

# CLIMATE CHANGE IMPACTS IN THE MEKONG RIVER BASIN: VULNERABILITY AND POLITICAL RESPONSE

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June, 2020

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## ABSTRACT

Climate change is causing negative impacts on all countries and their production activities. Mekong River basin is ranked as one of the most vulnerable regions under climate change. To adapt with climate change, Mekong countries have built their national policy strategies and action plans. In addition, some climate change response initiatives have been introduced and implemented at sub-regional level. This short paper reviews climate change impacts and responding policies of the Mekong countries. It uses data, maps, schemes and reports published by different sources for the analysis. All these information is systematized from Langcang upstream (Yunnan China, Myanmar) to mid-and-downstream (Thailand, Laos, Cambodia and Vietnam Mekong Delta). The paper also analyzes and discusses some challenges in the climate change policy implementation in the Mekong region.

*Key words: Climate change; Mekong River Basin, National policies; Response; Vulnerabilities.*

## 1. BACKGROUND

Climate change has become a global issue. Mekong river basin has attracted international attention in term of its vulnerability under climate change. The basin is formed by Mekong - the largest international river in the Southeast Asia which flows through 6 countries including China, Myanmar, Thailand, Laos, Cambodia and Vietnam (Figure 1). These countries have diverse geographical, cultural, ethnic, living and production characteristics. However, they are all dependent on water regimes, lands, and other natural resources for development. Mekong basin is known as a productive area for agriculture, fishing, and aquaculture. It is also reasonably endowed with natural resources such as minerals, energy, forest and biodiversity.

Similar to other tropical monsoon river basins such as the Ganges-Brahmaputra-Meghna in Bangladesh and India, the Nile in Egypt, the Mahanadi in India, and the Volta in Ghana, the Mekong River Basin has experienced as one of the world major deltas severely affected by climate change and sea level rise (Ericson *et al.*, 2006). Mekong river basin is home to more than 70 million people (2007) living across the six countries (Chem *et al.*, 2008). Therefore, it is even more vulnerable due to high population density and high poverty rate. Extreme climate parameters, not only in terms of intensity but also duration and frequency, create many potential risks to the lives and livelihoods of the local communities. Additionally, climate change raises a big concern over water security in the basin (Michel and Pandya 2009; De Stefano *et al.* 2012).



Countries are differently affected by climate change depending on their the natural, social and economic conditions. Therefore, each country may have different policy approach for climate change adaptation and mitigation. This paper analyzes climate change impacts in six Mekong countries and their responding policies. It focuses on some specific issues as following: (1) Climate change impacts in Mekong countries; (2) Climate change policies at national and regional level; (3) The main challenges in policy implementation; and (4) Conclusions and suggestions. The review uses data, maps, schemes and reports published by different sources. Information is presented systematically from Langcang upstream (Yunnan China, Myanmar) to mid-and-downstream (Thailand, Laos, Cambodia and Vietnamese Mekong River Delta).

### 3. CLIMATE CHANGE IMPACTS IN THE MEKONG REGION

Climate change has become a global issue in recent decades. It is associated with crop failures, life damages, economic losses and other critical ecosystem vulnerabilities. Under climate change, Asia and Pacific Ocean region are more vulnerable comparing to the rest of the World. According to some assessments, Mekong River Delta is one of the three most vulnerable deltas in the world. The region is affected by higher air temperature in average, stronger heat waves, increasing number of hot days, extending abnormal rainfall amounts, abnormal flooding patterns and sea level rise combined with salinity intrusion in the coastal areas (Ericson *et al.*, 2006; Eastham *et al.* 2008; TKK & SEA START RC, 2009; Tuan and Supparkon, 2011; MRC, 2014). Climate change affects not only floodplains but also highland regions by increasing extreme weather events, extensive forest fires, riverbank erosion and landslides.

The change of water regimes in the Mekong river system also negatively affects biodiversity, aquaculture and fisheries. In the Lower Mekong Delta of Cambodia and Vietnam, riverbank erosion and sea level rise result displacement of millions of people throughout the Delta (MRC, 2019). IPCC (2007) has warned that if the sea level rises 1 meter, the Mekong Delta may lose 15,000 – 20,000 km<sup>2</sup> of land, and about 3.5 to 5.0 million of people will be affected. However, above damage is simply estimated basing on the natural Delta topography and current population distribution. Other factors such as rainfall, upstream floods, storm surges and sea tide have not been calculated.

Based on Global Circulation Models (GCMs) combined with the downscaling regional climate model PRECIS developed by the Hadley Center, it is projected that, the average max/min temperature in the Mekong Basin will increase from 1 – 3 °C in the hot months (from January to April) in the next 2 - 3 decades. As forecasted, the basin will have longer dry seasons and shorter rainy seasons. On the other hand, Lower Mekong River Delta in Vietnam will be suffering from saline intrusion due to accumulated consequences from the decrease in the water flow from the upstream Mekong River and the raise in sea level. It will be resulting changes to cropping patterns and productivity due to negative effects on aquatic and terrestrial ecosystems (MRC, 2009).

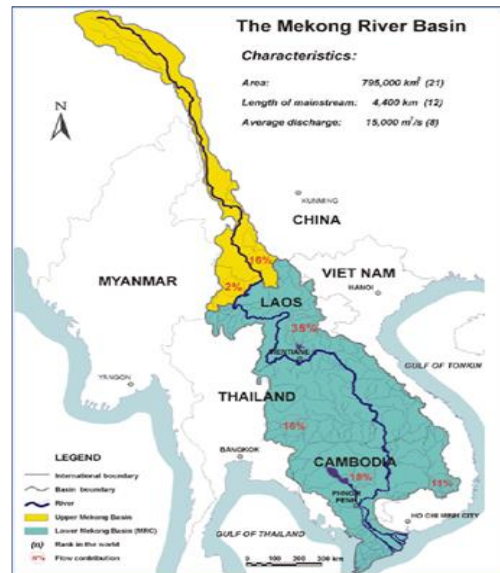


Fig. 1: Map of the Mekong River Basin  
Source: Mekong River Commission, 2009a

The rainfall will be fewer in the early rainy seasons (April – May) but it may increase dramatically at the end of rainy seasons (September – October). As forecasted, north-east Thailand and the Tonle Sap catchment of Cambodia will suffer from high water stress during the dry seasons (Eastham et. al., 2008). According Supparkorn (2008), if CO<sub>2</sub> amount in atmosphere is double from nowadays, the rainfall in the whole Mekong Region will be changed. It is also projected that the duration of the flood days in the border area of Cambodia – Vietnam, in Long Xuyen Quadrant and the Plain of Reeds may reduce. Otherwise, the flooding area may be extended its inundation boundary towards Ca Mau Peninsula. The storms seem to move down to the southern region in the East Sea. A combination of higher temperature, lower rainfall, extensive



flooding and sea level rise will affect significantly agricultural activities in general and rice production in particular, adding more pressure to the livelihoods of people living in the delta (TTK & SEA START RC, 2009).

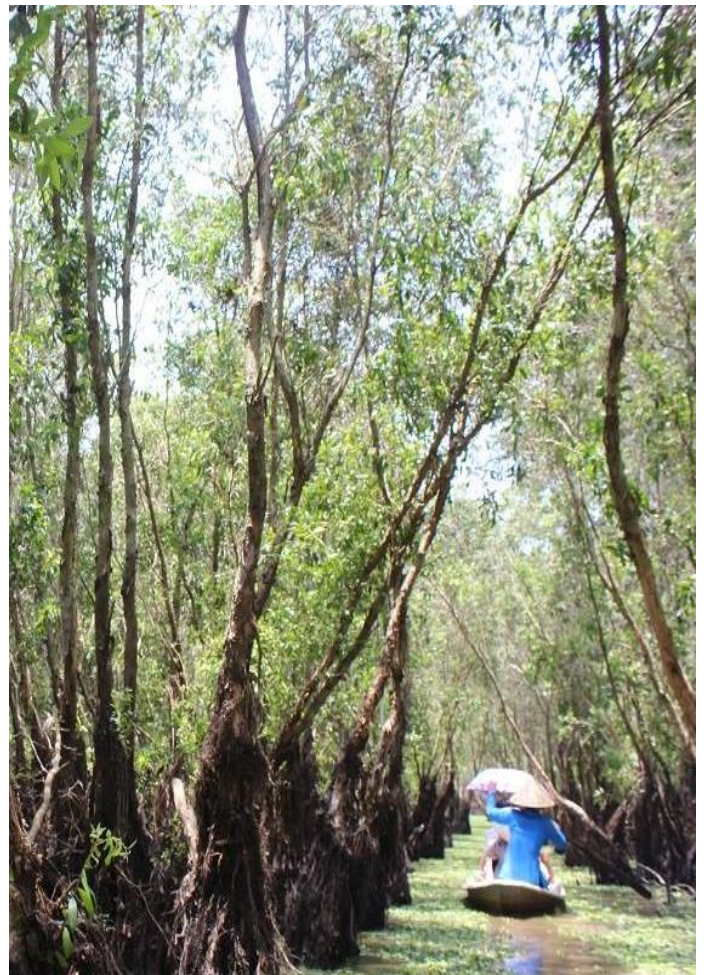


In China, Lancang River area (in Yunnan province) has features of highland and arid zone (Eija Pehu, 1999). Yunnan is an agricultural province. In the upland plains, rice and corn are main crops. Meanwhile, bananas, coconuts, sweet potatoes, soybeans and coffee are extensively grown in the south. During period of 2009-2016, the severe drought events continuously happened in Yunnan and its neighboring zones. Especially, Yunnan seriously affected by drought in the summer, autumn and winter of 2009, 2010, and 2012 (Wang and Meng 2013). During the period of 1961 – 2015, the mean annual precipitation decreased by 15 mm/decade and the temperature rose significantly by 0.19 0C/decade, indicating that Yunnan province has been in a transition to warming-drying climatic trend (Yungang et

In Myanmar, the Mekong river forms the border between the country and Laos. The Mekong river basin partly covers Shan State which is a hilly plateau. In the valley, the main crops are paddy, wheat, cotton, potatoes, groundnut, sesame, tea and tobacco. According to Myanmar Climate Change Alliance (MCCA, 2018), Myanmar will have general increase in temperature, clear-sky days, rainfall variability, flooding risks as well as greater frequency and intensity of extreme weather events across the country.

In Thailand, Mekong river basin covers Northeastern plus a part of Northern region (Nesbitt, 2005). Thailand is especially vulnerable to extreme weather events. The country was seriously affected by the worst flood in 2011 and the heavy drought in 2016 as a result of global climate change. Being an agricultural region, Northeastern Thailand needs a large amount of water for irrigation (62% of total water consumption). A frequent combination of climate vagaries as higher temperature and abnormal rainfall, the lack of irrigation and poor soil conditions explains low crop yields in Northeast Thailand (Lacombe et al., 2017).

Lao PDR is a landlocked country with 236,800 km<sup>2</sup> area which are extremely mountainous and forest areas. Approximately 90% of Laos territory belong to the Mekong River basin. With mountainous geographical characteristics, Laos is the source of several streams, rivers and tributaries of 62 Mekong sub-basins (MRC, 2005; MRC, 2010). Laos forests play an important role for water conservation in the Mekong river system. However, its forest cover has dramatically declined from 70% of the total land area in 1940 to 41.5% in 2002 (Lao PDR, 2010). Currently, droughts are still frequently occurring, damaging agricultural production and threatening people's livelihoods (Lao's MONRE, 2015). Along with droughts, floods are also extreme natural disaster events in Laos. During the last 30 years, Laos has experienced 22 notable floods (once in 1.4 years) and the most serious damages were in 1995 and 1996 (Chanthanet, 2005).



In Cambodia, the river flows into the territory after crossing the Khone Falls in Champasak province (Lao PDR). In the country, Mekong river is also called Tong-Le Thom River. Above Phnom Penh, it merges with Tonle Sap, main tributary in Cambodia. And then, it divides into two branches. Of which, the right is Ba Thac River (or Hau River in Vietnam), and the left is Mekong River (or Tien River in Vietnam). Both flow into the vast delta region of South Vietnam with about 220–250 km long. In Cambodia, rice crop and other upland production are highly dependent on rainfall. However, farmers face water shortages, droughts, and floods almost every year. Extreme climatic condition is creating negative impact on agricultural production in Cambodia (Bunthan, 2006).

In Vietnam, the Mekong river runs through southern region before its water drains to the East Sea. Vietnam Mekong Delta has been formed by the alluvium deposition of the Mekong River since last 5,000 – 6,000 years. It is the most downstream part of the Mekong River Basin. The natural characteristics of hydrology, climate, soil and topography combined with the active farmers make the coastal areas in the Mekong delta becoming the most suitable for rice and shrimp farming system (RSFS). However, the extreme meteorological and hydrological phenomena such as heat waves, dry spells, heavy rainfalls, more frequent droughts, floods, cyclones, irregular high tides and deeper salinity intrusion leads to many negative effects on socio-economic situation and ecosystem in the Mekong Delta. Drought and saline water affect the domestic water supply for the local residents in the coastal provinces. Approximately, about 40% of the Delta is affected by salinity intrusion during the dry season (Ha, 2014). In the period from 2015 to present, phenomenon relating to less rain and lack of fresh water from the Mekong River might influence rice cultivation in rice-shrimp systems.



### 3. NATIONAL POLITICAL RESPONSES

China has developed many different policies for climate change adaptation. A top-down policy system of climate change adaptation in China consists of 117 national and departmental policies, 31 provincial action plans and 21 provincial adaptation plans (X. J. He, 2017). Nevertheless, the mismatch between adaptation goals and resources arrangement in adaptation policy-making, and the difficulties of evaluation and supervision during policy implementation, still exist. On the other hand, China has to deal with the development demand and its increasing pressure. China still implements many economic development projects that are climate sensitive. During the period of 2011-2012, China has built many large-scale hydropower reservoirs in the Mekong river. In the China's development strategy, hydropower is not only to "response to droughts" but also to "versus a large mass of rural poor" (Kuenzer, 2013; Thomas et al., 2016). The development of a series of hydroelectric dams on the Lan-cang mainstream has caused many disadvantages to downstream countries, concerning over hydrological impacts, sedimentation, water security and fish migrations. (International River, 2013).

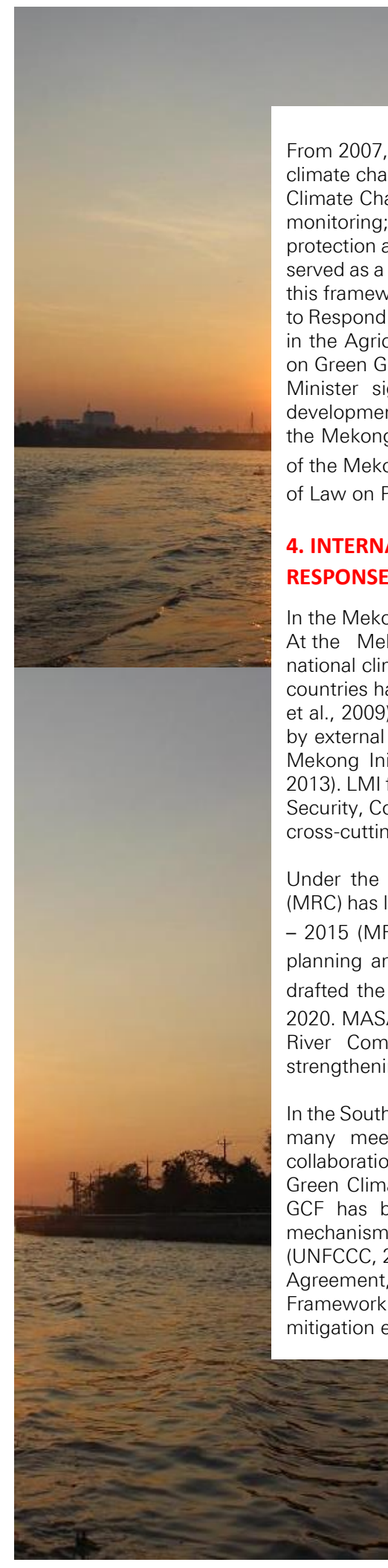


In Myanmar, Central Government has spent some efforts for climate change adaptation. At the same time, to increase farmer's incomes, Myanmar is also encouraging foreign investments for economic development and export-driven agriculture. In 2012, the National Environmental Conservation Committee (Ministry of Environmental Conservation and Forestry) has developed Myanmar's National Adaptation Program of Action (NAPA) to Climate Change as a guideline to prioritize and address the country's urgent needs in climate change adaptation. In 2016, Myanmar has released Myanmar Climate Change Strategy & Action Plan (MCCSAP) for the period of 2018-2030 (Ministry of Natural Resources and Environmental Conservation, 2016), covering the six following sectors: 1) Food Security; 2) Healthy Eco-System, 3) Sustainable and Resilient Transport, Industry and Energy; 4) Resilient Cities; 5) Health and Disaster Risk Reduction; 6) Education and Science. In 2019, Myanmar has released The Myanmar Climate Change Strategy and Master Plan (2018-2030) as a guiding policy and strategic framework for taking concrete, coordinated and sustained action over the long-term to transform Myanmar to a low-carbon and resilient country, which is able to develop country in a sustainable manner (Republic of the Union of Myanmar, 2019).

In 2013, Thailand has developed the National Climate Change Master Plan (NCCMP) for the period of 2015-2050. This plan is designed to support Thailand to achieve low carbon growth and climate change resilience targets by 2050. Thailand has also submitted an Intended Nationally Determined Contribution (INDC) plan that sets a 20-25% reduction in greenhouse gas emission by 2030 (Raweewan, 2015). In addition, the government also regularly issues decisions, policies and laws to support people to facilitate their transformations for climate change adaptation.

The Government of Lao PDR ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and the Kyoto Protocol in 2003. In 2008, the Climate Change Office were established in 2008. The National Strategy prioritizes seven areas for climate change adaptation and mitigation including: 1) Agriculture and Food Security; 2) Forestry and Land Use Change; 3) Water Resources; 4) Energy and Transport; 5) Industry; 6) Urban Development; and 7) Public Health.

The Government of Cambodia ratified the UNFCCC in 1995 and acceded to the Kyoto Protocol in 2002. On March 2007, Cambodia submitted the National Adaptation Program of Action to Climate Change (NAPA) to the UNFCCC as their primary policy framework (MOE, 2006). In 2013, Cambodia has released Cambodia Climate Change Strategic Plan (CCCSP) as a comprehensive national policy document responding to the climate change for the period 2014 – 2023. The goals of the CCCSP are: (1) Reducing climate change vulnerability for people and critical natural systems; (2) Shifting towards green development by promoting low-carbon production and technologies; and (3) Promoting public awareness and participation in climate change response actions.



From 2007, Vietnam has actively developed policy system and institutional arrangement for climate change adaptation. In 2011, the Government has approved the National Strategy on Climate Change which identifies some key areas such as (1) disaster response and climate monitoring; (2) food and water security; (3) proactive response to sea level rise; (4) forest protection and development; (5) greenhouse gas emission reduction. This legal document is served as a strategic framework for climate change adaptation and mitigation efforts. Under this framework, many other policies have been developed such as National Target Program to Respond to Climate Change, the Action Plan Framework for Adaptation to Climate Change in the Agriculture and Rural Development Sector Period 2008-2020, the National Strategy on Green Growth, and Law on Natural Disasters Prevention and Control. In 2017, the Prime Minister signed the Resolution No. 120/NQ-CP on sustainable and climate resilient development of the Mekong Delta, in which emphasizes one of the strategic directions of the Mekong Delta. Currently, a Regional Master Plan for the socio-economic development of the Mekong Delta in the period 2020 – 2030 and a vision towards 2050, as an application of Law on Planning (2017), is carrying out based on the spirits of the Resolution 120.

#### **4. INTERNATIONAL AND REGIONAL COOPERATION FOR CLIMATE CHANGE RESPONSE**

In the Mekong river basin, the climate change impacts have attracted great public attention. At the Mekong Climate Change Forum held in 2009, six Mekong countries discussed their national climate change adaptation strategies and related challenges. In the forum, all these countries have agreed to share research, data, and together identify research gaps (Heather et al., 2009), (MRC, 2009b). On the other hand, some other initiatives have been facilitated by external actors. In 2013, the Government of the United States has launched the Lower Mekong Initiative (LMI) for cooperation between five Lower Mekong countries (USAID, 2013). LMI focused to transboundary challenges with six pillars such as Agriculture and Food Security, Connectivity, Education, Energy Security, Environment and Water, and Health and cross-cutting areas such as Gender Equality.

Under the Basin Development Strategy and Strategic Plan, Mekong River Commission (MRC) has launched the Climate Change and Adaptation Initiative (CCAI) for the period 2011 – 2015 (MRC, 2016). CCAI focused on climate change impact assessments, adaptation planning and implementation within the Mekong Basin (MRC, 2018). In 2011, MRC has drafted the Mekong Adaptation Strategy and Action Plan (MASAP) for the period 2015 – 2020. MASAP identifies priorities and actions at the basin level, through which the Mekong River Commission (MRC) can contribute to addressing climate change risks and strengthening basin-wide resilience (MRC, 2018).

In the Southeast Asian region, the Association of South East Asian Nations (ASEAN), through many meetings, dialogues and conferences, has provided solid legal support and collaboration for regional and national climate change adaptation. At international level, the Green Climate Fund (GCF) has been formed since 2010 after the COP-16 in Cancun. The GCF has been established within UNFCCC's framework and operated as a financial mechanism to assist climate change adaptation and mitigation in developing countries (UNFCCC, 2013). On the other hand, some other international agreements such as the Paris Agreement, the United Nation's Sustainable Development Goals (SDGs) and the Sendai Framework are serving as a global strategic framework to direct national adaptation and mitigation efforts.






## 2. CHALLENGES AND THE WAY FORWARD

Mekong River plays a vital role in socio-economic development, especially for agricultural cultivation, fisheries, forestry and biodiversity conservation. The Mekong sub-region has been exposed to climate-related risks. That has become a major concern over people's livelihood as well as environmental and social security. According to many scientific evidences, the air temperature, rainfall patterns and other climatic characteristics in the Mekong river basin have been significantly changing. In over past 10 years, many regional workshops have been organized for sharing knowledge and fostering cooperation for climate change adaptation. On the other hand, many assessment and studies have been conducted to understand more about climate change impacts and potential solutions. These efforts have greatly contributed to building capacity and developing response policy system in the lower Mekong region. In actual, many national climate change policies have been developed basing on available information and knowledge. In general, each Mekong country has developed their own climate change response policies. However, there is still a long way between policies and practices. The below section discusses some key challenges that all Mekong countries have to cope with:

***Financial resources for climate change adaptation and mitigation:*** As climate change shows severer, stronger and broader impacts, huge financial resources are required in climate change adaptation. Developing countries are especially vulnerable and the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) estimates the costs of adaptation for these countries at between 28 and 67 billion dollars per year. Without international financial supports, developing countries cannot afford climate change adaptation. There several international financing mechanism has been established to support developing countries to adapt climate change. However, financing pathways are still challenging because it is not easy to meet conditions set by the donors. On the other hand, donors may have strong influence on designing climate adaptation and mitigation programs. In some case, their choices may not exactly match the priorities of recipient countries.

***Economic growth demand:*** Climate change adaptation and mitigation have been integrated into national development policies in all Mekong countries. By this direction, the countries are expected to pay more attention on climate aspect during their economic development process. However, as a developing region, Mekong countries are still fostering their economic growth targets. In actual, the governments still approve and implement many climate sensitive projects such as hydropower, unsustainable industrial production and extensive cash crop plantation with many negative impacts such as deforestation, pollution and land degradation. On the other hand, green house emission inventory is not carried out regularly although it has been included in national action plans. Mechanisms for effectively controlling and minimizing green-house gas emissions are still absent in Mekong countries. They are huge barriers for Mekong countries to shift themselves to lower carbon economies.



**Political relationship between Mekong countries:** Climate change is global issue. Therefore, global and regional cooperation is very important for addressing climate change. In the Mekong region, six countries are together relying on one river system. According to many studies, ecosystem-based adaptation is much more effective than administrative territory-based adaptation. It means that, to address climate change effectively, six Mekong countries need to work together with ecosystem-based approach. Unfortunately, Mekong countries have not made adequate political commitments for climate change mitigation and adaptation. Currently, Mekong River Commission (MRC) has only four country members including Thailand, Cambodia, Laos and Vietnam. China and Myanmar are not members of (MRC). That limit exchange and cooperation for Mekong river conservation between upstream and downstream countries. China has constructed 11 large-scale hydropower dams on the Mekong river. Despite adverse impacts, China have never informed and consulted downstream countries in hydropower dam construction and operation. MRC set up consultation and inform mechanism for Mekong river conservation. However, the organization does not have power and enforcement mechanism. As a result, Laos continues constructing and planning 06 hydropower dams on the mainstream Mekong river just after informing process. Thailand is also storing Mekong's river water in their reservoirs for agricultural irrigation. In general, Mekong countries do not have adequate commitment and cooperation. It is a big barrier for climate change adaptation and mitigation in Mekong region.

**The way forward:** Climate change adaptation and mitigation require interdisciplinary approach and multiple solutions. In addition, due to transboundary impacts, regional cooperation for ecosystem conservation and climate change adaptation must continue to be promoted through diplomatic channels. On the other hand, Mekong counties should actively participate in international dialogues to raise issues related to climate change impacts and compensation. At the same time, more efforts must be spent to help local communities to transform their livelihoods and adapt with climate change. Good indigenous experiences and local initiatives should be supported and promoted for bigger scale application. All other lessons learned such as government policies, institutional arrangements, and local good practices should be collected and shared across countries and communities. United Nations Sustainable Development Goals should be the central part for the Mekong River Basin development programs

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