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RIVERS COALITION IN CAMBODIA

(Formerly known as the 3S Working Group)

REVIEW AND FEEDBACK

ON

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ON THE CAMBODIAN PART OF THE SE SAN RIVER DUE TO HYDROPOWER DEVELOPMENT IN VIETNAM

(Prepared by SWECO Groner for Electricity of Vietnam)

Initially reviewed by Grainne Ryder

with additional comment and inputs

from International Experts and Rivers Coalition in Cambodia (RCC)

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An Alliance of Civil Society Organizations in Efforts to Protect and Restore River Ecosystems and River-Based Livelihoods in Cambodia

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1. Se San EIA Report

The 189-page EIA report was prepared in English by SWECO Groner in association with the Norwegian Institute for Water Research, and two Vietnam-based consulting firms: ENVIRO-DEV, and ENS Consult. The report is hereafter referred to as the EIA.

Its purpose: “to evaluate the impacts in Cambodia from the development and operation of Yali Hydropower Project and from future hydropower development on the Se San River in Vietnam.” [P7]

2. Se San EIA Review – background and purpose

In January 2007, at a meeting to review another EIA prepared by the SWECO Groner team for the Sre Pok River, the Vietnam National Mekong Committee and Cambodia National Mekong Committee representatives committed to releasing the Se San EIA and organizing a meeting to review the EIA with Cambodian stakeholders in March 2007.

The EIA was not released to NGO Forum on Cambodia until the end of May 2007 – about one week before a meeting organized by VNMC and CNMC was to be held in Phnom Penh to review the report. Cambodian NGOs complained about the short notice and the failure to provide a translated copy of the EIA to Cambodian stakeholders. The meeting went ahead on July 5, 2007. NGO Forum on Cambodia and several other NGOs declined the invitation to attend the meeting due to the short notice and the fact the EIA had still not been translated into Khmer as requested; nor were representatives of dam-affected communities invited or offered assistance to participate. Statements expressing concern about the unfair process for EIA review were released by the Se San community network and NGOs in Phnom Penh, respectively.

The following EIA review was conducted for Phnom Penh-based NGO Forum on Cambodia by a team of international experts in July 2007.

Its purpose:

1) to summarize the EIA findings for quick translation into Khmer and distribution to Cambodia stakeholders, including representatives of dam-affected communities in the provinces of Ratanakiri and Stung Treng; and

2) to assess from a downstream perspective the adequacy of SWECO’s record of downstream impacts and its recommendations to EVN on reducing downstream impacts and hazardous conditions.

3) to stimulate further discussion and initiatives on the Cambodian side of the Se San River to improve Cambodian participation and negotiations on all aspects of Se San management, including: the monitoring of dam operations and reducing hazardous flows, improving public safety, and mitigating dam-related damages to Se San fisheries, agriculture, and water quality.

3. Electricity of Vietnam Hydro Projects on Se San River in Vietnam

The EIA report contains several maps of the Se San River Basin and the location of the dams in Vietnam.

720-MW Yali Dam:

- first and largest dam on the Se San river about 70 kilometres upstream of the border
- construction began in 1993 without an assessment of social, environmental and economic impacts in downstream Cambodia or consultations with affected people
- Yali has been fully operational for five years
- 65-square kilometre reservoir was filled to a depth of 60 metres in 1998
- first generating unit began producing electricity in June 2000 and by January 2002 all four units were fully operational.

Additional hydro dams completed or under construction:

- 100-MW Pleikrong (only one upstream of Yali)
- 260-MW Se San 3
- 96-MW Se San 3A
- 360-MW Se San 4
- Se San 4A regulating dam

Project status and key features are summarized in Table 1 and 2 below:

Table 1: EVN Se San Hydro Cascade

No.	Project	Distance from Cambodian Border (km)	Reservoir Surface Area (sq km)	Installed Generating Capacity (MW)	Project Completed? Yes/No Date
1	Yali	~70	65	720	Yes Jan 02
2	Pleikrong	~90	53	100	No info
3	Se San 3	~55	3.4	260	Yes May 06
4	Se San 3A	~45	8.5	96	Yes Sep 06
5	Se San 4	~6	58.4	360	No info
6	Se San 4A	~1	1.73	0	Yes Aug 07
	Total		188.3	1,536	

Table 2: EVN Se San Dam Construction Schedule

Date	Event
Nov 93	Yali dam construction begins
May 98	Yali reservoir begins filling
Jul 98	Yali reservoir filling complete
Jun 00	Yali power station first unit commissioned
May 01	Se San 3 access road construction begins
Jan 02	Yali power plant construction completed and all four units in operation Se San 3A construction of access roads begins
Dec 03	Pleikrong construction begins
Apr 03	Se San 3A dam construction begins
Apr 04	Se San 4 access road construction begins
Nov 04	Se San 4A regulator dam construction begins
2005	Se San 3 dam construction completed Se San 3A dam construction completed Se San 3A electromechanical equipment installation underway
Dec 05	Se San 4 dam foundation excavation begins
Apr 06	Se San 3 first trial run
May 06	Se San 3A first trial run
Jun 06	Se San 3 completed
Sep 06	Se San 3A completed
Aug 07	Se San 4A regulator dam completed

Reviewers' Note: the EIA does not consider hydro dams planned by the Cambodian energy ministry for the lower Se San in Cambodia, or how this might affect commitments to mitigate damages caused by upstream dams. On July 17, 2007, Cambodian newspaper *Rasmei Kampuchea* reported that the Cambodian energy minister, Suy Sem, has asked Vietnam to help build two hydro dams on the lower Se San.

4. Affected Population in Downstream Cambodia

The EIA reports that an estimated 29,000 people in northeast Cambodia rely directly on the Se San river for their drinking water, as well as for bathing, fishing, growing crops and watering livestock. No estimate of the number of people adversely affected by upstream dam operations is provided. Nor does the EIA estimate the economic cost of the environmental impacts experienced by downstream communities.

5. EIA Highlights: What Cambodians Need to Know

In this section we have compiled a list of what we judge to be the most relevant statements and recommendations in the EIA report that concern downstream Cambodians:

DOWNSTREAM IMPACTS OF YALI AND ADDITIONAL SE SAN DAMS

FISHERIES

Fishery Decline Attributed to Yali and Future Dams

"Based on 100 years experience of hydropower regulations in Scandinavia and the reductions they give to downstream fish stocks, also in rivers with no fishing pressure, the EIA team is convinced that the Yali Regulation is a main cause of the decline in fishery yield in Se San." [p91]

"There is no doubt that the existing and planned regulation schemes in Vietnam will lead to eradication of several species of fish and other water living organisms in the Se San River." [p147]

"The Yali regulation [dam] has already contributed severely to reduced fish stocks, fish size and species composition in the Se San River to levels where fisheries no longer can supply the population along the river with the necessary amount of protein. . . . The planned new regulation [dams] in Vietnam can very easily give additional negative impact on the fish stock in the Cambodian part of the Se San River." [p149]

Lost Food Production, Income, Food Security

"Food production and income earning of the riverside populations have been disturbed (sic) to a significant extent." [p18]

"As fish catches have decreased, food security situation [in Ratanakiri province] is already at risk. . . . Any deterioration in nutritional status or increase in health problems should be alarming." [p170]

Property Losses and Health Problems

"The past operation of the Yali dam have reportedly caused sudden flow surges in Se San River, which has taken a toll on human lives, crops (stock losses), boats and fishing equipment and communication systems. There have also been changes in water quality over the past with notable impacts on wildlife and decline in fish stocks. There are daily flow fluctuations causing riverbank erosion, the water has become more turbid, it is colored, it smells bad, swimming in it

gives itchiness and in periods people and livestock get sick when they drink the water." [p18]

Poorest Familites Hardest Hit by River Bank Erosion

"Lower parts of the river banks become unstable and the use of many river banks for agriculture has become difficult and not possible in many areas. The decline in use of the riverbanks and sandbanks in the river for agirulcture was apparent during the field survey. For the poorest families and those with small pieces of land the impact on their lives is regarded to be significant." [p13]

WATER QUALITY

Toxic Algae in Yali Reservoir Linked to Downstream Health Problems

"The analyses confirm that there are strains of toxin producing blue green algae present in Yali Reservoir. Most likely, it is the Microcystis species observed in the microscopic analyis. This means that there might well have been incidents of toxic blue green algae that caused or cotnributed to the health problems of animals and people described during 2000." [p81]

"It seems very likely that, during the first 2-3 years [when the Yali reservoir was filling] there have been incidents with toxic blue green algae, which have [produced] water quality problems in Se San river in Ratanakiri . . . that caused or contributed to the health problems for animals and people during 2000." [p130]

" . . . most likely algae [was] produced from nutrients released by decomposing terrestrial litter in the [Yali] reservoir. This has most likely caused problems for the Cambodians with respect to the use of the water as untreated drinking water. The algae made the water smell badly, and they had some toxic effects of skin irritation, eye irritations, as well as respiratory problems headache and stomach ache after drinking the water. These are all typical symptoms from some blue green algae, most likely of the genus *Lyngbya.* This impact is no longer a problem arising from the Yali regulation [dam], but some of the same impacts may appear again due to the new [dams] that are under implementation." [p132]

*Reviewers' Note: The "algal problems" refers to Cyanobacteria: the scientific name for **blue-green algae** or "pond scum" which releases several types of toxins that can attack the liver (hepatotoxin) or the nervous system (neurotoxins) when ingested or can simply cause itchiness after bathing. Liver poisoning may take hours or days to appear and can cause abdominal pain, diarrhea and vomiting in humans and death in animals. In combination with other liver diseases such as hepatitis, the impact can be deadly. This is a well known problem in lakes and reservoirs.*

"The most frequently occurring algal toxin is a compound called microcystin (hepatotoxin), named after the organism it was originally detected from, the blue-green algae *Microcystis aeruginosa*. Some times one or more neurotoxins occur together with the microcystins. The symptoms described in the report from the Fisheries Office and NTFP (2000) is most likely a neurotoxin." [p 81]

Analysis Confirms Toxic Algae in Yali Reservoir

"The analyses confirm that there are strains of toxin producing blue green algae present in [Yali] Reservoir" [p81] and that the algae produces "exactly the same symptoms" reported by downstream Cambodians between 1999 and 2000. [p130]

"The samples from both the Yali Reservoir and the outlet of the reservoir gave positive significant detection of microcystin [an algal toxin]." Table 5.9 indicates concentrations of microcystin of 0.067 to 0.073 micrograms per litre in the Yali reservoir, and as far downstream as Vuon Sai in Cambodia, concentrations of 0.002 to 0.003 micrograms per litre. [p 81]

Water Quality, Downstream Residents At Risk For Next 5 to 10 Years

"The future regulations [dams] will inundate new terrestrial areas and will create nutrient rich water in downstream river for a period of 5 -10 years after the regulation [dams are built]. This may produce new algal problems." [p145]
"The first years after the [dam][1] increase content of suspended sediments (erosion material) and possibly algae produced from nutrients released by decomposing terrestrial litter in the reservoir, will cause problems with respect to the use of the water as drinking water without treatment. This seems to have been a problem the first years after Yali regulation and it may easily occur again in the first years after the Se San 3, Se San 3A and Se San 4 regulations. . . . After 5-10 years, the initial erosion will be over and the reservoirs will trap sediments and nutrients, and the water of Se San will improve." [p147]

Dry Season Testing Required

Testing done at the end of 2005 rainy season found concentrations of algal toxins in the Yali reservoir that were too low to pose an immediate health threat to downstream communities (the EIA does not assess the risk to communities

2 The Nordic consultants use the term "regulation" instead of "dam."

living nearest to the Yali reservoir). However, the EIA warns that toxic algal blooms can spread within a few days and that higher concentrations are likely in the dry season. The EIA recommends testing the Yali reservoir every 14 days in the dry season. [p81]

"Even though the concentrations were negligible during the investigation in Nov/Dec 2005, the concentration can be higher at the end of the dry season (April to June). The concentration of microcystin should be monitored throughout one complete dry season (November to June) with sampling every 14 days. This is necessary to draw a secure conclusion about algal toxins." [p81]

To make sure blue-green algae is no longer a problem in the Yali reservoir, "water samples and algal samples (both planktonic and benthic) should be taken toward the end of the dry season (April-June) and analyzed for nutrients, algal toxins and algal species composition. In addition the concentration of oxygen and nutrients in the deepwater of Yali should be monitored with sampling every month over an annual cycle. The new reservoirs under construction can give a new period of nutrient rich water that can create problem algae. The water should be monitored with respect to algae species composition and the algal toxins." [p131]

People Should Be Informed About the Dangers of Drinking Water With High Algal Content

The EIA recommends an information campaign that "informs the people about the danger of drinking water with high algal content... A toxic algal bloom can develop within 2-3 days." [p145]

RIVER FLOW IMPACTS

The EIA report includes the results of a "hydrodynamic modelling study" by Danish Hydraulic Institute in 2005. DHI used MIKE 11 computer modelling system to simulate flow conditions in Cambodia under natural conditions and with a number of dam operating scenarios agreed to by EVN. DHI findings are summarized as follows:

The dams in Vietnam can release water either through its spillway or its turbines. The turbines have a steady maximum discharge of 400 cubic metres per second whereas spillway releases during the rainy season can be anywhere from 2275 to 13,650 cubic metres per second – many times the flood experienced in Cambodia under natural conditions.

The dams are operated to supply power during peak load periods in Vietnam, which means running the turbines at full capacity for 6 to 12 hours a day

depending on water availability and load demand. Large spillway releases in the rainy season and turning the turbines on and off in the dry season when water levels are low are the two operating conditions that have the most influence on downstream flows and water levels.

The main factor controlling water level fluctuations downstream of the hydropower stations is the time period for which the turbines are kept at their maximum and minimum capacity during intermittent flow operation.

Yali Dam Changed Downstream Flow and River Levels
Operation of the Yali dam in Vietnam has:

- reduced peak discharges/water levels in the beginning of the monsoon by 500 to 1000 cubic metres per second and 1 to 1.5 metres
- increased water levels/discharges in the dry season by 100 to 300 cubic metres per second and 0.5 to 1.0 metres

Dams Increase Daily Water Level Fluctuations
The daily water level variations will be larger when all the power plants are operating than when only Yali is operating: 1.1 metre and 0. 6 metre daily fluctuation at Andoung Meass operating. [p56] The assumption is that plants will be running intermittently: 1 hour on and off, 3 hours on and off, and 6 hours on and off. The 6 hours on and off gives the maximum fluctuation.

Yali Releases Made Flooding Worse
"Rapidly rising water level in the rainy season …most likely caused by spillway releases from the Yali reservoir. Historical records 2000 to 2004 show that spillway releases have occurred during the rainy season. This might have resulted in more rapidly changes than what is experienced during a natural flood. [p63]

Accidental Spills
Accidental spills – opening of the Yali spillways during high flow – would increase water levels by 4 metres 30 kilometres downstream from the border and about 2 metres at Veun Sai. [p60]

Dam Operation Worsens Flow Fluctuations in Dry Season
"It should be noted that the Figures [of 0.6 and 1.1 metre fluctuation] are representing the high flow situation when the power plants are running at full capacity. The water level fluctuations will be greater during the low flow situation if the power stations then are run at full capacity." [p57]

5.2 MITIGATION: REDUCING DOWNSTREAM IMPACTS

"Mitigation measures related to impacts from Yali Hydropower Project should be

implemented as soon as possible to counteract existing impacts." [p153]
The hazardous situation in downstream Cambodia "requires major operational changes of the existing dam to ensure public safety, economic activities, and aquatic environment downstream of Yali Dam." [p19]
"Reducing water level fluctuations will reduce erosion and enhance possibilities for river bank agriculture." [p156]
"Measures to restore the natural water flow and fish stock in the river, to reduce riverbank erosion, to develop a warning system and a program for aquaculture as well as a community based management system of natural resources are important measures for social mitigation." [p 159]
"Restablishment of sustainable living conditions and livelihoods for the downstream people depends on the technical solutions taken both in the dam site and along the river in order to alleviate the negative effects from hydropower plant operation." [p158/159]
Restoring Fisheries "The only way of trying (sic) to save as many [fish] species as possible is to try to keep [water flow, water level, water quality] as close as possible to the natural conditions." [p48] **Releasing Flow to Trigger Fish Migration** "For many species it is the first flow increase in the beginning of the rainy season that triggers the migration. These triggering flows are often delayed and reduced in regulated rivers with reservoirs. The first part of the rainy season is used for filling the reservoirs. In several regulations in Norway and in other European countries, the power companies are obliged as part of the concession [agreement] to release triggering floods for salmon." [p146]
Four Main Mitigating Measures
The EIA report describes four main mitigating measures as follows: **1. Se San 4a re-regulating dam**

Information about the re-regulating dam was only provided to the SWECO team in May 2006, after the consultants visited Cambodia in December 2005, and after the consultants had submitted a draft final report to EVN in February 2006. “The final report was adjusted accordingly.” (p8) Note: DHI did not include the re-regulating dam in its 2005 analysis.

EVN is expected to complete the Se San 4A re-regulating dam this August.

Here is what SWECO et al says about the re-regulating dam:

“The Se San 4A re-regulating reservoir will level out the diurnal flow variations and is the most important mitigation measure for existing and future developments.”

Flow releases from Se San 4A re-regulating reservoir “should be stable and as equal to natural flow as possible. . . . this will almost eliminate sudden daily flow fluctuations and be the best measure to bring the river in Cambodia back as close as possible to the condition before Yali HPP was developed.” [p153/154]

SWECO claims this dam/reservoir will reduce the problem of daily water level fluctuations and related bank erosion in the river [caused by operating the dams for peak power] not only from Yali but from future power plants. [p154]

2. Modify operations at Yali dam

Until Se San 4A starts operating, Yali “should be operated in a way to minimize daily flow fluctuations.” [p154]

Reviewers’ Note: This is the same recommendation made by international hydro consultants Worley and Lahmeyer International in a confidential report commissioned by the Asian Development Bank in 2000.

3. Setup a Flood Warning System

“Spillway releases will from time to time be necessary, however, with an effective early warning system, downstream effects should be able to be considerably reduced. To reduce the insecurity experienced by people it is important to properly inform the local population about the warning system.” [p 63]

Establish an efficient warning system that can inform people living along the river in time about floods and impacts on water quality. SWECO recommends a warning system based on battery/solar cell operated sirens with wireless transmission. [p154]

4. River Monitoring

The EIA emphasizes that monitoring of impacts downstream in Cambodia is necessary "even if Se San 4A is operated as a re-regulation reservoir." [p163]

It recommends special attention be paid to the impact of the proposed minimum flow releases and operating regime of the hydropower plants, i.e., the effect of peaking power production on the downstream aquatic life, as well as river water quality and other ecosystem impacts.

Other Mitigation Measures Identified

Fish Bypass Systems

"It is possible to build fish bypass systems for some fish species. This has been partly successfully done for Atlantic Salmon and brown trout in Europe and North America, but for the fishes of the Mekong river system the knowledge on efficient fish ladders, bypass canals, etc. is very limited." [p146]

Fish Stocking

"If the regulation after some years prove to have reduced the biomass of particularly important fish species, for example by destroying their reproduction success, it should be considered to replace the loss by fish stocking programs." [p155]

Aquaculture & Rabbits

"It is likely that hydropower development in Vietnam will result in considerable loss of fish production along the Cambodian part of the Se San river. This loss can be compensated for by development of aquaculture along the river." [p155]

"An option to introduce fish ponds in order to replace the lost river fish with pond fish should be seriously considered, connected to extension training in order to provide people with appropriate skills in fish breeding. . . . **the option of introducing new, fast growing small species like rabbits** to increase meat protein in the diet, and the needed training in breeding these animals is one more option." [p159]

Fill Reservoirs Gradually in Wet Season

"The reservoirs should be filled gradually with an increasing percentage of the inflow. The start of the high flow season is important both for fish migration and for irrigation of rice paddies, and fish spawning wetlands. To allow the initial flow and water level rise to a normal manner will increase the time used to fill the reservoirs. This is also important to allow for necessary time for fish egg and larvae development as well as ripening of the rice crop." [p154]

Release Water for Downstream Rice Cultivation

"The requirement of ample water for the flooding of the paddy fields at the onset of the wet season is also vital thus either release of appropriate levels of water should be determined or preferably prolonging wet season filling (gradual) of reservoirs. The latter is a more plausible way to mitigate this impact. [p156]

Reduce Water Level Fluctuations in Dry Season

"Reducing water level fluctuations to ecologically sound levels especially in the dry season is of utmost importance as they have impacted the present conditions related to land use, agriculture and biodiversity." [p155]

Mitigate Erosion Damage

"Erosion is seen as one of the most significant problems resulting from the impacts of the Yali Hydropower Project. Se San 4A re-regulation plant will not change the need for mitigation of erosion damages already present. Mitigation through revegetation or rehabilitation of river banks would be a major need by the Se San River... Most importantly river banks and abandoned areas by and near the river (some back yard gardens, grassy areas and newly deforested areas) can be revegetated and rehabilitated." [SWECO, 156]

Reduce Nutient Input to Reservoir

"The reservoirs are prone to be eutrophic lakes, which can give rise to blue green algal problems. These can be mitigated by collecting the sewage water and build treatment plants before the effluent water is discharged into the rivers. Agricultural runoff should also be controlled, particularly if there are large scale animal husbandries. [p155]

6. Reviewers' Analysis and Conclusions

The omissions and deficiencies in the EIA report are largely the result of SWECO's position as consultant to the project owner in Vietnam, not the people or government of downstream Cambodia.

6.1 Access to Impartial Technical Expertise is Required for Effective Joint Management of Se San River

To rectify the pattern of project owner-driven environmental impact assessment and single-purpose operational decision making, Cambodian stakeholders need access to impartial technical expertise. This would enable a more equal participation by Cambodians in decisions affecting dam operations and mitigation programs along the transboundary Se San. The lack of technical/professional capacity in Cambodia to date has resulted in one-sided planning and operating

decisions driven by the dam owner/operator to the detriment of downstream interests.

6.2 Independent Verification of Re-Regulating Dam Impact and Other Key Mitigation Strategies Needed

The EIA states without substantiating evidence that the Se San 4A will "almost eliminate sudden daily flow fluctuations" and is the "best measure to bring the river in Cambodia back to as close as possible to the condition before Yali HPP was developed." But this was not verified by Danish Hydraulic Insitute since the consultants were only made aware that a re-regulating dam was under construction in May 2005, long after DHI had completed its "optimization" study of dam operations and recommendations for safe operations.

6.3 Legally Enforceable Operating Agreements Needed

Test operation of spillways and of turbines can lead to major sudden releases to the downstream, endangering human and animal life, as was the case with Yali dam. Cambodians are entitled to assurances from the dam owner/operator that a) dams will be operated to minimize hazards downstream; and b) in the event of accidental or unanticipated damages the dam owner/operator will compensate for damages.

The EIA makes a number of recommendations that may or may not improve the situation but without an operating agreement signed by EVN and the governments of Cambodia and Vietnam, Cambodians have no way of knowing for certain what EVN is doing to protect downstream communities from a repeat of the 1999/2000 tragedy. Information disclosure to date has been entirely inadequate for this purpose.

A "best practice" operating agreement would spell out the responsibilities of the dam owner to balancing its power production objectives with priorities in affected downstream Cambodia (i.e., public safety, water quality, migratory fisheries, river bank agriculture). It would also ideally uphold the rights of downstream communities to NOT be harmed by upstream dam operations and their right to seek redress in the event of damages (accidental or otherwise).

Operating agreements should be legally binding and publicly available. The following issues are typically covered in such agreements:

- Minimum release requirements for downstream navigation, water supply, migratory fisheries, dry season and wet season agriculture, and so on.
- Maximum ramp rates for downstream releases (to avoid drownings, injury, and damage downstream).
- Water allocations during normal operations.
- Operation during normal and heavy floods.
- Warning of people in the event of large flood releases and rules for evacuation of people and animals.

- Opening of spillway gates.
- Safety inspection.
- Drawdown procedures if dam safety is in doubt.
- Monitoring of operation data and procedures for distributing data to stakeholders.
- Review of operating rules.

6.4 Incomplete Mitigation Recommendations

The EIA report makes no reference to written statements submitted by local communities to the Cambodian and Vietnamese authorities (and made available to SWECO in December 2005) requesting compensation for losses incurred since Yali dam was built.

Making Se San Water Safe for Humans

The EIA predicts water quality problems over the next 5 to 10 years due to toxic algae in new reservoirs in Vietnam but fails to recommend a mitigation strategy that would reduce the risk to downstream communities or at least provide them with an alternative water supply during periods when algal blooms are likely. Simply warning people not to drink the water, as the EIA suggests, is inadequate.

In the Srepok EIA, also prepared last year by SWECO, SWECO recommends reducing the risk of poisoning and other water-related health problems downstream by investing in water supply and sanitation systems in riverside villages. SWECO further said this should be “first priority” before dam construction.

We recommend that alternative supplies of drinking water be made available to the downstream population for at least 5 to 10 years or as long as poisoning from toxic algae is a threat. The cost of providing alternative drinking water is the responsibility of the project owner and should have been factored into the initial cost estimate of Se San hydro development. (We note also that SWECO and other Nordic hydro planners neglected to advise their client, EVN, about these costs in earlier studies dating back to the 1980s).

Compensation for Lost Fishing Income and Property

International standards require that dam-affected fishermen are compensated for days when fishing is made impossible by upstream dam operations, and for lost income caused by dam-related impacts. Also, people should be compensated for losses in riverside agriculture.

The Srepok EIA (SWECO 2006) states that in the event of sudden or accidental floods that flush away boats, fishing equipment or crops, “full compensation in cash and/or kind should be provided.” (px)

Electricity as Compensation

SWECO recommends providing communities adversely affected by the Yali dam operations with electricity as a simpler solution to assessing people's losses and providing direct compensation. It should be noted that SWECO has made this recommendation without approval or prior knowledge of affected communities in Cambodia.

SWECO's recommendations do not absolve governments of their responsibility to initiate a process of reparation as requested by affected communities along the Se San. We note that neither the bilateral Se San committee (allegedly functioning since 2001) nor relevant authorities in Cambodia have produced a single piece of official documentation on damages or harm done to communities along the Se San river that could be used to file official claims for redress with Vietnam. Or if they have, Cambodians have no access to that information.

6.5 DHI Optimization Study Inadequate – Full Range of Cascade Modification Options Not Analyzed

The EIA recommends keeping flows as natural as possible but DHI did not study the full range of operating scenarios that could potentially achieve this. Specifically, DHI should be commissioned to study the downstream flow impacts if upstream dams changed from "store-and-release" mode of operation to "run-of-river" power production. A run-of-river cascade without Se San 4 should also have been analyzed. All operating scenarios should have been tested for their impact on downstream flow requirements.

6.6 Operating Rules Recommended by DHI Need Independent Verification

The EIA report says that actual and proposed operating rules were tested by DHI in agreement with EVN for Yali alone, and for Yali, Se San 3, Se San 3A, and Se San 4 in combination. The purpose of the DHI study was to "test scenarios with the purpose to avoid high flow velocities or sudden changes in the river system. This has been accomplished successfully and various operation rules for the turbine operation and spillway operation are provided for all the hydropower stations."[p49] Independent verification is needed to ensure what DHI has proposed is in the best interest of downstream Cambodians and to confirm that EVN has agreed to adopt DHI's recommendations.

6.7 EIA Executive Summary is Misleading on Toxic Algae Threat to Cambodians

SWECO Groner and Electricity of Vietnam should immediately rectify mistakes and contradictions in the EIA Summary as explained below:

The EIA Summary states: “No content of algal toxins were observed in the sampling in Nov/Dec 2005.” (p9) The main report gives detailed evidence of the presence and risks posed by toxic algae in Yali reservoir and the need for proper water quality testing in the dry season. The mistake is repeated again on page 84: “no content of algal toxins has been observed.”

In another contradiction, the EIA summary states: “It is not likely that the water coming out of Yali Reservoir will contain enough nutrients to create any algal problems in Se San River in the future.” (p9) However, the consultants go on, “analysis of algal species composition and algal toxins should be monitored through a whole dry season to verify the conclusion given above.”

Such contradictions between the summary and main report introduce confusion in the matter of public health risks where clarity is required.

6.8 Missing and Incomplete Information

The study relies mostly on one report prepared by the Fisheries Office in Ratanakiri province in 2000. No official reports on Yali accidental releases, deaths and drownings in 2000 are referenced. No interviews with Yali operators and managers are recorded. Nor is there any reference to Se San committee reports and minutes despite the claim that this committee has been working on Se San issues since its first meeting in 2001. Also, statements issued by local communities between 2005 and 2000 are not referenced in the EIA report even though they were submitted to the consultants in 2005.

The EIA includes a detailed questionnaire that SWECO says was used in a number of dam affected villages but no results are presented. Strangely, instead of presenting the results of their own field work, the consultants devote most of the EIA executive summary to commenting on an earlier survey of 59 villages by the Ratanakiri fisheries office from April-May 2000.

The EIA refers to earlier studies of Se San hydro development: by SWECO, Statkraft (Norway) and Halcrow (UK) but fails to mention a report by Worley and Lahmeyer International commissioned by the Asian Development Bank in 1999. That report criticized SWECO’s approach to Se San hydro planning, including its failure to warn its client, EVN, about the environmental and economic consequences of building and operating dams for supplying peak power to the Vietnamese grid.

6.9 No Public Consultation on Final EIA Report

International standards require that a draft EIA report be available to the public to provide input onto the final project decision and recommendations for mitigating anticipated impacts. In this case, the EIA report was prepared after project

construction got underway and without public consultation about its findings and recommendations.

SWECO submitted its draft final EIA report to EVN in February 2006 without providing the people and agencies interviewed and consulted in Cambodia with the opportunity to review its draft report. SWECO does advise EVN to consult with local communities and organizations when developing mitigation programs but fails to practice what it preaches in the process of preparing its final report. if SWECO should have insisted upon a public review of its draft recommendations with Cambodians before submitting its final report to Vietnam in order to ensure a credible and accurate final product.

7. Additional Remarks for Discussion

7.1 Electricity of Vietnam is expected to complete its Se San 4A re-regulating dam in August 2007. A Cambodian or Cambodian-directed team of experts is required to monitor the hydrological impact of the re-regulating dam in cooperation with Vietnamese authorities. Even if the re-regulating dam reduces hazardous daily fluctuations, other flow modifications at Se San hydro dams will likely be required to satisfy downstream flow objectives, such as flows to trigger seasonal fish migrations and make riverside cultivation in wet and dry season possible. A Cambodian or Cambodian-directed team of experts should initiate further dam optimization analysis to meet downstream flow requirements, in cooperation with Electricity of Vietnam.

7.2 Danish Hydraulic Institute has made some recommendations for safe operation of Se San turbines and spillway gates, as part of the Se San EIA. A Cambodian or Cambodian-directed team of technical experts should review these recommendations, monitor their application and recommend adjustments as required to comply with international dam safety standards.

7.3 If completed, the Se San 4 reservoir near the Cambodian border will have a reservoir almost the size of the Yali Falls dam reservoir. This will introduce greater risk of large flood releases, hazardous daily fluctuations, and algae-contaminated water in downstream Cambodia. A Cambodian or Cambodian-directed team of experts should discuss the status of Se San 4 construction and propose further analysis of alternative design and operating scenarios, including a no-build option.

End