

Water Security in the Mekong River Basin Challenges, Causes and Solutions

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Abstract

Water, an essential element in sustaining life is of special importance to society and economic development. Although renewable, water resources are not infinite. It can be said that equitable and sustainable water resource management in the context of climate change is a challenge that all Mekong countries have been facing. The challenge becomes bigger in the context of water scarcity when the total amount of water is sharply decreasing and the water quality is declining, failing to meet domestic and industrial needs. Based on a study into the current situation of water security in the Mekong River, the author points out the basic challenges that threaten water security in the river basin. At the same time, the author discusses the reasons leading to this situation. Based on the research on the current situation of challenges and underlying causes, the author proposes a number of necessary solutions to cope with current and upcoming challenges. These solutions, including legal, diplomatic, economic and political solutions, should be implemented in a synchronized and long-term manner in the future.

Keywords: water; security; water security; Mekong River; challenge.

1. Introduction

Water is the essential need of mankind. Being transboundary and transregional is one of the characteristics of water resources [15,30]. The most difficult thing is to harmonize the interests between countries that share the same water source to ensure the sustainable development of countries in the same basin. Therefore, water security is a complex issue of most concern to most countries [27].

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The Mekong River is the largest river in Southeast Asia, originating from the Tibetan Plateau, China, flowing through the territory of 06 countries: China, Myanmar, Laos, Thailand, Cambodia and Vietnam. The Mekong River has a main stream length of 4909 km, it is the second largest river in Asia and the 12th in the world, ranking 8th in total flow. There are about 60 million people living in the Mekong River basin of 795,000 km². The Mekong River has become an important element of economy and life for people throughout the basin and the countries through which it passes [11]. However, with the characteristic of an international river, the Mekong River is a transnational resource owned, managed and exploited by 06 countries [11]. Because of this, any exploitation activity of one of the 06 countries directly affects the water resources of the other countries. Under the impacts of climate change, the pressure of socio-economic development in each country through which the river flows, especially the development of hydropower dams in the river basin, the security of water resources has been threatened and faced with serious challenges. These challenges come from many different causes, including both subjective and objective causes. Therefore, finding solutions to overcome the above situation is important for a sustainable river basin to develop in the future.

2. Challenges to water security in Mekong basin

Although water security is a commonly used concept, there are many different definitions. The 2013 United Nations Commission on Water Security defines water security as the capacity of a community to protect sustainable access to the sufficient amount of water [26]. According to the author, this is the concept that best fits the international community today. With the above concept, it can be seen that water security in many countries has been seriously threatened. Water security is the link in the chain of food, energy, climate, economic growth and human security challenges that the world will face in the next two decades [29]. Currently, the Mekong River water source has been facing the following basic challenges:

First: *the river ecosystem is being gradually broken down and seriously threatened, leading to the amount and quality of the Mekong's water being changed in a bad way.*

The assessment of the ecological health of a river should be based on a number of factors including water quality, flow and riparian environment. In fact, a range of ecosystems in the Mekong basin is home to a diverse range of plant and animal species, many of which are still being discovered. River ecosystems have provided many valuable functions, including significant protection from floods and waste water filtration. The diverse ecosystem of the Mekong basin is the basis for a range of livelihood activities and food security for most people living in the region. Rivers provide fish and other products for food or income, provide water for farming and are important transport routes. This close relationship also means that people will be especially vulnerable when the water security of the Mekong is threatened, when the river ecosystem is degraded. However, the serious climate change worldwide has facilitated the spread of alien species and diseases such as malaria and dengue fever in the Mekong basin. These effects will only worsen as the climate begins to warm up, millions of tons of methane trapped in the permafrost in the Tibetan Plateau will be released and CO₂ from the forests will be released, insects attack, all of these effects will directly affect the quality and quantity of water resources [20]. One noteworthy issue is that the construction of a series of dams of China and some countries downstream of the Mekong has been posing significant challenges for the river and its natural resources. Mainstream projects

are to reduce vertical connectivity and unity of the Mekong ecosystem. Dams will turn 55% of the downstream length into a number of standing water reservoirs, and some sections of the river will flow quickly and strongly behind the dams. These dams will alter the natural flows of the river so that it cannot regulate floods and water during seasonal changes. Dams on tributaries can have a negative impact on the timing and length of the seasonal flow. Accordingly, the flow and aquatic environment, the vast ecosystem of the Mekong River will be threatened; more than 100 species will be endangered [3,7]. The loss to the river's biodiversity will be permanent and irreversible. Mainstream projects can cause serious terrestrial environmental damages, affecting the wetlands.

Second: *Serious water pollution*

Water in the mainstream of the Mekong River is not yet heavily polluted but the water in the tributary system along the river basin has been polluted. Water quality in small tributaries flowing into the mainstream of the Mekong is getting worse due to flooding, urban wastewater and the construction of hydroelectric dams. Waste, especially plastic dumped into rivers, is a problem for all river basin countries. Mekong Delta of Vietnam, Tonle Sap Lake of Cambodia, swamps near Vientiane in Laos, Khorat Plateau... can be considered as polluted hot spots in the Mekong River basin. In these areas, there are some persistent inorganic pollutants in the accumulation layer and aquatic organisms (phytoplankton, crustaceans and fish) with DDT being the primary pollutant. High levels of heavy metals have been found in areas with high boat traffic or high population densities, mainly in the lower section of Phnom Penh and in the Mekong Delta [19]. Especially in the Mekong Delta of Vietnam, many studies have shown that surface water pollution in artificial canals and some densely populated cities like Can Tho, Chau Doc and My Tho can threaten human health, animals and ecosystems due to many impacts from upstream combined with the effects of sea intrusion. The Mekong water flowing through this area is mainly used for drinking, irrigation and domestic use [8,16,17]. Currently, water pollution from industrial sources has been identified in the lower Mekong region, especially in cities like Vientiane, Phnom Penh, Northeastern Thailand and the Mekong Delta. Industrial development in the lower Mekong region is still at an early stage but has been increasing rapidly [8,16]. The industrial demand for water is expected to increase rapidly across the Mekong basin. The treatment of industrial liquid waste in countries is generally limited and the treatment and elimination of industrial and toxic wastes has not been implemented effectively. Industrial water pollution mainly concentrates around factories and in big cities, in the near future it will increase as the industry expands. The sharp decline in water quality in these areas is mainly related to agricultural development, urbanization and industrial waste [6,19,20]. It can be said that water pollution will be more serious in these areas under the pressure of population growth, industrialization, agriculture and tourism, requiring food production and economic growth. Improving water quality is a challenge for riparians.

Third: *Water scarcity in the Mekong basin*

At present, in many areas of high rainfall in the Mekong River basin, there is also a shortage of water. Water is scarce, especially in the dry season when ponds and lakes are exhausted. Water scarcity is different from drought because drought is a natural phenomenon but water scarcity is associated with water shortage due to unsustainable water use. There are two sections in the Mekong River basin including the upper part of the

basin, which flows within China and the lower basin, from Laos to the coast of the Mekong Delta. In the upper catchment, the main source of water is from melting snow in the Tibetan Plateau, contributing relatively little to the total volume of water, accounting for only 16%, Myanmar contributes 2% and the remaining 82% of the Mekong water is from rainfall in Laos, Thailand, Cambodia and on the spot of the Mekong Delta. Of that 82%, rainfall in Laos contributes 35%. The watershed from Thailand and Cambodia contributes 18% each [17, 23, 24]. But the rainfall in the lower basin depends largely on the weather. However, the impact of climate change and the Elnino phenomenon have led to a decrease in rainfall in Laos in recent years, low water level, the Mekong River Delta suffering from lack of floods, which means future water scarcity and exhaustion. Thailand has also mentioned three reasons for the decline of the Mekong water source due to drought, insufficient rainfall and the reduction of water discharged from hydroelectric dams upstream [10]. The Mekong River Basin in recent years has experienced water scarcity, notably the severe drought that led to economic losses of millions of dollars in 2017. In 2016 also in these areas, there was a severe drought caused by Elnino. The historic 2016 drought event is the clearest evidence. Most of the lower regions of Laos, Northeastern Thailand, Cambodia and the Mekong Delta of Vietnam were severely damaged by extremely dry weather. [16,17, 23]. The Mekong River Commission (MRC) announced in June and July 2019 that the Mekong water level was below the minimum level recorded for many years. According to Thailand's Nakhon Phanom hydrological station, the average rainfall in 2019 was only 90 mm/m³ compared to 2018's 300 mm/m³. In July 2019, even during the mid-rainy season in Thailand, the water level of the Mekong river flowing through Thailand reached the lowest level ever in the century [23]. In July 2019, in Chiang Sae, Chaing Rai Province, Thailand, the water level was 2.1 m, much lower than the average water level for 57 years (1961 - 2018) of 3.02 m. In Vientiane - Laos, the water level is 5.54m, 0.7 m lower than the average for many years. In particular, in Thailand, the water level of the Mekong River in the "golden triangle" bordering 3 countries Thailand, Myanmar and Laos has dropped to its lowest level over the century in 2019 [4]. In 2015, the flood was very low but the water level was even higher than 2019. Although everyone has the right to use water, in fact, some people have higher priority in using water. In most countries of the Mekong, water demand for urban areas with high population density and high economic value industries takes precedence over water scarcity. Rich households and people living near water infrastructure have many opportunities to access water, so the poor are at disadvantage, especially women and the poor in rural areas due to financial and location constraints. The transfer of water use from agricultural to urban and industrial sectors threatens farmers' livelihoods and consequently jeopardizes food security in the Mekong region. Also, drought resulting from climate change without any water source also has negative effects on agricultural development. Meanwhile, the demand for water for living and production will increase sharply due to socio-economic development and population growth in the countries of the Mekong basin. These countries are predicted to experience a tense dry season in 2030 [4,14,23].

Fourth: *The issue of saline intrusion has led to a sharp decline in the quality of water resources.*

Climate change in the Mekong River Basin will lead to major changes in the flow of the river and high tide will directly affect the extent of saline intrusion in downstream delta areas. Sea level rise and saline intrusion are increasing. The Mekong Delta is considered as one of the three deltas most affected by sea level rise and saline intrusion [1]. Across the Mekong Delta region, temperatures are rising, over the past 50 years, the temperature has increased by 0.5 to 1.5 degrees Celsius [4.8]. While the rainy season in some parts of the region may be

shortened, the total rainfall is forecast to increase. This means that there will be a lot of heavy rain in a short time. Sea level rise is threatening communities living in coastal areas of Mekong Delta as well as the ecosystems in coastal areas. Ice melting from the top of Himalayas can have negative impacts on the main flow of the area, leading to saline intrusion which directly affects the fresh water quality of the area [9,17]. The Mekong Delta is particularly endangered because it has a long coastline and the delta is only slightly above average sea level. Even a small increase in sea level can cause a catastrophic widespread disaster when the monsoon combined with high tides creates large waves, especially during the storm season. This will result in widespread and more severe floods, like typhoon Linda and typhoon Nargis. The sea level rise in the Mekong Delta is quite large, about 6mm a year and about 13 to 150 mm a year in the Chao Phraya Delta [4.8]. Soil collapse due to groundwater extraction and sediment's being captured by hydroelectric dams have led to Mekong Delta's gradual sinking and rising sea levels have led to severe saline intrusion, greatly affecting the quality of fresh water used for domestic and industrial purposes [9].

3. The cause of the challenges

The water security of the Mekong River Basin is seriously threatened due to many subjective and objective reasons, as follows:

First: *climate change has a strong impact on water security.*

The Mekong region, especially the downstream area, is vulnerable to the impacts of climate change. Climate change has caused extreme events such as increasing drought in the dry season, the effects of El Nino and La Nina, etc. This trend is changing the circulation of water in nature and thus having major impacts on water resources. On March 20, 2018, in Can Tho, Vietnam, the forum "The Mekong Under Threat: Protecting People and Ecosystems in a Fast-Changing Basin" was jointly organized by International Rivers (IR), Center for People and Nature (PanNature), coalition "Save The Mekong" (StM) and Mekong Environment Forum (MEF). In the forum, concerns about livelihoods and risks for tens of millions of families in the basin were raised. The dual impacts of climate change and development of the Mekong River Basin are facing a great challenge in adapting to and developing this area ... In many parts of the Mekong River basin, under the impacts of climate change, it is forecast that the temperature by 2030 will increase by about 0.8 degrees Celsius, along with the decrease in rainfall in the dry season, drought, severe water shortage in the future [4.17]. Without sediment, the delta will not be filled, the devastation of the flow will increase, and landslides in downstream areas will take place dramatically. The continuous flow along the river is replaced by terraced flows due to the occurrence of hydroelectric dams. The current hydrological regime is no longer seasonal and natural, but fluctuates according to the function of hydropower plants, which directly affects the environment and biodiversity. Because sediments are trapped in hydroelectric reservoirs, the negative sediment balance leads to a change in the topography of the river bed, river banks, estuaries and the coast of the delta. The amount of alluvial surface on the delta is thinner. Aquatic resources of fresh, brackish and salt water in the coastal areas are also negatively impacted [8,9,12].

Second: *Differences in sharing benefits in the Mekong basin*

No one can deny the direct or indirect benefits that the Mekong River brings. For businesses and investors, the benefits from the river are hydroelectricity and energy. For governments, that could be a source of revenue for the national budget, opportunities for development and energy security, food security, and water security. For riparian communities, the river provides resources to ensure livelihoods and daily living. In particular, the national interest is the dominant factor, impacting water security in the Mekong River [18]. While sharing the common geographic features of the Mekong, each riparian country has its own benefits and priorities. Thailand needs water for agricultural development in the Northeast; Laos needs capital and experts to develop hydropower plants; Cambodia needs the assurance of fish stocks in Tonle Sap Lake; Vietnam needs water for agricultural production in the Mekong Delta. China, the upstream country, through many political attempts, seeks to control the water source, the energy source that the Mekong brings, proceeds to dominate and control the Southeast Asian economy for political intentions. Since each country has the right to decide whether to use the river in its territory, they will unilaterally carry out plans and projects, especially hydroelectric projects, without taking into account the benefits of the river and other nations' interests. Also, the countries are not able to agree on a policy or guiding principle for ensuring the water security of the Mekong River [22,24].

Third: *the exploitation and use of water resources of the Mekong River, especially the construction and operation of hydropower dams, are a great risk to the security of river water resources.*

It is estimated that the total electricity demand of the Mekong sub-region increases by an annual average rate of 6.9% and about 61,000 billion W per hour [4]. Countries have simultaneously developed hydropower plants to meet the increasing demand for energy, serving economic development, forming a hydroelectricity race in the subregion. On the Mekong River, upstream of the Chinese basin (Lan Thuong), there are 08 hydroelectric dams. In the basin of Thailand, Laos and Cambodia, 12 mainstream dams and hundreds of branch hydropower plants have been built. Besides hydropower, the downstream area is also affected by water transfer projects of Thailand and China [7, 23]. The construction of hydropower will displace hundreds of thousands of people. In addition to the obvious impacts such as changing the flow regime, reducing sediment, obstructing waterway traffic and seriously threatening fish resources, hydropower also has a direct impact on flood control or water regulation. China is the country with the world's largest upstream hydroelectric potential. China's hydroelectric development program in the upper Mekong region started in 1986, including 15 major hydroelectric dams on the mainstream, half built with 8 hydroelectric dams blocking 40 billion cubic meters of water in 2019 [2,4]. For the downstream area, there are currently many projects under implementation. There are 10 hydropower dam projects on the mainstream flow through Laos and Thailand and two projects in Cambodia. Currently on the Lan Thuong River, as of July 2019, China has had 11 hydroelectric dams with a total electricity output of 21,300 megawatts. Moreover, China is also planning to build eight more dams in the river basin, both in the mainstream and on its tributaries. The Washington-based Stimson Center estimates that these dams could generate an additional 6000 megawatts of electricity for China. Hydropower investment in Laos has received great attention not only from Asian countries such as China, Thailand, Vietnam but also from European countries. While the impact is primarily outside of Laos, the Lao government gains economic benefits at a minimum cost of "equity capital", which is the rivers flowing along the country. There are many hydroelectric dams in Laos but they are smaller than those in China, as of July 2019, 64 dams yield less than 6000 megawatts of electricity, but 63 others are under construction. With the ambition to become a source of energy in Asia, Laos also proposed

building more than 300 dams. This plan could make the output of Lao hydroelectric plants exceed that of China [22]. In Thailand, Park Mun, the 25-year-old dam funded by the World Bank, operated by EGAT Thailand Power Authority on a Mekong tributary, has had an adverse effect over 6 times more than expected on the life of 262 households. The dam also ruined the local fishing industry, despite fierce opposition from locals and NGOs. Later, heavy rains swept away the dam causing inundation in neighboring communities in both Myanmar and Laos in 2018 [21,23,25]. The reason for the development of mainstream hydropower plants along the Mekong River is due to the increasing demand for energy. In recent decades, the Mekong basin has had a high economic growth rate accompanied by an increase in electricity demand. Hydropower is expected to be the economic leverage of the nations. Hydropower has long been considered a sustainable source of energy because it is renewable and does not emit greenhouse gases during the production process. In addition, theoretically, dams help control water flows, regulate water flows, prevent floods or drought downstream, thus helping to develop agriculture. Therefore, while the development of other renewable energy sources such as marine energy, wind power, solar energy still faces many financial and technical obstacles, hydropower is always a feasible option which can't be ignored by the states. In addition, there has been the support of major international and regional financial institutions. Despite having made a statement not to finance mainstream Mekong hydropower projects, major financial institutions such as the World Bank (WB) and the Asian Development Bank (ADB)'s heavy investment in hydropower for decades can be considered an indirect support for the development of this energy source [13,21,25]. However, hydropower, especially mainstream hydropower, has been causing a series of negative impacts for the whole basin. While hydropower only directly benefits national grid consumers, developers, financial investors and governments in the host countries, most of the costs and losses caused by hydropower development place poor coastal communities and a number of economic sectors at risk. If they are built, mainstream dams downstream of the Mekong will permanently change the flow and the nature of the river, affecting the quality and flow of water, reducing the amount of fertile alluvium, causing serious damages for fisheries and agriculture, profoundly affecting the lives and livelihoods of people living along the river and water security. The dam system also threatens aquatic and coastal ecosystems, pushing some of the Mekong's endemic species into extinction.

Fourth: *Cooperative mechanisms for ensuring water security and regulating the common interests of the Mekong basin are not effective in practice.*

The Mekong River Commission (MRC) was formally established in 1995 as an intergovernmental cooperation organization of Laos, Cambodia, Thailand and Vietnam on their shared common interests, including water resource management and sustainable development of the Mekong River. The MRC was established in the spirit of the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin [4]. Since its inception, MRC has adopted many regulations and procedures and become an advisory body, providing information in many areas such as fisheries, water transport, flood and drought management, environment, hydropower development. However, the activities of this mechanism are not really effective, because this is not a decision-making organization, and there is no enforcement power, the regulations that the MRC makes are not binding on Member States. The Greater Mekong Subregion (GMS) is a development cooperation organization established in 1992, with active support from Japan and particularly the Asian Development Bank (ADB). GMS is the most comprehensive cooperation program in Mekong sub-region

cooperation including Vietnam, Laos, Cambodia, Thailand, Myanmar and Yunnan Province, Guangxi (China) [4]. Although it includes 06 countries for the purpose of building trust and promoting regional cooperation, GMS does not really have many activities directly related to ensuring water security. The US Lower Mekong River Initiative (LMI) was launched on July 23, 2009 in Thailand during meetings between US Secretary of State Hillary Clinton and Ministers of Foreign Affairs of Cambodia, Laos, Thailand and Vietnam [4]. This is an American initiative to help downstream countries strengthen cooperation, improve their capacity to deal with non-traditional security challenges or cross-border issues. However, it is very difficult for LMI to directly prevent the construction of dams in countries and ensure the security of Mekong water resources because this mechanism does not involve the upstream country, China. The main reason for the inefficiency of the institutions is due to the different interests of the nations in their integration into the mechanisms. China and Myanmar are not yet official members of the MRC. Although China has become a partner country (it used to be an observer) and has begun to cooperate on a number of issues, the willingness to increase its level of cooperation has not improved much. Vietnam and Cambodia also want multilateral mechanisms to play a greater role in controlling the actions of upstream countries that cause damage to downstream countries. While Thailand and Lao are the countries in the middle, they will continue to fight for the common provisions that can be applied to all countries in the river basin [28].

Fifth: *Pressure from population growth and socio-economic development.*

Urbanization is a trend of the Mekong sub-region countries as people from rural areas flock to expanded urban centers in search of opportunities. Although the majority of the 60 million people living in the Mekong River Basin mainly live in rural areas, the rate of rural population growth is expected to decline over the coming decades. This is a great pressure on the water resources of the Mekong River, especially concerning the problem of fresh water distribution and water pollution. The conflict between fresh water demand and economic and living development needs takes place in many places.

4. Solutions

It is forecast that the population in the Mekong River basin may increase rapidly, industrialization and urbanization will accelerate and will reduce the area of agricultural land, while increasing the demand for clean water as well as generating more waste water. The increase in pressure on already depleted water resources has led to escalating conflict between the upstream and downstream water users. Addressing the challenges towards Mekong river is a regional issue requiring cooperation and agreement between the countries concerned with the support of the international community. Some of the following basic solutions need to be taken into consideration and implemented by countries, organizations and individuals in the river basin to deal with challenges to water security concerning the Mekong River.

First: *Ensuring the consistent participation of stakeholders in addressing water security issues in the Mekong River Basin*

Widespread commitment to address water security needs to be put on a regional scale to ensure that activities in

a country are not compromising or effectively reducing the efforts of neighboring countries. Governments should respect the regional common strategy such as investing in the development of renewable energy sources and technologies, and efficient use of energy to avoid economic and ecological risks, while ensuring economic development in an environmentally friendly manner. Environmental values should not be viewed as an obstacle to economic development but should be seen as an opportunity to transform into a truly sustainable future for the region. The benefit-sharing issue should be placed in the context of different benefits across the basin instead of focusing solely on each location, project or merely in terms of compensation for economic losses for the parties who are directly affected. Sharing here does not only imply the benefit aspect, but also takes into account the risks and negative impacts on other countries. Innovative payments for environmental services can be applied across the basin, coordinated by the MRC, to harmonize the interests of each country in the region. Regional agencies for water security should be established to conduct holistic, comprehensive and objective research. Because the real situation and possible impacts on riparians of hydroelectric dam projects are now thought to be underestimated, it is easy for some countries to adopt the policies without the comprehensive coordination of related parties. It is necessary to strengthen the perceived risk reduction actions of the leaders of basin countries as sovereignty and autonomy are among the factors affecting the prospects of cooperation in managing and sharing the benefits of water source. Leaders can feel the risk of being driven by outside decisions, not only in terms of control of infrastructure and resources, but also in terms of independent decision-making power in the territory. Obviously, besides cost and benefit calculations, national leaders are controlled by the risks and opportunities they perceive subjectively. Therefore, solutions to minimize risks in cooperation also play an role as important as improving economic benefits for member states. [30]. To ensure the principle of fairness and equality in development, countries in the basin need to consider and develop common standards for environment, society and investment that are responsible for development activities, thereby, stakeholders in countries have the same playing field in exploiting, managing and using Mekong water resources. That is the common trend in regional and global integration today.

Second: *Implement legal tools to address issues related to water security in the Mekong River Basin.*

States have the right to pursue socio-economic development goals that serve their countries, but when using the same river, they must follow the rules according to international practices. Legally, states need to promote the implementation of the 1997 United Nations Convention on the Law of Non-Navigational Uses of International Watercourses [4,24]. This is the first global convention to completely regulate relations between nations in the use of inter-country water sources with the aim of ensuring the equitable and rational use of water resources between upstream and lower areas. Although in many sub-regions, apart from Vietnam, no countries along the Mekong have joined the Convention, it is clear that in the coming time, countries need to accelerate the process of joining the Convention in order to apply the principle of fairly and reasonably using water resources as a common standard in the exploitation of the Mekong River. There is also the 1995 The Mekong Agreement for Cooperation for the Sustainable Development of the Mekong River basin and the Mekong River Commission's Water Use Regulations, which are internationally recognized water principles that need to be followed to ensure water security [4,24,25]. It is necessary to consider the issue of "water resources ownership" following the international trend of cooperation and development with the spirit of promoting the common interests instead of unilaterally developing the water resources of each country. The basic principles of

the 1995 Agreement on "equality, sovereignty", "fair and reasonable use" should be respected and, if necessary, specifically reinterpreted with goodwill and cooperation which have been originally confirmed since the Agreement was built. Moreover, attention should be paid to innovating ways of managing and using water sources in the whole basin. Monitoring data should be shared with countries in the basin. The stages from design to operation management of the hydroelectric plants need to be considered to minimize the negative aspects affecting the river basin ecological environment.

Third: *Strengthen diplomatic activities with countries in the region and major countries to maintain good relations, a peaceful and stable environment and avoid making Mekong a big problem in relations between nations, especially Southeast Asian countries.* The countries in the Mekong River basin need to ask developed countries like the US, EU, and Japan to invest and support in enhancing the capacity to respond to non-traditional security challenges, improve the lives of people living in the Mekong River basin. Enhancing the promotion of the people's diplomacy, the meetings and the exchanges of good practices between the people of the countries along the river, creating common voice and actions among the peoples of the countries in order to impact the government policy-making process. States should take advantage of existing cooperation mechanisms among countries in the region to bring Mekong water security into the agenda of ASEAN forums and conferences. Currently, the Mekong is a hot spot for dialogue and conflicts among countries in the region, the main cause of the conflict is the construction of dams or destruction of fast-flowing areas. With a special position as a source for agricultural activities, trade and water transport between countries in the region in general and the whole world, the Mekong plays an important role in promoting the economy in the countries it passes through, so it is necessary to have cooperation between the parties to ensure fairness, sustainable development and environmental protection in the activities of building facilities on this arterial river [31]. Therefore, it is necessary to frankly recognize the political nature of transboundary water. Because opportunities and access to water among countries in the same basin are different due to the nature of the water source, thus when managing, exploiting and using transboundary water sources such as the Mekong River, it is necessary to prioritize political solutions over environmental, technical and economic issues alone. For MRC, the most important intergovernmental organization in water management, it is necessary to reform processes and procedures towards transparency and consensus-based decision-making. The ambiguity of the 1995 Mekong Agreement has indeliberately facilitated states with interests in determining the rules of the game. However, reforming processes and procedures can help solve existing problems. The first is to democratize decision-making by allowing the public to contribute their voice to this process and the consensus of affected communities must be an important requirement including project agreements while important researches and MRC processes are still underway. Finally, it is the responsibility of the states to ensure that joint decisions comply with the Mekong River Agreement and when there are any questions or doubts involved, the MRC must invite lawyers to join, instead of being merely an authorized agency in decision-making, the MRC must develop a mechanism that allows the organization to have some of the instruments of accountability and conflict resolution among member governments. At the same time, international communication should be promoted in order to raise the awareness of people of riparian countries about the importance of water security; call on developing countries to place higher priority on water security in national plans and budgets; engage countries in food security, energy security, health and climate change initiatives. International seminars on water security

should also be conducted more in order to consult scholars' initiatives and recommendations in the process of protecting the interests of downstream countries.

5. Conclusion

Water is a limited resource. However, the current world population growth and rapid socio-economic development put great pressure on water resources around the world, notably the lack of water and pollution of the sources. The Mekong River system is to face major water security challenges in the coming decades. Hydropower plants development projects, irrigation network expansion and water transport systems combined with the effects of climate change will all have significant impacts on the river's environmental conditions and in some cases, threaten the biodiversity of aquatic flora and fauna in the basin and the livelihoods of people living in the system. The visible challenges are: water scarcity, especially clean water scarcity; water pollution; changes in the ecosystem in the river basin leading to drastic changes in the quantity and quality of water resources. The underlying cause of these challenges is the different interests among the countries in the Mekong basin; the situation of exploitation and use of water resources of the Mekong River; the construction and operation of of hydropower dams as a great risk to river water security, inefficient cooperation mechanisms, the pressure from population growth and socio-economic development. Whatever the causes are, the countries in the Mekong River basin all share the consequences of losses, not only this generation but many generations after. With any development activities in the basin, attention needs to be paid to water security for a sustainable development in the future. The solutions should be implemented in all countries, focusing on political and legal solutions. Each country should implement solutions appropriate with its geographical, natural, socio-economic characteristics to serve national and regional sustainable development, and at the same time, make sure to protect water resources throughout the Mekong River Basin at present and in the future.

V.N.H.H

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