



**MEKONG RIVER COMMISSION**

## **THE COUNCIL STUDY**

**Study on Sustainable Management and Development of  
the Mekong River including Impacts of Mainstream  
Hydropower Projects**

### **Key findings**

**March 2018 (as reported to the MRC Council),  
revised January 2019**

**Disclaimer**

The Council Study reports are considered final drafts prepared by specialists of the Mekong River Commission and international experts through an extensive process of consultation with representatives of the Member Countries and interested stakeholders. The contents or findings of the reports are not necessarily the views of the MRC Member Countries but serve as knowledge base and reference in the work of the MRC and its Member Countries in their ongoing technical and policy dialogues to ensure sustainable development of the Mekong River Basin.

*The MRC is funded by contributions from its Member Countries and Development Partners: Australia, Belgium, European Union, Finland, France, Germany, Japan, Luxembourg, the Netherlands, Sweden, Switzerland, the United States and the World Bank.*

**Prime Ministers of Cambodia, Lao PDR, Thailand and Viet Nam agreed to conduct a Study on Sustainable Management and Development of the Mekong River including Impacts of Mainstream Hydropower Projects during the Third Mekong-Japan Summit in Bali in November 2011.** The MRC Council, comprising Water and Environment Ministers of the four countries, commissioned the study the following month, with the primary aim of assessing the environmental, social and economic costs and benefits of existing and planned water developments in the Lower Mekong Basin (LMB).

**In what came to be known as the Council Study, researchers modelled three development scenarios.** The early scenario was the “baseline” for 2007. The medium-term scenario was for the “definite future” of 2020 with existing projects and those under construction or firmly committed. The long-term scenario was for “planned development” in 2040. Outputs were integrated to describe outcomes for selected environmental, social and economic indicators. The outcomes were analysed in six sectors – hydropower, navigation, irrigation, agricultural land use, water use and flood protection.

**Combinations of developments allowed the study to make cumulative assessments of the environmental, social and economic impacts.** Since such assessments tend to mask individual developments or those in specific sectors, the study developed sub-scenarios to isolate increases or decreases in the sizes of the six sectors under the scenario for 2040. The study also developed three sub-scenarios to isolate the impacts of climate change.

**The study found that combined investments in water resources for 2020 and 2040 were likely to negatively affect community resilience and vulnerability as well as sustainability and that the main trade-off was benefits accrued by power companies at the expense of fishing households.** Such an outcome is not consistent with the goals of the Mekong Agreement of 1995. Excessive investment in hydropower and labour-intensive agriculture is likely to reduce both food security and GDP growth in the LMB (see attachment). The planned expansion of traditional agricultural activities is likely to increase demand for labour at the same time as the manufacturing and service sectors expand. Overinvestment in agriculture also raises the prospect of underused or abandoned infrastructure.

## **CHALLENGES AND OPPORTUNITIES UNDER THE 2040 SCENARIO**

**Hydropower growth equals the combined economic impact of agriculture, navigation and fisheries.** Estimates of hydropower contributions have not traditionally been taken into account for economic and ecological trade-offs.

**Hydropower projects reduce wet-season flows and increase dry-season flows under normal operations** (except for climate extremes). This reduces flood damage but has negative impacts on river ecosystems, sustainability and food security associated with fisheries.

**Reduced sediment and nutrient transport downstream caused by hydropower projects in the Mekong Basin including China is expected to reduce soil fertility, rice production and fish yields.** The most vulnerable areas are the floodplains and the Tonle Sap Lake in Cambodia and the Mekong Delta in Viet Nam.

**Bank and bed erosion is expected to increase substantially due to sediment reduction and water-level fluctuations.** Erosion will especially increase in the Mekong Delta in Viet Nam and some areas along the Mekong from Vientiane in Lao PDR to Stung Treng in Cambodia.

**Wide-ranging negative ecosystem impacts are forecast from reservoirs created by mainstream hydropower projects, the building of flood-protection structures and barriers**

**to fish migration.** Reservoirs are expected to convert much of the Mekong from Chiang Saen in Thailand to Kratie in Cambodia into deeper lake-like habitats – except for the stretch from Vientiane to Pakse that will not be impounded. Such habitats are not suitable for many species inhabiting the Mekong but are beneficial for others such as bivalves, frogs and snails.

**Water-resource development is forecast to reduce food security and increase poverty.** At current levels of agricultural productivity, household incomes are forecast to decline. Poverty levels are expected to rise in most zones. The value of fish catches in the corridor 15 km either side of the Mekong is expected to decline by \$1.57 billion. Fish prices are likely to rise, affecting poor households. The value of the predicted increase in corridor rice production is \$0.95 billion.

**Benefits and trade-offs are not evenly distributed throughout the basin.** The study also found that they are not necessarily confined to single countries.

**Climate change is likely to amplify negative impacts and poses a significant risk to both food security and GDP growth, particularly under a drier climate.** Drier conditions reduce hydropower benefits by as much as \$4.5 billion in net present value and increase fish losses by about 10 percent. Overinvestment in agriculture and hydropower accompanied by more severe climate change could compromise prospects for LMB countries sustaining lower-middle income or middle-income status.

**Future growth potential of all Member Countries depends on the availability of natural capital – particularly soils, forests and fish.** Forecast declines in natural capital under medium-term development plans amount to nearly 80 percent of the combined GDP of the LMB in 2017. Substantial reforestation under long-term development plans would reverse this and increase natural capital by \$53 billion, about 38 percent of GDP in 2017.

## **SPECIFIC SECTORS**

**Hydropower:** Hydropower emerges as the water-related sector with a share of up to almost half of the growth potential of the four sectors (hydropower, fisheries, agriculture and navigation) combined under 2040 plans and is linked to negative trade-offs – about 26 percent of the hydropower gains would be lost in the fisheries sector under the 2020 scenario and 15 percent under the scenario for 2040. Under this scenario, mitigation could reduce fish losses by an estimated 11 percent.

**Navigation:** Under the 2040 scenario, hydropower dams create river stretches with sufficient water depth for larger vessels to navigate year-round, substantially reducing the need for dredging. If necessary investments are made, forecast growth for navigation can be achieved.

**Irrigation:** Irrigation efficiency in the lower basin needs to be improved. Sustainable irrigation requires reducing water-delivery losses, enlarging storage capacity, rehabilitating old irrigation facilities and strengthening the capacity of farmers to manage the facilities.

**Agricultural Land Use:** Regulated hydropower generation could enhance farm productivity by reducing flood and drought risks. In Viet Nam, however, reduced Mekong flows and rising sea levels will increase saltwater intrusion and lower rice production. Expanding farmlands and increasing irrigation capacity would make agricultural production more reliable but would come at the cost of accelerated soil erosion, increased use of agro-chemicals and land degradation.

**Water Use:** Concentrations of nutrients – nitrogen and phosphorus – tend to exceed MRC thresholds. Nutrient loads are amplified during the dry season, increasing risks to human health and degrading aquatic ecosystems.

**Flood Protection:** Reductions in sediment load due to dams will require significant spending on river bank protection in Cambodia and the Mekong Delta in Viet Nam. Trans-boundary erosion will increase rapidly with the completion of dams in the lower basin. Bank protection will require investments of up to \$6 billion. Flood risk and potential damage will increase 5 to 10 times as asset values rise, especially in urban areas that are more highly exposed.

## **POLICY RECOMMENDATIONS**

**Member Countries may wish to consider supranational policies with objective science-based approaches to ensure mutually shared benefits and costs – including those involving the private sector – to sustain water development in the region.** The study highlights the MRC's research contribution to trans-boundary deliberations and the design and testing of mechanisms to coordinate multiple-sector objectives. The MRC, in close collaboration with the National Mekong Committees of Cambodia, Lao PDR, Thailand and Viet Nam, can further support national and regional planning, including the management of trade-offs.

**Managing trade-offs between hydropower and fisheries is more efficiently achieved by sharing benefits across sectors rather than compensating losses between countries.** A possible solution to reallocate benefits acquired by power companies at the expense of fishing households faced with lower catches in all four countries could be a levy of 18.9 percent on annual earnings for plants on the Mekong mainstream and 8.6 percent for those on tributaries.

**Member Countries may wish to consider renewable power-generation technologies competitive with hydropower.** Assessing emerging new technologies would provide major insights for managing the nexus of water, energy and food in the LMB, the main focus of the Second MRC Summit in Ho Chi Minh City in 2014.

## Macro-Economic Findings from the Council Study

The scenarios for 2020 and 2040 combine positive and negative outcomes. At the narrow sectoral level, much of the hydropower and agricultural development seems very positive. Hydropower, however, is likely to trigger substantial losses in the fisheries sector.

**Cambodia shows substantial growth potential and could increase GDP from around \$21 billion in 2017 to more than \$60 billion in 2040.** Under the 2040 plans for developing water resources, however, growth is likely to be lower with GDP of around \$38.5 billion in 2040. This slowdown largely reflects excessive investment in labour-intensive agriculture and declines in fisheries caused by hydropower. Cambodia is likely to experience the highest trade-off – for every dollar gained from hydropower about 62 cents would be lost in fisheries. Drier-than-expected climate change would affect GDP substantially and cause a further decline in fisheries of nearly 15 percent. The scenario for 2020 with selected, highly beneficial agricultural projects is likely to have the greatest macroeconomic benefits.

**Lao PDR shows immense growth potential and could boost GDP from about \$17 billion in 2017 to more than \$42 billion in 2040.** However, negative trade-offs arising from water-related development are likely to slow growth, with GDP of about \$30 billion in 2040. Some investments are likely to fuel growth while others would counter the trajectory. Many hydropower projects are likely to be very beneficial to the economy. However, about 14 percent of the benefits would be lost in fisheries losses, triggering major food security issues. Seventy to eighty percent of hydropower benefits would go to investors from Thailand, China, Malaysia or South Korea. Drier-than-expected climate change would reduce hydropower benefits by as much as \$2.1 billion in net present value. Agricultural expansion is likely to be too ambitious as labour demand at current productivity would slow growth in manufacturing and services.

**Thailand has the potential to increase GDP of its Mekong Basin areas from about \$50 billion in 2017 to about \$90 billion in 2040.** Investment in water resources under the 2040 scenario, however, is likely to lead to lower GDP of \$71 billion, mainly due to lower fish catches. The benefits for Thailand or Thai companies from mainstream hydropower in Lao PDR are substantial – as much as \$82 billion in net present value for the 24-year time period. But these would be offset by income losses for small households along the Mekong of almost \$7 billion in net present value as fish stocks decline. Investment in manufacturing and services is seen as the most critical pillar for successful economic development.

**Viet Nam could double the GDP from the Mekong Delta from about \$50 billion in 2017 to more than \$100 billion in 2040.** Proposed water development plans for 2040 are, however, likely to result in lower GDP of \$81 billion due to several negative factors. Strategies to prioritise investment in food processing instead of food production and to stimulate additional growth in manufacturing and services (such as navigation and education) are very promising. But strong economic growth in the past has been inflationary. There is a risk that this will be repeated as fish and other food prices are likely to rise sharply if hydropower investments are made under the 2040 scenario. The trade-offs that hydropower is likely to cause for fisheries would be substantial at \$1.7 billion in net present value under the 2020 scenario and \$3.2 billion under the 2040 scenario. Effective mitigation could involve sustainable expansion of aquaculture and substantial investments in manufacturing and services to reduce vulnerabilities.