC member countries in a constructive and mutually beneficial manner to ensure the sustainable development of the Mekong River basin (MRC, 2001). Moreover, the Guidelines on Custodianship and Management of the MRC Information System under the PDIES are a repository of information on the river such as water availability, water use, water quality, and water extremes and flood monitoring. It 'collects and manages a range of data and information with its member countries and other regional stakeholders' and disseminates through its website and the MRC Data and Information Services Portal.

Amongst all datasets, water resources data sharing has recorded the largest number, solidifying the credibility of the MRC. It also serves as a platform for member states to promote the transparency of information related to pressing issues such as hydropower development. Recently, the MRC has worked on data exchange with China. As an MRC observer, China has

agreed to provide hydrological data to the MRC twice a day during the rainy season.[8] Despite the improved frequency of the information exchange, the level of data sharing from China still falls short of the requirement for effective water resources management. Since early 2020, in response to a call by stakeholders and to ensure that the Mekong's major dams (e.g. the Xayaburi and the Don Sahong) are monitored and disclosed, the MRC has been collaborating with the Lao PDR government and developers to keep track of the transboundary environmental impacts of these two dams through the MRC Joint Environmental Monitoring Programme. The purpose is to collect, create, and share reliable scientific data and information on the hydrology and hydraulics, sediment, water quality, aquatic ecology, and fisheries of each location throughout the basin.

Data sharing has drawn attention to other mechanisms. In the MLC framework, in response to requests from other partners for strengthening subregional cooperation in data sharing, China has proposed projects including the Lancang–Mekong River Space Information Cooperation Center and the Building of a Comprehensive Information Platform for the Lancang–Mekong Water Resources Cooperation.

Cooperation on data sharing has also drawn attention from external partners. The US, within the framework of the LMI, established the Mekong Water Data Initiative, a programme of the Sustainable Infrastructure Partnership, and put into operation 'Mekong Water' with the aim of supporting the MRC and promoting data sharing for disaster forecasting and policy making (Mekong Water Data Initiative, n.d.). On this basis, downstream countries are able to publish a new data sharing platform and a new impact assessment programme in the Lower Mekong. Moreover, the US intends to cooperate with the Republic of Korea (henceforth, Korea) to implement a project on using satellite images to assess floods and drought in the Mekong River; and collaborate with experts from the World Bank, Australia, France, and Japan to conduct dam safety assessments on 55 dams in the Lao PDR (To Minh Thu and Vu Thi Thanh Tu, 2019).

Consultation Related to Hydropower Development

The construction of hydropower dams has sparked controversy and increased strain amongst countries sharing the Mekong River, requiring a diplomatic approach to ease tension and mitigate the detrimental effects of these dams. Cooperative mechanisms facilitate water diplomacy through mutual notification, prior consultation, and dispute resolution.

[8] Before 2013, China shared its hydrological data once a day from 15 June to 15 October.

In this case, the MRC is an official platform for member countries to carry out their dialogue activities. Nonetheless, it should be noted that the MRC has no mechanism for basin-wide regulation of hydropower or other forms of sector development on the Mekong mainstream (Hung and Kenny, 2017); rather, it provides a platform for diplomacy instead of arbitration and enforcement. In accordance with the 1995 Mekong Agreement and the PNPCA, member countries need to hold prior consultations to discuss the potential transboundary impacts that mainstream hydropower development may have on the Mekong River flow regimes, water quality, and other environmental and socio-economic conditions before any commitment is made to proceed. The PNPCA have three separate parts: (i) notification – for tributary use and mainstream use, within the basin, in the wet season; (ii) prior consultation – for the use of water, within the basin, on the mainstream in the dry season, and for taking water out of the basin (inter-basin transfer) during the wet season; and (iii) specific agreement – for taking water out of the basin (inter-basin transfer) during the dry season (MRC, 2003b). The consultation process aims to prevent adverse impacts to riparian communities and the downstream. The first mainstream hydropower dam in the LMB, Xayaburi, is of great concern to riparian countries, donors, civil society, and non-governmental and international organisations due to its latent ramifications downstream. Before the Xayaburi proposal of the Lao PDR, hydropower projects in the lower river had only been constructed on the Mekong's tributaries, not on the mainstream. While proposed projects on the tributaries only need to notify other MRC member countries, mainstream development, considered to have more transboundary impacts, requires prior consultation so that member countries can rigorously review the project with the aim of reaching agreement on whether to proceed with the proposal, and if so, under what conditions. All mainstream development proposals are required to undergo the prior consultation process and aim to come to a unified agreement on how to proceed. Diversion projects, for example, diverting water from the mainstream Mekong will also require prior consultation and agreement amongst MRC member countries if the diversion involves using Mekong water in another basin. Up to now, 74 PNPCA projects have been submitted to the MRC, of which five projects have been under the prior consultation process while the rest have been initially informed and notified (MRC, n.d.). Although consultation is not about approving or disapproving the proposed water use, it is a rare tool for the notified countries and relevant stakeholders and communities to give suggestions and for the initiating country to accept certain measures to avoid, minimise, and mitigate any potential adverse transboundary impact and to find a better way to share the benefits.

In other examples, without the prior consultation process, the Pak Beng or Pak Lay mainstream hydropower development would not have been subjected to a second opinion. In the Pak Beng case, the MRC specialists and international experts reviewed the project documents to determine the projects' alignment with the MRC's Design Guidance on Mainstream Dams and to recommend measures for minimising and mitigating potential negative transboundary impacts. In its technical review, the MRC noted issues regarding the design and potential adverse impacts on downstream countries, fish passage, sediment transport, navigation lock design, and aquatic habitats. Although the 6-month consultation ended, the process did not end there. The Pak Beng and Pak Lay consultations both ended with the member countries agreeing on a JAP that provides mechanisms beyond the 6-month process for ongoing feedback, data exchange, and knowledge sharing between the developer and the Lao PDR, and the MRC and stakeholders concerning the ongoing design, construction, and operation (Sotheary, 2019).

With the notice and prior consultation process, the agreement only requires the parties to notify and consult 6 months in advance of a mainstream dam project; the consultee still proceeds with construction whether or not agreement is reached. This mechanism does not bind members to reach agreement, and the consulted country does not have the veto to request a project to stop. In fact, so far, the MRC Joint Committee has repeatedly had to extend the consultation period so that the MRC and its member countries fully evaluate the impacts and study measures to minimise the environmental impacts of projects. These regular extensions may cause stresses and rifts in the MRC if the country proposing the project states that member countries do not support or prevent the economic development of their country. Other mechanisms, albeit without niche consultation processes, also encourage discussions related to water utilisation in the subregion. Therefore, riparian countries have the space to raise such issues and affect policymaking.

Dispute Settlement

The MRC offers member states a pivotal mechanism for overcoming divergence related especially to hydropower plants, although other issues (particularly if they are placed beyond the mainstream and topics of concern apart from hydropower dams) are governed less effectively (Schmeier, 2013). The Mekong Agreement specified the MRC as the primary institutional mechanism for dispute resolution and asks for the MRC to 'make every effort to resolve the issue' (MRC, 1995: Article 34). If the MRC is unable to remedy a dispute, the next step is for 'the Governments to take cognizance of the matter for resolution by negotiation

through diplomatic channels within a timely manner' (MRC, 1995: Article 35). Furthermore, Article 35 of the 1995 Mekong Agreement provides space for external parties to act as external arbitrators and mediators (MRC, 1995). Although the MRC cannot perform the function of an arbitrator, to some extent, it spurs relevant stakeholders to pursue a diplomatic approach to solving disagreements.

Disaster Management

Natural disaster prevention and reduction is one pillar of water diplomacy activities. Existing mechanisms play the vital role of supplying fast and accurate flood and drought forecasting and early warning to the lower Mekong countries. The Flood Management and Mitigation Programme of the MRC provides technical and coordination services to the four countries in the LMB to prevent, minimise, or mitigate the civil and socio-economic losses due to floods and flooding, while preserving the environmental benefits of floods. Forecasts, flood data, technical standards, capacity-building, and training packages are key outputs of the programme.

In the Five-Year Plan of Action on Mekong–Lancang Cooperation (2018–2022), MLC member states reached a consensus on enhancing cooperation in the fields of disaster prevention and mitigation as well as humanitarian assistance – ensuring food, water, and energy security – while exploring various solutions for supporting people affected by disasters and the impacts of climate change (Lancang–Mekong Cooperation China Secretariat, 2018). These targets are concretised through a series of actions, including deepening Lancang–Mekong River flood and drought disaster emergency management, carrying out joint assessments of flood control and drought relief in the Mekong basin, and conducting joint studies on the early setting up of communication lines/channels for information sharing during emergencies such as floods and droughts on the Lancang–Mekong River.

On the LMI's agenda, disaster prevention and management are of high priority. The LMI Disaster Response Exercise and Exchange is an annual multinational exercise sponsored by the US Pacific Command under the Pacific Resilience series of exercises which it holds throughout the Asia-Pacific region. The objective of the LMI Disaster Response Exercise and Exchange is to boost regional readiness to tackle hazard situations in the Lower Mekong by advancing integrated subregional cooperation. According to the US Army, the exercise comprised a variety of activities, including working groups with panel sessions to discuss topics and promote communication and information sharing; a site survey where participants travelled to a dam near the mouth of the Perfume River in Hue; and a tabletop exercise where

member states worked together to develop solutions to a disaster scenario (Parameswaran, 2017). The GMS member states also coordinate to implement risk financing projects to help at-risk communities cope better with the economic costs of natural disasters and extreme weather (GMS Secretariat, 2017).

Regional Cooperation in Waterway Transport

The Mekong has been used for the transport of goods and people, especially in the stretches of the delta. However, upstream navigability remains challenging. The upper Mekong (starting from upstream of Vientiane) is full of rocks, reefs, and shoals that make navigation difficult and often dangerous. So far, riparian countries have attempted to facilitate waterborne transport for economic and ecological development. Three important regional agreements have been reached to regulate Mekong River navigation: (i) Article 9 of the Mekong Agreement (MRC, 1995) on Freedom of Navigation (Cambodia, the Lao PDR, Thailand, and Viet Nam); (ii) the Agreement on Commercial Navigation on the Lancang–Mekong River amongst the Governments of China, the Lao PDR, Myanmar, and Thailand, signed in 2000, followed by a Joint Committee on Coordination for Commercial Navigation; and (iii) the Agreement between the Government of Viet Nam and Cambodia on Waterway Transportation, signed in 2009. Development plans have been established under each mechanism of cooperation, including the Development Plan of International Navigation on the Lancang–Mekong River under the Joint Committee on Coordination for Commercial Navigation and the MRC Master Plan on Regional Waterborne Transport development in the Mekong Lower Basin. Notably, the MRC Navigation Strategy's focus 'to increase the international trade opportunities for the MRC member countries' mutual benefit, and assisting in coordination and cooperation in developing effective and safe waterborne transport in a sustainable and protective manner for the waterway environment' (MRC, 2003a: 38) can be seen as a foundation for water diplomacy amongst member countries in terms of waterway transport. In addition, waterway transport has been highlighted in the working agenda of subregional cooperative mechanisms such as CMLV and the Ayeyawady–Chao Phraya–Mekong Economic Cooperation Strategy. China has begun implementing projects on navigational safety and infrastructure transportation under the MLC framework.

Facilitation of Multi-Stakeholder Water Diplomacy

Although state actors are major players in water diplomacy, the engagement of non-state actors in water resources management has been increasingly noticeable and evidenced in

several mechanisms. In nature, the MRC is a purely intergovernmental organisation. However, it has been criticised for negligence of public voices in the basin community and concentrating exclusively on states' interests in water governance (Schmeier, 2013). In 2003, the MRC's Public Participation Strategy was issued, stating that 'stakeholder involvement in decision-making about sustainable development is fundamental to achieving feasible, equitable and lasting solutions' (MRC, 2003c: 3).This was buttressed by the issuance of the 2009 Communication Strategy, which emboldens people to access strategic documents, the minutes of Council meetings, programme documents, work plans, and functional data and research products (MRC, 2009a). This extends to 'para-diplomacy', which refers to the involvement of constituent units (regions) of (multi)national states in water diplomacy and helps enhance the effectiveness of water governance by engaging various actors' interests.

Furthermore, The benefits of establishing and strengthening partnerships with epistemic community groups for capacity development and knowledge enhancement should be appraise.. Noticeably, IWRM, considered the MRC's water diplomacy framework, is an exemplification of how a new approach to river basin governance proposed by the epistemic community was acquired and put into operation by an interstate institution. In addition, in February 2020, the MRC organised the 9th MRC Regional Stakeholder Forum to facilitate the participation of civil society organisations in the Luang Prabang hydropower project through holding informal dialogue to listen to their concerns and seek an appropriate avenue for effective coordination. Since consultation and policy-planning processes are embraced by non-state and sub-state actors, decisions can be responsive to local needs and contexts. Thus, informal water diplomacy in the Mekong basin is flexible and adaptative to the changing dynamics of the environment by stressing the role of local ecological knowledge. Such polycentric governance would not only vigorously boost robust river management through the diversification of problem solving, but also help achieve a greater sense of accountability and legitimacy (Sovacool, 2011).

Other mechanisms such as the LMI, MLC, and GMS also create space for the participation of relevant stakeholders. For instance, one development that is worth noting in the GMS is the adoption of a revised version of the Water Policy of the Asian Development Bank (ADB) in 2005 (ADB, 2003). The policy requires that 'all large water resources projects especially those involving dams and storage – given the record of environmental and social hazards associated with such projects – that all such projects will need to be justified in the public interest, and all government and nongovernment stakeholders in the country must agree on the justification' (ADB, 2003: 19).. By increasing openness and inclusiveness, mechanisms

attempted to bring in-depth multi-track water diplomacy to the fore in governing transboundary water resources.

7. Conclusions and Policy Implications

Although some positive outcomes have been achieved, subregional cooperation platforms show some limitations. First, despite the existence of more than 10 cooperative mechanisms, cooperation on water management in the Mekong falls far below expectations. Dams have been built on the river mainstream, causing irreversible and long-term environmental and economic impacts for the countries in the Lower Mekong Delta, such as lack of water, loss of sediment, and unexpected changes in the ecosystem. While the MRC is the most capable institution and has the mandate for water resources management, China has refused to be a member of the MRC and thus its actions in the upstream are not bound by the MRC's rules and requirements. Second, the countries in the lower Mekong region have limited economic capacity to invest in regional programmes and thus rely on external support. Mekong countries lack ownership over the funding and sometimes control of the development projects. This form of cooperation makes them voiceless and powerless in asserting their own regional and national interests vis-à-vis the geopolitical agenda of their development partners. The involvement of regional powers and their competing interests have complicated the Mekong cooperation dynamics beyond the control of Mekong countries (Bosba, 2018). Third, except for the MRC, which is an organisation, all other mechanisms are just forum-type policy consultation platforms for country leaders or specialists. There are no common rules for the use of water in the region, no mechanism with binding rules, and no dispute settlement mechanism. Fourth, the presence of so many cooperative mechanisms in a subregion of six countries inevitably leads to the overlapping and duplication of cooperative efforts. Thus, there remains significant space for the Mekong countries to play a more proactive role in setting the cooperation agenda and synchronising the areas of focus, which can help to harness these mechanisms more effectively for national and regional development. Fifth, there exist differences in the interests of Mekong countries as well as amongst the external partners, especially in the field of water resources management. Due to the pressure to speed up economic growth, the sustainable development aspect in many Mekong countries has not been paid enough attention; the 'power-shed' mindset is still dominant amongst regional policymakers. It is urgent that regional mechanisms play a greater role in coordinating the

different interests of individual countries in water usage on the basis of mutual respect and in accordance with international laws. Finally, power politics and the trust deficit amongst riparian countries and partners makes it difficult to coordinate amongst different mechanisms for common goals.

Despite the limitations, there are opportunities to strengthen water resources management mechanisms in the Mekong region. On the one hand, there have been positive moves in understanding the river, the way the water–energy–food nexus works, and thus the urgent need for more efficient water management. On the other hand, several external factors have emerged at the global and regional level which could facilitate better and more coordinated water resources cooperation in the Mekong. Looking ahead, to take advantage of existing mechanisms and overcome the above-mentioned limitations, it may be advisable for riparian countries and partners to consider the following recommendations:

- Riparian and partner countries should promote more rules-based governance of water management in regional cooperation for water management by (i) encouraging riparian countries to adhere to international law on water management; and (ii) establishing common standards and rules for IWRM, such as a code of conduct for the Mekong River basin. This code of conduct would help alleviate and prevent tensions in transboundary water management. It should consist of three main components: confidence building measures, preventive diplomacy, and dispute resolution mechanisms. Communication via the hotline, early warning, and the use of effective diplomatic staff are very important to prevent resource conflicts between riparian countries.
- The member countries should embrace the implementation of the 1995 Mekong Agreement through the five procedures and their technical guidelines, as they will be the IWRM -based rules for water resources development to provide the most benefit and minimum environmental and social harm. The implementation of the five procedures will support the national and regional development objectives for sustainable development.
- Members and partners should help strengthen the role and capacity of the MRC as a hub for water management and coordination amongst other mechanisms in the field of water management; and strengthen the implementation of the MRC procedures and technical guidelines. Information exchange and data sharing at all levels should be strengthened through bilateral and multilateral channels for regular updates, especially regarding new developments in the basin. Data sharing is crucial in both the rainy and dry seasons for equitable water resources management and disaster prevention and management.
- Riparian countries should coordinate to promote synergy amongst Mekong regional cooperative mechanisms so that they can be complementary and help address the interests of riparian countries. In the field of water resources management, major

partners such as ADB, the US, Japan, Korea, and the European Union are important as they can provide the resources, technology, and knowledge to serve regional economic development; and assist in seeking long-term and fundamental technology and policy solutions for sustainable development and environmental protection in the Mekong River region. In addition, the Association of Southeast Asian Nations (ASEAN) should play a more central role in the development of the Mekong Subregion. ASEAN can facilitate the policy coordination process, paving the way for elevating water governance and diplomacy in the Mekong River basin to a regional agenda. Simultaneously, this could increase opportunities for creating synergy amongst mechanisms that share topics of concern.

- Looking at the bigger picture, riparian countries should find alternative development opportunities that are less dependent on hydropower and extensive water use production. Cooperation should be promoted amongst Mekong riparian countries regarding the equitable and sustainable use of the Mekong River's resources, including water resources, on the basis of harmony of interests and with the aim of achieving sustainable development for the entire Mekong River basin.
- Any transboundary issues/conflicts should not be looked on as exclusively negative. Healthy conflict management can lead to growth and innovation, new ways of thinking, and additional management options. However, it is important to understand transboundary conflicts clearly, i.e. the fish losses and environmental damage which impinge on social and food security. Then, the negative impacts or conflicts could be effectively managed by reaching a consensus that meets the needs of all stakeholders. The goal is for all to 'win' by having at least some of their needs met. Recognition of this fact undoubtedly led to the Mekong Vision with the sharing of benefits.
- Transparency and public consultation are amongst the keys to the success of transboundary issues. Transparency would help to create an enabling environment for community participation and especially enhance the role of women. This service could be extended to the coordination of identifying and monitoring impacts so that mediation services may be offered early in the process to prevent tensions from leading to conflict.
- The member countries should envisage the future changes that will have significant impacts on water resources management in the Mekong basin, especially what the changes will be and the spatial distribution patterns of such changes.To what extent will these changes benefit people through the effective roles of state, community, and private sector action to respond to the food security of the poor who are affected by water resources management and development. Thus, state-of-the-art, evolving, and effective institutions such as the MRC will be crucial to facilitate development in the basin, with a sustainable basin perspective of the riparian states.
- Finally, water diplomacy – bilateral and multilateral – should be promoted on the basis of transparency and goodwill. A focus on transparency, as one of the most important principles and measures, could help build trust and confidence amongst the countries sharing the Mekong River. In this process, relevant governments should take a multi-stakeholder approach, encouraging the participation of government agencies and other groups such as academia, the private sector, and non-governmental organisations in subregional cooperation activities in a bid to strengthen mutual trust and understanding

and to seek new thoughts and ideas for future manoeuvres. The participation of the private sector in the process of designing and implementing cooperation programs should also be part of the process.

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