

# THE DON SAHONG DAM AND MEKONG FISHERIES

A science brief from the WorldFish Center

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## Key messages

- If built, the Don Sahong dam would be the first dam on the mainstream of the Lower Mekong River.
- The Hoo Sahong channel, the site of the proposed dam, plays an especially important role in fish migration basinwide.
- The Lower Mekong Basin hosts the most productive freshwater fishery in the world, contributing substantially to national and regional economies, food security and rural livelihoods.
- There are no effective measures in the region to mitigate the impact of dams on fisheries.
- The economic costs from lost fisheries production could outweigh the expected economic benefits of the dam. A comprehensive scientific assessment would be required to evaluate this.

## INTRODUCTION

Dams bring major economic benefits for some sectors of national and regional economies. In doing so however they frequently also bring substantial economic costs to others. Fisheries are one of the most important sectors affected by dam development and need to be fully understood if a river's full economic potential is to be harnessed. The present science brief examines available information on the potential impact of the proposed Don Sahong hydroelectric dam on the fisheries of the Lower Mekong River Basin.

## THE DON SAHONG DAM

The Lao government and Mega First Corporation Berhad (MFCB), a Malaysian engineering company, signed a Memorandum of Understanding in March 2006 on the Don Sahong hydroelectric power project<sup>1</sup>. According to the Chairman of MFCB, the USD 300 million project planned for completion in 2010 would have an installed capacity of about 240 megawatts. According to the MFCB director, "it will be a run-of-river project where we will build a barrage at one of the channels along the river"<sup>2</sup>. Although the engineering specifications are not public, the project would have more than four times the installed capacity of a dam earlier considered for the site, which was designed to be 26 meters high<sup>3</sup>. If built, it would be the first dam on the mainstream of the Lower Mekong River.

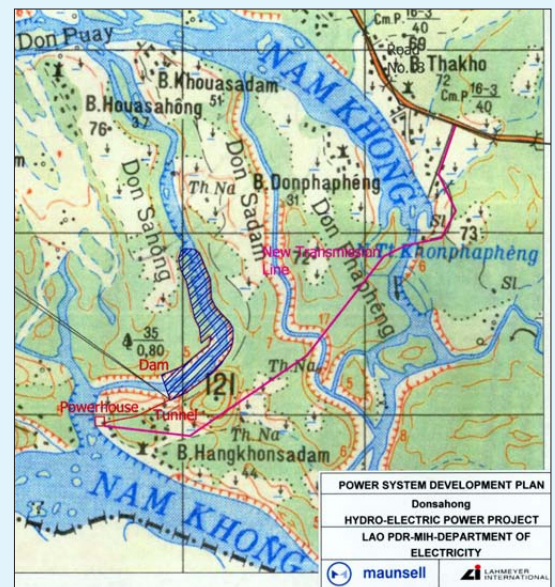


Figure 1. The proposed dam site<sup>3</sup>

## THE IMPORTANCE OF THE KHONE FALLS AND HOO SAHONG

Khone Falls is a key site for all Mekong fish resources. At the Falls, the Mekong River drops some 20-30 meters from the Khorat plateau to the Mekong plain. Here the river forms a complex network of

narrow, braided channels, named *hoo* in Lao. Scientists have documented the area thoroughly and found that it supports at least 201 fish species, including endemic or endangered species *Mekongina erythrospila* (“pa sa ee”) and *Probarbus jullieni* (“pa eung tad eng”)⁴. The area also supports one of the few remaining concentrations of freshwater dolphins (*Orcaella brevirostris*) in the Mekong.

Of special significance are the 28 scientific studies that show how it serves as a bottleneck for fish migration in the basin⁵. Hoo Sahong, the site of the proposed dam, is especially important as it plays a unique role in Mekong fish migration. An article published in the Mekong River Commission’s fisheries newsletter more than a decade ago described this well⁶:

*By April, the first schools of small migratory catfish arrive at the Khone Falls from Cambodia. The species Pangasius macronema (pa gnone siap) is caught in large quantities as they migrate up the Mekong past the waterfalls. Catches of this economically important species are particularly high in the Hoo Sahong channel of the Khone Falls; which lies between the islands of Don Sadam and Don Sahong. That is because Hoo Sahong is the only channel that migratory fish can effectively use in the lowest-water season to get past the Khone Falls. In fact, Hoo Sahong is well-known to all locals to be by far the most important channel for upriver migratory fish in all seasons. Most of the other channels that make up the Khone Falls have large waterfalls on them which migratory fish cannot get past. The Hoo Sahong channel, on the other hand, has no natural barriers along its approximately 7 km length, making it easily passable by migratory species of fish that move up the Mekong River to the Khone Falls from Cambodia.*

*... The Lao Government has long considered the channel to be of critical importance to migratory*

*fish. At various times in the 1960’s, 1970’s and 1980’s the Lao Government specifically banned fishing in Hoo Sahong because of its well-known function as a pathway for migratory fish. Villagers living upstream from Hoo Sahong often point out that if fish could not get up that channel, all the people living from Khong District to the north of Vientiane would not have enough fish to eat because migratory fish cannot easily get up other channels in the Khone Falls in large numbers... The blocking of Hoo Sahong could devastate much of the most important Mekong River fisheries in Laos.*

A dam on the Hoo Sahong would block the only deep channel that allows fish to migrate through the falls year round. This could effectively block dry season fish movements between the Lower Mekong plains and the Mekong basin upstream. As shown in figure 3, the dry season is a critical period for fish migration upstream. In the Mekong Basin, 87 percent of species whose migration status is known—including most of the commercially important species—are migratory⁷. Fish generally migrate between downstream feeding habitats (Tonle Sap, Cambodia floodplains) and upstream breeding zones (Northern Cambodia, Laos, Thailand). The intensity of fishing effort at the end of the dry season, accounting for 11 to 73 percent of total annual catch at Khone Falls, further shows how important migration during these months of lowest water levels is. Among these fish are breeders migrating to reproduce⁸. Obstructing fish migration at Khone Falls therefore would have social, ecological, and economic implications basinwide.

Many fish species are also sensitive to changes in water level as “triggers” to migration. While the proposed dam at Don Sahong is a “run-of-the-river” project, it would presumably alter flow patterns in the immediate downstream area, especially during the driest periods. This too, could disrupt fish migration. For 16 percent of migrant fish species,

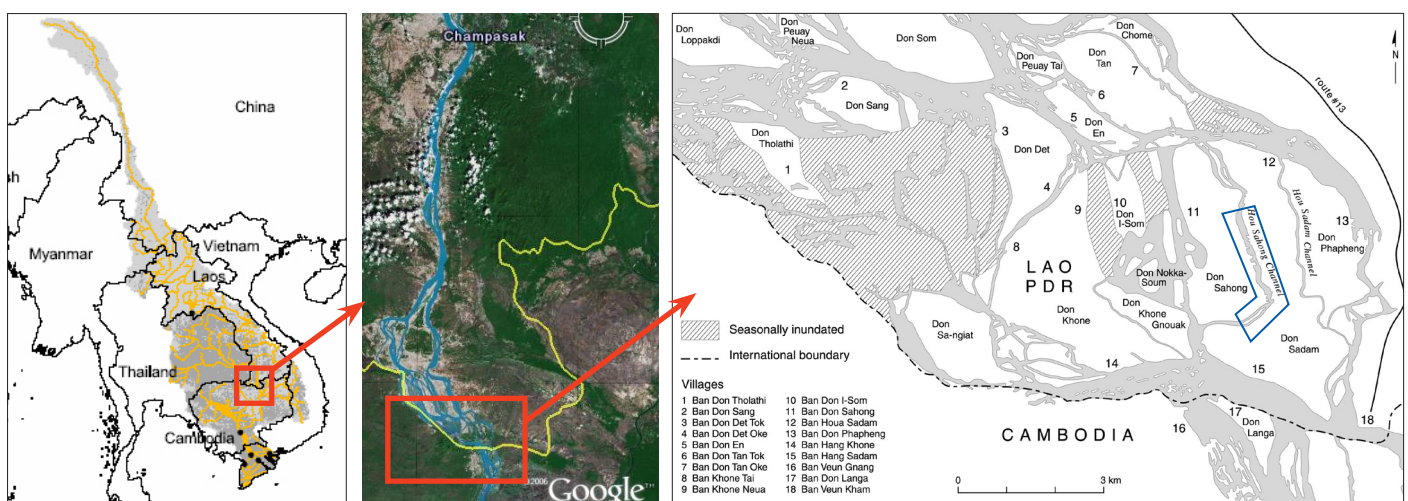


Figure 2. The Khone Falls

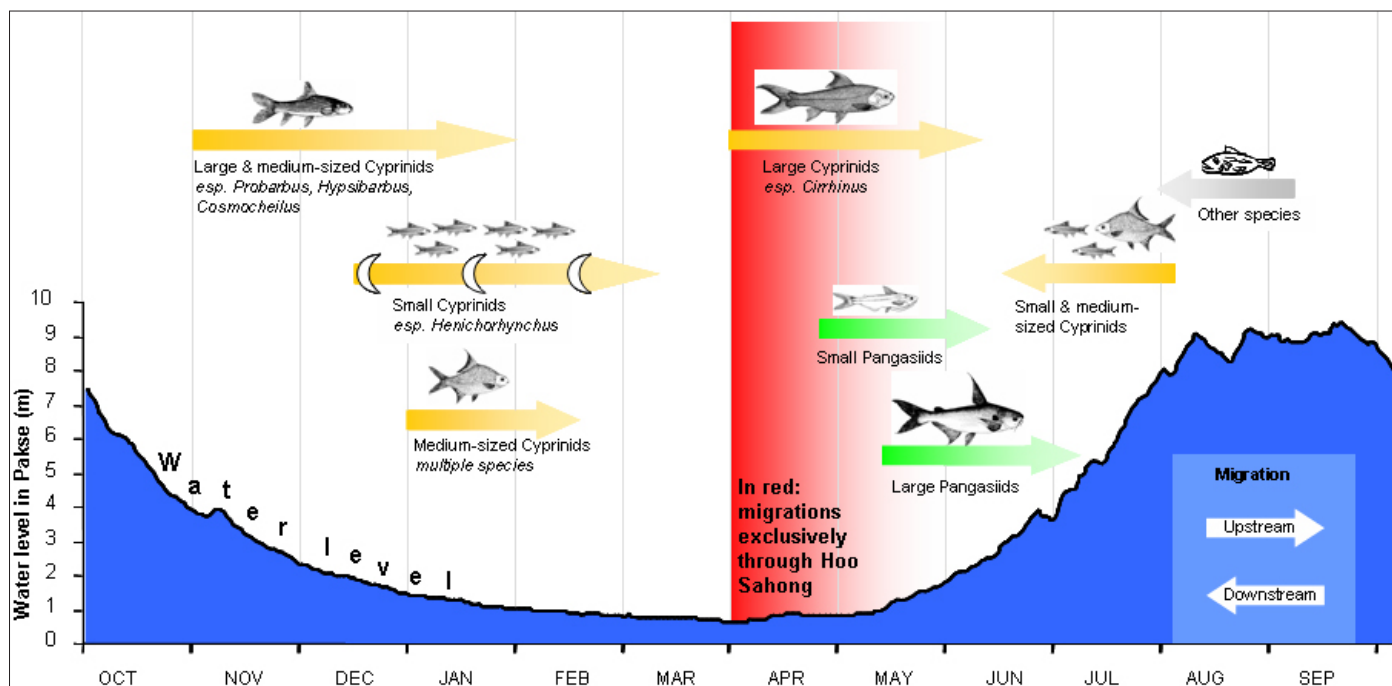


Figure 3. Fish migration patterns in Khone Falls. Adapted from Baran 2006<sup>7</sup>

it is hydrological cues that trigger their movement, often at the end of the dry season. Of the Mekong countries, Cambodia is especially vulnerable to such effects. Among the 10 fish groups that dominate the catch in the Tonle Sap Lake, for example, four are sensitive to hydrological triggers. These account for 18 percent of the volume of the Tonle Sap catch and 14 percent of its value<sup>9</sup>. Fish groups that are sensitive to hydrological triggers include shark catfishes (Pangasiidae), which are commercially important to both capture fisheries and aquaculture.

## THE ECONOMIC IMPORTANCE OF MEKONG FISHERIES

Wild capture fisheries are important to the economy of Lao PDR, contributing an estimated 6 to 8 percent of its GDP<sup>10,11</sup>. According to one of the latest comprehensive estimates, the harvest from wild capture fisheries in Laos (including catch in rice fields) amounts to 64,600 tons, or 78 percent of the country's total fish production<sup>10</sup>. Research estimates the direct value in the domestic economy at between USD 66 million<sup>12</sup> and USD 100 million<sup>13</sup> per year.

Fisheries are essential to local livelihoods and food security. In southern Laos, fish and other aquatic food consumption varies between 15 and 50 kilograms per person and per year<sup>14</sup>. In provinces bordering the Mekong, fish and aquatic products contribute between 27 and 78 percent of animal protein intake in people's diets, and provide an essential source of micronutrients<sup>14</sup>. The most recent Lao Agricultural Census showed that more than half the people of Lao PDR took part in capture fisheries in one way or another.

In southern Laos more than 80 percent of households take part, with aquatic resources accounting for about 20 percent of gross income<sup>10</sup>. During months when rice is scarce, people rely on fish and other aquatic foods to keep from going hungry. Without fish, most families have no alternative way to stay nourished<sup>15</sup>. A study in southern Laos concluded that "fishing cannot be described as important only for the poorest of the poor, but as an essential component of all the households' livelihoods"<sup>16</sup>.

Wild capture fisheries are important to all Mekong riparian countries, with an annual value of USD 2 billion per year<sup>17</sup>. The wild fish catch in the Lower Mekong Basin—the most productive freshwater fishery in the world—reaches an estimated 2.6 million tons a year, five times more than reservoir fisheries and aquaculture production combined<sup>18</sup>. Aquaculture represents only 10 to 12 percent of basinwide fish production<sup>18,19</sup> and fish farmers often feed cultured fish with small wild-caught species. As recently highlighted in a report produced under the Cambodia National Mekong Committee, the loss of even a small percentage of the fishery represents tens of thousands of tons and millions of dollars worth of fish<sup>20</sup>.

## MITIGATING THE IMPACT OF DAMS ON THE MEKONG

Despite various attempts, there are so far no examples of effective measures in the region to mitigate the effect of dams on fisheries<sup>9</sup>. Creating reservoir fisheries is often considered as a way to offset losses caused by damming. However in the Mekong Basin we know of only nine species that breed in reservoirs. Reser-

voir fisheries for these species would not compensate for the overall loss of fisheries production from the river. Fish passes are also frequently described as a potential mitigating measure, but experience has shown these to be inadequate. In the Mekong basin there are no examples of effective passes<sup>9</sup>. This is mainly because of ecological factors and the intensity of fish migrations. Available data show that fish migration can reach a density of 30 tons per hour in some areas of the basin<sup>21</sup>. This is too much for fish passes to cope with<sup>22</sup>. At the Pak Mun Dam in Thailand, despite construction of a fish pass, fishing communities both upstream and downstream of the dam reported a 50 to 100 percent decline in fish catch. They also reported that many fish species disappeared, especially migratory and rapid-dependent species<sup>23</sup>.

## CONCLUSION

In the absence of detailed design information it is not possible to provide a full assessment of the impact

of the proposed Don Sahong dam on Mekong basin fisheries. However this review of available information shows that the risks are very high. There are also many examples from other river basins showing the negative effects that dams have had on tropical inland fisheries production by blocking migration and altering seasonal patterns of water flow<sup>24</sup>. The original identification study that compared the economic returns of the Don Sahong site to alternative dam locations specifically noted that fisheries impacts had not been assessed<sup>25</sup>. However data on the economic value of the Mekong fisheries, and on the impact of dams on fish migration, suggests that the economic costs from lost fisheries production could outweigh the expected economic benefits of the dam. This analysis suggests that if the proposed dam is to be considered further, a comprehensive scientific assessment would be required to evaluate the costs and benefits in the larger context of Mekong basin fisheries. ☹

<sup>1</sup> Vientiane Times, 28 March 2006

<sup>2</sup> New Straits Times, 14 May 2007.

<sup>3</sup> Maunsell and Lahmeyer Intl. 2004 Power system development plan for Lao PDR. Final report, Volume C: Project catalogue. August 2004. 215 pp.

<sup>4</sup> Daconto, G. (ed.) 2001 Siphandone wetlands. Environmental protection and community development in Siphandone wetlands. Project supported by European Commission. CESVI, Bergamo, Italy. 192 pp.

<sup>5</sup> Baran, E., Baird, I.G., and Cans, G. 2005. Fisheries bioecology at the Khone Falls (Mekong River, Southern Laos). WorldFish Center: 84 pp.

<sup>6</sup> Baird, I.G. 1996 Khone Falls fishers. Catch and Culture (MRC newsletter), vol.2, no. 2, November 1996.

<sup>7</sup> Baran, E. 2006 Fish migration triggers in the Lower Mekong Basin and other freshwater tropical systems. MRC Technical Paper no. 14. Mekong River Commission, Vientiane, Lao PDR. 56 pp.

<sup>8</sup> MRC 2001. Fish migrations and spawning habits in the Mekong mainstream. CD-ROM. Mekong River Commission, Phnom Penh, Cambodia.

<sup>9</sup> Baran, E., et al. eds. 2007 Influence of built structures on Tonle Sap fisheries. Cambodia National Mekong Committee and the WorldFish Center. Phnom Penh, Cambodia. 44 pp.

<sup>10</sup> Lorenzen, K., Xaypladeth Choulamany, and Sultana P. 2003. Understanding livelihoods dependent on inland fisheries in Bangladesh and Southeast Asia. Lao PDR summary report. WorldFish Center, Penang, Malaysia. 15 pp.

<sup>11</sup> Souvannaphanh B., Chanphendxay S., Choulamany X. 2003. Status of inland fisheries statistics in Lao PDR Pp. 27-32 in FAO (ed.) New approaches for the improvement of inland capture fishery statistics in the Mekong Basin. FAO-RAP publication 2003/1. FAO, Bangkok, Thailand. 145 pp.

<sup>12</sup> LARReC Medium Term Plan 2000-2005. Living Aquatic Resources Research Center. Vientiane, Lao PDR.

<sup>13</sup> STEA 2003. Lao PDR biodiversity: Economic assessment. Science, Technology and Environment Agency, Vientiane, Lao. PDR (mimeo)

<sup>14</sup> Baran, E., Jantunen T., and Chong C.K. 2007 (in press). Values of inland fisheries in the Mekong River Basin. WorldFish Center, Phnom Penh, Cambodia. 58 pp.

<sup>15</sup> Meusch, E., Yhoun-Aree J., Friend R., Funge-Smith S. 2003. The role and nutritional value of aquatic resources in the livelihoods of rural people – a participatory assessment in Attapeu Province, Lao PDR. FAO Regional Office Asia and the Pacific, Bangkok, Thailand, Publication No. 2003/11. 34 pp.

<sup>16</sup> Garaway C. 2005 Fish, fishing and the rural poor. A case study of the household importance of small-scale fisheries in the Lao PDR. Aquatic Resources, Culture and Development, 1 (2) 131-144.

<sup>17</sup> MRC 2005. Annual report of the MRC programme for fisheries management and development cooperation. Mekong River Commission, Vientiane, Lao PDR.

<sup>18</sup> Van Zalinge, N., Degen P., Pongsri Chumnarn, Sam Nuov, Jensen J., Nguyen V.H., and Choulamany X. 2004. The Mekong River system. Pp. 333-355 in R.L. Welcomme and T. Petr. (eds.) Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries, Volume 1. FAO, Bangkok. 356 pp.

<sup>19</sup> Sverdrup-Jensen, S. 2002. Fisheries in the Lower Mekong Basin: Status and Perspectives. MRC Technical Paper n° 6, Mekong River Commission, Phnom Penh, Cambodia. 84 pp.

<sup>20</sup> Baran, E., So S., Kura Y., and Ratner B. 2007 Infrastructure and Tonle Sap fisheries. Policy brief. Cambodia National Mekong Committee and the WorldFish Center. Phnom Penh, Cambodia. 12 pp.

<sup>21</sup> Baran E., Van Zalinge N., Ngor Peng Bun, Baird I.G., Coates D. 2001. Fish resource and hydrobiological modelling approaches in the Mekong Basin. ICLARM, Penang, Malaysia and the Mekong River Commission Secretariat, Phnom Penh, Cambodia. 62 pp.

<sup>22</sup> MRC 2001. MRC Programme for Fisheries Management and Development Cooperation Annual Report 2000/2001. Mekong River Commission, Phnom Penh, Cambodia.

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<sup>24</sup> Kruskopf M. 2007 Impact of built structures on tropical floodplains worldwide. Report of the project "Study of the influence of built structures on the fisheries of the Tonle Sap". WorldFish Center, Phnom Penh, Cambodia. 98 pp.

<sup>25</sup> Mekong Secretariat. 1994. Mekong Mainstream Run-of-River Hydropower: Main Report. A study conducted by Compagnie National du Rhone, Lyon, France in cooperation with Acres International Ltd and Mekong Secretariat Study Team. Published by Mekong Secretariat, Bangkok, Thailand.



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