NEGOTIATING RIPARIAN RECOVERY

APPLYING BC HYDRO WATER USE PLANNING EXPERIENCE IN THE TRANSBOUNDARY SE SAN RIVER BASIN

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ABSTRACT

The recovery of aquatic ecosystems damaged by hydroelectric operations on Mekong tributaries requires a fundamental change in how the region's power utilities manage their hydro facilities. This paper first reviews the approach taken by one of the world's leading hydro utilities, BC Hydro of Canada, to make the transition from managing rivers almost exclusively for power generation to one that recognizes multi-purpose water use objectives. Second, the case for applying BC Hydro's approach in the transboundary Se San River Basin is introduced. Bringing together Se San dam operators, water and fisheries specialists, and downstream water users for such a facilitated technical review of Se San hydro operations would have multiple benefits. It would increase knowledge of Mekong riparian systems, improve understanding and communication among Se San stakeholders, and help define downstream flow requirements for fisheries conservation and other non-power needs.

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1. INTRODUCTION

The recovery and conservation of freshwater fisheries in the Mekong region has been a central priority for the Mekong River Commission since 1995 (Mekong River Commission Fisheries Programme, 2002). It has also been a consistent demand from riparian communities throughout the region that depend upon this resource for their food and livelihoods (Hirsch and Wyatt, 2004). As scientific knowledge about freshwater fisheries and the hydrological cycle in the Mekong region has improved in recent years, governments and state utilities responsible for power generation also recognize that hydro dams cause serious negative changes to freshwater fisheries and rivers (Mekong River Commission, 2001).

Fortunately, progress is being made to address these negative impacts with new technologies and more inclusive approaches to river management that attempt to integrate both technical and traditional knowledge, and balance power generation with other non-power objectives (i.e., fisheries conservation, water quality, transportation, flood hazard reduction, and riverside agriculture) (Postel and Richter, 2003).

Technological advances in information gathering systems, computer modeling techniques, and what's known in the hydro industry as decision-support software, for example, have made it much easier for dam operators to improve the flexibility and time-responsiveness of reservoir operations compared to the conventional fixed operating rules for entire months or seasons (UNEP, 2004). New operating systems developed by the world's leading utilities can manage releases from dams on a daily or even an hourly basis based on incoming information about upstream hydrological conditions, and specific criteria for downstream releases that have been decided in consultation with downstream water users and residents.

This paper focuses on the multi-stakeholder process adopted by one utility, BC Hydro of Canada, to generate a set of specific criteria for downstream flow releases from its hydro dams through both technical analysis and dialogue with dam operators, technical and scientific experts, and local resource users.

Following the review of BC Hydro's experience, the potential for applying this approach in the Se San River Basin is introduced.

2. BC HYDRO WATER USE PLANNING PROCESS

BC Hydro has an installed capacity of more than 11,000 MW, 90 percent of which is hydro (BC Hydro, 2005). The utility is provincially-owned and delivers power to about 1.5 million customers. About one-third of its

generating capacity is installed at two facilities in the Peace River Basin in northeast British Columbia.

In 1998, the government of British Columbia, under the Water Act, requested that BC Hydro undertake a Water Use Planning process to review the operating conditions of BC Hydro's power generation facilities. A Water Use Plan (WUP) is to be produced for each of BC Hydro's 30 hydro facilities in 25 watersheds. Water licenses issued for each facility are then to be amended to reflect the recommendations made in the WUP.

WUPs are technical documents defining the proposed operating parameters to be applied in the day-to-day operations of all BC Hydro hydroelectric facilities. The WUPs explicitly recognize multiple water use objectives, the legal rights and responsibilities of water users, and are the outcomes of advisory consultative processes. The main WUP task is the weighing of fisheries and ecological benefits and costs associated with a range of possible flow operations, taking into account changes in habitat suitability and probable response of fish to these changes.

Why is BC Hydro developing WUPs?

Prior to the WUP process, operating agreements and licenses for BC Hydro facilities were based on no or limited knowledge of the effects of hydroelectric operations on fish and fish habitat. BC Hydro was increasingly faced with costly legal action and financial penalties for damaging fish habitat.

Note that the WUP process does not address the historical impacts of hydroelectric development but focuses on improving regulation of flows and reservoir operations to balance power production objectives with non-power objectives. Nor was decommissioning of dams considered an operating alternative even though in some cases local communities wanted that option on the table.

The WUPs will address the following negative impacts on fisheries:

Flow Diversion – Diversion of water from one stream for use in power generation in another basin can cause the harmful lowering of flows and interfere in the ability of fish to identify and return to home streams when spawning.

Reduced Flows – A reduction in the flow released downstream of a facility can result in decreased habitat quantity due to a reduction in stream volume and total wetted area in the stream. Reduced flows may also cause a change in stream temperature, depending on the depth of outflow to the reservoir thermocline and the exchange rate in the river.

Rapid Flow Fluctuation – The rate of change of flow through a dam is known as the ramping rate. A ramping rate that is too high during flow increase may displace fish from favoured habitats, while a rapid decrease in flows can leave fish and benthic invertebrates (food sources) out of water or trapped in isolated pools. Rapid changes in flow can also disrupt fish spawning activity.

Inadequate Flushing Flows – Inadequate flushing flows can reduce productivity by permitting sediment buildup. At higher discharges, a river reconditions its natural channel, and flushes out accumulated sediment. The limited and regulated flow regimes at many of Hydro's dams do not incorporate flushing flows.

Altered Water Quality – When water is impounded, water temperature, dissolved oxygen content, total gas pressure, sediment and nutrient levels, pH and dissolved metal concentrations can all change. Aquatic organisms that depend on physical water parameters, including both fish and the species they feed on, can be adversely affected by these changes in water quality.

Who is involved in the WUP process?

The WUP process is open to the public, including First Nations, provincial and federal agencies, environmental organizations, and communities affected by hydro facilities.

For each WUP a consultative committee is usually established to represent various interests, including the public. This committee is divided into subcommittees to address specific issues such as fisheries, etc. These committees usually then have access to technical resource specialists drawn from government agencies, BC Hydro, and consultants.

To assist the WUP process, a number of oversight committees have also been established: Management Committee, First Nations Water Use Planning Committee, and Fisheries Advisory Team. These committees are usually made up of senior staff from provincial or federal agencies, BC Hydro, First Nations, and other key stakeholders. These committees provide direction and coordination for the WUP process.

BC Hydro is committed to working with all interested parties to develop WUPs that are acceptable to all parties. Where consensus is not achieved, the consultation report will document the disagreements and reasons for them.

Current status

Now in its fifth year of preparing WUPs, 24 out of 30 WUPs have been completed. The WUPs for BC Hydro's largest dams, including the 2730 MW Bennett/Shrum station in the Peace River Basin have not yet been

completed. The entire WUP process is expected to cost the province of BC $25 million.

The 13-step process

The Water Use Planning process is a public process that follows a 13-step procedure (BC Hydro, 1998):

Step 1	Initiate a WUP process for the particular facility.
Step 2	Scope the water use issues and interests.
Step 3	Determine the consultation process to be followed and initiate it.
Step 4	Confirm the issues and interests in terms of specific water use objectives.
Step 5	Gather additional information on the impacts of water flows on each objective.
Step 6	Create operating alternatives for regulating water use to meet different interests.
Step 7	Assess the tradeoff between operating alternatives in terms of the objectives.
Step 8	Determine and document the areas of consensus and disagreement.
Step 9	Prepare a draft WUP and submit it to the Comptroller [provincial water regulatory body] for regulatory review.
Step 10	Review the draft plan and issue a provincial decision.
Step 11	Review the authorized WUP and issue a federal decision.
Step 12	Monitor compliance with the authorized WUP.
Step 13	Review the plan on a periodic ongoing basis.

Principles of water use planning developed by BC Hydro

The dam owner/operators and all participants must understand and abide by four key principles:

Inclusiveness – All participants must have access to the same information; this forces all parties to justify their interests to all parties in the context of other valid priorities, and perhaps to compromise.

A structured process – The rights and responsibilities, as well as expected outcomes and specific limitations on the process, must be communicated to all participants at the beginning. The entire process must be professionally facilitated and designed to accommodate translation, in order that different interests and levels of expertise are fully recognized.

Access to information and data – All participants should have access to the same information and the tools or expertise to assess that information. One of the criticisms from local water users in BC was that they did not have access to neutral technical experts and had to rely on government and utility staff to represent their interests. In the Se San case, neutral

technical advisors could be provided to Cambodian stakeholders by the Mekong River Commission, or seconded from hydro utilities with the right expertise and no commercial links with Electricity of Vietnam.

Flexibility over time – Plans should be kept flexible as new information becomes available that can inform operating and management decisions and agreements.

3. GENERAL RESULTS REPORTED BY BC HYDRO

The WUP process (BC Hydro, 2005) resulted in a variety of levels of agreement on the preferred hydroelectric operating regimes. Where no consensus was reached on a single operating alternative, active monitoring and adaptive management was initiated to test alternative flow regimes.

The process was able to focus on the key scientific uncertainties and knowledge gaps associated with system regulation and fish conservation.

The process resulted in a much more complex and risk-conscious set of recommended flow regimes, and a greater recognition of uncertainties about effects on fish. Target flows, timing and ramping rate specifications have become more important in flow regulation than just average flow volumes.

WUP has clearly provided the technical studies and inputs necessary to identify the key variables and information gaps for developing a longer term program to determine the optimum flows.

In some cases, WUP has resulted in increased base flows, in others it has set minimum and maximum flows during sensitive migration and spawning periods in exchange for more flexibility in non-sensitive periods.

In the Coquitlam River, for example, base flows have approximately doubled. At Shuwap River, minimum flow releases have doubled. While these increases are significant they are still only a portion of the pre-dam natural flows. And there remain many unknowns about the biological effects of the increased flows.

In Coquitlam River, ramping effects on fish were a concern but there was a lack of field data. So the fisheries department suggested new ramping rates as a starting point for monitoring results.

The benefits of flushing flows for fish are well recognized. But there remains considerable uncertainty about their cost-effectiveness in improving habitat conditions and managing flooding risks. In Coquitlam River, cost of flushing flow was estimated at $1.4 million per year in lost power generation revenues.

4. WUP EVALUATION BY WATERSHED WATCH SALMON SOCIETY

Watershed Watch Salmon Society (Quadra Planning, 2004) looked at seven WUPs to evaluate whether the WUPs will 1) eventually lead to increased conservation and production of fish and 2) the extent of acceptance of the WUP recommendations by First Nations and whether WUP addressed First Nations concerns. Selected findings are as follows:

The WUP experience highlighted the complexity of fish flow performance measures. The area of available spawning habitat under different flow regimes may be less important than the type and timing of flows and the minimum number of days per year when spawning conditions/opportunities are optimum for selected species.

Some participants felt that it would be more efficient to complete the technical analysis in advance of the stakeholder consultations so that there would have been more clarity about what is known and unknown before the public discussion begins.

Lost Power Generation – WUP outcomes resulted in estimated changes in power revenues from –21 percent at Coquitlam River to +6 percent at Ash River, and changes in fish indicators in the range of +10 to 30 percent at the study facilities.

In some cases, increased fish flows meant reduced power revenues, but not always. At Stave River, the preferred option may increase revenues by $.4-.5 million per year, and at Ash River, revenues increased by .6 million per year (6 percent). At Bridge river, power revenues are expected to increase by $1.8 million per year.

At Ash River, downstream fisheries conservation objectives conflicted with reservoir fisheries and recreation objectives upstream. Preference was given in the end to downstream fish objectives.

First Nations/Riparian Interests

Most participants were pleased with the improvements for fish although they also recognized that the end results did not offset the loss in natural flows and conditions that existed prior to dam construction.

There was no mechanism within WUP to address the historical "footprint" impacts of hydroelectric development which in many cases overwhelm the operational impacts; nor is there an alternative process for

systematically identifying these issues directly with First Nations. For example, five tribes along Coquitlam River have asked for compensation for destruction of the salmon population. This was beyond the scope of the WUP process.

The WUP process did not sufficiently recognize the status, rights, and entitlements of First Nations, rather regarded First Nations input as simply one of many stakeholders in one decision.

There was no commitment to providing First Nations with the resources to adequately and consistently participate in the technical aspects of the fisheries assessments and therefore they depended upon government technical staff to represent fish conservation concerns and interests.

Where traditional use studies were completed, they had some effect in highlighting issues that would have been otherwise overlooked, and in at least one case likely altered the final recommendation.

Even where consensus was reached, First Nations had a largely passive role in accepting the recommended alternative because they were often not directly and intensively involved in the decisions and the proposed alternative usually appeared to be better than the status quo and therefore was supported.

WWSC Conclusions

WUP process has improved the knowledge base and better defined flow requirements for fish conservation at BC Hydro facilities. Recommended flow alternatives have been positive for fish conservation.

The technical analysis and stakeholder discussion provide a foundation for addressing downstream fisheries impacts caused by hydro operations.

One of the important contributions WUP has made – identified critical uncertainties and data gaps and established the framework for ongoing monitoring and adaptive management on key fish flow issues.

Resulted in significant advances in understanding the interactions between hydroelectric operations and fish conservation, and improving methods for balancing competing objectives.

Narrow focus on flow regulation meant that fish habitat limiting factors could not be addressed. More flexibility in addressing all fish flow issues could have contributed to more room for innovative solutions and agreements.

Much of the analysis focused on flow regime effects on habitat suitability and quality. It proved more difficult to estimate the biological impacts. These were largely derived from professional judgement.

Many participants did not want to forego provincial power revenues in order to reduce the impacts on fish.

Observations by WWSC

WUPs have not yet been translated into water license amendments with clear legal status. Cannot judge whether WUPs have been a success until get more data for fish and final regulatory approvals of changes to operating regimes are completed.

WUP is largely a BC Hydro process for engaging stakeholders in the review and updating of its operating licenses, rather than a more public process by the regulator of determining long-term allocation and management of water within watersheds.

WUP process puts a heavy burden on public members who participate and must uphold the public interest. Unlike government or utility participants, public members are not paid and have invested significant volunteer time into lengthy technical and complex procedures.

"While significant fish conservation benefits and consensus have been achieved, there remain many specific issues to be resolved in the monitoring phase. There is a concern by many of the participants that the support and role of monitoring will be diminished once the revised licenses are issued."

"The WUP process runs the risk of repeating mistakes made in the US Pacific Northwest by spending enormous resources on a negotiated, stakeholder process that may ultimately provide little benefit" if the utility remains out of compliance with the WUP and the Fisheries Act, which does not allow damage to fisheries or fisheries habitat.

WUP is no substitute for water user property rights and other tough enforceable legislation to protect fisheries; property rights holders and government must be able to sue BC Hydro; governments and/or courts must impose fines on the utilities for violating operating agreements, harming fish, polluting etc.

For example, in 2001, BC Hydro reduced water flows at the High Keenleyside Dam without prior authorization from the department of fisheries. Stranding and mortality of juvenile fish on the Columbia River resulted from dewatering of the channel. The fisheries department fined BC Hydro $375,000, proceeds will go to conservation of fish habitat along the river. BC Hydro also agreed to develop procedures in conjunction with the fisheries department to reduce fish stranding and examine flow changes.

Where the process failed to reach full consensus was generally in situations where a lack of flexibility was available to adjust the process to accommodate particular expectations, or performance standards of the participants.

5. APPLYING BC HYDRO WATER USE PLANNING PROCESS IN SE SAN RIVER BASIN

The Se San River is an important tributary of the Mekong River that flows from Vietnam's central highlands through northeast Cambodia where it joins the Sekong and Mekong mainstream.

In the last decade, Vietnam's power utility, Electricity of Vietnam Corporation, has built four large-scale hydro dams (with installed capacity ranging from 100 to 720 MW) on the Se San River's upper reaches. These dams allow EVN to regulate the river's flow almost exclusively for power generation, which has dramatically changed the downstream hydrological regime and negatively affected fisheries and other river-related livelihoods (Hirsch and Wyatt, 2004, Baird, 2002). No assessment of flow requirements downstream of Yali and Se San 3 dams was done prior to construction. (Worley, 2001, Worley, 2000, Halcrow, 1998, Electrowatt, 1993).

Similar to BC Hydro's experience, riparian communities living along the Se San in northeast Cambodia have asked Electricity of Vietnam (via provincial government authorities, the Cambodia National Mekong Committee, and the Mekong River Commission) to restore the river's natural flow and consult with them about studying and mitigating the impacts of its operations on sedimentation, water quality, and fisheries (Ryder, 2004, Cambodia National Mekong Committee, 2003, World Bank Newsletter, 2003, Se San Ratanakiri Community Representatives, 2002).

Electricity of Vietnam, for its part, has already taken several important steps to reduce the negative downstream effects of its Se San hydro operations. With the approval of the Cambodian National Mekong Committee, it has developed procedures for notifying downstream communities in advance of any large releases or emergency conditions that would increase the flood hazard in northeast Cambodia (Cambodia National Mekong Committee, 2003). It has hired hydro consultants from Denmark, Norway, and Sweden to assess the downstream damages caused by its first and second hydro dams, Yali and Se San 3 (Lifenborg, 2005, Gutman, 2004, Enggrob, 2004). And last November construction began on EVN's fourth dam near the Cambodian border which, according to the Vietnam National Mekong Committee's Deputy Secretary General, Nguyen Nhan Quang, will be operated as a regulating dam that will reduce the large fluctuations in flow releases that are causing problems for downstream communities and migratory fisheries (Personal Communication, 2004).

6. CONCLUSIONS

The BC Hydro water use planning process and outcomes provides important lessons and guidelines for advancing a negotiated flow regime for the Se San River. Initiating a WUP process would help to advance knowledge about Se San, Sekong, and Mekong freshwater fisheries and environmental mitigating strategies, engage local water users in management decision making, and better define downstream flow requirements for fisheries conservation and other water user priorities.

Potential international sponsors for this initiative include: the Mekong River Commission, the Global Water Partnership, funded by Sweden and the World Bank (Global Water Partnership, 2005), which includes government agencies in Vietnam; and the Asian Development Bank's Water Fund (Asian Development Bank, 2005), funded by Norway, which "promotes a participatory approach to water resource management that combines capacity-building, empowerment of water users, and investment."

REFERENCES

Asian Development Bank Water Fund, 2005. www.adb.org/Water/CFWS

Baird, I., Baird, M., Cheath, C.M., Sangha, K., Mekradee, M., Sounith, P., Nyok, P., Sarim, P., Savdee, R., Rushton, H., and Phen, S., 2002. *A community-based study of the downstream impacts of the Yali Falls dam along the Se San, Sre Pok and Sekong Rivers in Stung Treng province, northeast Cambodia*, Report published by Se San Protection Network, Partners for Development, Non Timber Forest Products Project, Se San District Agriculture, Fisheries and Forestry Office, and Se San District Office, Cambodia.

Baird, I., 2000. *Hydropower development on the Se San River in Vietnam and downstream impacts in northeast Cambodia,* Report for Ratanakiri Fisheries Office and Ratanakiri Non Timber Forest Products Project, Cambodia.

BC Hydro, 2005. Water use plans. www.bchydro.com

BC Hydro, 1998. *Water Use Plan Guidelines*, Province of British Columbia, www.bchydro.org

Cambodian National Mekong Committee, 2003. *Prime Minister's five solutions in order to avoid damage to downstream by Ialy reservoir water release.* Unofficial translation, Phnom Penh, Cambodia.

Cambodian National Mekong Committee, 2003. *Fax to Vietnam National Mekong Committee Re: The Yaly hydropower Project, August 11, 2003*.

Clayton, G., 2003. *Alouette management committee report*, www.alouetteriver.org

Coren, Michael, 2003. Yali Falls: Cambodia appeals to Vietnam. *Phnom Penh Post*, December 4, 2003.

Development Today, 2003. Norwegian advisor holds thorny compensation issue at arm's length. No 14, Oslo.

Electrowatt, 1993. *Environmental and financing studies on the Yali Falls hydropower project (basin wide*). Vol 1, Mekong Secretariat and Ministry of Energy, Socialist Republic of Vietnam.

Enggrob, H., 2004. E-mail communication to G. Ryder, November 5, 2004.

Fields, D., and Mullen-Dalmer, D., 2003. *Managing existing hydro facilities: BC Hydro's water use planning program.* Presentation to Hydro 2003 International Conference, Dubrovnik, Croatia, November 3 – 6, 2003.

Global Water Partnership, 2005. www.gwp.sida.se

Gutman, J., 2004. Letter to G. Ryder and A. Imhof, Re: Hydropower developments on the Se San River, J. Gutman, Director, Strategy and Operations, East Asia and Pacific Region, Asian Development Bank, June 4, 2004.

Haggart K., 2003. Damn the fish: Lessons from Glen Canyon. *Three Gorges Probe*, www.threegorgesprobe.org

Halcrow and Partners, 1999. *Se Kong – Se San and Nam Theun River Basins hydropower study.* Asian Development Bank, Manila.

Hirsch, P., and Wyatt, A., 2004. Negotiating local livelihoods: Scales of conflict in the Se San River Basin. *Asia Pacific Viewpoint,* Vol 45, No 1.

Lerner, M., 2001. *Draft Se San legal and policy study*, Oxfam America, Phnom Penh, Cambodia.

Lifwenborg, G., 2005. E-mail communication to G. Ryder, February 25, 2005.

Matthews, G., 2005. E-mail communication to G. Ryder.

Mekong River Commission, 2005. Development of water resources the key to defeating poverty in the LMB. *Mekong News*, Vientiane, Lao PDR.

Mekong River Commission, 2005. www.mrcmekong.org

Mekong River Commission, 2002. *Mekong River Commission statement on issues relating to Yali Falls dam and Se San 3 hydropower plant project*. November 26, 2002.

Mekong River Commission Fisheries Programme, 2002. Fisheries in the Lower Mekong Basin: Status and Perspectives. *MRC Technical Paper 6*, Mekong River Commission Secretariat, Phnom Penh, Cambodia.

Mekong River Commission Secretariat, 2001. *MRC Hydropower development strategy*. Mekong River Commission Secretariat, Phnom Penh, Cambodia.

Ojendal, J., Mathur, V., and Sithirith, M., 2002. *Environmental Governance in the Mekong: Hydropower Site Selection Processes in the Se San and Sre Pok Basins*, Stockholm Environment Institute, Stockholm.

Pacific Fisheries Resource Council, 2003. www.fish.bc.ca

Personal Communication, 2004. Nguyen Nhan Quang, Deputy Secretary General, Vietnam National Mekong Committee, Bangkok, Thailand, November 18, 2004.

Personal Communication, 2004. Even Mikal Sund, Senior Energy Advisor, NORAD, Oslo, Norway, November 9, 2004.

Personal Communication, 2003. D. Thomson, Community Relations Manager, Vancouver Island Region, Nanaimo, British Columbia.

Postel, S., and Richter, B., 2003. *Rivers for Life: Managing Water for People and Nature*. Island Press, Washington DC.

Quadra Planning Consultants Ltd., Regional Consulting Ltd., and Nowlan, L., 2004. *Preliminary Review of Fisheries Conservation Gains within BC Hydro's Water Use Planning Process*, Report for Watershed Watch Salmon Society, British Columbia.

Ratanakiri Se San Community Representatives, 2002. *Joint statement from ethnic minority groups living along the Se San River in Ratanakiri*, Se San Protection Network, Cambodia.

Ryder, G., and Imhof, A., 2004. *Letter to Jeffrey Gutman, World Bank, Re: The World Bank and Electricity of Vietnam Corporation's Se San hydro development.* March 12, 2004.

Ryder, G., Managing river conflict: A Canadian model. *Phnom Penh Post*, January 15, 2004.

Vanderwal, J., 1999. *Negotiating restoration: Integrating Knowledges on the Alouette River, British Columbia*. M.Sc. Thesis, University of British Columbia, April 1999.

Watson, S., 2002. Insight – British Columbia – Following the plan. *International Water Power and Dam Construction*, November.

White, W., 2000. *Review of the Se San 3 hydropower project feasibility study*. Report for Probe International, Toronto, Canada.

World Bank Newsletter, 2003. Villagers in Ratanakiri share concerns with World Bank. *World Bank Newsletter*, November 2003.

World Business Council for Sustainable Development, *BC Hydro: collaboration through water use planning*. www.wbcsd.org

UNEP, 2004. *Proceedings*, UNEP Dams and Development Project Workshop on Addressing Existing Dams, Nairobi, Kenya, August 2004. www.unep-dams.org

Worley, 2001. *Phase II final report – Environmental, social and technical analysis for Se San 3 hydropower project, Summary environmental impact assessment*. Asian Development Bank Vietnam TA 3222-VIE, Manila, February 2001.

Worley, 2000. *Se San hydropower project, Draft Yali/Se San 3 environmental and social impact analysis study*, Vol 1 and 2, Asian Development Bank PPTA 31362-01-VIE, Manila, April 2000.

March 2005, Ubon Ratchatani, Thailand