

MAJOR ISSUES AND CONCERNS OF THE MEKONG RIVER, AN INTERNATIONAL RIVER

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Introduction

The Mekong River originates on the Tibetan Plateau, flows through southern China, Myanmar, Thailand, Cambodia, Laos and Vietnam before emptying into the South China Sea (Figure 1). The river establishes the borders between many of the above countries. It is the source of life for all the inhabitants in its basin as major settlements have historically sprung up along its banks, floodplains and estuaries. The river provides water supply for the people, irrigation for agriculture, as a means of transportation, a source of food in fisheries, hydro-electric power, water use for industries, recreation and tourism, and as vital wetland habitats for wildlife.

Yet, for millions of years, the Mekong River has been meandering and flowing from Southwest China through Southeastern Asia unhindered and undisturbed by human-made obstructions or diversions (Sears, 2001). Historically, in the past, human adaptation to the river and flood plain environment was manifested in small-scale subsistence agriculture that did not bring about many negative effects. Humans merely adapted to the regimes of the river and co-existed side-by-side with it. However, the Mekong River Basin has undergone profound alterations that have accompanied the changes in land use and the economic development of the region. Amongst other things, the construction of dams, reservoirs and water diversion systems have brought about not only environmental degradation but also increasing environmental hazards such as landslides, sedimentation, water pollution and floods. More significantly, competition and conflicts (internal and external) between neighboring countries in terms of power generation, water use, navigation, fishing and other developments have marked a greater part of the history of this great river basin. Since the Mekong

River Commission (MRC) was formed in 1957, it has been the agency in charge of planning and coordination of development of the basin. Amongst other things, the MRC has attempted to develop the basin into a very productive hydroelectric power region. However, lack of funding, war and civil strife, non-cooperation of some member countries, competition in water resources utilization, and other conflicts have curtailed the effectiveness of the MRC.

Geography of the Mekong River Basin

The Mekong (called the Lacang-Mekong or Lacang-Jiang in China) flows from the Tibetan Plateau southeastward through the Yunnan Province of China and becomes a small portion of the eastern border of Myanmar (formerly Burma). As it flows from Myanmar, the Mekong becomes a portion of the northern border of Thailand and then leaves the Thai border and loops eastward and then south in western Laos. This loop again borders northern Thailand a few miles east of Vientiane and is the border between Laos and Thailand, the entire length of western Laos. Upon leaving Laos, the Mekong flows through the eastern one-third of Cambodia (formerly Kampuchea) and then through southern Vietnam into the South China Sea. The Mekong River is approximately 2,182 miles (4880 km) in length and the river's watershed affects approximately 50 million people (does not include the Chinese and Myanmar sections of the river). The largest populations involved are the 20 million in northeastern Thailand and the 20 million in the Delta region of southern Vietnam. The remaining 10 million people are in Laos and Cambodia. (Jacobs, 1995) The Mekong River ran its entire length unencumbered by dams until tributary development projects (in Thailand) and mainstream dams (in China) were planned and initiated in the latter portion of the Twentieth Century.

To better understand potential development solutions along the Mekong River Basin, one should be familiar with some of the region's recent history. Since 1957, Japan has been a major influence and involved with the countries of Southeast Asia in an attempt to create a stable Asian Cooperation/Commerce Zone. This would not only give Japan (hopefully) a major influence in Asian politics but also provide a market for their products to help rebuild their economy after World War II. To do so, the Japanese had to become monetarily involved in Asia to strengthen some economies (i.e., China, Thailand, and Myanmar) and help rebuild war ravaged economies (i.e., Vietnam, Laos, and Cambodia). Japan has been a major contributor/investor to the Mekong River development with not only money but also with construction expertise and technology. (Hori, 1997)

International Conflicts and War

For many centuries, the countries bordering the Mekong either had antagonistic feelings towards each other or totally ignored each other. The most logical reason for this mistrust is the types of governments governing those countries. China, for centuries, was characterized by feudal landownership and is now Communist. Thailand is a Constitutional Monarchy, the only country that has never been colonized. The three remaining countries (Laos, Cambodia and Vietnam) were feudal, and at times, colonies of foreign powers and are now Communist. Since the fall of Communism and the disbanding of the USSR, the Communist governments in Asia have altered their government-controlled economies and have interested in foreign markets and attracted foreign investments in their semi-private and private market economies.

Hence, historically there was little cooperation or contact between and among the countries having a stake in the Mekong River basin, perhaps with the exception of people living immediately along the river's course. Due to competition for land, water resources and other natural resources in the basin, many disputes mark the relationships between various countries at one time or

another. Centuries of antagonistic relations and distrust between and among these countries cannot be put aside or overcome in a few years even with the best diplomatic efforts (Sears, 2001).

Until the end of hostilities in Vietnam (circa 1945-1974), Laos (circa 1965-1974) and the overthrow of the Pol Pot regime and the treaty with the Khmer Rouge (1991) in Cambodia (formerly Kampuchea under Pol Pot), these three countries were unable to plan or implement development. In Vietnam and Laos, during the mid-60's to mid-70's all of their manpower and government resources were tied up in the war. In Cambodia (1978-1991), bloody civil war prevented any participation or planning. Since the Vietnam War and the hostilities in Laos and Cambodia, two of the three countries (Vietnam and Laos) have built dams and developed tributaries of the Mekong River.

Haphazard Development and Environmental Degradation

In addition, development has been haphazard as there is little co-ordination even within the same country, let alone between different countries. In the Laos for example, upstream logging and agriculture developments have caused sedimentation and downstream flooding (Jacobs, 1995). In the case of conflicts between countries, developments in China, Myanmar and Laos (all upstream) have given rise to flooding and water pollution problems in downstream countries such as Kampuchea and Vietnam (Xiaofeng and Dongling, 1997). In a nutshell, the need for development and revenues to uplift the people's standard of living largely overrides the need for environmental conservation. Hence, the majority of national policies of the Mekong basin did not worry much about development effects of the countries up or downstream.

The issue of Nationalization of the river by each individual country also gradually impinged upon the river's environment (i.e., forest, soil, plant/animal diversity, fisheries losses and diminished water quality and quantity) and created local social problems (i.e. degraded environment and resources

plunged indigenous peoples into abject poverty) as development became more rapid in the last half century or so (White, 1962). The realization of the damage to the ecosystem and ecology of the entire region did not become immediately apparent. During the later part of the twentieth century, while economists were seeking to utilize hydroelectric and water diversion in their economic development of the river, the damage to the ecology became evident. (White, 1963) Planning for the development of the Mekong had little involvement of scientists or experts on previously developed river systems to avert the environmental outcomes that would ensue.

Poverty Amidst Rich Natural Resources

Despite the richness and diversity of the Mekong River Basin (Qichen and Lijuan, 1997), most of the countries within the basin are developing or Third World countries. This is more so in the past although China and Thailand may well be classified as newly industrializing countries (NICs) now. Hence, lack of funds to develop the basin was a major problem in the early years. Foreign aid was also lacking. Without external monetary and expert support, all of the Eastern and Southeastern Asian countries involved did not have the national incentives or the funds available to alleviate the centuries old social and environmental/ecological problems that may have been created. The World Bank, the Asian Development Bank and foreign government investors (i.e. Japan, Sweden, United States, etc.) have played key roles in developing the Mekong River. In the past few years, however, they have slowed or stopped their investments in the projects to reevaluate the outcomes to society and the environment, by using environmental impact studies that were not previously done. Dwindling economies and military operations in the sixties, seventies, and eighties also lessened the availability of funds from some foreign investors.

Thailand was probably one of the exceptions in that it had sufficient resources to carry out substantial developments in the basin. In the early 1950's, Thailand built dams along the Mun River in northeast Thailand and planned to divert the Mekong and the Mun

Rivers to irrigate the region. In contrast, Myanmar (Burma), thus far, has not made plans for building on the Mekong River and does not want to be a member of the MRC. Vietnam was of course completely impoverished by the war with the United States. Regional and civil wars also had a role in impoverishing many countries in the Mekong basin. For example, war and hostilities occurred between Vietnam (circa 1945-1974), Laos (circa 1965-1974) and Cambodia (formerly Kampuchea under Pol Pot). Consequently, much valuable resources were poured into the war rather than used constructively to plan or implement development. In Vietnam and Laos, during the mid-60's to mid-70's, all of their manpower and government resources were tied up in the war. In Cambodia (1978-1991), bloody civil wars prevented any participation or planning. However, since the Vietnam War and the hostilities in Laos and Cambodia, two of the three countries (Vietnam and Laos) have built dams and developed tributaries of the Mekong River.

Laos is the poorest country along the Mekong River, thus, the Asian Development Bank and foreign country investors are essential to their plans. The World Bank and other outside investors are now debating Laos' plans for development and utilization of their timber and hydroelectric potential. The investors are trying to determine Laos' exact intent in developing their portion of the Mekong River (whether for monetary gain or ethnic cleansing).

The Mekong River Commission (MRC) and Development of the Mekong River Basin

The Mekong River Basin is a region with vast natural resources. The region is at the cross-roads whereby many volatile countries meet and history has shown that conflicts and wars have rocked the political stability of the region. More importantly, the Mekong River is an international river that is subject to competition for its resources by all the countries involved, and conflicts are not uncommon. The international community is not slow to recognize this. The United Nations started targeting some developments on international co-operation as far back as the 1950s but their efforts

have not been sustained, both on the count of commitment as well as funding.

In 1957, the United Nations sponsored the formation of the Mekong River Committee (MRC) to coordinate the development of water resources of the Lower Mekong River. Even though Myanmar and China are also located on the Mekong River, they are considered as part of the Upper reaches of the Mekong. They did not become members of the MRC. Myanmar was not interested in developing the Mekong and thus did not want to be a member. China was not a member of the Economic Commission for Asia and the Far East (ECAFE) in 1957, so it was not authorized by the Commission's by-laws to be a member of a United Nation's sponsored organization.

In the late 1960's, Thailand built the Bumibol and Sirikit dams along the Ping River in northeast Thailand to irrigate this arid region. (Jacobs, 1995) Until the end of hostilities in Vietnam (circa 1945 to 1974) and Laos (mid 1960's to 1974), these two countries were not conducive to planning or implementing projects. During this period, the Vietnamese and Laotians focused their manpower and governmental resources to war affairs. Vietnam and Laos established Communist governments after the conflict. The MRC's contracts with governments were no longer valid and could not be implemented. Therefore, it was necessary for the MRC to reestablish itself and begin coordination for planning again. After 1977, the beginnings of civil wars precluded Cambodia's participation in the MRC. In January 1977, the three nations (Thailand, Laos and Vietnam) met in Bangkok (Thailand) and formally established the Interim Committee for Co-ordination of Investigations of the Lower Mekong Basin. The Interim Mekong Committee would have to operate for the next fifteen years with only three of the four member nations.

From 1978 to 1994, it was important for the Interim Mekong Committee to develop different strategies. Originally, the completed plans to develop the entire Lower Mekong River Basin without Cambodia, a scaled-down planning scheme had to be adopted. With Cambodia in the middle of the Lower

Mekong Region, both ends of the basin could be developed, but not the center. Also, funds for development from foreign investors and banks declined after 1978 and would not return to pre-1970 levels (Sears, 2001). The decline of funding by foreign investors was due to shrinking economies in their own countries. (Jacobs, 1995)

Cambodia could not function as a member of the MRC after 1977 and was off-limits to the Commission during the period (1977-1991); this was because of continuous civil wars. Even during the midst of continual conflicts, the MRC developed plans for use after the conflicts. In this way, Cambodia could build and develop their portion of the Mekong with little delay (Chomchai, 1991). The end of the Pol Pot regime and the treaty with Khmer Rouge (1991) allowed the remaining countries of the MRC to begin to implement full development of the Lower Mekong. Since the Vietnam War and the hostilities in Laos and Cambodia ceased, two of the three countries (Vietnam and Laos) have built dams and other developments on the tributaries of the Mekong River.

During 1992, Cambodia was again able to send a representative to the MRC and actively take part in planning and development. In 1995, the Mekong River Committee was re-established as the Mekong River Commission with the assistance of the United Nations Development Program (UNDP) to coordinate and implement cooperative sharing of the Mekong River and its resources. The main members are: Thailand, Laos, Cambodia, and Vietnam; now, with China as an auditing member. This is a key phase of the committee, since China was not and could not be a member of the committee prior to 1995. Now, 5 of the 6 countries bordering the Mekong River are involved in the implementation of resource development and sustainability. The committee took prompt action to improve Asian relations in order to carry out cooperative development of the water resources in each country. (Hori, 1997)

No matter whether the MRC or any other agency is designated to coordinate and regulate the implementation of any plans for

development, some basic problems must be resolved prior to any development. Just a few of those key problems are listed below and will be discussed individually:

1. Hydroelectric power and Irrigation
2. Water resources, Water quality and Fishing.
3. Navigation, Transportation and Communications.
4. Salt Water intrusion (Vietnam Delta) and Groundwater Over-Extraction

Current Issues and Concerns from Development

1. Hydroelectric Power and Irrigation

Presently, Eastern and Southern Asia (along the Mekong River Corridor) is a vast, virtually untapped market for foreign goods and technologies (as many investors and market analysts believe). At the same time, Eastern and Southern Asian countries are trying to create their own foreign markets/exports to equalize their imports and build their economies. Along the Mekong River Basin, Asia is modernizing manufacturing and increasing agricultural outputs to increase exports and to create their market share in the world economy (presently only Thailand and China). Simultaneously, to provide political and economic stability in the Mekong Basin, the poorest countries of the MRC (Laos, Cambodia and Vietnam) are trying to catch up with their Asian neighbors. To ensure social and political stability for the entire Mekong River basin, all of the MRC countries need to build sustainable economies. Thailand and China have a lead in both economic stability and developed economies; they were able to begin development 30 years earlier (1960's). However, both countries have been guilty of rapid over-exploitation of natural resources resulting in environmental degradation and this needs to be overcome.

Most economists and investors agree that only 1% of the Mekong River's potential for development has been achieved. This may be a small percentage of the whole area, but economists and investors are primarily seeking the monetary potential of an area, not the social or environmental aspects.

With the environmental devastation and the increase of environmental hazards and environmentally caused diseases, communities are realizing that they need to change their over-zealous approaches to resource exploitation. Local communities have long used adaptive and environmentally friendly approaches to development and in recent decades, many communities are beginning to use innovative and sustainable approaches to reach traditional goals and objectives.

While hydroelectric power from dams built on the Mekong River and its tributaries seem as a key to the generation of the needed energy for developing the potential of the MRC nations, gigantic dams may not necessarily be the only solution. Nearly 200 hydroelectric dams are planned along the Mekong and the multiple tributaries, but due to cost and the recent rise of the "green" awareness, many have been stopped or dropped. (Jacobs, 1995). There are sufficient tributaries to build many small dams and maintain enormous development, but the potential environmental degradation from the development needs to be properly addressed. The MRC has not had the funds, experience or sufficient years to effectively research the effects of the dams and diversion systems. Apparently, the MRC has not conducted research on previous dam projects and their results. It needs to take into consideration EIA Studies, as well as, environment audit systems in all its projects, big or small. It seems that by repeating mistakes along the Mekong River, the entire basin will have the familiar and resulting negatives of the Columbia River basin. These two developments created a network of dams and reservoirs, but impeded and destroyed life downstream.

The MRC member nations' main focus, initially, is to provide electric power for industries (the base of the present economy). Because of the proximity to the industries, the urban populace will be the first to benefit from the electricity (city lights and home conveniences). Electricity to the rural areas will require intense planning and investment. For the non-urban populace to receive electricity, the countries could establish a Rural Electrification Co-

operative. For an example, the successful Co-op system established by the Tennessee Valley Authority (TVA) in the United States is still being used to coordinate between the power producers and the consumers.

A second purpose for intercepting river water is for irrigation purposes. Northeast Thailand, the Vietnam Delta, and Southern China are most interested in building diversions for irrigation. All three countries have built diversions systems and are planning to build more in the future. Laos and Cambodia, though, are still in the subsistence farming stage of development and will require more investment and expertise to increase their harvests and exports. In the long term, banks may not be willing to invest in Laos and Cambodia to make them equal with the other MRC members; the lack of manpower in the countries and amount of arable land may not support the monetary investments. (Jacobs, 1995)

Dams and diversion systems can and do aid economies as well as introduce desperately needed capital and investments. But, what are the problems that occur with such development?

2. Water Resources, Water Quality and Fishing

Water resources are of paramount importance in the development of countries in the Mekong River basin (Heng and Haixing, 1997). Investors will try to hide the pitfalls associated with the development of a river, such as the Mekong, to encourage the MRC into plans that may or may not be good for the members. For developing economies, such as most of the MRC membership, these projects have been approved with little or no attention paid to the history of projects in other countries and regions (i.e., the United States, South America, etc.). (Tu, 2000) Investors know these histories, however, they will not commit financial resources to countries that are too cautious.

The infrastructure (roads, railroads, etc.) built before these dams provided access to previously impenetrable areas. The entire Mekong Basin possesses extreme

topographic features (mountains, jungle, swamps, etc.) that could not be economically developed before the dam construction, due to limited access, except on foot or by the river. With the easy accessibility of these areas, mining and forestry development increased dramatically. For MRC members needing financial assistance (who needed to pay back loans for dam building, water diversions and crop investments), the development of these resources was a blessing. Not until a few years after completion of the dams, did they realize the problems that they have created.

Much of the Lower Mekong Basin is mountainous with dense jungle where soil is very thin and kept in place by the trees that grow above. When these trees are removed, the thin soils easily wash down slope. With a humid, tropical climate and seasonal monsoons, the high reaches of the mountain areas are stripped of soil by runoff. This soil is carried by overland flow to the river or the impounded lake and this causes high rates of sedimentation. (Chan, et. al., 2000) Mining (i.e., gold, silver, metals, etc.) is done in some of the same areas and the mine tailings or chemicals used in the mines are part of the runoff. Soil and chemical wastes create a toxic blend that can be sent down to the river when the floodgates are opened. (Chan, et. al., 2000)

Numerous dam sites, but not all, are experiencing a similar problem. Inhabitants down river are receiving uneven flows of water from the impounded lakes. These uneven flows have caused flooding of rice fields and excessive riverbank erosion. For centuries, during low flow conditions along the river, the locals would build vegetables gardens in the soils of the riverbank. These gardens are a major food source and add variety to their diets. The dam does not regulate the water downstream in equal amounts or at regular intervals each day, so the local populace cannot predict the daily river levels. The villagers can no longer plant gardens along the river to supplement their diet.

Green algae is growing in the upper layers of the water in the impounded lakes. When the dam releases water over the spillways,

only the upper layers of the water are released and the algae flows with the water (the green algae is detrimental to people, animals, and fish). Numerous people and livestock have died from the algae. Because the farmers and crops need water from the river, the food becomes infected, which causes long-term illness and death. (Lohmann, 1990)

The uneven flow of water and the pollution have also affected the fish, another local major food source. When generating electricity, dams raise the temperature of the water and increase turbidity. The size of the dam and the megawatt output of the powerhouse will determine the changes in temperature and turbidity of the water downstream. This temperature increase and turbidity may affect the water as much as 100 miles downstream. Fish will not survive in these conditions. During the uneven release of water from the dam, many of the fish are swept further downstream. Many of the fish do not survive and may not return to the same areas. Seasonal fish migrations for feeding and spawning are blocked by the dams. Fish ladders have been built on some of the dams but the fish have not been successful in overcoming these obstacles. Fish species are dwindling in some portions of the river. In other locations, the fish face extinction and many fishermen are losing their livelihoods. (Tangwisutijit, 2000)

When water is released from the dams, the resulting high water levels create riverbank erosion and unusual flooding of the rice fields. People understand natural flooding during the wet season, but high water levels and flooding are now occurring during dry season. This flooding is due to the release of excess water from dams above the villages. Stream bank erosion is the major problem. The high water inundates fields near the river, drown cattle, and sometimes people. The high water levels and the floods that are induced affect the rice crops, fishing and village lifestyles. (Kenji and Linsheng, 1999)

3. Navigation, Transportation and Communications

For countless centuries, peoples of the Mekong River Basin have been navigating the Mekong River unencumbered. The varying topography (mountains, jungle, and marshes) of the Mekong River limit movement overland, thus, the river and its tributaries become very important for transportation, communications, and supply. Only those villages along the river have contacts with advancing technologies or the outside world through movement along the river.

Unrestricted navigation of the river is considered essential to the import and export trade. This trade helps the economy of the local area. The climatic regime of the Mekong River with seasonal flow fluctuation determines timing of the river's navigability. During the dry season, lower water levels of the Lower Mekong preclude the river's use except by shallow draft boats. For the duration of the dry season, trade diminishes between different sides of the river as a result of low load capacities of shallow draft boats. At other times, during rainy season, the only means to reach other cities is by boat. Dams change the water levels and may severely restrict the required movement of food and people between cities. The river sometimes serves as a boundary between countries and it is the only medium of contact and trade. In the Laotian and Cambodian mountains areas, the river is the only means for reaching the outside world.

Variations in climate and terrain also determine what infrastructure can be built for the Mekong River Basin. Roads, railroads, and other transport facilities are present in Thailand because of the large population centers and relatively easy terrain to traverse. An investment in any roads or railroads in Laos and Cambodia would be a very expensive endeavor and would not show any quick return of money. The mountains, jungle, and sparse population centers would not be conducive to long term investment. Investors are looking for a quick return on their money, not a long-term debt. Neither Cambodia nor Laos have the resources available (i.e., metals, lumber, etc.), without intense, long-term investment and environmental degradation, to attract the interest of investors. The mining and lumber industries have already been

exploited to pay for the projects already completed and have caused the loss of approximately 70% of the countries' natural resources.

4. Salt Water Intrusion (Vietnam Delta) and Groundwater Over-extraction

The Delta Region of Vietnam developed slowly from wind-blown and water-deposited soils. Nutrients and soil sediments from upstream are transported by the Mekong River and the annual monsoon floods and deposited on the mouth of the Mekong River (The Vietnam Delta). With the nutrient and soil deposits of the Mekong River, the delta developed rich soils and has become one of the most productive rice producing areas of Southeast Asia. This region is now home to approximately 20 million Vietnamese farmers, the second largest population in the MRC Basin. (Northeast Thailand has the largest population)

The topography of the land is low, with many marshes and swamps, which creates water problems. The delta depends on the regular flow of the Mekong River to recharge the wells and the nutrients of the rice fields. With more dams and diversions upstream, the amount and quality of water reaching the area will diminish. Even though only a few dams have been built upstream the effects are already noticeable.

The Vietnam Delta Region is bounded entirely on the east by the South China Sea. The Vietnamese people draw water daily from the wells in the area, this amounts to millions of gallons each day. In the past few years because of dams built upstream, inadequate river levels have created a desperate situation for the people. Salt water is replacing fresh water in an increasing number of wells and many of the rice fields. Rich farmland is lost to the salt intrusion of the South China Sea. The Mekong River levels are insufficient to flush the salt water from the wells and the marshes. With further development along the river the salt-water intrusion will intensify. There are significant water-level losses from the Yali Falls hydroelectric project on the Se San River located in Vietnam 70 miles upstream of the Cambodian border, and other proposed

Vietnamese dams. (Lohmann, 1992) The resulting problem of salt-water intrusion will move farther up to the river, possibly to the entire basin of the Mekong River.
Conclusion

The Mekong River Basin is an important region in the future, as it has been in the past and present. Future development efforts should be coordinated amongst the countries involved with a view to share resources and development them in a comprehensive and co-ordinated manner. Countries involved need to realize that disputes and conflicts would benefit no one, least of all the peoples who inhabit the land near the river. More importantly, co-ordination, mutual-help and tolerance must be adopted by all countries to avert international conflicts and war. The United Nations have warned that the wars in the 21st century would not be fought over gold or oil as in the past, but over water – a most precious resource that is becoming scarce. Already, the world is witnessing conflicts in water-stressed regions such as the Middle-East (Jordan River), India-Pakistan (Indus River), India-Bangladesh (Ganges-Brahmaputra Rivers), North Africa (Nile River) where wars have broken out. Countries in the Mekong River basin must avoid conflicts and war at all cost.

In the case of the environment, development efforts must adopt the United Nation's sustainable development approach rather than the west's rapid development approach which has decimated their environments (Yanxiong, 1997). Efforts should now be intensively focused on preventing further environmental and ecological damage. Most of the previous articles lament at the poor levels of sustainability, though the acceptable level of sustainability was not clear. In order for future development of the Mekong Basin to proceed smoothly with minimal environmental and ecological damage, sustainable development must be practiced by all the countries involved.

Future development needs to also focus on individual projects, and their related problems and disputes but in an integrated manner based on the model of Integrated River Basin Management (IRBM) (Chan and Kung, 2001). The length and the immensity

of the Mekong Basin area will make any analysis of the Basin exceedingly broad and not applicable to the MRC's needs, as such, extensive, coordinated, scientific expertise will be required to provide the vital statistical information needed by the MRC to manage and monitor all development projects.

The Mekong River is not confined to one jurisdictional boundary, as it flows through its many geographical regions. Because it flows through many countries and various cultures, conflicts of interest are inevitable and successful management can be complicated and difficult. However, the following are some suggestions:

1. Prioritize the projects and invest wisely.

The MRC nations are eager to develop and expand their economies. Banks and other lending institutions are not philanthropists; the main motive for lenders is investments and large, quick return on their money. Natural resource sustainability and preservation is the last priority in the investor's mind whilst profit margin is the number one priority. No matter who sponsors the lenders, banks and other lending institutions main objective is profit.

Since the MRC nations have such poor economies, anyone offering "Easy Money" is welcomed and encouraged, even when environmental concerns are neglected. In many cases, investors pressure the recipient to rush through planning and implement projects quickly to receive a quick turnaround on their investment. This has led to environmental degradation and unsustainable exploitation of resources. Many recipients are also overwhelmed by the amount of money involved and will attempt into doing anything to receive more.

2. Research and implement in reference to hydroelectric power stations, water diversions systems.

Hydroelectric power generation is not new. Hydroelectric power plants and the accompanying problems and environmental concerns, have been studied for nearly 90 years. With the comprehensive research on the dams and power stations in the United States, Europe, South America, and Africa, the same mistakes should not be made.

3. Plan for sustainability PRIOR to construction of projects.

The planning and implementation process to preserve natural resources and to promote development must be done before construction, not after the resources have been depleted. Many local village people were relocated prior to impounding the water. The infrastructure built for the project gave easy access to mining and forestry industries. This encouraged the act of stripping natural vegetation and forests. Plans for reforestation of accessed areas and selected cutting of trees may help sustainability. Educate local populace about sustainability.

4. Build fish hatcheries and restock domestic fish species.

This suggestion calls for long-term investment by the MRC and financial backers of the projects. Without long-term investment and adoption, this will not occur. For most of the people of the Mekong River Basin, fish are essential to proper diet. Fish stocks are constantly declining due to dams, diminished water quality and contamination. The deterioration of diets and livelihoods can become serious problems that will undermine the fragile peace of the Mekong Basin and its development. Initiating fisheries and replenishing domestic fish stocks in the main river and the tributaries, are essential for the sustainable development of the region.

5. Monitor and address problems that may occur because of proximity to hydroelectric power stations.

The unexpected flooding, water pollution, and food contamination increasingly affect indigenous villagers. These problems are caused by water discharge from the dam site in the upper stretches of the river and lake. Green algae grows exponentially in the upper levels of the lake. Villages below the dam have diminished fish stocks and food contamination. Any food items (e.g., fish, livestock, rice, etc.) are contaminated by green algae. The algae causes diseases and even death. The villagers need to know the responsible agency to contact in order to receive prompt action before diseases and death increase dramatically.

Before the MRC can proceed with future plans, the member nations need to step back and re-evaluate the environmental and social conditions that were created. The environments surrounding the developments and the social conditions of the people have continually deteriorated. Forests, water quality/quantity, livelihoods (resettlements), disease and death have seriously increased.

The MRC nations are desperately seeking investment capital. However, the countries' ambitions are beginning to strain both the resources and the sustainability of development. Development of hydroelectric power, timber harvesting, mining, manufacturing, and money all come with a price. Sustainability should be the motto and barometer for current and future investors. The Mekong River possesses potential to create enormous power for countries of Asia, but the cost to societies' standard of living and the environment damage must be given as much attention as the regional development.

Naturally, the urban populace, as yet, have not been affected by the social and environmental problems; the urban dwellers have only reaped the benefits. With the instability of some of the governments of the MRC, the social and political situation could become very volatile. Three of the MRC countries (Laos, Cambodia, and Vietnam) have spent numerous years in bloody civil wars, further hostilities cannot be far below the surface of their consciousness. The MRC nations must re-evaluate their priorities, re-establish social and environmental impacts and plan for a clean future. The political and social economies and the stability of the MRC region will be determined by the outcomes of their plans.

Future research needs to focus on sustainable development of natural resources. (Fisheries, forestry, agriculture, water resources, etc.); environmental impact assessments of all future projects; Integrated River Basin Management (IRBM); water resources sharing; natural hazards management; and bilateral relations between the countries involved.

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Figure 1: The Mekong River Basin.