LIVELIHOOD SECURITY AND FLOOD RESILIENCE FOR SUSTAINABLE DEVELOPMENT IN GREATER MEKONG SUBREGION

Indrajit Pal
Associate Professor and Chair, Disaster Preparedness, Mitigation and Management, Asian Institute of Technology, THAILAND
Email: ***indrajit-pal@ait.ac.th***

1. INTRODUCTION

Program highlights and key research areas include: climate hazards and early warning systems, disaster governance, policy and risk management, multi-hazard vulnerability and risk assessment, remote sensing and gis for disaster mitigation, floods and droughts, community based disaster risk reduction and management.

Figure 1. Education Footprint

Figure 2. Wise Enrollment (from August 2011 until August 2022)

From a climate perspective, rainfall is changing, with an increase in extreme precipitation. In time, it is very likely that extreme precipitation events will be more frequent and more intense, particularly in the midlatitudes and wet tropical regions of the world (IPCC, 2014). The IPCC indicates that increasing warming may result in a larger fraction of the global population being affected by major river floods (IPCC, 2014).

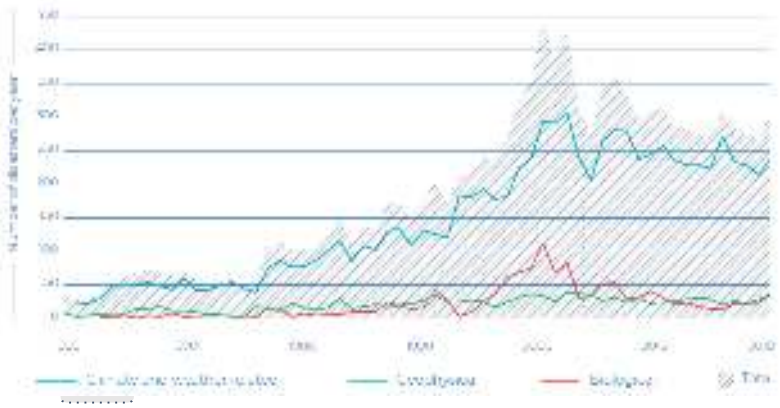


Figure 3. Graph of Climate and Weather-related Disasters
Source: World Disasters Report, 2020

Climate change is making weather less predictable, rains more uncertain and heavy storm rainfalls more likely. Since 1960s, floods have been by far the most significant of the climatological hazards, and the proportion of floods has steadily increased. Due to global warming many subsystems of the global water cycle are likely to intensify, resulting in many regions in an increase of flood magnitude as well as flood frequency. Sea-level rise increases the risk of coastal floods, particularly in case of storm surges. Many million more people are projected to be flooded every year due to sea-level rise by 2080s. Climate change also works in an indirect way to aggravate urban flooding (WMO, 2009).

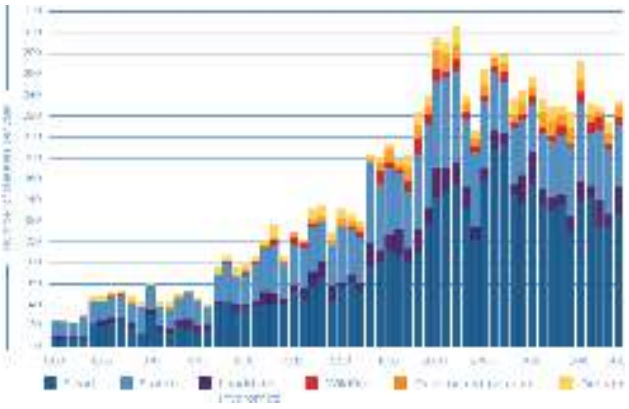


Figure 4. Graph of Climate Change and Floods
Source: World Disasters Report, 2020

Figure 5. Climate Change Impact
Courtesy: WMO

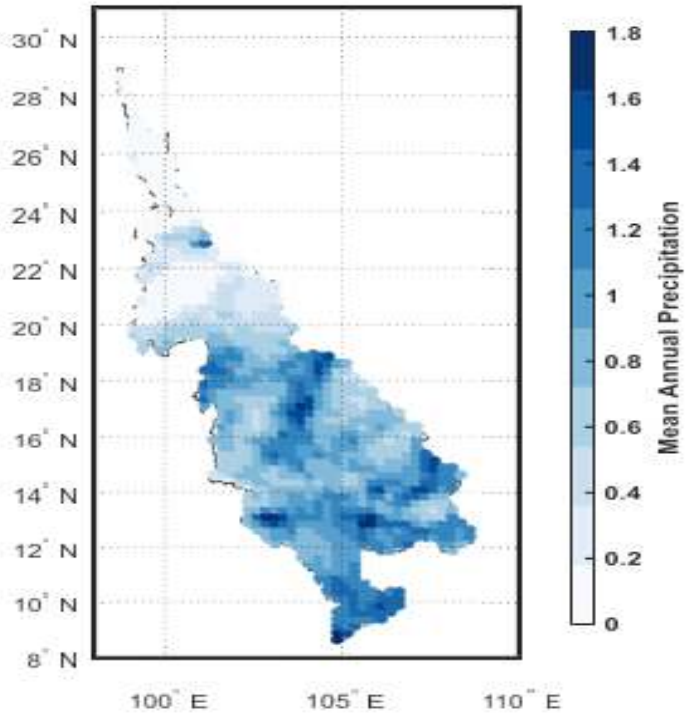
2. RESULTS AND DISCUSSION

The Mekong River runs 4350 kilometers from the Tibetan Plateau to the South China Sea and is 11thlongest river globally (MRC, 2010). Plays a vital role in the region and is linked with several environmental, political, and economic development phenomena in the region (Jacobs, 1995). Most importantly, it is linked with the people's livelihood, as agriculture and fishing are the region's primary sources of economic growth (Liu et al., 2020)

Figure 6. Mekong River Basin

80% of the people living in the basin area rely directly on the river for their food and livelihoods (Liu et al., 2020). Change in the region's environment over the last few decades due to deforestation, increased river damming, urbanization, growing human populations, and natural disasters (Spruce et al., 2020). Climate variability, demographic trends, land-cover change, and other causative factors all contribute to hydrological hazards and their consequences.

The probability distribution of precipitation using gamma density function for specified monthly time scales.



By 2060 the average annual basin-wide Temperature increase could be as low as 0.3˚C or as high as 3.3˚C depending on the global emissions trajectory. Average basin-wide change in dry season rainfall is projected to vary between -23% to +23% by 2060 and wet season rainfall between -18% to +16%. Annual river flow changing by between -59% and +27%, and dry-season minimum one-day flow changing by between -65% and +35% at Chiang Saen by 2060 under climate change only scenarios.

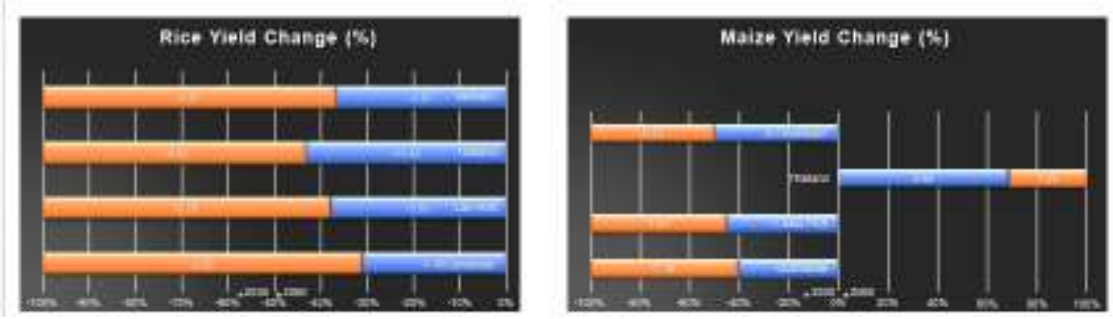


Figure 7. Graph of Potential impact : Agricultural yields

The most significant impacts on rice yield are projected to be in Thailand and the most significant impacts on Maize in Lao PDR.

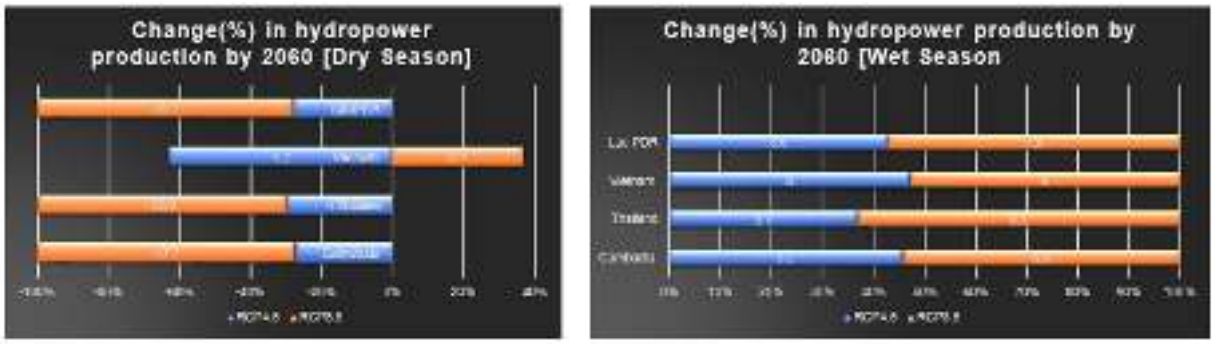


Figure 8. Graph of Potential impact :Hydropower

The largest reductions in power production due to climate change are projected to occur with the high emissions scenario (RCP8.5) under the drier overall model and this is worse in Thailand than elsewhere (almost -40%;).

Figure 9. Graph of Potential impact :Flood inundation Area

Increase in flooded area in each LMB country using a composite of all models under medium (RCP4.5) and high emissions (RCP8.5) scenarios to 2060.

Table 1. Minimum Value of Urban Infrastructure at Risk from Flooding

Country	Province	Urban area at risk	Exposed population	Infrastructure value at risk(in mil USD)
Cambodia	Kandal	842	44150	961.36
	Phnom Pen	2683	143755	3139.27
Vietnam	Can Tho	1772	99944	2067.4
	Vinh Long	436	23316	508.68

DPMM's Ongoing Research in Mekong Region

- Capacity building for measuring multi- hazard livelihood security and resilience in the Lower Mekong Basin
- Systems Approach For Resilience Assessment at Lower Mekong River Basin, Thailand

Contributions Capacity building for measuring multi-hazard livelihood security and resilience in the Lower Mekong Basin is develop an index-based user- friendly tool for multi-stakeholders for assessing livelihood security and multi-hazard resilience, and develop the capacities of stakeholders in three countries (Thailand, Cambodia, and Vietnam) on the understanding and application of the tool developed.

Figure 10. Capacity building for measuring multi-hazard livelihood security and resilience in the Lower Mekong Basin

Contributions Systems Approach For Resilience Assessment at Lower Mekong River Basin, Thailand is an indicator library and resilience framework that is most relevant for assessing the resilience of riverine communities towards flood hazards, assessment of community resilience status and identify the key influencing factors contributing to the resilience of the communities, and demonstrate the influence of the key components and their future impact by using model simulation software.

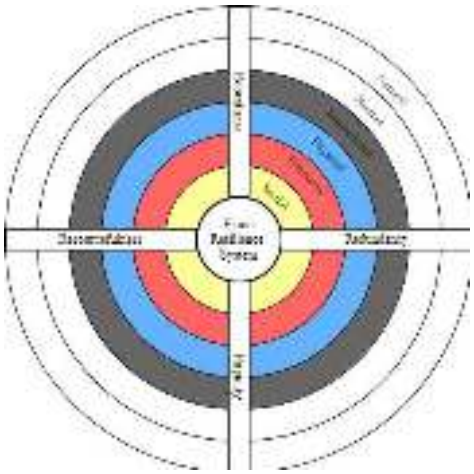


Figure 11. Systems Approach For Resilience Assessment at Lower Mekong River Basin, Thailand

3. CONCLUSION

Based on the elaboration above, the Impact of Flood in Livelihood could be concluded that: first, Transformative Change resulted: 1) discovered evidence of an increasing migration trend in a rural area of Cambodia over time (Nguyen & Sean, 2021), 2) conversion of rice fields into aquaculture ponds (Dang et al., 2021), 3)Cash economy as a source of households livelihood (Morton & Olson, 2018), and 4) livelihood strategy has concentrated on a smaller number of activities bringing immediate or short-term returns (Zhou et al., 2021).

Second, Impact Chain in Livelihood resulted: 1) new infrastructure (hydropower, for example) and irrigation improvements in the upstream Mekong have altered

the volume and seasonality of flow, 2) tremendous influence on agriculture, resulting in massive crop losses and reduced agricultural output (Abhishek et al., 2021), and 3) high rate of poverty, lack of agricultural technology, and heavy reliance on the environment for livelihoods (Nguyen & Sean, 2021).

Third, Impact in Sustainable Development resulted: 1) mass migration creates labor shortages in agriculture and rural areas, 2) effects of dams and climate change on the river has led to important scientific concepts and discussions on sustainable development (Gabriel et al., 2021; Phoumin & Minh Thu, 2020), 3)the consequences of climate change may jeopardize Asian countries' ability to achieve sustainable development, and 4) the need for structural transformations in the agriculture sector in order to increase their resilience to climate change impacts is critical for their long-term survival (Figueiredo et al., 2021).