

# Strategic Analysis Paper

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## Livelihoods and Food Security on the Mekong River

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### Key Points

- The construction of dams on the Mekong River in China, Laos and Cambodia could generate significant economic benefits for the region, but they will also impact downstream fisheries and rice growing regions, mainly by reducing food security and threatening livelihoods.
- Despite efforts to preserve fish migration routes through the engineering of alternative routes it is likely that migration will be impacted, potentially decreasing wild fish stocks.
- Aquaculture could provide an alternative means to produce fish, but standards will need to be enforced to ensure the sustainability of the industry.
- Rice production is likely to suffer as a result of fewer nutrients reaching the Vietnamese Mekong Delta, impacting food security and the economy of one of the world's major rice growers.

### Summary

A large part of mainland South-East Asia depends on the Mekong River for food and water security. Fish and rice, which both depend on the river, are the main sources of food for millions of people in the region. Food security and livelihoods are threatened by the construction of hydropower facilities in China, Laos and Cambodia. While these facilities are likely to further the economic development of the region this will come at the expense of traditional farming and cultural practices. While aquaculture and other protein-rich crops could replace existing staple foods, this will require a considerable shift in traditional practices and economic policy.

## Analysis

The economic capacity of the Lower Mekong Basin (LMB) is immense. The river plays a central part in the livelihoods of rural people and is an important resource for food and water security. These resources and the livelihoods of the people that rely on the river are threatened by dam construction, sand mining, rising pollution and the increased salinisation of soils and water. The main threat to the river comes from the construction of hydropower dams. These pose a threat to the ecology of the river system and the livelihoods and food security of riparian communities.

### ***The Strategic Importance of the Mekong River***

The Mekong is one of the largest and most ecologically diverse rivers in the world. From its headwaters in the mountainous Tibetan region of China it flows south through Yunnan province before flowing parallel to the eastern-most border of Myanmar. It then moves into the LMB composed of Thailand, Laos, Cambodia and Vietnam. Due to the geological barrier provided by the Shan hills of eastern Myanmar, only a small portion of the basin is located within this country. The main river does not flow through Thailand either, instead forming part of the country's northern and eastern border with Laos. Numerous tributaries, such as the Chi and Mun Rivers, however, flow out of Thailand and into the Mekong. Over 70 million people live within the LMB. Of the 12 million households living in the region, 80 per cent depend directly on the river for their food and livelihoods.



Source: Stratfor.com

The Mekong plays a crucial role in the economies of LMB countries. It supports one of the world's largest inland fisheries, which has a total economic value estimated at [US\\$17 billion](#) – about three per cent of the region's combined gross domestic product. Fisheries are most economically important to Cambodia and Laos, where the sector constitutes 18 and 12.8 per cent of the economy respectively. Associated secondary industries, such as fish processing, markets, fuel and equipment sales as well as boat building, contribute at least another US\$3.6 to US\$7.4 billion annually. Millions of subsistence fishing communities, which are not included in these figures, also depend on the waterway for their survival. The river is also a source of irrigation for all four LMB countries. All of these industries are likely to be affected by the construction of large dams.

The Mekong River has between 175 and 250 gigawatts of technically feasible energy available for exploitation. Hydropower dams, if constructed, could provide massive economic stimulus for the region, producing energy, raising national incomes, creating employment and lifting people out of poverty. On the other hand, however, there is a potential risk to existing agricultural production, the natural environment and the livelihoods of millions who will continue to rely on the river.

### ***Hydroelectric Dam Development***

Plans to develop the hydropower potential of the Mekong have existed since the 1950s, but have been disrupted by war, political instability and the 1997 Asian Financial Crisis. Current regional stability, strong economic growth and the increased energy demands of powerful regional states have made these plans appear more politically and economically viable.

By 2030, 70 dams could be operational on the length of the river. These projects, if they go ahead, have the potential to bring new sources of wealth to countries in the Upper Mekong Basin. At the same time, however, the impact of the dams on communities that will continue to rely on the river, both in the regions where the dams are to be located and further downstream, could be immense.

Many of the dams set for construction on the Mekong will be run-of-river, a form of hydroelectric dam that is seen as less environmentally disruptive than storage dams. As International Rivers, an environmental organisation, [points out](#) it is difficult to define a run-of-river project. These projects do not store large amounts water and avoid some of the problems associated with large reservoirs, but these projects are not without their drawbacks. Most run-of-river projects use small dams or diversion tunnels to harness the energy producing potential of water. When they use tunnels, water is diverted from the riverbed to underground channels that can divert some or all of a river's flow and change its temperature, velocity and depth. Where these projects store water, in what is known as peaking run-of-river dams, water is stored during periods of low electricity demand and rapidly released during peak demand periods. These changes have the potential to completely and irreversibly alter the natural ecological balance of the river and damage fish stocks.

## **China**

Over the last 60 years, China has built at least 86,000 dams within its borders, capable of providing up to 282 gigawatts of electricity. Most of these dams have been built on internal, not transboundary, rivers. Its internal rivers are coming under increased pressure, however, as dams have choked their flow and rising levels of pollution renders the water increasingly unusable.

In search of more hydropower, China is turning to transboundary water ways. In a bid to satiate its increased demand for energy it plans to construct numerous hydroelectric dams on the largest and most powerful rivers in the region. By 2050, China is expected to generate [500 gigawatts](#) of electricity from hydropower, 30 per cent of this capacity will come from the Mekong, Salween and Brahmaputra rivers.

Almost half of the Mekong's course is in China, giving Beijing considerable opportunity to exploit its rapid flow. In 1995 China became the first country to construct a dam on the Mekong. Since then it has built another five dams on its stretch of the Mekong. After China had built two of these dams, it was feared that the cascade of dams would reduce fish stocks and sediment flow downstream. As the upper riparian, China has considerable influence over lower riparians.

## **Thailand**

In 1994, Thailand completed the construction of the Pak Mun Dam on the Mun River, a tributary of the Mekong. A fish ladder was built into the dam to mitigate the impact it would have on fish migration. The measure has been [deemed useless](#) and fish populations upstream of the dam have declined. The dam has had [negative impacts](#) on the natural and social environment. It has destroyed fisheries, affecting the livelihoods of thousands of inhabitants.

Approximately 100 fish species migrate up the Mun River between February and June for spawning and feeding before migrating back to the Mekong mainstream in October and November. The construction of Pak Mun Dam, however, has interrupted this cycle. About 60 communities living along the river relied on migrating fish for their food security and livelihoods. In 1995, they received compensation for the hardship they endured during the construction of the dam and were promised that fish stocks would recover. By 1999, however, it became obvious to the communities that their lives were unalterably changed by the construction of the dam as fish stocks remained depleted.

The Pak Mun Dam could provide a warning to the region. New dams under construction also plan to utilise fish pass facilities, such as fish ladders, to minimise the impact on migration. As Thailand has demonstrated, however, these facilities do not always work as intended.

## **Laos**

Laos is one of the least developed countries of South-East Asia and its hydropower potential could generate considerable revenue and investment opportunities. The Mekong River Commission (MRC), in a [2010 report](#), estimates that Laos is likely to receive 70 per cent of

export revenues generated by the 12 mainstream projects, equal to US\$2.6 billion. For at least the first 25 years of operation, however, the developers and financiers of the projects will receive the majority, between 69 and 74 per cent, of gross revenues. Laotians are unlikely to receive much benefit from the construction of large dams in their territory. The damage dams could do to their food supply and livelihoods is a large price to pay for projects that do not guarantee significant returns.

Laos has ambitions to become the “battery of South-East Asia” by constructing a number of dams on the Mekong. These dams would not only generate enough energy to meet domestic demand, but export the surplus to neighbouring countries. By 2025, Vientiane wants hydropower to be its main source of revenue.

Xayaburi Dam, the first Laotian dam to be constructed on the Mekong mainstream, is located in a mountainous valley in the north of the country. It is expected to generate 1,260MW of electricity, 95 per cent of which is set to be exported to Thailand under a power purchase agreement signed in 2010. If construction goes as planned, it will be fully operational by 2019.

In 2011, Cambodia and Vietnam called for the project to be halted until transboundary impact studies were conducted. Vientiane has ignored this request and has continued with construction, making a mockery of the MRC’s Procedures for Notification, Prior Consultation and Agreement. Efforts to produce an effective water regime for the region has proven challenging and is unlikely to occur in the foreseeable future.

After its project was challenged, Laos hired Pöyry, a Finnish engineering company, to conduct a study on the potential transboundary impacts of Xayaburi Dam. Its report identified several concerns, such as the potential impact on fish migration and sediment flow. It has [suggested a number of measures](#) to reduce the risk of these impacts, such as the adaptation of the navigation lock and the introduction of multiple fish pass facilities to allow for fish migration. These alterations might mitigate the barriers to fish migration through the dam, but international donors were also sure that similar alterations would allow for fish migration in Thailand’s Pak Mun Dam, which turned out to be incorrect.

The construction of another controversial dam, the Don Sahong, began in January 2016 in the Siphandone wetlands, the world’s largest artisanal freshwater fishery that [100,000 people](#) in the region depend on for food and income. In this part of the Mekong the river splits into numerous branches and plunges over a 20 metre fault line, forming thousands of channels and islands. Many of these are large and steep, forming powerful waterfalls. The exception is the Hou Sahong channel, where water descends down the fault line through a number of rapids rather than large waterfalls. This makes it the [most easily traversable](#) section of the wetlands for millions of fish. The Don Sahong will be built by a Malaysian property company, Mega First Corporation Berhad, which has no experience in dam construction. The construction of Don Sahong is likely to have ramifications for fishers in the Siphandone region.

In an attempt to lessen the potential disruption to fish migration, dam developers have begun to clear and level the smaller Hou Sadam and Hou Xang Pheuak channels in the hope



of providing alternative routes. This solution has never been attempted on any river before and might not solve the problem. That it is being undertaken by a construction company with no experience of dam building or water engineering does little to inspire confidence. On the other hand, if the new routes closely mimic that of Hou Sahong there is little reason to doubt that fish will be able to migrate through them, thereby minimising the threat to food supplies and livelihoods downstream.

### ***Cambodia***

There are two hydropower dams planned for construction in Cambodia. Officials expect the energy source to meet more than 75 per cent of the country's requirements by 2030. Currently, electricity is generated almost entirely from imported fossil fuels and alternative energy sources are limited. Dams, however, are unlikely to provide an uninterrupted electricity supply. Additional [coal-fired power plants](#) are being constructed to avoid supply disruptions during the dry season when water levels in dams decline.

The Sesan II Dam is the largest Cambodian hydropower project currently underway. It will block the Sesan and Srepok rivers and is expected to be completed in 2017. Farming communities that have been relocated to make way for the dam have complained that they have not been adequately compensated and the parcels of land given to them [will not be large enough](#) to continue farming cattle. A government official suggested they utilise a nearby forest as a source of income instead of maintaining food production.

Tonlé Sap, a large lake that swells from 3,000 square kilometres to 10,000 square kilometres in the wet season, is of major importance to the country's food security. Outflow from the lake during the dry season helps to limit seawater intrusion downstream in the Vietnamese Mekong Delta, a major rice growing region. Without this outflow, rice growing regions will be susceptible to increased salinisation.

Dams constructed upriver of its border, in China and Laos, are likely to have the largest impact on Cambodia. Mekong fisheries provide the country with 12 per cent of its GDP and are an important source of nutrition for its people. It has been estimated that up to [75 per cent](#) of the fish caught in Tonlé Sap migrate to the deep pools of the Siphandone wetland during the dry season, but dam construction in Laos could interrupt this and cause fish stocks to decline.

### ***Vietnam***

Vietnam is the furthest country from the source of the Mekong and the one most likely to be negatively impacted by upstream development. While it has built some dams on tributaries of the Mekong, it is not planning to build any dams on the mainstream as there are no suitable sites.

The Mekong delta region, in the country's south, is home to 18.6 million people – about one-fifth of the total population - and accounts for more than half of the country's rice and fruit production. About 60 per cent of the country's fish production is also located in the delta. Sediment from upstream is vital for rice production in the delta as it replenishes soil nutrients. Dams block this sediment from flowing downriver, potentially damaging fertile

rice growing areas. Furthermore, without a strong outflow of water into the South China Sea, saltwater is likely to intrude further upstream into the delta, polluting water and turning fertile soil increasingly saline.

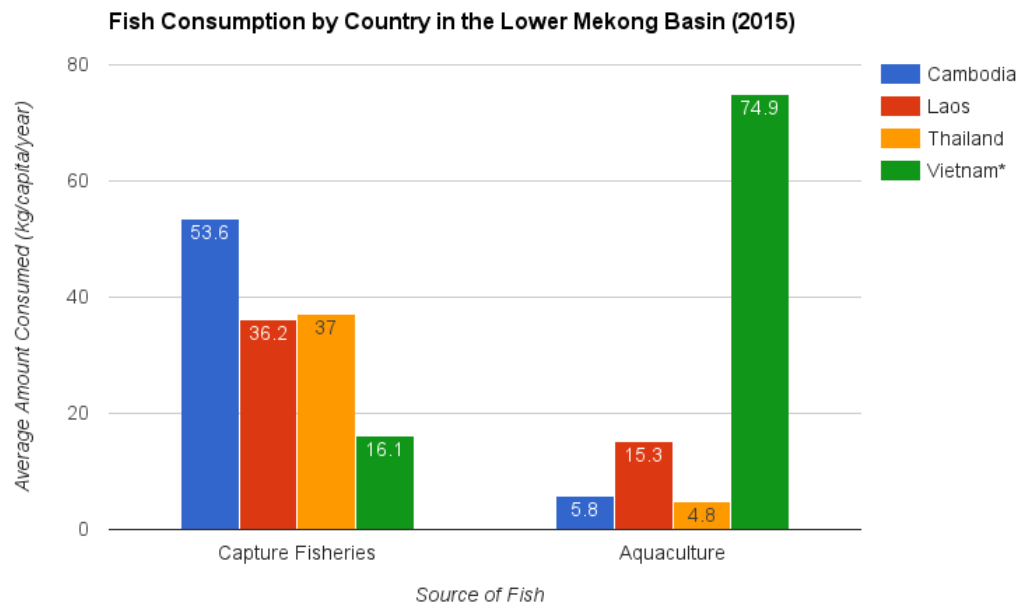
Even without the additional challenges that could come with upstream dam development, the delta faces considerable problems. The region's climate is changing, average temperatures in the region [increased](#) by 0.5°C between 1979 and 2009. Weather extremes are also projected to become more pronounced, with some years considerably wetter than usual and others considerably drier. Large parts of the delta are less than one metre above sea level and are at risk of saltwater intrusion. More widespread salinity is the greatest immediate challenge to the delta's future. Saltwater intrusion further upriver, the result of prolonged dry seasons, would render larger swathes of agricultural land infertile, threatening crop production. None of these predictions are likely to be beneficial to rice production.

In April 2016, Hanoi submitted a report authored by DHI, a Danish environmental consultancy, to the MRC stating that if the 11 proposed dams are built upstream there will be "high to very high adverse effects" on fisheries and agriculture in Cambodia and Vietnam. The [report](#) predicts annual fishery and farming losses of more than \$760 million in Vietnam and \$450 million in Cambodia. As the delta region alone accounts for [more than a quarter](#) of Vietnam's GDP, these figures appear to be very conservative estimates.

### ***The Impact of Dams on Agriculture and Fisheries***

Communities living along the river depend on fisheries for a large portion – up to 80 per cent in some regions - of their diet. Fish is a valuable source of protein and people would struggle to find protein-rich alternatives. For instance, to get the [same amount](#) of protein provided by one kilogramme of fish someone would need to consume 2.5kg of rice. A reduction in fish numbers will drive people to develop other food sources, which, in turn, will lead to the conversion of forests and woodland to pasture. The region could import more food to resolve supply gaps, but given the region's self-sufficiency policies, this would require a substantial change in economic policy. The region is highly dependent on fish from the Mekong River and any disruption to that supply will prove deleterious to food security.

About 70 per cent of fish in the Mekong are migratory. These species migrate along the length of the Mekong River, shifting between marine and freshwater habitats, between upstream and downstream areas of the main river and between its tributaries and floodplains. Distinct migrations between the upper, middle and lower parts of the LMB have been observed and monitored. Migration takes places throughout the year, but peaks at the onset of the wet season. Dams threaten to disrupt or, in the worst case scenario, prevent fish from migrating entirely.



Source: Mekong River Commission

\* Vietnamese figure includes fish consumed outside of the LMB

While the majority of the LMB currently relies on capture fisheries, aquaculture could provide an alternative to wild fisheries. Fish farms already produce the majority of Vietnam’s fish supply. The rise of aquaculture is likely to lead to a concentration of fish species, however, as it is unlikely to provide the same level of biodiversity as the Mekong River. Fish farms are also more exposed to disease outbreaks and without effective water treatment facilities can increase pollution. If the region turns to fish farming, standards that ensure the sustainability of the industry will need to be implemented.

The construction of dams is also likely to reduce the productivity of the region’s rice fields. In 2014, countries along the Mekong produced more than 100 million tonnes of rice, about 15 per cent of the global total. Vietnam, as the lower-most riparian, is likely to be most impacted by the changes to the river’s natural flow. The country’s rice growers have faced mounting [challenges](#) in recent years, from the growing strength of regional competitors to the rising salinity and declining nutrient content of Vietnamese soils. Dams on the Mekong will trap greater amounts of the silt and sediment that is vital for replenishing soils. Rice crops will suffer without the nutrients provided by this silt and sediment.

## Conclusion

The construction of multiple large dams in the northern and central portions of the Mekong River threatens fisheries and agricultural production along its entire length. Tens of millions of people in four countries downstream of China rely on the river to provide them with food, employment and income. Unless alternative sources of food and income are developed these people are likely to be worse off after the construction of the dams.



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