

Trial and Error Too Risky for the Don Sahong Dam: A Technical Review of the Don Sahong's 2013 Environmental Impact Assessment

International Rivers January 2014

The following is a summary of an independent technical review carried out on the Don Sahong Dam's 2013 Environmental Impact Assessment report entitled: *Don Sahong Hydropower Project, Lao PDR Environmental Impact Assessment, January 2013. Prepared for Mega First Corporation Berhad, by National Consulting Company, Lao PDR.*

Summary:

An independent expert review of the “Don Sahong Hydropower Project, Environmental Impact Assessment,” commissioned by International Rivers has found that the EIA contains serious limitations and lacks critical information required to understand the full severity of the project's potential impacts, particularly on fish and fisheries in the region. This summary is based on a selected compilation of independent reviews from four regional and international experts on fisheries, Irrawaddy Dolphins, hydrology and trans-boundary impacts. Together these experts have identified critical gaps in the report, including:

1. Vague and limited information about fish migration for specific species in the Hou Sahong channel along with the other 16 channels in the Khone Falls area;
2. A lack of credible data with which to conduct comprehensive analysis of the complex flow regime for each channel, to understand how the hydrology will be altered by the project and;
3. No transboundary impact assessment for the project was carried out despite the dam being located on a shared river less than 2 kilometers from the Lao/Cambodian border.
4. No meaningful consultation with communities downstream in Cambodia, or indication of specific measures of compensation for local affected communities.

The EIA claims that the project will not have significant impact on fisheries due to the proposed mitigation measures. However these claims are based on models which have never been tested in the Mekong, and there are doubts as to whether they could be successful on such a large scale. The project developers claim that they are taking an “adaptive approach” to fishery mitigation by continuing to conduct studies as they go along for a period of 10 years. However this “trial and error approach” belies the very serious impacts that this project would have on the Mekong River. If the mitigation measures are not successful or developers are not able to solve the problems that arise then local communities in Laos and throughout the Mekong will be the ones to pay the price.

The Don Sahong Dam threatens to irreversibly alter the unique ecosystems of the Khone Falls area, jeopardizing inland fisheries, livelihoods and food security in the Mekong. The MRC commissioned *Strategic Environmental Assessment of Hydropower on the Mekong Mainstream* states, “The Mekong mainstream should never be used as a test case for proving and improving

full dam hydropower technologies”¹. This is certainly true for the Don Sahong Dam. Further studies, including a transboundary environmental impact assessment and meaningful public consultation are needed to understand the true impacts of the Don Sahong Dam. The Mekong River is one of the world great rivers and an essential resource for the region, sustaining and nurturing the livelihoods, health and cultural identity of millions of people. The entire region will share the consequences of decisions made about the development of hydropower on the Mekong mainstream. Therefore these decisions must be made based on sound studies and proven technology, along with thorough consultation amongst regional government and affected communities. Given the serious flaws found in the report and the fact that the Mekong River transcends geographical boundaries, International Rivers recommends that the project developer be required to carry out a new EIA for the Don Sahong Dam, which includes transboundary impacts, before any decision is made over whether to build the project.

Impact on Fisheries and Food Security

Introduction: The most significant environmental and socioeconomic impacts of the Don Sahong Dam would be felt by local and regional inland fisheries. The Don Sahong Dam would block the Hou Sahong Channel, which has been recognized, by scientists and the MRC, to be of critical importance to migratory fish. It is one of the key pathways in the Mekong used year-round by fish migrating between Cambodia, Laos, Thailand and Vietnam. The impacts of the project threaten inland fisheries, livelihoods and food security in the Lower Mekong Basin. While the EIA acknowledges the importance of the Hou Sahong Channel for fish migration, the EIA claims that the impacts of the project on fish will not be significant as the negative effects can be mitigated². However these claims are unsubstantiated and according to one fisheries expert, highly optimistic. The proposed mitigation measures have never been tested in the Mekong and it is not known whether they can be successful in mitigating the loss of the Hou Sahong Channel for fish migration, or make up for the livelihoods lost due to the impact of the dam on local fisheries.

- **Assessing the Risks:** The fishery studies presented in the EIA are based on limited information about household fish catch taken from studies done in six villages that would be directly affected by the project³. The data recorded considers the combined weight of all the fish species; however it does not identify and document distinct species.⁴ Scientists have confirmed that the Hou Sahong Channel supports at least 201 distinct species of fish including endemic and endangered species⁵. Each of these species has a varying pattern of migration. In order to understand the full impacts of the Don Sahong Dam on fish migration and fisheries in the area, as well as assess mitigation measures, it is necessary to study the individual species along with the proportion of each species that use each of the 17 channels. This distinction is also necessary to determine fair compensation for affected fishermen, as the price of different species varies greatly.

¹ MRC Strategic Environmental Assessment, 2010

² Don Sahong Dam EIA – Annex D, 2013 (Executive summary)

³ Don Sahong EIA – Annex D, 2013 (Includes: The Don Phapheng, Hou Sadam, Don Sahong, Don Escom, Hangkhone and Hang Sadam Channels.) (Pg 3)

⁴ Don Sahong Dam EIA - Annex C, 2013 (Pg 21) and Annex D (Pg 3)

⁵ The Don Sahong Dam and Mekong Fisheries, World Fish Center, June, 2007

- The Khone Falls is an area of unique global biodiversity and natural beauty. In 2006 in recognition of the need to protect this unique landscape and ecosystem it was proposed for nomination as an international Ramsar site. However the Don Sahong Dam threatens the eligibility of the site and plans to build the project have stalled the Lao Government from pursuing the nomination. Limited information is presented in the EIA about the wildlife and aquatic animals that would be impacted by the project, including inaccurate information about the number of bird species, including endangered species, found at the project site.⁶
- The project will require a major water diversion to increase the volume of water passing through the Hou Sahong Channel; this will dramatically change the water levels in various channels in the Khone Falls area. The amount of water in the Phapheng Channel, which hosts the Phapheng Falls- a popular tourist location, and other nearby off-shoot channels will be reduced to a minimum of 800 m³/s, which is less than the minimum environmental flow of 1,000 m³/s that was initially proposed in the 2007 EIA.⁷ The decrease in water levels during key fish migratory seasons, particularly at the start of the rainy season, will greatly impact fisheries in important fishing channels, including the Hou Phapheng, Hou Som Nyai, Hou Som Noi and Hou Kacheviang channels. These impacts, particularly on the migration of specific species up alternate channels are not documented in the EIA and there is no compensation proposed for villages that have fish traps in the area, (i.e. Thakho and Don Phapheng villages.) According to the EIA, studies were only conducted on the Hou Sahong, Hou Sadam and Hou Xang Pheuak channels.
- The deepening of the Hou Sahong Channel at the upstream end and modification of the neighboring Hou Xang Pheuak and Hou Sadam channels⁸ is proposed to mitigate the passage of fish upstream and downstream of the dam. While the EIA claims the new channels will be able to accommodate all sizes of fish, there is no evidence for this claim. Many of the proposed mitigation measures have never been tested in the Mekong; it is therefore unknown whether they will be successful. The MRC Secretariat's 2007 review of the EIA also called into the question the viability of the mitigation measures proposed for the Don Sahong Dam, having never been undertaken on this scale anywhere in the world. The MRC states that such channel modifications need to be thoroughly investigated and proven to be effective prior to the dam being built.⁹
- Further mitigation measures that are unproven in the Mekong include studies on “fish-friendly” low-head bulb turbines that are proposed in the EIA, as well as the “trap and transport system” that is proposed to catch large fish from below the dam site and truck them to above the dam. This method poses a significant threat to the endangered Mekong Giant Catfish and potentially other species, such as *Pangasius krempfi*, which migrate from the Mekong Delta in Vietnam each year.¹⁰ It is also not clear why the “trap and transport system” measure would be needed if the modified channels really are able to accommodate all sizes of fish in the area.
- The MRC's *Preliminary Design Guidance for Proposed Mainstream Dams in the Lower Mekong Basin* (PDG) determines that “successful mitigation” of fish passing upstream

⁶ Don Sahong Dam EIA, 2013 (Pg 3-13) & Daconto, 2001, *Siphandone Wetlands*.

⁷ Don Sahong Dam EIA, 2013 (Pg 4-9)

⁸ Don Sahong Dam EIA - Annex D, 2013 (Pg 10)

⁹ Review of 2007 EIA for Don Sahong Dam, MRC (Point 64)

¹⁰ Hogan *et al*, Long distance migration and marine habitation in the tropical Asian catfish, *Pangasius krempfi*, 2007

and downstream of a dam is achieved if 95% of fish can pass without being killed.¹¹ The figures provided in the EIA report for the Don Sahong Dam reveal that a higher percentage of fish might be killed when passing downstream through the turbines, particularly fish longer than 50 cm¹². For these fish the calculated rate during certain times of year is 88-90%; however these figures are based on species found in North America and not in the Mekong River.

- There are concerns that the mortality rate of larvae will be high when passing through the turbines, however the impacts are uncertain due to a lack of studies.¹³ The EIA cites the MRC's guidelines that suggest no more than a total of 30% mortality of fish eggs and larvae passing downstream.¹⁴ However even a 30% loss would be a significant impact. The Don Sahong Dam developers claim that turbine operations will be curtailed during periods of larval drift if the mortality of fish eggs and larvae passing through the turbine exceeds 30%¹⁵. However it is unclear how mortality rates will be monitored given the large number of species that migrate through the channels each with seasonally distinct patterns and how the dam's operation can be curtailed while still meeting the requirements for minimum energy production.
- The EIA emphasizes that fisheries studies will be carried out for a 10-year period while the dam is being built and in its early years of operation, and that "adaptations" will be done in light of data collected. However it is unclear how the engineering design of the dam could be further modified if the mitigation measures are not successful. Furthermore the EIA does not indicate who would pay the costs if plans to protect fish are not successful. This implies that project developers do not plan to take any financial responsibility for the impacts of the dam.
- The EIA appears to present the project itself as a problem solver, emphasizing the extractive pressure on fisheries in the area, and claiming that the project will not only help to enhance the area but also improve the production of local fisheries. However there is no clear explanation of "alternative livelihood" options or compensation for local fisherman who will be impacted by the project or restricted from using the Ly fish trap.

Impacts to the Irrawaddy Dolphins

Introduction: The Don Sahong Dam site is located just one kilometer from a core habitat of the critically endangered Irrawaddy dolphins. This group of six dolphins is the last remaining in Lao PDR; they inhabit a trans-boundary deep water pool on the border between Laos and Cambodia¹⁶. There are a total of 85 dolphins remaining in the Mekong, many of which are found in downstream sections of the Mekong River in Cambodia.¹⁷ An independent review of the Don Sahong Dam's EIA demonstrates that the project poses a high risk to this already vulnerable species and is likely to precipitate the extinction of this group of dolphins in Lao PDR.

¹¹ Preliminary Design Guidance for Proposed Mainstream Dams in the Lower Mekong Basin, MRC (point 61)

¹² Don Sahong Dam EIA, Annex C, 2013 (Pg 15)

¹³ Don Sahong Dam EIA, Annex C, 2013 (Pg 32)

¹⁴ Don Sahong Dam EIA, Annex C, 2013 (Pg 41)

¹⁵ Don Sahong Dam EIA, 2013 (Pg 5-22)

¹⁶ Brahminy Kites Haliastur Indus fishing with Irrawaddy dolphins *Orcaella brevirostris* in the Mekong River, Ryan 2012

¹⁷ Irrawaddy dolphin demography in the Mekong River: An application of mark-resight models, Ryan et al 2011

Assessing the Risks:

- Excavation of the channels is a key part of project construction. To increase power output of the dam, the developers propose to increase the amount of water flowing through the Hou Sahong channel by excavating 2.5 million cubic meters of hard rock from the channel and surrounding area. The majority of this excavation will be done using explosives that will create very strong underwater sound waves. Dolphins have a highly sensitive hearing structure and are sensitive to these strong underwater forces that can injure or kill them. The developer plan's to dry the riverbed before excavating the channel, separating the dolphins from the explosions with a coffer dam. While this will minimize some of the risk of acute impacts on the dolphins, the dam site is very near to the dolphin pool and there will still be strong noise disturbances from the explosions. It is not clear from the EIA how long this process will take; the large volume of rock that needs to be removed could take years, leading to prolonged impact and disturbance on the local dolphin population.
- Further excavation of the dam's tailrace could reach within hundreds of meters of the area used by the dolphins.¹⁸ The developers have said explosives will not be used to excavate this area; however there are no clear details given about the alternative methods that will be used. Even using mechanical excavation with drills, jackhammers and hydraulic methods would create a large volume of noise and will have a serious impact on the dolphins, given their close proximity and the protracted time that this process will take.
- Sediment flow is an important ecosystem process; dam reservoirs can trap large volumes of sediment, which has the potential to change the geomorphology of the river. The location of the Don Sahong Dam means that sediment will be able to flow through other channels in the surrounding area, but the disturbance of sediment during construction and the flushing of sediment during operation still pose a threat to dolphins in the area. The flushing of sediment creates a burst of sediment-heavy water, which can be 20 times as dense as the typical flow. It is not clear how increased sediment would affect the dolphins; however it is probable that it would have a negative impact on their habitat if large amounts of sediment are ingested or interfere with their breathing.
- During construction and operation there will be increased disturbances around the site from boat traffic and industrial activity. The Irrawaddy dolphins are particularly shy and sensitive to boat traffic and their increased presence could lead to acoustic injury, stress, and dispersal from the site. The heavy industrial activity in the area also poses the threat of chemical spills which would have acute consequences for the local dolphin pool. Such possibilities are not explored in the EIA, however the likelihood given the length of construction should be considered.
- Ongoing operation of the dam's turbines will also impact the local dolphin pool. The large amount of noise is likely to irreversibly alter their habitat making it unlikely that the dolphins would re-colonize the site once the dam is operational.
- If the dolphins from this pool were lost it would amount to a 34% decline in the species in the Mekong River. Such a large reduction on such a small overall population would greatly increase the risk of extinction. The cumulative impacts of the project on the local dolphin population must be taken into consideration when examining the long-term impact of this project. It is likely that together these impacts will have an acute impact on

¹⁸ Don Sahong Dam EIA, 2013. (Pg 2-5)

the very small population of dolphins that remain in the Mekong River.

Hydrological Concerns:

Introduction: The site of the Don Sahong Dam is a complex area made up of 17 different channels. The hydrological and hydraulic regime of this section of the Mekong is defined as a “dynamic equilibrium situation.” The project developers propose to excavate the Hou Sahong Channel as well as surrounding channels to increase flow and power output from the dam. However even as little as 5m depth excavation upstream and 1.5m depth excavation downstream would violate the fragile equilibrium of this area. The impacts of such a dramatic change in water levels and the effects on fish and fisheries in the area have not been adequately documented in the EIA.

Assessing the Risks:

- The impacts of the Don Sahong Dam on hydrology and downstream flows are analyzed through a scheme of five channels in the project vicinity, and conclude that only the Hou Sahong, Hou Sadam and Hou Phapheng channels would be affected by the project. However this study does not give a comprehensive analysis of the complex hydrology of the area, taking into account all 17 channels¹⁹. In order to understand the importance of the role that the Hou Sahong Channel currently plays within the system of channels, and accurately measure the impacts that the Don Sahong Dam will cause by blocking this channel, comprehensive studies must be done on all 17 channels. This was also expressed by the MRC in their review of the 2007 EIA.²⁰
- The developers plan to use surrounding channels for fish migration and mitigation measures, however there is no hydrological and hydraulic data for 12 out of the 17 channels. Data on the water level and discharge for each individual channel is needed with measurements from 1000m³/s to 2000m³/s to make sure the flow is distributed equally across the channels. The majority of the information on hydrology reported in the EIA is based on the “DSHPP Mekong River Model,” however there is very little information about the model itself, the methodology and what is being studied. More transparency is needed from the project developers in order to understand what areas of study are still going on.
- While flood calculations for the river were done, design peak flow was not carried out for the dam site and it is not clear what flood peak was used for the spillway.
- Project developers have said that the dam will produce comparable electricity between dry and rainy season, however according to studies from one hydrologist, during the dry season the dam will be required to stop operation for hours in order to fill the reservoir. In order to run one unit – the turbine and generator – a minimum flow of 70% is required, with maximum turbine discharge between 306m³/s and 420m³/s. This level of flow corresponds with a discharge of around 2200m³/s to 2500m³/s at Pakse. However during the dry season the flow at Pakse drops significantly, and can be as low as 1100m³/s²¹. It’s also worth noting that Compagnie Nationale du Rhône (CNR) carried out their own

¹⁹ Don Sahong Dam EIA - Annex A, 2013 (Pg A-3)

²⁰ 2007 Review of the Don Sahong Dam's Environmental Impact Assessment (EIA) Report, MRC (Points 64-69)

²¹ Don Sahong Dam EIA, 2013. (Table 5-8)

complimentary hydraulic study of the Don Sahong Dam in 2011 and their studies also found that the overall power generation for Don Sahong was being overestimated based on the limitations in accurately modeling the flow throughout all channels in the Khone Falls area.²²

Transboundary Impacts and Consultation:

Introduction: The site of the Don Sahong Dam is less than two km upstream of the Lao/Cambodian border; however there is no specific section in the EIA that addresses transboundary impacts. The stakes are highest for Cambodia when it comes to the interruption of upstream and downstream fish migration cycles. The potential impacts from the Don Sahong Dam would be felt immediately downstream in Stung Treng province, and could reach further as the project has the potential to impact the connectivity of fish migration for species that spend part of their cycle in the Tonle Sap Lake. There are also potential impacts upstream on Thailand and further downstream for Vietnam.

Assessing the Risks:

- One of the key issues in the EIA which influences engagement and consultation with neighboring countries is the classification of the Don Sahong Dam as a mainstream or non-mainstream dam. In the 2013 EIA, project developers base their definition solely on hydrological consideration, claiming that the Hou Sahong Channel is not part of the mainstream as only 15% of the Mekong flow passes through the channel. However this is a very narrow definition that ignores important ecological characteristics of the area. The fisheries expert, for example, who conducted the evaluations for the 2007 EIA determined that Hou Sahong is part of the Mekong mainstream based on migratory fisheries data. Furthermore the viability of mitigation measures including channel modifications to the Hou Xang Pheuk and Hou Sadam channels should have no bearing on the status of the Hou Sahong Channel as a critical fishway.
- There are contradictions throughout the project documents as to how the project is defined. Earlier documents including MRC-funded studies and maps on the MRC website show the Don Sahong Dam as one of 11 proposed mainstream projects. The dam's 2013 Cumulative Impact Assessment (CIA) carried out by the project developer also indicates that the Don Sahong Dam is a mainstream project stating that; "There are no dams on the mainstream of the Lower Mekong at this time, but there are at least eleven being planned, including the Don Sahong Hydropower Project"²³. As a mainstream project the Don Sahong Dam should be required to undergo the MRC's full Procedures for Prior Notification and Prior Consultation (PNPCA) process, allowing for regional consultation and decision-making.
- The EIA claims that consultation with people downstream in Cambodia indicates support for the project²⁴ however there is no evidence of meaningful consultation with communities in Cambodia. The CIA presents limited information, including photos and a list of names of officials met during a field investigation carried out in October and

²² Compagnie Nationale du Rhone, Thakho Hydropower and Tourism Development Project, Complementary Hydraulic Study about the Don Sahong Dam, May 2011

²³ Don Sahong Dam Cumulative Impact Assessment, 2013 (p.vii) and Table 1-1 *Mainstream Dams on the Mekong* (Pg 3)

²⁴ Don Sahong Dam EIA, 2013 (Pg 4-10)

December 2009²⁵, however there is no evidence of more recent engagement or consultation with stakeholders in Cambodia. This means that information presented during this field investigation was based on outdated studies and inaccurate information about the project. The CIA later states “an official public consultation workshop or other meeting to inform concerned authorities about the progress of the DSHPP [in Cambodia] was not carried out. Ongoing consultation to obtain their opinion about this project is needed as the project moves forward.” Further public consultation is needed in Cambodia, using the up-to-date studies and project designs for the Don Sahong Dam. Consultation should also take place in Thailand and Vietnam as impacts would be felt in these countries as well.

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²⁵ Don Sahong Dam Cumulative Impact Assessment, 2013 Appendix C (Pg 46)

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