

## Review of FEG Annex A of the MRCS Prior Consultation Report to JC

Section	Comment
Preamble p44.	The opening disclaimer statement suggests the FEG were unprepared and ill-informed and that others may find errors ambiguities and omissions in their expert report. This is not a confident start.
1.1 – p47	What is a keystone location – please define?
1.1 – p47	<p>it is only the Hou Sahong channel that allows for year-round migration and is large enough..."</p> <p>There are no scientific observations on fish passage to support this statement.</p> <p>The Baran 2005 paper cited by FEG is a review which repeats the anecdotal evidence collected from local fishers by Ian Baird in the 1990s. The term 'large enough' is unquantified and vague (Does it mean minimum channel width, or depth or volume of flow?). There is no standard measure of channel largeness for fish passage.</p> <p>What is meant by "large numbers of fish"?</p> <p>What are large species?</p> <p>The other channels are large by any measure and large fish are commonly caught in them.</p>
2 p48	Significant socio economic studies have been carried out by the developer but are not reported in the Fisheries annexes. These were the SIA (2013) and the EIA (2007) presented as an Annex to the SIA (2013). Therefore the bulk of socio economic information available on the project has been overlooked by the FEG team. This omission is apparent in the discussion of socio economic issues reported below
2 p48	<p>The FEG ignored the reports and information on fisheries related work undertaken by the developer since 2012 and released to them by the developer during the consultation meeting –</p> <p>Developer wonders what was the point of the consultation process if the documentation which was released to FEG in good faith to assist the consultation process was not permitted for use because it was "not passed through the formal consultation route". Although the FEG states these documents were used - none are cited anywhere and re are numerous incidences where information provided by the developer could have illuminated issues which the FEG closed off stating "no data were unavailable, missing or incomplete".</p>
2 p48	"The main empirical information..." this criticism of the methodology ignores the Methods report provided to FEG that described in detail all on methods developed during 2013 and used by the project from mid 2013 to date and ongoing, to acquire a comprehensive baseline data set which addresses all the issues raised.
2 p49	<p>"With respect to mitigation measures the project itself and the EIA is not complete"</p> <p>1) fish-friendly turbines (no final solution with respect to type of turbine is proposed.)</p> <p>On site visit FEG were given blade strike modeling of the final turbines design proposed for the project at date (2014) with the relevant hydrological information.</p>

	<p>2) downstream fish passage (no solution developed.</p> <p>Actually up to date information was provided to FEG (see ref list) in form of a technical review by international expert (Dr Andy Tumpenny) of potential deterrence options – the FEG chose not to cite that information here.</p>
P49	<p>“there is a fundamental requirement to achieve the best possible design result before the Joint Committee would be fully enabled to arrive at an agreement that contains agreed upon conditions (PNPCA Art 5.4.3), and <b>this is not the case for DSHPP</b>”</p> <p><b>The developer contends this statement is not true and that is because the FEG have ignored or overlooked much of the data which was available to them to present to the JC.</b></p> <p>In the preamble p1 of their report the FEG attempt to exonerate themselves from these omissions by stating “The report has involved no in depth discussion with the MRC, other sectors, stakeholders or the developers and represents only provisional assessment of key facts and information provided and may be subject to alteration and clarification.”</p> <p>A relevant example is their lack of basic knowledge about the hydrological changes in the system in the Hydropower era. Therefore this statement that the report finds the information provided by the developer is lacking is a reflection on the adequacy of the FEG ability to report rather than on the developer capacity to develop a suitable mitigation strategy.</p> <p>Iteroparous - this definition is inaccurate. The definition is “may spawn more than once in its life”.</p>
3 p51 after Fig 2	<p>The late dry season is not the most important migration period at Khone Falls, either in terms of biomass or ecological significance. There are a few high value species (P. Krempfi which spawn in Feb March) but the main migrations in the late dry season are for dispersion / feeding and are undertaken by small cyprinids. Describing the late dry season in the tropics as “Spring” is a mistake.</p>
3 p52	<p>Not clear how this is related to the Khone falls no geographical context or even reference to this important point except MRC RIS project?</p>
3 p52	<p>“A complete uinventory is lacking form the EIA...”</p> <p>Yet the EIA reports the same sources of data and references as the FEG report.</p>
3 p52	<p>The head pond of the DSH has a max depth 30m and length of 4-5 km. The basin morphometry is comparable to naturally occurring deep pools in the river.</p> <p>The volume and surface area of the DSH will be 10 to 100 times smaller than other reservoirs in the Mekong basin, so water passing the head pond will have residence times of 2- 4 hours to maximum.</p> <p>The potential for this velocity change to cause excessive larval fish loss by sedimentation seems unlikely but if real it must be matched by similar losses in the deep pools elsewhere in the system.</p>
P53	<p><b>DSH limits access to deep pools – implications not considered fully by EIA?</b></p> <p>The issue of “access to deep pools by some species” is a subset of the overall problem of any dam potentially denying all fish species passage between desirable habitats.</p> <p>The mitigation measures described in the DSH EIA were based on compliance with the MRC PDG for 95% passage by all species in both</p>

	directions. If this requirement is satisfied, there is no issue.
P53 Fishery Activities	<p>This comment is not relevant to fisheries - the harvest and consumption of amphibia, aquatic reptiles and crustaceans will not be altered by the loss of the fish migration pathway through Hou Sahong, nor by loss of wetland habitat - the core area of the Siphandone has been reported as 60 km<sup>2</sup> (ICEM 2012). The DSH project would inundate a mere 0.02Km<sup>2</sup> of land.</p> <p>The DSH project is addressing the income and livelihoods of affected villages in the social programmes. As part of that a comprehensive baseline survey of aquatic food consumption was completed in 2014. These data are in process of analysis now.</p>
P53	<p>BDP estimate DSH will reduce aquatic production by 15%. FEG then extrapolate this as 15% of 3mill tonne/yr of catch = 450,000 tonne/yr. Cacot (2007) show sthe catch is much lower than this but also the impact of fishing pressure is unsustainable.</p> <p>NB - BDP estimate of impact is for the Mekong cascade - there is no individual estimate for DSH and the BDP assume no successful mitigation.</p> <p>So the estimate of DSH impact is purely speculation and not accurately referenced to BDP work.</p>
P53 – Ecological studies	<p>Dot point 1 – the FEG comments are reveal the extent of their ignorance on the knowledge of the complex hydrology of the Khone Falls system that has been acquired by measurement and modelling during the course of the project. FEG would have profited by discussing these studies and learning with the Hydrology experts in MRCS and by reading more widely that the two Annexes of the EIA which they have cited.</p> <p>The statement “It appears the [hydrological] studies are exclusive to Sadam, Sahong and Xang Pheuak” shows again shows ignorance of h3e extent of information available in the EIA, the Engineering design and subsequent hydrological and hydraulic reports all of which were available to the FEG through the MRC and the Developer website.</p> <p>The studies by the developer using hydraulic and hydrological models of the entire Khone falls show flow in only four channels is affected and no channels west of Xang Pheuak (which transport 80% of the wet season peak flow) are affected. The impact on flow in Xang Pheuak is minor to insignificant.</p>
3.3 Ecological studies p 53 and following	<p>FEG say Fisheries monitoring as described in EIA is inadequate - not fit for purpose. MFCB have developed a comprehensive baseline monitoring program since the EIA was completed. It was developed and implemented in 2013 and full details of the program were provided to FEG at the site visit. This document (Hortle et al. 2014) describes the monitoring in detail and addresses these questions.</p>
p. 54	<p>“fishing is now prohibited” ... only large illegal gears are prohibited in the channels, but in fact they continue to be used.</p>
3.3 Ecological studies p 54 and following	<p>Almost all the questions raised in these dot points show the FEG did not read the information provided to them at site.</p> <p>E.g. “No methods or experimental design is presented to get these [fish monitoring] data.</p> <p>FEG hold a copy of the monitoring manual describing all methods used how developed rational and basis for methods – and had the entire system explained on site with opportunities to question the developers</p>
3.3 Larval studies	<p>FEG – “needs reporting in full” and are concerned over adequacy of budget.</p>

	<p>As explained on site during the FEG visit - The larval studies report is now in preparation. The sampling period spanned two spawning seasons in 2013 and 2014.</p> <p>Collected 1000 samples and 26000 larval fish all have been counted ID'd and measured.</p> <p>The last samples were collected in September 2014. As explained to FEG at site - a thorough scientific investigation takes time and cannot be rushed.</p>
4 p59	The hydropower era flow will appreciably increase dry season discharge through HXP (not recognized in the discussion of deepening channel inlets here)
Fig 5	The Google earth images of Sahong and HXP provided grossly misrepresent the status of the channel HXP as these were recorded in Feb 2010 which was at the height of an extreme event and the second lowest flow year ever in the MRC data set for southern/ Stung Treng. This is not a valid representation of the future low flow condition in the HXP channel – see hydropower era and the new definition of low flow in Hydrology section.
P61	Fish Passage – the FEG report criticizes the section of HXP as the alternate passage and goes on to present alternatives called high flow passes – but there is no evidence at all that these alternate pathways (Lipi and Khone Phapheng) are effective - no one has this evidence. Others (e.g. World Fish) are actively investigating other alternative pathways - there are many channels. Moreover the developer is not limiting the fish passage development to H Xang Pheuak - but it is a logical starting point.
P62 Sadam passage	The comment about Sadam that fish are unlikely to find this alternative pass because they are only be attracted to the highest flows is not supported by any local evidence. It contradicts the conceptual model proposed by Baran / Baird based on LEK that upstream migrating fish actively search for new pathways when they fail to get passage through channels with high attraction flows but impassable barriers (Lipi and K. Phapheng) This discussion (about Sadam) accepts a general view that more attraction flow means more fish. There is a strong opinion among fishers that because of fast currents in this area most fish hug the edges while swimming upstream, and especially during high flow they swim through the fringing vegetation. This aspect is not considered at all. The position of Sadam Channel relative to Phapheng is important. Fish returning downstream along the western edge after failing to ascend Phapheng waterfall will encounter the flow from Sadam first, which compared with any constructed fishway is a very large flow.
Papheng p. 62	There are two Lee traps at the bottom of the Khone Phapheng (falls). There are no traps at high elevation on this water fall. The MRC has monitored fish catch in the side channels (Som Nyai and Som Noi ) since 1993. There is no evidence form the MRC studies or others to support the FEG claim that fish are likely able to pass through these side channels. Roberts and Baird (1995) reviewed LEK on fish passage at all falls. They state that fish "can not pass" Phapheng waterfall.
4.4.3 Recommend	HXP recommendation that to position the attraction flow at base of dame takes no account of the high flow velocity in the Sahong channel tailrace

	<p>or the conceptual model of upstream fish migration based on Local Ecological Knowledge, that fish explore multiple pathways – they need to as there are many upstream pathways but few are passable</p>
4.5 p63	<p>Downstream passage through turbines is not known to be significant. The project is working to establish if it is. That would occur if two conditions are met</p> <p>1) migration occurs when a large proportion of the total flow passes the Sahong turbines (e.g. dry season)</p> <p>AND</p> <p>2) there are no mitigation measures or the measures to prevent or deter fish from entering Hou Sahong are unsuccessful.</p> <p>The baseline monitoring by the developer will determine 1). The developer is investigating 2) as part of the mitigation programme (FEG received both these reports).</p>
P 64 Blade strike	FEG were provided with updated blade strike model for turbines to be used in plant. All these details were included
P 65 larval drift	<p>The full methodology of the comprehensive larval study conducted from June 2013 to Sep 2104 was provided to FEG but has been overlooked. All the issues raised here are addressed therein.</p> <p>At Khone Falls there is an obvious advantage for downstream-migrating fish to avoid Khone Phapheng, which would cause high mortality of large fish. This statement is unsubstantiated. There is no evidence that fish are killed or injured by passage over Phapheng Waterfall. If this was an issue then some fish would surely be seen dead or injured at times in Phapheng Channel below the falls, but some fishers interviewed were not aware of such dead or injured fish. The lee traps at the base of Phapheng catch both downstream and upstream migrating fish and the operators report they are in good condition. The waterfalls are in fact cascades where fish moving with the main flow will simply be carried with the water.</p> <p>The edge effect is very limited in this case because the DS channel takes a significant part of the flow.</p>
P 66 larval drift	<p>Do the FEG have any evidence that Mekong fish larvae will “fall to the bottom if flow rate &lt; 0.3m/s). What is the basis for this statement?</p> <p>Screening is not the only option. The project is considering others for deterrence - see Turnpenny report.</p>
Recommendations P 66	A review of screening by an international consultant (FSG) was provided to FEG but in not mentioned.
p. 68, 5.1	Mekong’s fisheries = Mekong basin’s fisheries
5 P68	<p>FEG wrote &gt; Limited socio economic information available – no records on affected people etc...</p> <p>The reviewers only read Annex C and D on fisheries and did not bother to read the NCG SIA (2013) or the NCG EIA Annex of socio economic data collected in 2007 (First EIA), both of which report extensively on this.</p>
P72	<p>Risk assessment is a useful approach to focus energy and resources into mitigation efforts.</p> <p>The flaw in the approach is the subjective allocation of likelihood of the risk event occurring.</p>

	For example the FEG cite the major risk of fish "failing to enter HXP because of the inadequate attraction flow. This ignores the conceptual model that fish in Khone Falls area will explore alternate pathways and are caught in large numbers in HXP and Sahong although the Lipi and Phapheng falls currently provide the greatest attraction flows in the area.
p. 73	These terms are used incorrectly. They should be "small" "medium-sized" and "large" not "...-bodied". A large-bodied fish is one with a relatively fat body, like a puffer fish.  The length ranges seem wrong. A fish 150 cm long is surely not medium-sized. For the Mekong, any fish > 1m is surely large.
p. 75	"because under the proposed design there are no downstream fish facilities" This statement is not clear. All alternative channels are downstream migration routes.
7 p 76	FEG did not read the monitoring program report Hortle et al 2014.  In principle, fishing pressure is an impact on migratory fishes in the area. "In principle" is not correct. it is a fact.
7.1 p 77	FEG state the developer should engage fishers across a wider area, to more effectively reduce fishing pressure... FEG forgets that it is not the obligation of the developer to reduce fishing pressure around the LMB – that is the role and duty of fisheries agencies in the Riparian states and the MRC. The MRC PDG require the developers to provide passage for 95% of all migratory species that reach the project. The developer proposes to improve the likelihood of successful passage of spawning fish around the project, by reducing fishing pressure in adjacent channels.
7.2 Gaps in monitoring	FEG did not read the monitoring report Hortle et al. 2014
86	De Silva and Funge Smith 2005 and Hortle 2005 ... References are missing from the report  The Mekong Basin figures are quoted by DS and FS for some Thai reservoirs only, and are based only on catches from some landing sites which are monitored by the DOF, so they do not include small-scale HH catches, nor the catches of shrimps and clams which may exceed fish catches in some reservoirs.
9 p81-87	How is this relevant? DSH is not mentioned here? These scenarios are for are multiple dams
10 p 87	Workshop on fish passage design with MRC? Why? If the MRC had expertise in fish passage design they would not need to hire the FEG.
10.3	"limited information on downstream fish passage was provided" A detailed review (FGS 2014) was provided to FEG, this was not mentioned at any place in this report.
10.3 p88 no specifications of the bulb turbine design	The turbine design parameters included in the EPC tender were provided to FEG (in the updated blade strike model)
10.6 Actions p90	This recommendation to model the hydraulics of all the channels that cross the Khone Falls in detail needs to take account of cost or benefit.

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	The developer approach is to monitor fish passage performance. If proposed mitigations are inadequate, the developer will identify those channels which fish can already pass, but which can be improved.
10.6 Actions p91	as stated elsewhere in this report DSHPP has no effect on sediment transport. So no need for this developer to study the impacts of other dams on sediment transport in the Mekong.