

SPECIAL EVALUATION STUDY

ON THE

SOCIAL AND ENVIRONMENTAL IMPACTS

OF

SELECTED HYDROPOWER PROJECTS

December 1999

ABBREVIATIONS

ADB	–	Asian Development Bank
ARIS	–	Anai River Irrigation System
BPM	–	Bukit Peninjau Miri
DMC	–	developing member country
EdL	–	Électricité du Laos
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMCO	–	Environmental Management Cooperation Office
H ₂ S	–	hydrogen sulfide
HEPC	–	Hunan Electric Power Company
ISA	–	initial social assessment
Lao PDR	–	Lao People's Democratic Republic
NCR	–	native customary right
NGO	–	nongovernment organization
PCR	–	project completion report
PLN	–	Perusahaan Listrik Negara (State Electricity Enterprise)
PRA	–	participatory rapid appraisal
PRC	–	People's Republic of China
RRP	–	resettlement and rehabilitation program
SALCRA	–	Sarawak Land Consolidation and Rehabilitation Authority
SEIA	–	summary environmental impact assessment
SESCO	–	Sarawak Electricity Supply Corporation
TA	–	technical assistance
THPC	–	Theun-Hinboun Power Company
WSFS	–	West Sumatra Fisheries Service

WEIGHTS AND MEASURES

ha	–	hectare
m ³ /s	–	cubic meter per second
km	–	kilometer
m	–	meter
MW	–	megawatt

NOTE

In this report, "\$" refers to US dollars.

EXECUTIVE SUMMARY

This study aims to provide recommendations for improving the design and processing of hydropower projects funded by the Asian Development Bank (ADB) to minimize the adverse environmental and social impacts. Four case studies were assessed for accuracy of identifying potential impacts; appropriateness of the mitigation measures designed; effectiveness in implementing them; and the procedures for monitoring, receiving feedback on, and evaluating progress. The study projects operate in a variety of regimes (Malaysia, Indonesia, People's Republic of China [PRC], and the Lao People's Democratic Republic [Lao PDR]), with different institutional systems for hydropower development and were exposed to different stages of development in ADB's policies and guidelines.

ADB renewed its focus on environmental and social concerns in 1993 prior to the approval of some of the case studies. However, some specific policies on these concerns were approved after 1994 and, therefore, were not binding for the case study projects. This study discusses these new policies in parallel with the case study impacts, not to evaluate the compliance of the projects but rather to learn from their experiences for implementing current and future projects bound by the new policies. ADB is making continuing efforts to reform its procedures to adhere to its latest policies during project formulation and also to deal with the developing member countries' (DMCs') implementation realities.

The Batang Ai Hydropower Project¹ in Malaysia was approved in 1981 before ADB had adequate expertise on environment and social concerns. The Power XX (Singkarak) Project² in Indonesia was approved in 1990 prior to the required circulation of the summary environmental impact assessment (SEIA) to the Board. Both the Hunan Lingjintan Hydropower Project³ in the PRC and the Theun-Hinboun Hydropower Project⁴ in the Lao PDR (owned by a joint venture company) were approved in 1994, with SEIAs for each and a resettlement plan for the Lingjintan Project. Subsequent to the renewal of ADB's focus on environmental and social concerns in 1993, specific policies and guidelines for energy (1995), involuntary resettlement (1995), forestry (1995), fisheries (1997), and indigenous people (1998) relating to hydropower development were approved. At this study's initiation in 1998, the projects approved after 1995 had not been sufficiently implemented to draw meaningful assessments or recommendations. ADB has taken efforts in more recent (nonstudy) projects to address several of the weaknesses addressed in this study.

The consultation process was not very effective in most of the study projects. Weak consultation resulted in improper identification of impacts, building of exaggerated expectations among the affected persons, and inadequate implementation of mitigation measures. ADB should continue technical assistance to help develop the process in the countries that need it, remembering that in some cases it is not the lack of knowledge that weakens consultation but the lack of tradition or institutional arrangements.

¹ Loan 521-MAL: *Batang Ai Hydropower Project*, for \$40.4 million, approved on 17 September 1981.

² Loan 1032-INO: *Power XX Project*, for \$235 million, approved on 25 September 1990.

³ Loan 1318-PRC: *Hunan Lingjintan Hydropower Project*, for \$116 million, approved on 27 September 1994.

⁴ Loan 1329-LAO: *Theun-Hinboun Hydropower Project*, for \$60 million, approved on 8 November 1994.

The preparation of study projects in terms of environmental and social concerns was weak due to the quality of baseline data and incompleteness of coverage. In the study projects, the use of environmental or social scientists was limited during the planning stage, resulting in the misidentification of impacts, irreversible damage to some natural resources, and lack of timely and adequate attention to some mitigation measures. Consistent with other hydropower developments, the most significant environmental impacts identified were associated with migratory fish species. Environmental and social scientists need to be an integral part of the design team for sensitive projects and could be supplemented by a panel of experts. ADB should ensure that project management acts upon the panel's recommendations for mitigation measures.

Study projects have not resulted in disastrous environmental and social impacts. However, several shortcomings occurred, most of which could have been avoided or compensated for with more diligence on the parts of the project proponents, DMC agencies, and ADB. Identification and mitigation of project impacts improved with later study projects. Measures that were conspicuously needed (i.e., housing) were planned during project design and implemented. Other measures that necessitated coordination among local agencies, effective participation from affected persons, and substantial funding from the DMCs were not always implemented in an efficient and timely manner. Other impacts on natural resources (migratory fisheries and biodiversity) were yet to be mitigated in some study projects at the time of the Operations Evaluation Missions. The Lingjintan Project performed better than other study projects in terms of resettlement efforts due to institutional capabilities of the local agencies and the adoption of the development resettlement concept where resettlement arrangements are embedded in an integrated regional development program.

Compliance with environmental clauses in construction contracts has not been satisfactory because many have very modest clauses and, in some, the accountability placed on the contractor is slight. DMC agencies and ADB should be more rigorous in screening the capacity of construction firms to abide by the environmental and social requirements. ADB should also, by way of specific assurances in the loan agreement and monitorable targets in progress reports, ensure the implementation of important measures, such as income restoration programs and mitigation of fishery resource impacts. To ensure success, ADB should consider providing itemized allocations for these purposes as part of the loan.

Monitoring impacts have been better during construction than in the operations phase due to the use of review missions, progress reports, and panels of experts. However, the quality of the progress reports needs to improve, with the inclusion of monitorable indicators and exclusion of average statistics that hide outliers signaling adverse impacts. A clearinghouse for all monitoring efforts and a formal follow-up by ADB on whether impact monitoring is translated into changed action are recommended.

Some environmental and social impacts that occur may go unreported because of weak scrutiny by DMC oversight agencies and ADB. Often, ADB's supervision efforts are greater than those of DMC agencies, but the lack of environmental and social specialists still constrains the extent and depth of the review functions. Yet, this study demonstrates the value of ADB's review missions in catalyzing needed mitigation and monitoring during project operations. Deploying multiskilled supervision teams at the midterm review and increasing the number of relevant staff are recommended if ADB is to consider the systematic review of environmental and social mitigation measures.

Institutional capacities of DMC agencies responsible for enforcing environmental and social concerns vary substantially across countries. The project units responsible for implementing mitigation measures (in some cases) have been inappropriately staffed, inadequately funded, and established too late with insufficient authority. ADB should continue to support, where needed, the development of relevant enforcement agencies, especially using technical assistance for long-term mentoring programs. Identification of institutional development needs in using the pipeline of projects would be useful.

ADB has made sizable advances in expanding and clarifying its policies for environmental and social concerns. But at times, the positions stated may be too ambitious, and should be sharpened and supplemented by more practical steps. Development of policies to protect biodiversity and heritage resources is also needed. Evolving policy changes create a discrepancy between the policy recommendations at project approval and those prevailing during project construction, potentially resulting in the public's misinterpretation of ADB's policy compliance. ADB should transparently clarify its position regarding the compatibility of a project with policies developed after project approval. If compliance with evolving policies is required, additional contingency funding may be needed so the Project's economic viability is not affected.

ADB staff members' involvement in preparing project environmental and social documents and recommending their adequacy to the Board creates an awkward dual function. The role of project environmental and social specialists and that of peer reviewers who ensure the Project's adherence to ADB's guidelines should be separated. This necessitates augmenting ADB staff with such expertise. A formal cutoff date for comments on the SEIA well in advance of the Board approval date is needed to thoroughly respond to external comments received. The implied responsibility for monitoring operational mitigation measures over a long period is an administrative burden ADB may not want to accept. If adequate institutional capacity is prepared, local agencies may be ready to officially take over this responsibility; if not, external audits are recommended.

I. INTRODUCTION

A. Background

1. One of the consistent areas of controversy surrounding hydropower development has been over environmental and social issues. To improve decision making and provide a reasoned response to the concerns raised, the Operations Evaluation Office of the Asian Development Bank (ADB) conducted a special study on the environmental and social impacts of hydropower projects. Four case studies that provide a range of conditions and periods of development were evaluated. The case studies selected⁵ were (according to chronological order of approval date) the Batang Ai Hydropower Project in Malaysia (Batang Ai), Singkarak Project in Indonesia (Singkarak), Hunan Lingjintan Project (Lingjintan) in the People's Republic of China (PRC), and Theun-Hinboun Project (Theun-Hinboun) in the Lao People's Democratic Republic (Lao PDR). The study also relied on other project examples, literature, and ADB procedures and policies relating to environmental and social concerns of hydropower development. The study aims to provide recommendations to improve the preparation, design, implementation, monitoring, and supervision of current and future ADB-funded hydropower projects.

B. Study Objectives and Scope

2. The main objectives of the study⁶ are to determine whether ADB is adequately emphasizing the mitigation measures for adverse environmental and social impacts of hydropower projects and to provide recommendations for improving their design and implementation. The major issues discussed are whether (i) the environmental and social impacts of the hydropower projects have been correctly identified at the design stage; (ii) appropriate measures have been introduced to mitigate any adverse impacts identified; (iii) the mitigation measures suggested in the environmental and social documents have been effectively implemented; and (iv) ADB, developing member countries (DMCs), and hydropower project managers have systematically monitored and evaluated the implementation of those mitigation measures and provided adequate feedback.

3. The scope of the study includes (i) the assessment of the quality of project at entry in relation to environmental and social aspects, including the reliability of baseline databases and the adequacy of the feasibility studies; (ii) analysis of the environmental impact assessment (EIA) and summary impact assessment (SIA) processes for their comprehensiveness; and (iii) a review of ADB's internal business practices with a view to recommending operational

⁵ Loan 521-MAL: *Batang Ai Hydropower Project*, for \$40.4 million, approved on 17 September 1981, closed on 10 February 1986; Loan 1032-INO: *Power XX Project*, for \$235 million, approved on 25 September 1990, completed construction in August 1998; Loan 1318-PRC: *Hunan Lingjintan Hydropower Project*, for \$116 million, approved on 27 September 1994, construction ongoing; and Loan 1329-LAO: *Theun-Hinboun Hydropower Project*, for \$60 million, approved on 8 November 1994, closed on 14 October 1998.

⁶ The study was financed under TA 5793-REG: *Impact Evaluation and Special Studies in the Bank's Developing Member Countries*, for \$910,000, approved on 19 May 1998.

improvements where necessary. The rest of this chapter presents the methodology used in collecting information for the study. Chapter II provides a description of environmental and social impacts in each case study and reviews the mitigation measures introduced. Chapter III presents a discussion of major issues relevant to the study, and Chapter IV summarizes the conclusions and provides the main recommendations.

C. Case Study Selection Criteria and Methodology

4. Impact is often evaluated after project completion. However, the study would have limited value if restricted to evaluating only completed projects. All completed projects at the time of study design were approved prior to 1993, and they would not have included ADB's renewed focus on environmental and social concerns. ADB revised the guidelines regarding EIAs in 1992 and initiated the incorporation of social dimensions into ADB operations in 1993. In addition, inspection of projects during construction and early operations phases provides an opportunity to discern the immediate impacts before other factors can obfuscate cause and effect. Since most environmental and social impacts are associated with the first stage projects (i.e., construction of dams, weirs, and reservoirs), second stage projects that financed additional turbines and power station extensions were not included as case studies. Therefore, case studies were selected from first stage hydropower generation projects approved between 1980 and 1994 and include both completed projects and ongoing projects with substantial progress in implementation (Appendix 1).⁷

5. Although ADB renewed its focus on environmental and social concerns in 1993, several of ADB's specific policies on these concerns were approved after 1994 (Appendix 2) and, therefore, were not binding for the case study projects. However, this study discusses these new policies in parallel with the case study impacts, not to evaluate the compliance of the projects but rather to learn from their experiences for implementing current and future projects bound by the new policies. ADB is making continuing efforts to reform its procedures to adhere to its latest policies during project formulation and also to deal with the DMCs' implementation realities. Appendix 3 provides information on ADB's recent efforts in addressing environmental and social impacts of hydropower projects approved after 1994.

6. The case studies selected cover a variety of hydropower projects, including large reservoirs, run-of-the-river projects with relatively small reservoirs, projects that raise the water level of an existing lake, out-of-basin water transfers, and peaking and baseload facilities. Two of the study projects necessitated the displacement and resettlement of many affected persons. In the other two study projects, the need for a resettlement plan was not anticipated because physical relocation was deemed unnecessary,⁸ although the projects had impacts on income-generating sources. The affected persons of all four projects are rural farmers and fisherfolk. The study projects are at different stages of construction and operation and each has been exposed to a different stage of development in ADB's policies and guidelines. The study

⁷ Projects approved after 1994 are not included in the study as their implementation stages were too short to make meaningful assessments or recommendations.

⁸ In this study (as in ADB), resettlement refers not only to relocation but also to temporary and permanent loss of land, resources, community structures, network and systems, income, and other assets. ADB's policy on involuntary resettlement was approved in 1995. Prior to that, the World Bank's Operational Directive 4.3 was being applied to ADB projects as per the President's Letter of Staff Instruction on policy and administrative issues signed on 15 February 1994.

projects also operate in a range of institutional regimes and legal systems pertaining to hydropower development. One of the study projects is being operated as a joint venture company with the State holding the majority of shares. Map 1 provides an overview of the location of these projects. Appendixes 4-7 provide descriptions of project impacts and project-specific recommendations.

7. The study team comprised an evaluation specialist, environmental specialist, a social anthropologist, and domestic consultants from each of the case study countries. The team used a mixed methodology comprising a literature review, discussions with project-related personnel, participatory rapid appraisals (PRAs), and site inspections. The team reviewed ADB's policies, guidelines, and project-related documents to identify main issues, and prepare questionnaires. The team also had field missions (collectively called the Operations Evaluation Mission [the Mission] for this study) to the case study areas in Malaysia, Indonesia, PRC, and Lao PDR during November 1998-February 1999. The Mission held detailed discussions with government officials; and visited libraries, universities, and statistical data centers to collect information on the sociopolitical contexts within which the projects were planned and executed. The Mission interviewed district and local officials in the project areas to collect monitoring data. The main method of data collection from affected persons was PRAs with the assistance of the domestic consultants. A total of 23 PRAs were conducted with at least 4 PRAs in each project area (Appendix 8). The information gathered through the PRAs enabled the Mission to understand the scale of project impacts on the affected persons; learn about their perceptions, fears, worries, and expectations; and understand how they respond to the impacts. The Mission presented its preliminary findings, observations, and recommendations to officials in each country and incorporated their feedback in the individual project details presented in Appendixes 4-7.

II. FINDINGS AND IMPACTS

8. To facilitate better understanding of the impacts in relation to the project interventions, this chapter summarizes case study descriptions, their preparation of mitigation measures, their implementation, and monitoring details. Appendixes 4-7 present the details of each case study and report the progress achieved in the implementation of mitigation measures and indicate recommendations for each case study project as needed. Selected photographs from case study projects are provided in supplementary Appendix A.

A. Batang Ai Case Study

9. **Description.** The Batang Ai Project (Map 2, p. vi) featured the construction of a main dam and three saddle dams to harness the hydropower potential of the Batang Ai catchment area (1,200 square kilometers [km²]). The other components included a surface 108 megawatt (MW) power station, 275 kilovolt transmission line, consulting services for construction supervision, and a panel of experts to review project design and implementation. Batang Ai was the earliest of the four case studies to be reviewed under the study. The Executing Agency was Sarawak Electricity Supply Corporation (SESCO). All power generation units were commissioned by September 1985, about six months ahead of schedule and about 20 percent below appraisal cost estimates. The project completion report (PCR) was completed in December 1986.

10. **Preparation.** The Batang Ai Project was approved in 1981 before environmental guidelines were developed in ADB and the relevant agencies were established in Malaysia. Therefore, its preparation did not include an environmental mitigation plan. However, because of the substantial involuntary displacements, a resettlement scheme was planned, and the state steering committee brought various government departments together to implement the scheme. The Batang Ai Project took special interest in implanting the Iban social organization and cultural institutions in the resettlement scheme, with longhouses and rice land as the central components. To reduce the stress of displacement, the affected persons were to be resettled within the same district and among other Ibans. As such, resistance to relocation was minimal, sporadic, and unorganized. During preparation, a decision was taken to increase the inundation line of the Batang Ai reservoir by 4 meters (m) to optimize economic efficiency.⁹ This decision created considerable difficulties for some longhouses because several areas were submerged before the land surveys were completed, and compensation was not accurately estimated or completely paid.

11. **Implementation.** Due to the changed inundation line, the affected persons moved before their alternative housing was ready and camped for several months in temporary shelters or stayed with other families. They survived on the compensation money and cultivated uninundated parts of their ancestral land. Although project planners attempted to preserve Iban traditional customs and living style and provided satisfactory housing facilities, they failed to

⁹ The Project's planned power output of 4 x 23 MW was changed with ADB approval to 4 x 27 MW by increasing the full supply level of the reservoir by 4 m.

provide the most important cultural asset, rice land to some resettlers due to the unavailability of cultivable rice land. Rice is the staple food of the Ibans, who also use it for their sacred rituals.

12. Since the construction was carried out nearly two decades ago, the study cannot comment on the environmental mitigation measures. A survey of the area found an abandoned batching plant and areas that had not been properly restored. Sufficient time has elapsed for spoil areas to become vegetated on their own. Some measures taken during project implementation, such as the creation of the Batang Ai National Park (in part to protect the Batang Ai watershed), development of ecotourism, and local management of wildlife resources, contribute to protecting biodiversity and the primary forests in the area. The development of aquaculture has also been successful in providing economic opportunities to residents and mitigating fishery losses related to the Project.

13. **Monitoring and Feedback.** SESCO manages the reservoir, flow releases, and power generation with no other regulatory body to oversee operations or dam safety. SESCO has an environmental department that is mainly staffed by civil engineers. Environmental monitoring was inadequate and currently restricted to water quality testing designed for other purposes. In Batang Ai, a few regional nongovernment organizations (NGOs) became interested in pointing out the adverse impacts of the Project on resettlers. Although the NGOs initially brought the hardships of the people to the attention of the authorities, some of their recent reports are not well informed and as a result, misleading.¹⁰ The PCR Mission recruited an anthropologist because of serious allegations raised by NGOs regarding the Project. Although from the engineering aspect, it was considered to be a well-conceived and well-implemented hydropower project, the PCR pointed out the gaps in the resettlement process and the hardships the resettlers had to undergo despite a resettlement plan.

14. **Environmental Impacts.** The preproject conditions supported large migratory fish species adapted to fast-moving water. They now appear to be rare or nonexistent in the reservoir and the upper reaches. However, nonmigratory fishery resources in the reservoir are abundant, as the Department of Agriculture has released several species adapted to lake and reservoir conditions. Floating cage aquaculture has been successfully introduced into the lake and production was estimated at close to 20 tons per month at the time of the Mission. The Department of Agriculture now licenses aquaculture in the reservoir, so only some resettlers have accessibility. The escape of exotic tilapia from the cage aquaculture may pose a long-term risk to the fisheries in the reservoir and downstream, as this species can overpopulate. Fish cage culture and lack of proper clearing of vegetation from the reservoir have contributed to the anoxic conditions of the reservoir.¹¹ Conditions for aquatic life in the Batang Ai River below the dam are poor due to a lack of minimum flow releases during the dry season and periodic bouts of poor water quality characterized by hydrogen sulfide and possibly reduced dissolved oxygen.

15. Based on the site inspection and informal interviews, the project area was largely used for shifting agriculture with some areas maintained as primary forests for religious and community uses. As a result, most of the area viewed was secondary forest with associated wildlife and plant species. The establishment of the Batang Ai National Park (24,040 hectares

¹⁰ The International Rivers Network and the Integrated Development for Ecofriendly and Appropriate Lifestyle (an NGO based in Malaysia) reported that the Bukit Peninjau Miri resettlement in the Miri District was "part and parcel" of the Batang Ai hydropower resettlement, although the Government wanted to conceal that fact. This report is factually incorrect (Appendix 4, paras. 4 and 5).

¹¹ Hydrogen sulfide produced under these conditions is toxic to most forms of aquatic life and humans.

[ha]) in 1991 and the adjacent Lanjak Entimau Wildlife Sanctuary (168,758 ha) and Bentuang Karimun Nature Reserve (1.2 million ha) have contributed to conservation of biodiversity and development of ecotourism. However, several landslides and signs of turbidity were observed along the shoreline, probably caused by newly cleared agricultural land very close to the reservoir. Project records indicate the water surface elevation changes as much as 10 m due to operations. Although SESCO may have compensated for the land up to the inundation line, it was not clear who had management responsibility for land adjacent to the reservoir.

16. **Social Impacts.** The reservoir of the Batang Ai Project displaced 21 Iban longhouse communities comprising about 520 families.¹² Most of these families were relocated below the reservoir in two phases in 1982 and 1984.¹³ The State acquired 3,077 ha of native customary rights land in the downstream area of the Batang Ai reservoir and distributed it among resettler families. However, no titles were given, with the State still owning the land. Each family received the right to cultivate about 3.3 ha in the resettlement area but did not receive the 0.8 ha of promised rice land as suitable land for terraced rice cultivation was not found in some areas.¹⁴ Additional payment of RM4,940 per ha was suggested by the Land and Survey Department in lieu of the promised rice land, but this has not yet been paid. According to SESCO, at present about 440 ha are in dispute (valued at RM382,778).

17. The plan of the Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) to introduce cocoa and rubber plantations was delayed by several years due to the lack of staff and labor, and difficulties in obtaining planting material.¹⁵ The cocoa plantations failed before 1989 and the area was planted with oil palm. Currently, there are about 1,215 ha of rubber and 1,012 ha of oil palm in the resettlement plantations. Rubber plantations are not well cared for or are not tapped as current prices are low. Some profits from oil palm plantations were shared with resettlers from 1993. Until then, they earned wages from the plantations that belong to them. At present, vegetable and fruit gardens are well developed and cash crops, such as pepper, are becoming popular due to high prices.

18. Housing and public infrastructure in the resettlement area are satisfactory. Access roads, schools, a clinic, and shops provide satisfactory services for resettlers and their hosts. Electricity and treated water have improved living conditions. Longhouses for most resettlers were built by the Housing Commission. In some cases, the Housing Commission used the RM8,000 that was assigned to each resettled family as compensation for its ancestral longhouse as a down payment for the new house, and stipulated that each family should pay the remaining cost over 25 years at the rate of RM120 a month. However, the resettlers informed the Mission of their reluctance to pay the housing loan as they believe that RM8,000 from each family was sufficient.

19. Resettlers' average income from their plantations was substantially lower (about RM230 a month) compared with the income (RM523 a month) that was envisaged from plantations after 10 years. This also compared unfavorably with the average monthly family income of RM675 of those who continued to live in native customary rights lands in upstream Batang Ai (without the Project). But the resettlers survived the initial period of resettlement by

¹² This comprises about 422 extended families with approximately 3,600 persons.

¹³ PCR, para. 94, and Appendix 10 indicates that the total cost of compensation was RM35.4 million.

¹⁴ Although the original allocations were stipulated in acres, a conversion factor of 1 acre = 0.4049 ha was used.

¹⁵ The total losses of these two crops in the resettlement area were RM23 million by the end of 1997. The liability for this debt (about RM30,000 per family) has not been settled yet, and a policy decision regarding this is pending.

cultivating pepper in home gardens and other crops in the uninundated land in the partial danger zone. At the time of the Mission, their incomes were restored or exceeded expectations due to employment in Kuching and other towns and at industrial locations.

20. A frictional relationship existed earlier between the hosts and the resettlers, but this has gradually diminished with time. The host community sometimes did not allow resettlers to enter their newly developed lands because the State had not yet paid compensation for the land. The resettlers were at times fined by their hosts for breaking taboos by collecting forest products without permission. As such, older resettlers felt they were encroachers on others' territory. In addition, without the material base (rice land), women's traditional superior status as custodians of the sacred rice weakened, and it took more than 10 years for women to adjust their social position and accept their subservience to men.

B. Singkarak Case Study

21. **Description.** The case study is related to the construction of the 175 MW Singkarak Hydropower Project in West Sumatra (Map 3, p. vii).¹⁶ The Executing Agency is the State Electricity Enterprise (PLN). Prior to the Singkarak Project, Singkarak, a natural lake (112 km²), had one effluent to the Ombilin River, which flows eastward to the strait of Malacca. The Project diverts a major part of the lake water westward after using it for power generation in an underground powerhouse cavern. The Project discharges 47 cubic meters per second (m³/s) on average (77 m³/s at peak) to the Anai River, which flows westward into the Indian Ocean near Padang. The discharge through the gated weir to the Ombilin River was reduced from an average of 51 m³/s to a sanitary flow of 2 m³/s.¹⁷ The Project also diverts and uses the flow from Buluh River, a tributary of the Anai River. During implementation, the cost of construction increased significantly due to geological problems related to excavating tunnels. The Project began operations in 1998. The PCR was not completed at the time of the Mission.¹⁸

22. **Preparation.** The Project was expected to have significant impacts on the lake and areas downstream of the weir up to the confluence of the Selo River (for about 29 km) in terms of restraints on irrigation, human water use, and riverine fisheries. Environmental mitigation measures were determined based on several studies.¹⁹ An environmental monitoring program was prepared (appraisal report, Appendix 22). The cost of mitigation measures was embedded under the preparatory works in the cost estimate and covenanted in the Loan Agreement.

23. However, the extent of the preparation was lacking in some aspects. While the fisheries data on the lake was quite extensive, the data on aquatic life downstream of the dam was inadequate. The detailed fisheries studies found probable significant impacts to downriver fisheries, but these impacts were considered less important in the summary environmental impact assessment (SEIA). Therefore, the proposed sanitation flows did not consider instream needs for aquatic life or the probability of reduced flows from the confluences due to increased population pressure. As physical relocation was not anticipated, a survey was not conducted to

¹⁶ Loan 1032-INO (footnote 1) also includes the engineering design of the 19 MW Tanggari II hydropower scheme in North Sulawesi. The Singkarak component amounts to \$185.8 million.

¹⁷ During the Mission, there were discussions to increase the minimum flow to 6 m³/s for six months a year.

¹⁸ The PCR was completed on March 1999.

¹⁹ EIA of Singkarak Hydroelectric Power Project (parts I and II) (Appendix 11).

evaluate the socioeconomic impact of the Project on those living in the area. The potentially affected persons first learned about the Project through informal consultation because of studies conducted for the EIA. Although local research institutes and the university that participated in the socioeconomic surveys in the 1980s were capable and available to communicate and consult with the potentially affected persons, the project preparatory team did not seek their assistance.

24. **Implementation.** Mitigation measures implemented in the downstream Ombilin River area include releasing of sanitary flows, modification of waterwheel bypasses,²⁰ industrial pollution control at the coal washing plant, construction of weirs for water supplies for the Salak thermal power plant, establishment of the intake for coal washing facilities, and provision of Sawahlunto drinking supply. Construction of flood control works on the Anai River and provision of public health facilities during construction were also completed. Measures that did not appear to have been implemented at the time of the Mission include lengthening of the Sumani pump intake, installation of the flood warning system, and provision of washing and sanitary facilities by modifying the Ombilin riverbed. According to mitigation plans, these were to be implemented prior to project construction or commissioning.²¹

25. **Monitoring and Feedback.** Monitoring measures implemented include partial monitoring of discharges at Ombilin weir, water surface elevations, and fisheries yield in the lake. Monitoring yet to be implemented at the time of the Mission included that for groundwater levels around the lake, the flood warning system, and regular water pollution control. The project environmental group was staffed by two civil engineers and a high school graduate with extensive experience. Singkarak Project is one of five projects within the group's area of responsibility. However, this group did not necessarily compile and maintain all the monitoring or impact information. Other agencies collected and maintained some data.²² The plant operator had no information on the results of monitoring done by other agencies, and little action has been taken to remedy the impacts.

26. **Environmental Impacts.** The reduction of fish yield and the number of fisherfolk affected around the Singkarak Lake and areas downstream of the Ombilin River were underestimated in the EIA and other environmental studies. The project appraisal document (para. 116) estimated partial loss of yield for 180 fisherfolk and indicated that the decrease of 1 percent could be easily offset by introducing efficient fishery methods. The West Sumatra Fisheries Services (WSFS) estimated a 25 percent reduction in the fish yield near the lake since the Project began.²³ WSFS did not monitor fish yield in the downstream area. Harvest reductions ranging from nearly 100 percent at the Ombilin weir to 70 percent near the confluence with the Sinamar River were reported in the PRAs. WSFS has not effectively propagated a type of fish named bilih as planned due to a fish parasite (*Olitropus typhus*) in the lake and inadequacy of information about traditional fishing techniques. Fish migration and spawning have also been affected. Fisherfolk report, and WSFS confirms, that at least three species were no longer in the river and that populations of the soft-shell turtle have declined significantly. Increased water downstream from the power plant has resulted in the opening of several fishponds (some in converted rice fields), increasing fish production in this area.

²⁰ Bypasses were implemented at only a few waterwheels and were unsuccessful in the upper reach.

²¹ The draft PCR indicates that some more mitigation measures had been implemented since the Mission.

²² West Sumatra Fisheries Services is responsible for monitoring fish yield data and the director general of geology in the Ministry of Mines and Energy is generally responsible for monitoring the groundwater levels.

²³ Details in Appendix 5, para. 7.

27. As anticipated, the Project has had little or no long-term direct impact on the water quality of Singkarak Lake. However, several indirect impacts were evident. Reduced flows in the Ombilin River led to increased incidences of skin and intestinal sickness and the rapid movement of waterborne disease vectors. A drop in groundwater levels (reported to be 2-3 m) resulted in dysfunctional wells and increased use of the river for bathing and defecation.²⁴ Water quality deteriorated rapidly after the Selo confluence due to increased sedimentation and higher densities of households and industrial users. In addition, illegal harvesting of primary rain forests along the access road from the bridge across the Buluh River to the tunnel entrance.²⁵ This logging could also result in the loss and degradation of habitat for several sensitive species in the vicinity of the access road, including the Sumatra tiger.

28. **Social Impacts.** The Project was beneficial in terms of low-cost power generation from renewable energy sources. The Project neither required relocation of residents nor did it create substantial land disturbances for the plant construction. The downstream dwellers of the Anai River benefited from the Project as they can now cultivate two assured rice crops a year (6,000 ha) in addition to other cash crops and also maintain many fishponds due to the diverted water. But the partially developed phase 2 irrigation system area now experiences more floods, which damage crops and dwellings. On the other hand, downstream dwellers of the Ombilin River suffer major income losses as a result of this transbasin diversion.

29. According to the PRAs, water level fluctuations and inadequate operations management of the Ombilin weir caused substantial spills and unacceptably low flows in the downstream area. Sudden floods caused by the opening of the weir were reported to have destroyed or damaged more than 100 waterwheels and weirs on the Ombilin River in 1998. The Project had agreed to pay Rp0.5 million per waterwheel that the Project deemed damaged due to the fluctuations during the testing of operations, but the payments had not been received at the time of the Mission.²⁶ Floods also damage dwellings and fishing infrastructure. Farmers are eligible for insurance payments only if the water level in the lake reaches 367 m. However, the lake area is flooded when the water level goes above 363 m.²⁷ In three large villages on the Ombilin River, about 300 ha of irrigated rice is affected in the dry season²⁸ as farmers cannot use their waterwheels for irrigation due to the low water level on the river.

30. The Project generated employment opportunities for local community members and outsiders. Many local villagers worked as laborers and drivers at project construction sites. No major clashes occurred between local workers and other recruits (mainly from rural Java). Without resettlement schemes, social infrastructure development was limited to a few access roads. Road access and rural electrification improved conditions for several villages along the roads. However, expansion of activities such as brick manufacturing had adverse ecological implications resulting from the uncontrolled removal of sand and clay and increased collection of firewood from the adjoining forests.

²⁴ PLN informed the Mission that it plans to provide about 50 drinking water wells for the use of 500 households.

²⁵ The Mission was informed that subsequent to its visit, a permanent guard post was established to prevent illegal logging.

²⁶ As of February 1999, PLN is reported to have paid this compensation.

²⁷ Since the Mission, PLN is reported to have paid 85 percent of compensation for the area affected by the 363 m water level.

²⁸ The Project agreed to compensate for 170 ha, but the payment was not received at the time of the Mission.

C. Lingjintan Case Study

31. **Description.** The Project (Map 4, p. viii) included the construction of a 240 MW²⁹ run-of-the-river hydropower plant on the Yuanshui River in Hunan Province. The Project was expected to serve as a reregulating station for the 1,200 MW Wuqiangxi hydropower scheme (completed in 1996) located 41 km upstream. The Project is the most downstream development of 17 proposed hydropower schemes on the main river and tributaries of the Yuanshui River. About 4,060 persons in rural households had to be moved from agricultural and residential lands. ADB financed \$116 million of the total cost of \$367 million. Hunan Electric Power Company (HEPC), selected as the Executing Agency, initially managed the Project, but later the Wuling Hydropower Development Company took over this responsibility. The Project was under construction at the time of the Mission, and the first turbine began operating at the end of 1998.

32. **Preparation.** Preparatory documents compiled were comparatively better than for the other case studies. The resettlement program began in 1992, and it was considered a development “challenge” rather than a “burden” on project resources and the State. As a result, the program aimed to secure bases for household income and welfare, taking the affected persons beyond their traditional occupations (such as subsistence farming) and rebuilding lost property, mostly on newly cleared, flattened hilltops and terraces. The revised compensation and land development fund (Y227.8 million) was to finance the program. The program intended to resettle people as close as possible to their original homes to make the physical shift less traumatic.

33. During the resettlement planning stage, agencies dealt intensively with township and village leaders, thus indirectly drawing the individual households into the planning framework. Elected leaders, some of whom were resettlers themselves, were involved in searching for alternative income sources for villagers and in securing more compensation investment funds. The rice land remaining after the Project in each village was to be divided equally between the resettlers and the hosts. As such, the average rice holding size per villager would decrease by about 50 percent to 0.7 ha (1 mu) in the project area. Relocating resettlers in their own villages redistributes their hardship and loss of income among all villagers. However, the plan gave scant attention to the host communities: basic data on their socioeconomic conditions, attitudes toward resettlers, and coping strategies with resettlers were not carefully considered. The socioeconomic baseline data used was county-level aggregate data available in the official statistics. However, this was inappropriate for the project-impact zone, which spread over parts of some counties.

34. On the environment side, preparatory documents were not always consistent and lacked adequate information on baseline conditions or comprehensive descriptions. The Lingjintan Project, Wuqiangxi, and the 15 proposed projects along the Yuanshui River will also have adverse impacts on migratory fish in the river and possibly in Lake Dong Ting.³⁰ The available

²⁹ This has now been changed to 270 MW with nine turbines instead of eight as planned.

³⁰ The Wuqiangxi hydropower plant, built in 1996 prior to Lingjintan dam, is 41 km upstream on the Yuanshui River (1,050 km). Although the Wuqiangxi project has greater potential to adversely impact migratory fish, the Lingjintan facility is the most downstream, and without fish passage, all upstream would be potentially adversely impacted. The cumulative impacts of both are substantial, but the occurrence of navigation locks provides an opportunity to reduce impact. The suggestion made regarding the operation of Lingjintan boat locks should be applied to those at Wuqiangxi as well (Appendix 6, para. 26).

environmental documentation for this Project neither adequately address the significance of this impact nor does it propose sufficient mitigation.

35. **Implementation.** About 70 percent of the affected persons had been resettled at the time of the Mission; the rest were to be resettled before May 1999. By July 1998, a total of 509 ha of land had been developed through rice land adjustment and reclamation and use of hilly land, which benefits 2,238 persons. A special fund was used to relocate 24 valuable historical tombs and relics during the relocation process. According to the plan, the resettlers' main occupation will continue to be land cultivation. Cash crops, animal husbandry, and aquaculture were expected to become important sources of livelihood in the area. Local industries, such as bamboo products and freshwater pearl culture, would supplement these incomes. Initially, household incomes of the resettlers and their hosts may decrease, but the resettlement fund and social insurance mechanisms were expected to support them to improve their livelihood.

36. Efforts have been substantial to control mass wasting related to reservoir creation, as have been those to mitigate groundwater impacts and reduce inundation through the construction of berms. Revegetation and site rehabilitation efforts have been implemented successfully in some areas, but the problem still needs improvement. The remaining problems observed were related to liquid and solid waste disposal, hazardous materials control, health and hygiene, and erosion control.

37. **Monitoring and Feedback.** Monitoring of the resettlement program was the responsibility of the Mid-South Design and Research Institute and the Resettlement Work Monitoring Corporation. Preparatory work was done for income restoration, land distribution, and supply of housing for each village. However, monitoring of the resettlement process and resettler income and handling of adjustment problems received little attention. According to the County Resettlement Bureau, steady increase of average household income among the resettlers had been noticed: from Y928 in 1993 to Y1,361 in 1996 to an expected Y1,800 in 1998. However, the data to support this trend was not readily available. Without a database to monitor affected persons, their socioeconomic conditions, and changes in income sources, it is difficult to support or refute claims of increasing income among resettlers. The annual progress reports on the Lingjintan resettlement program described what the Project was expected to do rather than what had been achieved. Average incomes of the affected persons in the project areas mentioned in the report would often hide the disproportionate changes in the incomes of some villagers.

38. On the environment side, the State Environmental Protection Agency conducted some monitoring. However, the agency reported its monitoring findings to the project owner. There appeared to have been misunderstandings regarding the various parties' monitoring, reporting, implementation, and enforcement responsibilities. The monitoring design was broad and provides a reasonable baseline for standard air and water quality parameters but not for biological indicators or adequate focus on the Project's construction or operational impacts.

39. **Environmental Impacts.** Although the Lingjintan Project is a run-of-the-river facility, it will change the character of the Yuanshui River from a free-flowing system to a lake-like condition. Subsequent to project completion, the water surface elevation changes in the reservoir area could reach 1.9 m in one day.³¹ This would result in a varial zone where daily

³¹ The environmental documentation does not describe the elevation changes that can be expected downstream of its

inundation and desiccation would eliminate most biological activity and subject fish fry to stranding and increased predation. The fishery community would change from that of a migratory to a still water fishery.

40. The Mission found some deficiencies and problems with the implementation of environmental management and mitigation measures, including inadequate management and treatment of toxic substances, such as petroleum products, solid domestic waste, and construction waste and wastewater. Daily site inspections to enforce mitigation measures do not seem to be done. In addition, there was no clear line of responsibility to solve the environmental problems that might become apparent with inspections.

41. **Social Impacts.** Postproject productivity of commercial fishing was expected to be similar to preproject conditions due to the extensive aquaculture program that was under construction. However, it was not clear that the same traditional fisherfolk will be involved in the new aquaculture development. Although persons who lost their farmland received assistance to develop new lands or find other occupations, resettlers reported declines in incomes. Income-generating activities, such as animal husbandry or fishponds, need substantial initial investments. A major part of the new production plans constitutes medium- to long-term plantations, including tea, chestnut, bamboo, and timber, which take 5-20 years to generate income. These lands were reported to be distributed on a contract basis among villagers who had initial investments and skills. Land readjustment programs, fishponds, and new houses have occupied most of the grassland and vegetable gardens, and some resettlers now have to buy vegetables. As other income-generating activities are rare in the area, some resettlers migrated seasonally from their villages in search of supplementary employment.

42. The Hunan provincial government claimed that the Lingjintan resettlers already earn more than before due to the livelihood schemes introduced (such as cultivating watermelon and establishing fishponds). The resettlement officials also expected to divert a small amount of profits from the hydropower project (Y0.006 per kilowatt-hour) to the resettlers and their hosts once the Project was in operation. However, the PRAs revealed that resettlers appeared to be experiencing an income decline. The resettlers believe that within 3-4 years, they would be achieving better socioeconomic conditions. Although average income may have risen, this disparity in assessment may be because some resettlers were more affected than others due to the uneven distribution of access to livelihood programs.

43. Each relocated household received a standard-size house plot with infrastructure. About 70 percent of the total cost of a new house was provided by the government as compensation. Household savings and borrowings finance the rest. The new houses were generally superior. Newly constructed community centers are of better quality and have electricity, water, and toilets. Yet, obtaining safe drinking water remained a problem at the time of the Mission, especially because new resettlements are at high points of the village land, making it difficult to dig wells.

44. Resettlers were happy with their new brick houses, which outwardly indicated that they may have achieved a superior lifestyle compared with that in their former timber houses.³² However, resettlers were worried about several items: (i) their shrinking land-based income

dam after operations.

³² Some families were displaced before their new houses were ready and had to live with their relatives and friends for several months.

sources needed for routine expenses, (ii) their moving closer to hill slopes because of the possibility of landslides or close to the inundation line of the reservoir because of frequent and serious floods, and (iii) their new production ways and the potential to succeed. They tried to find new livelihoods outside their villages to survive. Despite the economic worries, pressures, and scarcities that an influx of resettlers creates, relations between resettlers and their host communities are generally satisfactory. The host communities have responded with sympathy and understanding.

D. Theun-Hinboun Case Study

45. **Description.** The Theun-Hinboun Project (Map 5, p. ix) is a transbasin run-of-the-river hydropower project that diverts a major part of the water from the Nam Theun River, channels it through an underground tunnel, uses the water for 210 MW power generation in a surface powerhouse, and discharges the water to the Nam Hai River (a tributary of the Nam Hinboun River, flowing west to the Mekong River at the border of the Lao PDR and Thailand). The Project's objective is to support economic growth through enhancing foreign exchange earnings by exporting 95 percent of the electricity generated to Thailand. The Executing Agency for the Project is a joint venture company named Theun-Hinboun Power Company (THPC), of which 60 percent is owned by Électricité du Laos (EdL), 20 percent by MDX Lao Company Limited, and 20 percent by Nordic Hydropower AB. The feasibility study for the Project was completed in 1994, and construction commenced at the end of 1994. Operations testing began in January 1998, and commercial operation commenced in March 1998.

46. **Preparation.** The feasibility study included a detailed EIA that was completed in May 1993. An SEIA was prepared by March 1994. The license agreement between THPC and the Government stipulated that THPC shall bear the costs of compensation, resettlement, and environmental mitigation up to \$1 million. ADB received several letters from interested parties during the processing of the Theun-Hinboun Project³³ indicating that the baseline information in the EIA was inadequate. Due to concerns raised by various parties, several studies were prepared subsequently and a more detailed agreement was signed by THPC and the Government in 1996, increasing to \$2.59 million the funds available for mitigation. Additional independent studies (Norplan 1997)³⁴ provided better documentation of the baseline conditions and impacts. However, the Project was not necessarily bound by mitigation proposed by later studies.

47. As the physical relocation of persons was not anticipated, the Project unfortunately did not have a resettlement plan to systematically address income restoration and other social impacts. However, the EIA proposed several community programs in the project area. The improvement of public infrastructure (roads, community health, and educational facilities), and compensation for loss of rice land in the tailrace canal area were among the programs. The

³³ The Canadian Director of ADB received several letters, including one in which the Canadian International Development Agency wrote, "While SEIA covers the main issues, it is clear that some important impact risks are being overlooked..., in our opinion, the major impacts needing either drastic mitigation measures or considerations of alternative designs or sites." The international NGO ecologist wrote to the British Cabinet and pointed out major drawbacks, including fisheries downstream, impact on local communities, as well as the actual size and extent of the project-impact zones. ADB's 28 September 1993 reply neither adequately answered the issues raised in the letter nor effectively denied the allegations.

³⁴ Details in Appendix 11.

Nam Hai area was to secure better quality water in larger quantities, enabling farmers to cultivate irrigated rice. The community programs supported the relocation of persons from the headpond area to rice land that could be opened up in the Nam Hai area as a result of proposed state agricultural development programs. The headpond communities were also expected to benefit from increased fish production. The project-impact zone was considered to be about 21 villages, mainly in the headpond area and upper Nam Hai plain.³⁵

48. **Implementation.** Several attempts were made during implementation to rectify the inadequacies of the preparatory documents and plans. Although it was not presented in the SEIA, a reregulating pond was constructed during implementation to reduce the impact of the peaking operation on soil erosion. Similarly, THPC paid to relocate a village shrine, although there was no special arrangement to safeguard cultural monuments in the EIA. THPC, during implementation, commissioned several studies on irrigated agriculture, rural development, and fisheries development to find out how to improve affected persons' incomes and lifestyle to help the government prepare a structured development plan. But the implementation of those plans is a problem, as the government does not have sufficient funds.³⁶

49. THPC also consented to a schedule of environmental and social requirements in 1998.³⁷ In November 1998, THPC and ADB agreed to redefine the project-impact area to include the Nam Kading to the confluence of the Mekong River plus the area from Nam Hai to the confluence with the Mekong. The newly defined project-impact zone covers 53 villages instead of 21 as originally considered, and includes an estimated 4,283 households containing about 25,000 persons. At the time of the Mission, a survey was proposed to be carried out in the newly defined project area, and the draft questionnaire was being prepared.³⁸

50. **Monitoring and Supervision.** The Loan Agreement stipulates that the Borrower will complete an environmental audit of the Project including a study of project impact on downstream fisheries (Loan Agreement, Schedule 5). The Loan Agreement further stipulates that the Borrower will consult with ADB on the results of such an audit so that appropriate mitigation measures are taken to reduce the impacts to fisheries and implement an environmental management program satisfactory to ADB for areas affected by construction.

51. THPC conducted an environmental audit and either has conducted or plans various monitoring efforts that meet ADB's requirements. A fisheries monitoring report, which will fulfill the Loan Agreement requirements,³⁹ was being prepared at the time of the Mission. To oversee the implementation of mitigation measures and the monitoring program, THPC established the Environmental Management Committee Office (EMCO) in 1996. However, THPC and ADB agreed in October-November 1998 that the capacity of EMCO is insufficient to fully execute its responsibilities.⁴⁰ Both EdL and THPC have verbally committed to mitigating impacts that are caused by the Project and have made reasonable efforts to remedy environmental problems as they become apparent.

³⁵ None of the villages downstream of the Nam Kading area, where the water flow would be reduced, were included in the impact zone at project preparation.

³⁶ Appendix 7 project-specific recommendation suggests that ADB may consider supporting the Government to obtain funding through dialogues or cofinancing arrangements.

³⁷ THPC correspondence with the Asian Mezzanine Infrastructure Fund, dated 5 August 1998.

³⁸ The socioeconomic survey's health and nutrition studies were reportedly carried out (Appendix 7).

³⁹ A draft final fisheries monitoring study was made available to ADB during the writing of this evaluation report.

⁴⁰ According to THPC, since the Mission, the staff and other resources have been augmented.

52. The preliminary information about the Project was distributed to the 21 villages in the initial "project-impacted zone." EMCO launched a program to create awareness among affected persons about the Project through leaflet distribution, radio programs, and group consultations with village leaders. Compensation payment ceremonies are used to communicate with the affected persons. A community liaison officer was appointed in September 1998 on a temporary basis to work with EMCO on the public information program.

53. **Environmental Impacts.** Prior to the Project, the aquatic communities included many species that are migratory and are important to the fishery.⁴¹ Fish were abundant and used as a dominant portion of the protein intake of villages and, at times, for commercial uses. The Nam Theun River had high biodiversity with 70-100 or more species. Fishery resources were exploited from above the headpond area to the confluence with the Mekong River. As reported by many authors and some villagers, fish populations along the lower Mekong River system have been declining for reasons unrelated to the Project. The Nam Hai River was an intermittent system that had no through flows during the dry season; the river is now reported to be running through the dry season. These two rivers also supported an important and apparently abundant seasonal fishery that was a major protein source for adjacent villages. The biodiversity values in Nam Hai-Nam Hinboun system are not as high as they are in the Nam Theun-Nam Kading system. Based on the information collected during the Mission, project impacts on fishery resources and dependent villagers were incorrectly assessed in the EIA and have not been adequately mitigated. Without adequate mitigation in conjunction with improved fishery management measures, the long-term decline of fishery values will continue and accelerate in and around the newly defined project area.

54. The project area and its surroundings are of high ecological, biodiversity, and scenic value. The area includes habitat for many species whose numbers have declined throughout their range or are endangered with extinction. The area also includes two protected areas. Of particular concern are the effects of the reduced flows on the Nam Kading protected area immediately downstream of the dam. Many areas surrounding the Project are covered by primary tropical rain forests rich in biodiversity and include flora and fauna that are not completely known. Even without the Project, the wildlife resources in the area have been under considerable pressure from hunting, which has increased with the influx of people toward the project area. The construction of the transmission line did not significantly impact the forests within the Khammouane limestone protected area. The towers were put in by helicopters and access is by foot. The valley surrounded by this protected area has a large tin mining operation that has existed since 1918, but it does not have substantial primary forests. Disturbed areas along temporary access roads have not been adequately rehabilitated.⁴²

55. **Social Impacts.** The construction/improvement of roads and higher water levels in some areas increased people's mobility and access to market centers, opening opportunities for new commercial activities. It also created several roadside settlements. However, unless rules are strictly enforced, increased exploitation of timber⁴³ and wildlife resources would become an indirect adverse impact of new access roads. But on the other side, high water levels and the collapse of dry season crossings and some roads in the Nam Hai area restrict communication

⁴¹ This is the first of the proposed hydropower projects in Nam Theun.

⁴² This problem falls under the defect liabilities of the civil works contract and will be corrected.

⁴³ See Appendix 7 for information on logging operations close to the access roads. Despite THPC's attempts to limit access to this area, logging is reportedly continuing.

and transportation.⁴⁴ Increased and fluctuating water levels damaged vegetable gardens on riverbanks and also deprived livestock of grazing lands in some locations. Water level fluctuations in rivers apparently changed the nature of the fishery, both in terms of species composition and methods of fish harvesting. Most of the village communities in the downstream Nam Kading area, headpond area in Nam Theun and Nam Gnouang, and Nam Hai and Nam Hinboun areas report that their fish catches have been significantly reduced during the last year.

56. People in the project-affected area are mostly traditional shifting cultivators. Some of these people in Nam Theun and Nam Gnouang areas are willing to relocate in the Nam Hai plain⁴⁵ if irrigation and other facilities are provided. In addition, some villages in the hilly areas moved to the roadside in search of employment and state assistance. These diverse processes of relocation in the project-affected areas have been accelerated by the project impacts, such as increased and fluctuating water levels, riverbank erosion, and decreased fish harvests. Mission findings indicate that the relocation of entire or parts of communities may become necessary in some project-impacted zones. Several village communities in Nam Hinboun and Nam Hai areas were vulnerable to heavy bank slumping (falling) and frequent water-level fluctuations since project operation began. Riverbank erosion is likely to continue for several years, scouring the riverbed, widening the rivers, and slumping riverbanks. As a result, it is difficult to predict the extent of relocation of communities that may occur.⁴⁶

57. The October 1996 agreement on environmental mitigation measures addressed some of the above issues. But unfortunately, the agreement did not recognize the need for a long-term comprehensive social mitigation plan. However, it established a resettlement compensation fund to settle compensation for relocation, the loss of agricultural land, and structures. Despite the absence of large-scale physical relocation, a project of this nature needs a social mitigation plan to address the above issues, including compensation and income restoration. As found in the PRAs, the Project has adversely affected villagers' household income levels. However, the impacts may be short term. The survey of the project-impacted area provides a good opportunity to formulate such a plan in consultation with the affected persons, taking into consideration their skills, resources, and traditional practices. Although compensation payments made so far under the Project have been adequate, no framework exists to systematically determine the payments.⁴⁷

58. THPC constructed a first-aid station and gave the local persons access to it. In addition, two schools were built and another was refurbished. The temporary employment opportunities at the dam and powerhouse area provided attractive additional income for local persons during construction. Villagers agreed to support the hydropower project because they believed it would bring them better public infrastructure, such as electricity. At the time of the Mission, four villages in the project area had received electricity since the construction was completed. The provision of electricity is the responsibility of EdL and provincial authorities.

⁴⁴ THPC reports that it has taken steps to address some of these problems since the Mission.

⁴⁵ The Land Law of 1992 restricted the villagers' customary access to forests for the purpose of slash-and-burn cultivation. The law stipulates that land cannot be left fallow for longer than three years. The Government can claim such land for reforestation or plantations. This is a period far shorter than the normal cycle of slash-and-burn cultivation (8-15 years for the land to return to the original status). The 1996 law entrenches state allocation of land rights to households for permanent agriculture only.

⁴⁶ See Appendix 7 for mitigation attempts.

⁴⁷ The Government did not have a stipulated policy on compensation.

59. THPC has agreed to consult those villagers who lost their vegetable gardens and garden lands and work out a compensation scheme. THPC will also compensate fisherfolk for lost or damaged nets. THPC worked out a compensation scheme with district authorities, and village leaders have been informed to send lists of the estimated losses to EMCO. THPC intends to also extend this scheme to villages falling within the newly defined project-impact zones. According to PRAs, drinking water was one of the main areas adversely affected by the Project. Backwaters of the headpond have widened Nam Theun and Nam Gnouang. Water is mostly muddy on their banks. On the Nam Hai, soil erosion has affected the availability of good water.⁴⁸

E. Comparative Information on Case Studies

60. **Gender.** Often at the project preparation and implementation stages, the impact of the Project on gender was not considered as the projects were approved prior to the adoption of ADB gender and development policy.⁴⁹ But as the PRAs revealed, women play a vital role in household income generation and in resettlement activities. In the case of Theun-Hinboun, the Project affected women more than men. The loss of vegetable gardens, which women generally tended, deprived them of their own funds. New gardens built on higher ground and the impact of sedimentation on drinking water necessitates that they carry water from the river. Many women reported in the PRAs that their leisure time was reduced because they now must work harder to continue their traditional businesses, such as cattle grazing and vegetable cultivation. In the case of Batang Ai, without the material base (rice land), women's superiority weakened, and this has led to conflict and tension as men and women struggled over dwindling resources and different interests (Appendix 4).

61. The need for young women to find other sources of income in nearby towns eroded their traditional high social status. The breakdown of community values, increased physical mobility, and the presence of a large urban and mobile labor force in the project construction sites for several years have encouraged undesirable social practices in project areas. In Batang Ai, social scientists with similar developments in nearby Lubok Antu soon after the resettlement scheme was established. The degradation of local women's status is also reported in Theun-Hinboun. For example, police bulletins in the project area report an increasing number of arrests of women, some of whom moved to the project area from neighboring countries. In Singkarak, the villagers showed grave concern to segregate villagers from outside laborers, mainly because of the threat the outsiders posed to their traditional values and the dignity of women.

62. **Compensation.** Often, compensation estimates were included in project plans when projects involve many directly affected persons. If the number of affected persons was small or the impact was not direct relocation, compensation payments tended to become ad hoc. Hasty land surveys and protracted legal battles (Batang Ai), incomplete land records (Theun-Hinboun), and the lack of coordination among agencies (Singkarak) caused delays in compensation payment, and at times adversely influence the incomes and living standards of

⁴⁸ THPC is working to ensure the completion of the waterwells program.

⁴⁹ Therefore, very little data was available to conduct a proper analysis. ADB's policy on gender and development was approved in 1998 which requires consideration of gender concerns as part of the initial social assessment and gender mainstreaming strategies to be included in project design.

the affected persons. Moreover, the loss of community property (grazing land and forests) was usually not counted in compensation calculations. Cultural property was being given more consideration in the more recent projects. In Theun-Hinboun, although there was no special arrangement to safeguard cultural monuments, THPC paid to relocate a village shrine. In Lingjintan, there was a special fund used to relocate 24 “very valuable” historical tombs and relics. Table 1 compares the compensation arrangements in the four case studies.⁵⁰

⁵⁰ Appropriate and acceptable compensation means that compensation resources given (not necessarily in cash) are sufficient to at least restore the previous level of income of project-affected persons.

Table 1: A Comparison of the Compensation Arrangements in the Four Case Studies

Item	Batang Ai	Singkarak	Lingjintan	Theun-Hinboun
Type of Land Tenure	Native customary rights to land; settled land under the Sarawak Land Code.	Private land, common land, and state land.	State land operated by the village community; household use rights.	State (swidden) land for rain-fed rice and vegetables, "certificated" land for irrigated rice and settlements.
Land Compensation	Generous compensation for hosts and relocatees. However, some compensation still outstanding.	Negotiated low compensation rates, paid for acquired sites and access roads. Delays in payment.	Compensation given to village group for production alternatives; remaining land (half of original) redistributed.	Limited, but adequate compensation for loss of cultivated land; planned compensation for river erosion and flooded gardens.
House Compensation	New longhouses with electricity and water at the resettlement scheme.	Not applicable as no houses affected.	Better housing with modern amenities, partly (30 percent) financed by affected persons' savings and debt.	Plans to relocate households affected by housing problems.
Other Property Compensation	Assisted transport of timber, furniture, and livestock; limited compensation for graveyards.	No compensation arranged as no relocation occurred; limited repairs to waterwheels damaged due to project impacts.	County help for removal of livestock, cultural property, etc.	No policy at the time of Mission. Planned to compensate for loss of fishing nets and gardens due to floods.
Compensation for Crops	Crop-specific compensation disputes on quantity and condition of crops.	No compensation.	Limited compensation.	Cash compensation; ad hoc arrangements.
Fisheries	No compensation for lost fisheries, but a state fisheries program established in the reservoir.	No compensation or program; tilapia introduced unsuccessfully in the lake.	No compensation policy or program.	No compensation policy or program.
Compensation for Common Property	Limited access allowed to the national park and forest reserves.	Access limited to forests in the project area; brick kilns using firewood and river gravel removal allowed.	Limited access allowed.	Access not yet barred by government, but possible future plans.
Employment	Employment as plantation laborers brought by Sarawak Land Consolidation and Rehabilitation Authority.	No compensation for loss of employment, e.g., fisherfolk and rice farmers.	Plan to diversify employment; river gravel removers and gold diggers uncompensated.	Temporary work site employment; some permanent staff; a few new employment opportunities in mitigation programs.

63. **Environmental Impacts.** Table 2 summarizes the impacts of the four case studies on fisheries and other common categories (Appendix 10). Consistent with most hydropower development, the most significant environmental impacts identified were associated with fisheries, particularly migratory fish species. Projects did not have adequate management of

Table 2: Comparative Information on Environmental Impacts in the Case Study Projects^a

Latang Ai	Singkarak	Lingjintan	Theun-Hinboun
Terrestrial and Aquatic Life			
Many riverine species in the lower reach or upper reaches, and habitat conditions due to seasonal drawdown, and quality. Aquaculture increased; escaped fish outcompete native fish species. Minimum flow releases aquatic life in dry season.	<p>?? Reduction in fish yield (reported 25 percent in the lake and 70-100 percent in downstream Ombilin River) and creation of fishponds in Anai River and associated income changes.</p> <p>?? Extirpation of three fish species, declines in other species, decline in fish migration, and reduction in habitat in Ombilin River related to insufficient water flows.</p> <p>?? Fish parasite (<i>Olitropus typhus</i>) found in the lake; may impact native fisheries and pose a risk to aquaculture along the Anai River.</p>	<p>?? Change from free-flowing river to lake-like conditions impact migratory fisheries due to changes in water depth, velocities, and temperature. Fish stranding and increased predation.</p>	<p>?? Absence of fish passage for upstream migration may affect headpond (Nam Theun) fish populations. Short-term increases in headpond at inundation and subsequent decline due to increased water level.</p> <p>?? Reduced flows below dam; absence of provisions to address entrainment and mortalities for species migrating downstream (Nam Kading).</p> <p>?? Increased reported harvest pressure downstream of dam and decline in harvest (percent) in the lower reach approaching the Mekong.</p> <p>?? Increased access and mobility for fisherfolk headpond area and difficulty to access lower reach during dry season.</p> <p>?? Reduced fish harvest in Nam Hai and Nam Hinboun resulting from higher flows, flow fluctuations, turbidity, and decreased efficiency of traditional methods.</p> <p>?? Reduced primary productivity due to lack of algae and macrophytes in Nam Hinboun downstream beyond Nam Hai confluence.</p> <p>?? Degradation of riparian community due to fluctuations, and decline over the longer term in fish populations due to secondary impact</p>
Terrestrial Vegetation			
Protected areas have wildlife populations to reservoir area. Approximately 90 km ² was flooded, changed ecological conditions from riverine, forest, and some access to a reservoir.	<p>?? Illegal harvesting of primary rain forests.</p> <p>?? Long term loss/degradation of habitat for sensitive species, such as the Sumatra tiger.</p>	<p>?? Inundated riparian communities, habitat loss, and loss of species dependent on river conditions, such as mergansers.</p> <p>?? Backwaters created but limited, reduced by varial zone impacts.</p>	<p>?? Improved access to protected areas resulted in increased exploitation, harvest, slash-and-burn agriculture.^b</p> <p>?? Increased hunting and trapping pressure as result of the reduced availability of fish in protected and other areas.</p>

^a presents summary impacts as well as suggested project-specific mitigation.

^b The area will not be as severely impacted by slash-and-burn or harvesting activities as it is difficult to access and includes limited forest resources and wildlife.

Table 2: Comparative Information on Environmental Impacts in the Case Study Projects (continued)

Iatung Ai	Singkarak	Lingjintan	Theun-Hinboun
<p>Quality and Health</p> <p>is anoxic due to improper vegetation; results in poor water quality. Minimum water flow uses degraded riparian areas. Leaking from fish cages. Located on the Engkari tributary of</p>	<p>?? Reduced flow regime and drop in groundwater levels have led to dysfunctional wells and increased use of the river for defecation and bathing, causing skin and intestinal disorders.</p>	<p>?? Increased sedimentation of water downstream in Nam Hai and Nam Hinboun</p> <p>?? Some erosion in headpond area due to increased water level.</p>	
<p>Stability</p> <p>landslides, newly cleared reservoir not under management.</p>	<p>?? Over 100 waterwheels were damaged on the Ombilin River.</p> <p>?? Loss of some rice harvest due to increased flooding in phase 2 area of Anai River Irrigation Scheme.</p>	<p>?? Communities fear increased flood risk.</p> <p>?? Shoreline landslides evident.</p>	<p>?? River widening and sloughing.</p>
<p>Areas</p> <p>Access road areas show landslide problems, but determine the extent of its contribution because it occurred in 1988.</p>	<p>?? Degraded areas in need of rehabilitation, especially near roads.</p>	<p>?? Improper control in managing toxic materials, such as petroleum products, and concrete accelerators.</p> <p>?? Lack of adequate disposal of solid and human waste.</p>	<p>?? Exposed construction work sites are prone to erosion.</p>
<p>Local Impacts</p> <p>1 village (520 families) relocation.</p> <p>Construction on line construction and causes increased river bird hunting, loss of fish, and loss of forest on line right-of-way going maintenance.</p>	<p>?? No impact from physical relocation of people.</p> <p>?? Brick manufacturing led to sand removal and firewood collection.</p>	<p>?? 4,753 persons (830 rural households) required physical relocation.</p> <p>?? Removal of shrub and forest due to resettlement and creation of fishponds.</p> <p>?? Rice fields and upland farm area creation has led to erosion and impacts on vegetation and ecosystems.</p> <p>?? Transmission line construction and operational impacts.</p> <p>?? Wuqiangxi plant operations cause water level fluctuations.</p>	<p>?? The access road along the transmission line is being used for an extensive logging operation associated with the Hinboun Valley Rural Development Plan.</p>

river flows to maintain fisheries at preproject levels.⁵¹ In addition, cumulative impacts are associated with extensive development and planned development of hydropower and flood control projects for the Lingjintan and Theun-Hinboun projects. None of the projects were designed to mitigate for impeded spawning runs, with most fisheries mitigation efforts directed at aquaculture.

64. **Summary.** Identification of major project impacts improved with later study projects (Lingjintan) as EIA preparation and consultations with affected persons were introduced. Yet, these efforts could be improved with consultations geared to improve participation, systematic collection of baseline information, and the use of multiskilled project preparation teams. A majority of the mitigation measures that were obviously needed (i.e., housing, infrastructure facilities, and aquaculture programs) were preplanned and introduced during project design. At times, there were delays in accommodating changes in project design. However, some mitigation measures (i.e., income restoration programs, vegetable gardens, and drinking water) that necessitated coordination among agencies, participation from affected communities, and adequate funding from the projects and local agencies were not always addressed in a timely and efficient manner. Other mitigation measures that affected natural resources (i.e., migratory fisheries and biodiversity) had yet to be done in some study projects at the time of the Mission. Implementation of mitigation measures in study projects was not smooth in the early projects (Batang Ai) prior to the introduction of guidelines related to hydropower development, mainly due to inadequate preparation and enforcement to be successful. Progress in addressing environmental and social concerns needs to be better monitored, and the feedback loop needs to be strengthened in all study projects. These important issues and suggestions for improvements are discussed in the next chapter.

⁵¹ Although the Lingjintan Project was expected to have a reregulating nature for the upstream Wuqiangxi power plant, it may not fully dampen Wuqiangxi fluctuation effects. A detailed analysis of hydrology and operations with regard to the peaking schedule needs to be done in the EIA to fully determine Lingjintan's ability to mitigate Wuqiangxi impacts.

III. KEY ISSUES

65. Sections A-G in this chapter review the key issues relevant to the case study projects, with the issues discussed according to the main project processing stages. Sections H-J present the key issues evident from the study projects as they relate to ADB's internal business process. The intent is to draw attention to the strengths and weaknesses from each example to improve the implementation of future projects. It is encouraging that ADB has taken steps in more recent projects to address some of these key issues.⁵²

A. Communication and Consultation

66. **Consultation Process.** Some study projects do not have a good record in implementing effective consultation processes (Table 3). Consultations did occur to a limited extent, but they were not well planned or documented. In Theun-Hinboun, environmental documents were published only in English and were therefore inaccessible to local leaders and NGOs.⁵³ In many remote areas in Batang Ai and Theun-Hinboun, where it is difficult to provide information to illiterate villagers through newspapers or pamphlets, efforts made (Appendix 4, paras. 6 and 14, and Appendix 7, para. 8) during project preparation to address this problem were not very successful. Although the radio was used in Singkarak to reach local communities for flood warnings, messages did not reach all affected persons during the operations testing period. In addition, the Singkarak Project did not always adopt a "good neighbor" policy and, appeared to be unaware of the project impacts and the communities' dissatisfaction with the Project. In each case, the channels for effective communication and consultation should be adapted to the particular circumstances with realistic planning and proper implementation.

Table 3: Affected Persons' Participation in Project Preparation and Implementation^a

Participation	Singkarak	Batang Ai	Theun-Hinboun	Lingjintan
Communication	Satisfactory	Satisfactory	Poor	Good
Consultation	Poor	Poor	Poor	Satisfactory
Decision making ^b	Poor	Poor	Poor	Poor

^a Scale: very good, good, satisfactory, poor.

^b Decision making refers to opportunities provided to persons affected by the Project to take part in the design of mitigation measures, project implementation, and monitoring with project staff.

Source: Twenty-four participatory rapid appraisals conducted during the Mission with approximately 300 participants. Ratings are based on the team's comparative evaluation of participatory activities done in each project.

67. The communication and consultation process with the affected persons should be preplanned and organized such that all parties can be prepared. In all study projects (except Lingjintan), the affected persons first learned about the Project through informal consultation because of the social studies conducted.⁵⁴ The survey interviewers may not be sufficiently knowledgeable about the Project to describe the proposed project and its impacts and related

⁵² See Appendix 3.

⁵³ In 1998, ADB adopted the practice to translate SEIAs into the appropriate local language (Appendix 3, para. 18).

⁵⁴ See Appendix 3, para. 14, for approaches taken in more recent ADB projects.

commitments. A simple, easy-to-understand description of the project in the local language is a preferable tool to use. At consultation meetings, politicians sometimes influenced the creation of exaggerated expectations that included free electricity, guaranteed long-term jobs, access roads, water supplies, and other commitments that were not subsequently fulfilled. Or, project personnel at the design stage made informal commitments that would not be supported by different project personnel operating the facility. Usually the positive impacts of the proposed projects were highlighted: capacity to earn foreign exchange (Theun-Hinboun), regional development (Batang Ai, and Lingjintan), and a better environment and rural electrification (Singkarak).

68. **Mediation Process.** Another important component of consultation is the affected person's awareness of the formal mediation process available to settle disputes. The absence of efficient and effective appeal boards prevents the speedy and amicable resolution of project-related disputes. For example, in Batang Ai, increase in the reservoir inundation line resulted in several longhouses being submerged before the land surveys were completed, prolonging compensation disputes. In Lingjintan, legal channels for appeal were not effective in addressing disputes on compensation, land acquisition, or the adequacy of "production ways" given the introduction of state-mandated "developmental" resettlement projects. Illiterate, poor local people have a better chance of access to authorities and speedy settlement if such appeal boards are set up in project areas during its implementation.

69. **Country Characteristics.** At the DMC level, the extent of consultation was very much dependent on country-specific laws, regulations, and practices. Where environmental laws and regulations were less developed, the consultation process tended to be short and ad hoc. In addition, the rigor in carrying out the consultative process also varied. In some DMCs, consultation was discouraged to avoid adverse public opinion; in others, no tradition or institutional framework exist to seek public opinion, and opposition to government-supported projects could lead to regulatory or other retribution. Another shortcoming was that government agencies reviewing draft EIAs of the study projects did not often have the institutional capacity for rigorous independent review. ADB needs to continue to provide technical assistance (TA) to develop the consultative process, particularly in countries where the process in practice is different from that recommended by ADB.⁵⁵

B. Preparation of Mitigation Measures and Project Design

70. **Adequacy of Baseline Information.** Several weaknesses in the quality of the baseline data collected in the study projects led to the misidentification of project impacts. The project designers did not initiate baseline surveys; they used instead existing socioeconomic databases.⁵⁶ As the affected population did not match that of the previous surveys, accurate baseline data was not available. The preparatory documents were also not comprehensive and did not always describe the methodology used for obtaining baseline data. In Singkarak, data on aquatic life downstream of the dam was inadequate; in Lingjintan, there was no description of riparian vegetation or rookeries. Fishery data collected in Theun-Hinboun did not address upstream and downstream areas that were impacted. Without adequate baseline data or descriptions of

⁵⁵ See Appendix 3 (para. 15) for TA given to prepare a public participation plan that considers level of literacy and ethnic consideration.

⁵⁶ The Batang Ai planners had direct access to Sarawak Museum's 1970s socioeconomic surveys of the Lubok Antu area. In Singkarak, the project planners benefited from a series of studies done in the mid-1980s by the local university and research agencies. The Lingjintan project planners used county and provincial statistical data. In Theun-Hinboun, a socioeconomic survey was done at the preparation stage.

methodology used for measuring baseline data, impacts are difficult to assess, quantify, and monitor.

71. Some technical aspects were also inadequately treated in project preparatory work. Of particular concern was the apparent weak treatment of fisheries and heritage resources. Many of the impacts on fisheries have been identified in more recent ADB documents.⁵⁷ As collecting this information can be costly, joint work with local universities and research institutions where such capacity exists is preferable. Without accurate information, it is prudent to assume significant impacts and plan for subsequent mitigation and monitoring. With respect to heritage resources, case study projects did not conduct surveys to identify them but addressed the issues when brought to their attention. In practice, the SEIA should, at a minimum, specify where heritage values have been studied and addressed and whether any significant issues were encountered.

72. **Completeness of Coverage.** Impartiality of impact statements is a cornerstone of effective project assessment. In most cases reviewed, the detailed EIAs and SEIAs were prepared through project proponents. ADB staff reviewed and assisted in preparing the SEIA. Quality control from the DMC agencies that approve the EIAs was inadequate. Some preparatory documents reviewed during the Mission understated or overlooked project impacts that should have been expected resulting in insufficient technical review of these impacts. For example, the Theun-Hinboun SEIA states that no significant adverse impacts are expected on biodiversity and proposed no minimum releases through the downstream Nam Kading protected area. The SEIA also states that there will be no impact on primary rain forests; this is despite that the transmission line alignment (i) cannot avoid such forests, (ii) traverses 12 km of degraded primary rain forest on the Nam Hinboun-Hai Plain, and provides access roads currently used by logging operations supported by the Lao PDR. Similarly, in Singkarak, the impact of minimum water flows was overlooked. The Batang Ai Project appraisal report stated that "the Project will have no significant environmental or social impacts." This statement is inconsistent with an area which has great diversity and many endangered species and migratory fish, no fish passage, no requirements for minimum releases, and the involuntary relocation of about 4,000 indigenous people.⁵⁸

73. Another weak area in the reviewed documents was the practice of defining the project area to exclude adjunct infrastructure (transmission lines, access roads, adits, and others). The Mission found that impacts associated with these auxiliary infrastructure components are inconsistently treated. For example, there were no environmental documents prepared for the transmission lines required for the Lingjintan Project.⁵⁹ In other instances, impacts resulting from the project changes are overlooked and are not properly treated. For example, increasing the reservoir elevation (Batang Ai) or shifting the location of burrows/adits/access roads (Theun-Hinboun and Lingjintan projects) were not properly addressed.⁶⁰ Adequate provisions are needed to address the impacts once the final location of adjunct infrastructure has been decided. Nonintegration of social and environmental procedures and reviews can also lead to problems. The Lingjintan and Batang Ai

⁵⁷ *Environmental Guidelines for Selected Infrastructure Projects* (ADB 1993), identified fisheries impacts as well as encroachment of historical/cultural values as a probable impact. All preliminary project preparatory studies for the case study projects were completed or under way at the time of this report.

⁵⁸ ADB's environmental and social guidelines were developed after the Batang Ai and Singkarak appraisal reports.

⁵⁹ Similar issues occurred with the Khimti Khola Project (Loans 1430-NEP and 1431-NEP: *Himal Power Limited*, for a total of \$36.5 million, approved on 23 January 1996) where transmission lines were prepared under a separate EIA and access road identified in the detailed project EIA became a nonproject access road. In some of its recent projects, ADB has taken a more overall view of the Project by evaluating the project components and finances as well as the other major components (Appendix 3, para. 19).

⁶⁰ Some projects require construction contractors to clear the new areas with the respective environmental unit (Kali Gandaki [Loan 1452-NEP: *Kali Gandaki "A" Hydroelectric Power Project*, for \$160 million, approved on 23 July 1996]; and Khimti Khola projects [footnote 55]); however, this is not consistently implemented in all projects and there is no real punishment or cost to the contractor or the management when compliance is not met in the DMCs.

projects had a substantial resettlement component. Mitigation efforts, such as building fishponds in natural drainages and clearing land for the purpose of constructing new rice fields can be extensive and have significant adverse impacts on erosion, water quality, fisheries, and wildlife. The increased population densities and additional infrastructure can also have adverse impacts. These items were not addressed in the documents reviewed for the study projects.

74. **Inconsistent Treatment.** In other instances, project impacts identified in the detailed studies were not adequately addressed and sometimes contradicted statements made in the main body of the EIA or the SEIA. For example, the detailed Singkarak fisheries studies found probable significant impacts on downriver fisheries, but these impacts were considered less important in the SEIA.⁶¹ In some cases, the SEIA identified additional issues and impacts not reflected in the detailed EIA. The Lingjintan Project SEIA correctly identified probable impacts on migratory fish and prescribed a study on migratory fish.⁶² These impacts were not reflected in the detailed EIA. If the SEIA is viewed as an updated version of the EIA as opposed to a summary, significant changes are defensible as understanding is improved and the project is better defined. However, a preferable approach would be to have the EIA amended to reflect changes in the SEIA and provide the technical basis for the changes. SEIAs, being summary documents, are not geared to give sufficient technical detail on important resource issues. However, as a minimum, SEIAs should specify where technical information is available and why certain aspects of the assessment do not warrant further investigation.

75. In the four study projects reviewed, use of environmental or social scientists was limited during the planning stage, resulting in a lack of timely and adequate attention given to some mitigation measures. For example, if a dam is to include a fish ladder or screen, this needs to be evaluated early in the planning and design stages. Similarly, the need for a multilevel intake at a reservoir is much easier to accomplish if it is incorporated into the design instead of being stipulated by an external review after an alternative intake structure has been designed. Modifications in design to minimize adverse impacts become more difficult and expensive with time.

76. **Peer Review.** Other factors affecting the quality of project preparation were the lack of or inadequate consultation, weak or undocumented peer or agency review, and poor understanding of requirements. As many DMCs do not have sufficient institutional capacity for technical reviews, ADB sometimes provides advisory TA grants together with its hydropower development projects (Theun-Hinboun⁶³ and Kali Gandaki [footnote 56]).⁶⁴ In more recent projects, ADB typically requires a panel of experts with environmental and social expertise to provide independent technical review during the design and document preparation stages and, in some cases, during the construction stage. However, it is difficult for one "specialist" to have the necessary breadth of knowledge and technical expertise. In addition to ADB review, requiring the promulgation of draft EIAs and circulation to stakeholders, including NGOs and international agencies such as the United Nations Environment Programme, allows for more intensive technical review, increases the transparency of the decision-making process, and reduces ADB's technical review burden.

⁶¹ Likewise, the wildlife appendix in the detailed EIA of the Khimti Khola Project (footnote 55) identifies the presence of and possible impacts on endangered species, while the main body of the report and the SEIA state that there are no endangered species and no impacts on endangered species.

⁶² Unfortunately, no studies on fish migration had been planned at the time of the Mission.

⁶³ TA 2054-LAO: *Theun-Hinboun Power*, for \$100,000, approved on 4 January 1994.

⁶⁴ TA 2613-NP: *Institutional Strengthening of NEA's Environmental Division*, for \$534,000, approved on 23 July 1996; and TA 2614-NP: *Power System Masterplan*, for \$600,000, approved on 23 July 1996.

77. **Integrated Approach.** Another area inadequately identified at the preparation stage is linkage with other development efforts. In some study projects, design and assessment of environmental impacts have been conducted with little attention paid to surrounding development efforts.⁶⁵ In the Theun-Hinboun Project, access roads and inexpensive power are, in part, the basis for a regional development project that proposes to increase irrigation and agricultural development. However, due to the nonintegration of approaches and timing, the Project will have adverse impacts on primary forests and dependent species. The regional development can be coordinated and planned, thereby minimizing adverse impacts and benefiting local communities and the environment. Adequate linkages must be developed at the preparation stage between the project preparation team and local NGOs and government agencies, who may be developing other projects near the project area, to ensure project commitments fit into an overall, cohesive regional development approach and to win their cooperation. In the case of the Singkarak Project, ADB has indirectly developed some linkages with another ADB-funded (Anai River) irrigation project using the water diverted from the Singkarak hydropower facility.⁶⁶

C. Mitigation Implementation

78. **Implementation Focus.** Some mitigation measures have been very successful. For example, the creation of the Batang Ai National Park in part to protect the Batang Ai watershed, development of ecotourism, and local management of wildlife resources contribute to protecting biodiversity and primary forests. The aquaculture program has also been successful in providing economic opportunities to communities and mitigating for fishery losses related to the Project. The Lingjintan Project mitigation also includes substantial efforts taken to control mass wasting related to reservoir creation and extensive investment in aquaculture development. Although minimum flow releases in the case study projects may be insufficient, they begin to set a precedent for considering instream needs when determining operations management.

79. Early preparation using a multiskilled design team and establishing an environmental management unit can improve mitigation implementation.⁶⁷ Most projects established an environmental management unit or its equivalent as part of the mitigation plan. For example, the Theun-Hinboun, Lingjintan, and Singkarak projects all had such units. These units were often under the control of the engineer (the construction manager) or were supervised by the project proponent. Therefore, they tend to have conflicting mandates. Staff are generally seconded from the proponent's staff, DMC agencies, and, in some cases, hired independently. In most cases, local staff members supervise environmental units, with some expatriate supervision.

80. **Constraints of Implementation.** In the study projects, the implementation of mitigation measures have been hampered by lack of clear specification, assignment of responsibility, inadequacy of funds, absence of support from local agencies, and inadequate enforcement capacity. For example, in the Singkarak Project, environmental documents suggested that there would be adverse fishery impacts in the Ombilin River, but the proposed sanitation flows did not clearly specify instream needs for aquatic life. In other cases, barriers to fish migration,

⁶⁵ In its more recent projects (approved after 1994), ADB is giving earlier consideration to potential environmental and social implications using strategic environmental assessments, anticipating institutional strengthening needs and comprehensive basin-wide planning (Appendix 3, paras. 4-9).

⁶⁶ Under Loans 1017-INO and 1018-INO(SF): *Integrated Irrigation Sector Projects*; for \$170 million and \$30 million, respectively; approved on 17 April 1990. See Appendix 3, para. 20 for examples of how more recent ADB projects use TA and project proceeds to further environmental and social goals.

⁶⁷ In some of the more recent projects, ADB staff with appropriate experience are giving more attention to environmental and social monitoring (Appendix 3, para. 21).

documented as impacts in the Theun-Hinboun, Lingjintan, and Singkarak projects, were not mitigated. A multiplicity of environmental documents, licensing agreements, loan covenants, letter agreements, statements in public hearings, mitigation management plans, and environmental site plans that prescribe inconsistent and sometimes conflicting mitigation creates further confusion as to what measures are binding.⁶⁸ Clear identification of a funding or implementing body has also been a problem in the study projects. The project documents for Theun-Hinboun state that a management plan for the Nam Kading protected area will be prepared and implemented to ADB's satisfaction. However, funds or parties that would implement the program (other than the Borrower) are not stipulated. Another concern is delegating mitigation responsibilities to a group other than the project proponent, resulting in little oversight or coordination (Singkarak).

81. When mitigation efforts are expected to be provided from local revenues, obstacles to funding and disbursement in an efficient, timely manner are frequent. In the Singkarak, Batang Ai, and Theun-Hinboun projects, compensation payments were not complete at the time of the Mission because of lack of specifically allocated funds for the purpose; lack of data; and streamlined mechanisms. Similarly, environmental units, when they are locally funded, often have difficulty in securing operational budgets, which makes their ability to monitor, oversee, or implement mitigation difficult. Another related problem is the funding of long-term mitigation measures, such as fish hatcheries. In developed countries, these are funded by the project through operational revenues; however, this has not been well-established in DMCs. Plans are of little utility unless their implementation is funded and there is institutional commitment to their implementation. The Borrower did not allocate funding for implementing the Theun-Hinboun fisheries management plan and, as a result, it may become a study that just sits on a shelf.

D. Compliance with Project Commitments

82. **Determination of Commitments.** One of the key issues related to compliance is determining the Project's exact commitments and parties responsible for implementation. Mitigation requirements are eliminated and added in various documents over time. Some discrepancies in required mitigation were apparent when comparing the technical appendixes of the EIAs and SEIAs (Singkarak and Lingjintan projects). Another difficulty with EIAs and their summaries is that they are not legally binding.⁶⁹ Often, recommendations by a third party in an impact statement may (or may not) be accepted by the project proponent and do not necessarily constitute a project commitment. ADB should use its leverage in incorporating the measures it recommends into the Loan Agreement by reference to other applicable documents. In addition, other project documents can also include actions and indicators to promote better compliance of mitigation measures. For example, the project framework can incorporate identification and monitoring of mitigation measures as activities along with monitorable indicators. This would ensure concurrent monitoring during project implementation using the project performance report.

83. **Compliance Performance.** Compliance with environmental clauses in construction contracts has not been satisfactory. Examples of noncompliance included failure to (i) develop a biodiversity management plan (Theun-Hinboun), (ii) monitor groundwater (Singkarak), and (iii) conduct migratory fish studies (Lingjintan). Only the Lingjintan Project was in the construction phase during the Mission, and the problems observed were related to liquid and solid waste

⁶⁸ The Theun-Hinboun SEIA stipulates no minimum releases. The Loan Agreement states that monitoring will be done and suitable flows will be determined in the future. The licensing agreement stipulates a 5 m³/s release. Other environmental documents have recommended more (6-10 m³/s or more [Appendix 7, para. 38-2]).

⁶⁹ EIAs need to be revised during preparation and implementation.

disposal, hazardous materials control, health and hygiene, and erosion control. The Theun-Hinboun environmental monitoring unit was providing reasonable reporting on compliance during operations. Reasons for lack of compliance in some projects are varied and include ambiguous and modest contract language, lack of incentives, lack of penalties and accountability, poor oversight, management contractor priorities, and conflicts with schedule and budget.⁷⁰ These difficulties are not specific to hydropower projects and are applicable to any large infrastructure project. Appendix B presents a model for environmental clauses in contracts. In addition, it is useful to ensure that the bidders for construction contracts have key staff with necessary skill and experience to implement the identified mitigation measures and monitoring plans. Procurement documents also need to include relevant loan covenants dealing with environmental and social concerns. Training local workers to adhere to international standards regarding health, safety, and hygiene required in large confined construction camps is also a good practice.

84. Compliance with social mitigation commitments stipulated in the project documents was also varied. The DMCs' compliance with resettlement assurances has been satisfactory in Batang Ai and Lingjintan, although with delays in implementation. But the assurance relating to income restoration of the affected persons recorded the weakest compliance. In Batang Ai, resettlers' income did not reach "without-Project" income levels for several years.⁷¹ In Singkarak and Theun-Hinboun, the Project Agreements did not include primary assurances, such as income restoration. In Singkarak, although several farming and fishing communities lost their main livelihood, no compensation had been paid at the time of the Mission (except for a few damaged waterwheels on the Ombilin River). In Theun-Hinboun, some income restoration and improvement plans have been recommended at the project operation stage, and THPC has been paying compensation on a case-by-case basis. However, the Government does not appear to have funds to implement the income improvement activities recommended by recent studies (Appendix 11). The compensation payments, agreed when the Loan Agreements were signed, were generous in most cases and generally paid without delay in all four study projects. However, if additional compensation was agreed on due to implementation adjustments, delays in paying were long (Batang Ai, Singkarak). Compensation was generally paid only for the land acquired for project purposes, excluding other significant losses of livelihood and income of the affected persons.

E. Impact Monitoring and Feedback

85. **Measuring Progress.** The recent study projects have required submission of periodic progress reports to ADB as instruments for monitoring progress. The quality of such reports for the study projects is poor. For example, average monthly data on income does not show variation across families and average water quality parameters (i.e., temperature and dissolved oxygen values) parameters do not indicate the changes that occur within a day. To improve the monitoring efforts, experts must design, taking into consideration the DMCs' institutional capabilities, predetermined project-specific performance indicators. If such capabilities are absent or weak, such skills must be improved by providing needed advisory TAs. Typical monitoring needs for construction of hydropower projects are provided in Appendixes C and D.

⁷⁰ ADB has, in more recent projects, adopted the establishment of an in-depth panel of experts comprising environmental and social specialists during project preparation and construction to provide guidance with adaptive environmental management (Appendix 3, paras. 22-25).

⁷¹ However, at the time of the Mission, resettlers' income levels increased due to other economic activities pursued by them (Appendix 4).

86. **Oversight and Feedback Loop.** Another issue is determining the responsible parties for reporting and overseeing. For example, on the Singkarak Project, the fisheries agency was responsible for implementing a fisheries management plan and monitoring. However, the project operator had no information on the results and no action had been taken to remedy the impacts. Most projects did not have a formal means by which impact monitoring translates into changed mitigation or operation. However, the Theun-Hinboun Project is modifying mitigation and increasing monitoring based on ADB requests and other factors.

87. As the involuntary resettlers undergo major demographic, economic, and sociocultural changes within a very short time, they tend to develop various psychological and physical pressures. Some of these aspects are covered in special research studies done on the Batang Ai Project.⁷² To capture such behavioral patterns, longitudinal studies that use selected key indicators are needed. Monitoring in this sense is the continuation of consultation between the affected persons and the project managers.

⁷² Siam, Thomas Kunyam. 1987. *The Socioeconomic Impact of a Hydroelectric Project on Resettlement People: A Case Study of the Batang Ai*, BA (Hons) thesis submitted to Department of Geography, University of Malaysia, Kuala Lumpur. SALCRA. 1990. *A Socioeconomic Study of Three SALCRA (Sarawak) Land Schemes: Participants' Perception, Attitudes, and Levels of Living*. Kuching. However, many of these studies are not available at ADB or the relevant government department or agency and are often classified as "confidential" with limited accessibility.

F. Supervision of Environmental and Social Concerns

88. **DMCs' Role.** The review role provided by DMC social and environmental institutions has been less than satisfactory. The case studies show that some environmental and social impacts went unaddressed and, in some cases, unreported until the Mission (Singkarak Project). In the Lingjintan Project, some monitoring was conducted by the State Environmental Protection Agency, but it did not behave as a regulatory body and reported monitoring findings to the project management. The situation in the Lao PDR appears to be similar. Monthly reporting was made to the Science, Technology, and Environmental Organization, but no activity, participation, comments, or inspections resulted. There is no independent oversight of project operation or dam safety for the Batang Ai Project. Even when the supervision responsibility was institutionalized (Singkarak and Lingjintan projects), there was little evidence of any serious scrutiny by oversight agencies. The reasons for this weak supervision are the (i) absence of effective laws and regulations that define regulatory oversight, (ii) lack of technical strength and depth in the institutions to provide a meaningful oversight function, (iii) pressure on the professional staff in oversight agencies not to follow up on adverse impacts of institutionally favored projects, and (iv) paucity of operational funds to carry out the supervisory responsibilities.⁷³

89. **ADB's Role.** ADB's supervision role on mitigation implementation is generally conducted through its loan review missions, requirements for a review by a panel of experts during implementation, and review of progress reports. In many instances, ADB's efforts to ensure mitigation implementation are greater than the role taken by the DMC agencies; but in some projects, these efforts were not sufficient.⁷⁴ ADB did not take an active role in mitigation implementation in projects such as Singkarak.⁷⁵

90. In the past, ADB's supervision missions generally tended to focus on structural engineering problems and financial overruns. Exceptionally, the Batang Ai PCR Mission recruited an anthropologist because of serious allegations raised by NGOs regarding the Project's weaknesses in addressing social concerns. More recent projects (Theun-Hinboun and Lingjintan) tend to use social specialists when social concerns are anticipated.

91. In general, ADB's study project review missions were constrained by limited resources and lack of environmental and social specialists within ADB (Appendix E). Project officers and engineers conducted review missions during multiple project missions, which allowed little time and expertise to adequately supervise environmental and social concerns (Appendix F). Instead of visiting the relevant locations themselves, ADB staff members at times have to rely on counterpart agencies to inform them about the extent of the environmental and social impacts. However, as the current study demonstrates, considerable field data can be gathered during a short mission and analyzed with a low budget when the work is undertaken by experienced specialists.⁷⁶

⁷³ At the time of the Mission, funding of environmental institutions may be particularly problematic because countries were facing financial challenges.

⁷⁴ In some recent projects (Kali Gandaki [footnote 56] and Khimti Kholā [footnote 55]), ADB's use of a panel of experts or an independent engineer provides considerable pressure for implementing prescribed mitigation during the construction phase.

⁷⁵ Back-to-office reports from July 1996 to November 1998 did not mention environmental and social concerns.

⁷⁶ Total budget used for this study (TA 5793-REG: *Impact Evaluation and Special Studies in the Bank's Developing Member Countries*, for \$910,000, approved on 19 May 1998) was \$165,000 plus resources for one other ADB staff member's time and travel.

92. A key conclusion of ADB's 1997 Annual Performance Evaluation Program Report⁷⁷ is that "the single most important action ADB can take to improve portfolio performance and project outcomes is to strengthen the quality of its own project supervision." ADB's role in supervision is relatively clear until completion of the feasibility study and approval of the loan wherein project proponents must meet ADB's requirements to proceed with the loan. Similarly, ADB's role during construction is well entrenched as the ADB provides ongoing financing of the construction effort. ADB's role as the oversight agency of mitigation implementation becomes more difficult once the construction stage is completed and funds have been provided. ADB review during operations has typically been limited to postconstruction evaluation of selected projects, similar to this study.⁷⁸ One way to address this issue is to finance hydropower projects over a longer time that includes the first few years of operation.

93. What is encouraging is that the feedback given during this study to DMC agencies and ADB staff generated a keen interest in addressing the study findings and implementing further mitigation measures during project operation. This implies that ADB's postconstruction periodic review has a good potential to generate much higher benefits than its costs, and therefore should be strengthened and better organized. However, ADB's own resource constraints may limit the duration of the review period to a few years during project operation. It may be advisable at the end of this time to agree upon operational and other long-term commitments with the Borrower. To do this, necessary provisions need to be stipulated in the loan documents to allow for such agreements even after ADB funds have been disbursed. As ADB's ability to monitor and enforce these long-term commitments over the life of a hydropower facility is problematic, ADB may want to delegate them to others, such as the United Nations Environment Programme.

94. One of the difficulties ADB faces is its dual role as a development agency and as an enforcer of its own policies and guidelines on environmental and social issues; these two roles are potentially conflicting. ADB is not an environmental or social agency, and its goals are to improve the economies of its DMCs and contribute to poverty alleviation by providing financing. ADB must balance its mission as a funder of development with its policies and procedures that require mitigation of adverse impacts so that affected persons are at least as well off as without the projects. Sometimes, what is acceptable as a project or mitigation is a matter of judgment, and ADB management must take great care that treatment is evenhanded, transparent, and defensible.

G. Institutional Capabilities

95. **Status of Capabilities.** All the DMCs visited for the case studies had federal institutions with responsibilities in the impact assessment and mitigation process and state- or regional-level institutions (except the Lao PDR) with some environmental and social responsibility in hydropower development and process. Although the institutions are largely in place, and ADB and other funding bodies have supported their development, the status of the regulatory agencies and their institutional capacity to address environmental and social concerns vary substantially across the countries in which the study projects operate. Some DMCs such as the PRC have well-established regulatory frameworks that have been in place and have improved over time.

⁷⁷ Postevaluation Office. 1997. 1997 Annual Performance Evaluation Program and Review of 1996 Activities. Asian Development Bank, Manila.

⁷⁸ ADB is currently doing a similar study TA 5828-REG: *Study of Large Dams and Recommended Practices*, for \$800,000, approved on 28 December 1998, which will build on this study and compare them with other project benefits and costs.

96. **Contributing Factors.** There were several contributing factors that affected the weak institutional capabilities of DMCs. Availability of revenues was one major factor. Environmental and social agencies were typically nonrevenue-generating units, and because of other competing demands on available resources, they were often underfunded. At times, these agencies could not even fund the operational budgets for site inspections. Poor coordination and communication between agencies were other contributing factors. In the study projects, environmental documents were rarely reviewed by other government agencies (such as the department of fisheries, department of health, and tourist board). In addition, the fragmentation of responsibilities lead to poor institutional performance. In the Singkarak Project, monitoring efforts were not coordinated. In Batang Ai, the state steering committee appointed several departments to implement the hydropower project and the division of responsibilities between the Department of Agriculture and SALCRA resulted in the poor performance of the plantations.

97. At times, DMCs created new agencies to meet the need for a particular institutional capability, such as project impact monitoring units.⁷⁹ In practice, even these units were not appropriately staffed or put into place until well into construction, when it was too late. Many environmental units were made up of engineers with limited knowledge about environmental and social issues (Singkarak, Lingjintan, and Theun-Hinboun projects). The units were low in priority for receiving support, staff, and facilities. The units were managed and operated by local staff, who do not have much ability to influence project management. As a result, their influence in forcing compliance, requiring additional mitigation, or implementing operational changes was undermined. A recent example was EMCO of the Theun-Hinboun Project (para. 51).⁸⁰ Sometimes, environmental management units found their roles in conflict. On the one hand, the unit's role was to represent the owner in terms of implementing mitigation, negotiating compensation, and reporting on compliance. On the other hand, the unit was supposed to monitor compliance and protect natural and cultural resources.

98. **ADB's Support.** The lack of multidisciplinary teams (including social and environmental specialists) in some of the study projects during preparation and review missions often leads to inappropriate assessment of the strength and experience of local institutions selected to address social and environmental issues. In addition, the DMC governments failed to acknowledge the weaknesses of institutions nominated to undertake implementation programs. There was inadequate coordination and follow-up by ADB regarding the capability of agencies to implement mitigation measures. The Batang Ai appraisal report stated that "SALCRA is well qualified to supervise successful implementation of the resettlement." The report also recommended that SESCO (the Executing Agency) officials should receive training but did not consider SALCRA officials for training because the state government assured the Mission of their adequate capability. The 1986 PCR pointed out SALCRA's inexperience with resettlement, but neither the Government nor ADB took action to correct the inadequacy, leading to the continuation of SALCRA's poor management of the plantations.⁸¹ In the Singkarak Project, the environment management and mitigation plan indicated that to overcome specific institutional weaknesses, a committee comprising of several agencies would be established. However, no indication exists that such a committee was established or operated in Singkarak. Some case studies used local capabilities when available (Mid-South Design and Research Institute in Lingjintan) and others did not. In more recent projects, ADB has begun to anticipate the need for institutional strengthening prior to the provision of major invest assistance (Appendix 3, para. 9).

⁷⁹ Project-related monitoring and reporting units are put in place where there is no cost-effective environmental regulatory agency to monitor the Project.

⁸⁰ See Appendix 7 for developments since the Mission.

⁸¹ In 1986, a London-based NGO, Survival International expressed its doubts about SALCRA, which had a poor track record implementing the difficult resettlement program. But this allegation was not followed up by the DMC or ADB.

99. ADB and other organizations have funded various TAs to provide training support. These are typically relatively short-term efforts, which often include international trips that provide little serious training. A longer term mentoring program that emphasizes self-determination and provides continuity is a preferred approach for TAs. In the Lingjintan Project, the ADB TA was awarded to HEPC (the Executing Agency). However, HEPC's role was transferred during implementation (without ADB's knowledge) to a river development authority called the Hunan Wuling Hydropower Development Company. ADB had no information on the company's technical, institutional, and financial capabilities.⁸² The Project will, therefore, only indirectly benefit from the TA given to HEPC.⁸³ ADB needs to review and improve its current procedures applicable to such situations so that it could take appropriate remedial action without much delay.

H. Environmental Policies and Guidelines: Applicability and Limitations

100. ADB has made sizable advances in expanding and clarifying its policies with regard to the environment. In 1986, ADB endorsed its position on the environment with broad statements containing several principles (Appendix 12).⁸⁴ ADB has also prepared several operational guidelines for addressing environmental issues.⁸⁵ ADB has recently formalized policies on fisheries (1997), forestry (1995), and indigenous peoples (1998). These and policy initiatives for the energy sector (1995) directly or indirectly address ADB's position on integrating environmental policy into review of hydropower projects (Appendix 13 provides a summary of relevant policy statements related to hydropower development).

101. **Adequacy of Coverage.** ADB has yet to specify policies in some areas, such as heritage resources and biodiversity. In the case study projects, there was inadequate preparation to identify heritage resources. When they were discovered during implementation, ADB encouraged mitigation measures to protect them (Batang Ai and Lingjintan projects). International convention recognizes that heritage resources are irreplaceable (as are many natural resources) and must be considered when assessing the effects of proposed projects. Until ADB's own guidelines are developed, it can adopt policies of internationally recognized organizations.⁸⁶ In general, resources within an area that will be potentially affected by a project are surveyed during the identification stage to record heritage resources. Subsequently, measures to minimize detrimental effects to the resources can be developed, implemented, and monitored with the collaboration of relevant DMC departments.

⁸² At the time of the Mission, ADB had written a series of letters to the HEPC regarding this breach of project covenants, and work was ongoing to sort out the problem.

⁸³ HEPC has majority ownership of the Wuling Hydropower Development Company. Some HEPC employees have joined the Wuling Hydropower Development Company.

⁸⁴ These include (i) reviewing projects to ensure significant environmental impacts are identified and measures are taken to avoid adverse impacts and, where possible, to enhance the environment; (ii) promoting environmental awareness among its staff; (iii) acting as a regional resource center to ADB and DMCs; and (iv) supporting projects with direct environmental benefits and initiating environment-oriented projects (ADB 1987, p. 1). Details in Appendix 11.

⁸⁵ These include *Environmental Considerations in Bank Operations* (ADB 1979), *Review of the Bank's Environmental Policies and Procedures* (ADB 1985), *Implementation of Bank's Environmental Policies and Procedures and Its Future Activities* (ADB 1987), and *Environmental Considerations in Bank Operations* (ADB 1992). Details in Appendix 11.

⁸⁶ 1983 *Conventions and Recommendations of UNESCO Concerning the Protection of the Cultural Heritage* forms the foundation of later work. Heritage resources include archaeological resources, historic places, exemplary structures, and cultural resources of contemporary people. The World Bank also developed a technical paper on the subject (Goodland and Webb, 1987) that made reasonable policy recommendations.

102. ADB has no formal policy for natural resources and biodiversity. In Batang Ai, the Government took several measures to protect biodiversity in the adjoining protected areas. In Theun-Hinboun, there was no such preparation. In a recent paper,⁸⁷ ADB outlines the areas of research it will promote and claims the importance of recognizing the roles agriculture, natural resources, and biodiversity play in sustainable development. For instance, ADB is committed to preserving old growth forests and biodiversity in conjunction with maintaining its forestry policy. However, it is not clear whether ADB's biodiversity commitment, other than that related to forestry, is multisectoral. The paper provides a good literature review and describes rapid assessment techniques and the direct measures ADB has taken to protect biodiversity. However, the paper does not address how ADB's development actions have affected biodiversity.⁸⁸ The paper also does not provide guidance on how, or if, biodiversity should be incorporated into the EIA process. These items should be included in a biodiversity guideline or policy. In addition, the absence of adequate scientific information should not be used as a reason for failing to take measures to conserve biodiversity.

103. **Evolving Policy Changes.** Appendix 2 shows that the study projects were approved prior to promulgation of most related policies. However, the policies were in place during the construction of most of the projects. ADB needs to consider (and clarify operationally) whether projects need to comply with policies developed after project formulation, especially during construction. While ADB would want to be fair and not change the rules on projects designed under different environmental guidelines, the public may not understand this and could be critical of items that would be considered unacceptable under current guidelines. If ADB desires to adopt policies approved during construction, it should be stated on project documents, and additional mitigation measures should be considered in a transparent manner on a case-by-case basis.⁸⁹ Some study projects (approved prior to 1995) did not adhere to ADB's recent positions on old growth forests (1995) and fisheries (1997). A current example is the construction of roads or rights-of-way through old growth forests in the Singkarak Project (approved in September 1990) and the Theun-Hinboun Project (approved in November 1994).⁹⁰ Construction of both projects was completed in 1998. The fisheries policy (approved in 1997) states that "it is important that, in formulating such projects, their effects on fisheries resources be thoroughly assessed, and that any potential negative impacts on those resources be identified, investigated, and eliminated or mitigated" (p. 34). In all the study projects, adverse impacts to fisheries have neither been fully investigated or assessed nor have they been eliminated or adequately mitigated. However, the projects are not legally required to do so because they were approved before the adoption of the policy.

104. If ADB requires consideration of compliance with a recent ADB policy up to the point of construction completion, this would necessitate increased mitigation efforts, possibly additional design efforts, and probably increased costs. If ADB does not require adherence to policies approved during construction, this should be communicated to project stakeholders in a transparent fashion. One way ADB can address these uncertainties is to allocate additional mitigation funds⁹¹ for contingency purposes that would be used for addressing anticipated and unanticipated impacts or changes in ADB policies and required increases in mitigation.

⁸⁷ King 1998 (details in Appendix 12).

⁸⁸ The paper notes that biodiversity projects comprise only a small portion of environmental projects supported by ADB. Appendix 4 in the paper describes the objectives of six ADB-funded projects with biodiversity components.

⁸⁹ Because ADB adopts policies after a lengthy preparation time, some policies that may be effective during project implementation could be anticipated during project preparation.

⁹⁰ Kali Gandaki and Khimti Khola projects (footnotes 55 and 56) approved in 1996 also had similar impacts on old growth forests.

⁹¹ Although mitigation measures generally require local currency funds, ADB could encourage implementation if funds are provided by ADB under a specific line item earmarked for this purpose in foreign exchange or local currency.

105. **Integrated Approach.** A constant struggle with the development of policy is balancing the varying interests: natural resources interest, indigenous peoples' interests, and development within a local/national/regional perspective. There are competing interests in considering resettlement and primary forests. If a project is proposed for a forested area containing old growth forests, the choice may come to resettlement of forest-dependent communities adjacent to the forest, or the felling of old growth forests (Theun-Hinboun). ADB gives very little direction as to how to address competing policies. As value judgments are involved in dealing with such issues, the basis for the decision making needs to be transparent. To address this, ADB needs to ensure that a thorough EIA process is conducted, along with adequate opportunities for informed public participation. ADB should evaluate these conflicts on a case-by-case basis against the backdrop of the overall project in a transparent way that enables the various stakeholders to understand the basis for a policy breach, if any. Providing good documentation on such decision-making processes in the ADB web site would be useful.

106. An integrated approach should try to address policy conflicts openly and assure that development within one sector does so with a full understanding of its policy implications across sectors. ADB's Policy on Indigenous Peoples operationalizes this principle through the range of policies and practices.⁹² "A basic principle in ADB's operations is examination of all implications and effects of the development initiatives and interventions it supports" (para. 57, p. 12). The policy also identifies the organizational implications of, and which bodies within ADB will be responsible for, developing a policy that "would complement and support, and be complemented and supported by, other ADB policies" (para. 33, p. 7). This integrated approach could also be applied to policies relating to the environmental concerns.

107. ADB's energy policy⁹³ is evolving to more clearly address environmental considerations from a benefit-cost analysis standpoint. However, full integration of these considerations into DMCs' energy planning cycles will take time. In the interim, ADB needs to safeguard the interest of communities that are adversely affected. One ADB energy policy initiative⁹⁴ states that ADB is supportive of the export of power from one DMC to another country if it "clearly leads to a reduction in the relative levels of local and transborder environmental impacts" (para. 56, p. 21). The initiative suggests that the regional environmental impacts can be reduced by appropriate mitigated hydropower development by avoiding those impacts associated with fossil fuel plants. However, effective protection for the exporting DMC is insufficient and it will often take the brunt of the social and environmental impacts. This is particularly true for resource-rich but economically dependent countries, such as the Lao PDR, which may not have a better (more environmentally benign and economically viable) option to generate foreign exchange.⁹⁵ The advantages to the region can be at an unacceptable local cost to the country. Perhaps the wording should be strengthened to mirror the wording used in the indigenous peoples policy (footnote 88): "Policy must ensure that ADB interventions. . . are not imposing the negative effects of development on indigenous peoples without appropriate and acceptable compensation" (para. 57, p. 12).

I. Social Policies and Guidelines: Applicability and Limitations

⁹² R55-98: *The Bank's Policy on Indigenous Peoples*, 27 March.

⁹³ R4-95, Revision 2: *Bank Policy for the Energy Sector*, 6 October.

⁹⁴ ADB 1995c (Appendix 11).

⁹⁵ In more recent work, ADB is emphasizing a strategic environmental assessment and integrated bioregional approach to development (Appendix 3).

108. ADB's policies and guidelines for incorporating social dimensions in its operations are evolving.⁹⁶ The 1993 publication *The Guidelines for Incorporation of Social Dimensions in Bank Operations*⁹⁷ presents a broad social policy framework for designing and implementing ADB-financed projects.⁹⁸ The guidelines emphasize the importance of certain key dimensions of human development, including poverty alleviation; the role of women in development; and the need for mitigating, if not avoiding, any adverse impacts of development interventions on communities and individuals. However, these policies are in some instances normative and ambitious and seek to set out the desired directions of the ADB policy rather than being operational guidelines. This section highlights some of the difficulties these guidelines reflect, either in concept or in operation. They should be sharpened wherever possible and, in some cases, supplemented by more practical steps.

109. **Scope of Guidelines.** Although a desirable policy is outlined in implementation, it sometimes has been hedged by qualifications and limitations to cater to the practicalities of particular DMCs to the point where the policy is vitiated. When this principle is applied, for example to ADB-government cooperation with NGOs, several practical problems arise. In practice, when a DMC finds that an NGO is exposing the adverse effects of that particular government policy or action, it tends to restrict similar NGOs from participating in that field. Given this reality, it might be more useful to take short but practicable steps in the desired directions. As a start, it may be better to encourage a government to work with a friendly NGO than with no NGO at all. For example, if ADB insists on an independent local group's review of a draft project proposal as a requirement of project processing, a DMC may be encouraged as a first step to appoint at least a "benevolent" NGO to carry out the review. Such a step has more value than a guideline, which is observed only in default.

110. Similarly, the positive thrust of the policy guideline on indigenous people is diluted by the declaration in the ADB policy document (footnote 88) that "each of the elements of policy and practice addressing indigenous people would be considered within the context of national development policies and approaches, and the fundamental relationship between the Bank and governments would be the basis for country-specific operations in a given country" (para. 58). In this context, the interests of the indigenous people may be violated by national policies. In such cases, it may be more advisable to narrow the scope of the resettlement guidelines applicable to indigenous people to a few principles, such as livelihood restoration, compensation, and the protection of their cultural heritage. In Batang Ai and Lingjintan, the resettlers had to use their cash compensation for subsistence until their agricultural schemes generated sufficient income.⁹⁹

111. In other instances, policy guidelines may lend itself to interpretation and action prejudicial to the best interests of the affected persons themselves. The 1997 guidelines (Appendix 12) relating to involuntary resettlement insist that "appropriate patterns of social organization should be promoted and existing social and cultural institutions of resettlers and their hosts should be supported and used to the greatest extent possible." However, "appropriate patterns of social

⁹⁶ This study could not evaluate projects approved after ADB's various policies related to social dimensions were effective as these new projects were not adequately completed at the time of the field work for this study. However, the Operations Evaluation Office is conducting another special evaluation study on the policy impact of involuntary resettlement which will follow up on some of the findings of this study.

⁹⁷ Supported by the *Handbook for Incorporation of Social Dimensions in Bank Operations* (1994).

⁹⁸ The guidelines incorporate several previous policy and recommendations of various committees, including *The Role of Women in Development* (1985), *Bank's Cooperation with Nongovernmental Organizations* (1987), *Recommendations of the Task-Force on Poverty Alleviation* (1988), *Staff Guidelines on Institution Development* (1987), *Guidelines for Social Analysis of Development Projects* (1991), *Staff Instruction on Indigenous People* (1994), and *Handbook on Benefit Monitoring and Evaluation* (1992). Details in Appendix 11.

⁹⁹ These projects were approved prior to the approval in 1998 of ADB's policy on indigenous people.

organization” can be decided by the government and not by the people’s traditional patterns of livelihood, their communities, and their culture. For example, both in Batang Ai and Theun-Hinboun, the government considers swidden agriculture and the gathering of forest products to be detrimental to the people and the economy. This runs counter to ADB’s own policy on indigenous people, which is pledged to safeguard their habitat, livelihood, and sociocultural identity. In these instances, ADB could use a detailed sociocultural study to delineate principles of organization of the would-be affected persons of a project. If the study shows that the project will damage the social organization, a clear covenant should be included in the loan agreement to avoid such harm.

112. Despite the many revisions of its policies and guidelines, both DMC officials and ADB staff members displayed a limited understanding of ADB policy principles. For example, ADB, as well as project proponents, appears to have understood involuntary resettlement only as relocating people.¹⁰⁰ As a result, a mitigation plan was not considered as necessary to deal with land acquisition and the loss of income issues in both Singkarak and Theun-Hinboun because they did not involve relocation of affected persons. However, ADB’s subsequent insistence on more elaborate project identification and initial social assessment (ISA) (including consultative meetings with the affected persons), and ADB’s determination to send more social scientists on fact-finding, supervision, and evaluation missions may help ADB staff members and DMC project officials apply ADB policies with more understanding and in a more comprehensive manner for present and future projects (Appendix 3).

113. **Application of DMC Policies.** Even when policies are developed in DMCs to address land and water issues, there are application problems. Comprehensive land laws and compensation regulations exist in most of the DMCs, but their efficiency and fairness in application to the case studies are far from satisfactory, except in the Lingjintan case. This is particularly true where the land rights of the indigenous people are involved (Batang Ai).¹⁰¹ The difficulty in defining what is traditional or customary, the intervention of several government departments to implement the relevant laws, and the enactment of several laws to deal with the same issue have confused officials as well as the local community members. For example, in Theun-Hinboun, the villagers’ rights to access the state forest reserves are covered by several laws, which sometimes clash with each other in their application. Similar problems occurred on water rights in the Singkarak Project. A project preparatory TA could identify and resolve these issues in consultation with the stakeholders.

¹⁰⁰ ADB (Chief, Office of Environment and Social Development) interoffice memorandum dated 14 November 1997 on ADB’s policy on involuntary resettlement indicate that ADB has failed to inculcate basic resettlement principles among its project staff. The memo dated 21 January 1999 on Resettlement: Effects of Land Acquisition provides an example of ADB staff members’ lack of clarity regarding resettlement issues. There is continuing staff training on the resettlement aspect, and ADB is conducting a TA 5781-REG: *Review of National Resettlement Policies and Experience with Involuntary Resettlement Projects*, for \$831,000, approved on 10 March 1998.

¹⁰¹ In Theun-Hinboun, compensation problems arise from the lack of formal compensation practices or law in the Lao PDR.

J. Procedures for Addressing Environmental and Social Concerns

114. **Feedback and Transparency.** According to ADB guidelines, the Board makes a decision 120 days after the SEIA is made public. During this period, the project proponent and ADB receive comments on the SEIA, and provide responses to the comments to those who submitted comments and to the Board. This scheduling is awkward because the only cutoff date for receiving comments is the actual Board decision date, making it difficult to carefully and thoroughly respond to comments submitted close to the decision date. By having a formal cutoff date well in advance of the Board approval date, DMC officials and ADB staff will have sufficient time to respond before presenting the SEIA to the Board.

115. More transparency in ADB procedures addressing environmental and social concerns can be achieved through using the ADB web site. At the time of the Mission, it was inconvenient to locate ADB policies on the web site, but the site was being upgraded. For transparency purposes and for enabling DMC officials, project proponents, preparers of EIAs, and other interested parties to quickly and easily access the latest versions of ADB policies and operational directives, the site should be regularly updated. Upon considering a project, a checklist for the project could be developed in which all applicable ADB policies and potential conflicts are indicated.¹⁰²

116. **Duplicity of Roles.** ADB is in an awkward position in the EIA process, as it is officially not the project proponent, the lead agency, or responsible for preparing the EIA or SEIA per se. However, in practice, ADB staff, in both operations and central divisions, are heavily involved in preparing environmental documents, particularly the SEIA.¹⁰³ Draft documents are provided to ADB and reiterations are conducted such that the SEIA is acceptable to ADB staff. The SEIA and supporting EIA, in conjunction with the ISA and the resettlement plan, provide the basis for the environmental and social components to the report and recommendation of the President. This places ADB staff in a position of actively developing project documentation while making recommendations to the ADB Board about the adequacy of the documents and the appropriateness of mitigation, and whether the project should be financed. It is, therefore, difficult for ADB staff to manage these dual functions, especially within one unit (Environment Division). Separating these roles would contribute to increasing the efficiency of ADB procedures for addressing environmental and social concerns. This could be achieved by assigning specific peer reviewers for environmental and social concerns who are not responsible for preparing a particular project but only act in the capacity of a reviewer or advisor.¹⁰⁴

¹⁰² Appendix 9 provides a checklist of environmental and social impacts that are typically associated with hydropower projects.

¹⁰³ Although external consultants often prepare the EIA, ADB staff input is needed in terms of how various ADB policies can be adhered to during project design.

¹⁰⁴ At present, there is general peer reviewing during the project approval process but what is suggested here is a more substantial review with respect to the quality of the EIA and initial social assessment by environmental and social specialists.

IV. MAIN CONCLUSIONS AND RECOMMENDATIONS

117. The following conclusions and recommendations are based on the case studies reviewed. Although some of the recommendations are already being addressed in more recent projects as indicated in Appendix 3, they are also included in the following paragraphs to emphasize their usefulness and facilitate systematic application.

A. Communication and Consultation

118. In some of the study projects, the communication and consultation process was weak, resulting in improper identification of impacts and inadequate implementation of mitigation measures. Failure to consult local interest groups led to adopting inappropriate media for communication and building exaggerated expectations among the affected persons. Advance participation in discussing project impacts creates a sense of partnership between the affected persons and the project designers.

119. **Recommendations.** ADB needs to continue providing TA to help develop the process in the countries that need it, keeping in mind that in some cases it is not a lack of knowledge that prohibits good consultation, but rather the lack of tradition or weak institutional arrangements. Consultation with peer agencies should, at a minimum, be required during scoping of the EIA or the ISA, and in response to a draft EIA and ISA.

120. ADB needs to continue to emphasize the need for public participation as in recent projects. Both the consultation and mediation processes must be well organized to be more effective. Impact assessments need to be prepared in local languages where this is not currently being done. Surveys of the project-affected persons and public consultation meetings should be held for any category A projects¹⁰⁵ in all potentially affected areas, taking into account the extent of literacy and adapting to the community's culture of participation.

B. Preparation and Design

121. Failure to collect primary socioenvironmental baseline data in the study projects, inaccuracies in technical review, and incomplete coverage in preparatory documents led to misidentification of impacts and weak treatment in some study projects of areas such as timely income restoration and mitigation of fisheries impacts. Limited use of environmental and social experts during planning and the poor review capacity in the DMC agencies resulted in creating some inconsistencies in detailed impact statements and in the summary documents.

122. Inadequate or inconsistent treatment of impacts associated with auxiliary infrastructure components (such as transmission lines and access roads), nonintegration of resettlement components in the environmental assessment process, changes in project design during implementation, and weak linkages with other parallel development efforts meant that some secondary impacts of projects did not have appropriate mitigation measures.

¹⁰⁵ Category A projects are those which are expected to have significant adverse environmental impacts.

123. Leveraging economic activity and improved infrastructure with hydropower development requires linkages with other development efforts, coordination in terms of the timing of the events, and assurances that the funding for them is available from ADB or other sources. The measures (strategic environmental assessment and integrated bioregional approach) that ADB has taken in this regard in more recent projects are encouraging (Appendix 3).

124. **Recommendations.** Project preparatory work needs to include the collection of adequate baseline data as done in some recent EIAs and SIAs. A description of the methodologies adopted in measuring the base conditions should also be indicated. Where base knowledge is absent at the time of the EIA, ADB should consider case by case whether to refrain from supporting the Project until necessary information is acquired or to make sufficient contingency arrangements to address the adverse impacts as they become apparent.

125. The environmental and social scientists need to be an integral part of the design team for sensitive projects. A panel of experts could supplement the scientists as needed (Appendix 3). Although the project may finance the panel, ADB should oversee whether the panel's recommendations are taken into consideration by project management. The draft impact assessments need to be promulgated to stakeholders, related NGOs and universities, and international agencies to increase transparency and to support ADB's technical review responsibility.

C. Implementation and Compliance

126. At times, implementation of mitigation measures is hampered by want of clear specification, absence of links to the impacts identified, assignment of responsibility, inadequacy of funds, lack of support from local organizations, and poor enforcement capacity. When mitigation measures are revised or supplemented to suit the changes that occur during implementation, often it is difficult to make such measures binding and fund them as well.

127. Compliance on some environmental clauses in construction contracts has not been satisfactory in some projects. This may be because of conflicts with budget and schedule, inadequacy of constraints placed on the contractor, and the lack of oversight. While some social mitigation measures, such as the development of aquaculture, construction of housing, and provision of some public infrastructure, have been satisfactory in study projects that had resettlement plans, timeliness of compensation and income restoration programs left much to be desired.

128. Developing plans or carrying out studies to complement hydropower projects without implementation requirements, insufficient funding, and institutional support can result in wasted effort and inadequate mitigation of project impacts. ADB needs to ensure that the development of plans include funding arrangements and assurances that implementation will occur and on schedule.

129. **Recommendations.** ADB should, by way of specific assurances in the loan agreement, and monitorable targets in progress reports, ensure the implementation of important measures such as income restoration programs and mitigation of fishery resource impacts. In addition, indicating identification and monitoring of mitigation measures in other project documents (i.e., the project framework and project performance report) would also enable concurrent monitoring. To

ensure success, ADB should consider providing itemized allocations for these purposes as part of the loan for their implementation.

130. DMC agencies and ADB should be more rigorous in screening the capacity of construction firms bidding on large hydropower projects. Prequalification requirements, financial penalties, and performance bonds should be explicitly indicated as part of the contract. Where appropriate, payment for specific environmental actions should be identified in the bill of quantities.

131. The project proponents should ensure that at the end of the defect liabilities period an independent environmental audit is completed (as in more recent projects) to identify mitigation measures that were not met and require contractors to address the inadequacies noted.

D. Monitoring and Feedback

132. In general, project monitoring has been better during construction than in the operations phase. The frequent visits from ADB and the government, interviews with affected persons, and progress reports on construction provide better incentives for monitoring.

133. In project progress reports, aggregate statistics (such as average income of affected persons and average monthly flow data), hide the outliers that signal substantial adverse impacts. In addition, social concerns (such as resettler satisfaction, impact on vulnerable groups), cannot be captured without longitudinal studies.

134. **Recommendations.** The quality of the progress reports submitted to ADB should be improved. To bolster monitoring efforts, predetermined project-specific performance indicators need to be designed by experts, taking into consideration the institutional capabilities of the DMCs and the resources available for analyzing them. Technical experience is required to recognize unrealistic monitoring data due to errors in collection, analysis, or compilation.

135. Because environmental and social impacts are interrelated, it is useful to have a clearinghouse for all monitoring efforts, especially when several agencies carry out such monitoring. Specification of a formal means, by which impact monitoring translates into changed mitigation or operation and ADB scrutiny of such, may encourage proper follow-up action.

E. Supervision

136. Some environmental and social impacts that occur during implementation may go unnoticed or unreported because of weak scrutiny by DMC oversight agencies. Often ADB's efforts to supervise implementation of mitigation measures are greater than the role taken by DMC agencies. ADB's own resource constraints and lack of environmental and social specialists limit the extent and depth of the review function during implementation. Its role becomes even more difficult once the project is operational and the funds have been fully disbursed. Yet, the implementation of this study demonstrates the value of ADB's review mission in catalyzing needed mitigation and monitoring during project operations. Several mitigation measures were undertaken in the study projects since the Mission.

137. **Recommendations.** Multiskilled supervision teams (supplemented by external consultants or panels of experts where needed) should be required at least at midterm review for category A projects to evaluate the progress of environmental and social mitigation measures. ADB internal resources need to be enhanced and the relevant staff available increased if ADB is to consider systematic review of environmental and social mitigation measures.

138. It is also necessary to establish procedures and guidelines for postcompletion project administration, including possible periodic postcompletion review missions for partly successful and unsuccessful projects. Provision for such arrangements during project operation needs to be specified in the loan agreement and an adequate budget must be available for postcompletion missions, especially for sensitive projects.

F. Institutional Capacity

139. The project units responsible for implementing environmental and social mitigation measures, in some cases, have been inappropriately staffed, inadequately funded, and established too late with insufficient authority. Institutions responsible for supervising environmental and social concerns relating to hydropower projects are largely in place in the DMCs reviewed. However, their capacities vary substantially across countries.

140. **Recommendations.** ADB should ensure the project unit managing mitigation implementation has the necessary management and technical skills and the authority. If not, management by long-term specialists may be required. This responsibility needs to be separated from enforcement responsibility that should rest with government agencies. ADB should also continue to support where needed the development of relevant enforcement agencies, especially using TA for long-term mentoring programs. Until these agencies obtain the required capabilities, periodic external audits are recommended. It would also be useful to examine ADB's pipeline of projects and use country programming missions to identify institutional development needs in advance of project preparation and provide the required assistance in the form of advisory TA.

G. ADB Policies

141. ADB is continually making sizable advances in expanding and clarifying its policies with regard to environmental concerns. However, ADB needs to develop operational positions relating to a few other areas, such as the protection of heritage resources and biodiversity. Policy changes also create a discrepancy between ADB's policy recommendations at loan approval and those prevailing during project construction, potentially resulting in the public's misinterpretation of ADB's policy compliance.

142. The ADB policies and guidelines for incorporating social dimensions into ADB operations are still maturing. In some instances, ADB staff displayed a limited understanding of ADB's involuntary resettlement policy principles, resulting in some study projects not having an action plan to deal with community property, land acquisition, and income restoration when no physical relocation occurred. Training on these principles is ongoing in ADB.

143. A constant struggle with the development of policy is balancing the varying interests (natural resources management, indigenous peoples' interests) with those of development in a national and regional perspective. Some ADB policies and guidelines have a single focus, and it becomes difficult to determine how they would apply to hydropower development projects. An integrated approach is useful for trying to understand the policy conflicts across sectors and to find compromises with full understanding of their implications on individual policy positions.

144. **Recommendations.** ADB needs to review some current policy statements and guidelines to make them more applicable, relevant, and realistic. When there are policy conflicts in addressing hydropower development, ADB should ensure adequate opportunities are available for public participation. The value judgments involved in such a decision-making process should be transparent to stakeholders.

145. The impact assessments should include analysis of potential conflicts with ADB guidelines and policy and present measures to minimize conflicts and mitigate for residual impacts. ADB should consider separating the project environmental and social document preparation function

from the review function within ADB. For category A projects, it would be useful to have environmental and social peer reviewers in addition to environmental and social specialist staff working on the Project.

146. ADB should clarify operationally its position regarding compatibility of a project with policies developed after project approval. If compliance with its policies approved up to construction completion is required, this may necessitate additional contingency funding so as not to affect the economic viability of the project.

H. ADB Procedures

147. Many of the conclusions and recommendations regarding ADB procedures have already been discussed in the previous sections of this chapter. Therefore, the remaining important ones follow.

148. ADB's procedures and scheduling of the consultative process are not very transparent and not allow adequate opportunities for comprehensive responses for comments received by outsiders. In addition, ADB has potentially conflicting dual roles as a development agency and an enforcer of its own policies and guidelines.

149. **Recommendations.** In fulfilling these dual responsibilities, ADB needs to take great care that its actions are evenhanded, transparent, and defensible. Improving the presentation and updatedness of the ADB web site to increase transparency should be considered.

150. A formal period for external comments for EIAs should be established and maintained, giving sufficient time for response prior to the project approval decision.

151. ADB needs to develop and implement formal procedural requirements to address significant changes in project design between the loan approval and completion of construction. Instead of a formal EIA amendment, a requirement to obtain final site clearances and meeting mitigation standards under the direction of a panel of experts is a more pragmatic way of addressing such changes.

152. Implied responsibility for mitigation implementation over the life of a hydropower project is an administrative burden ADB may not want to accept. If adequate institutional capacity is developed, ADB can rely on local agencies to take this responsibility. For ongoing operational mitigation measures such as fish hatcheries, it is useful to have continued funding from power plant revenues (as a special tax on consumers) after commercial operations begin.

APPENDIXES

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2	Comparison of Project Timetables with Timing of Policy Implementation	45	2,5
3	Progress in Addressing Social and Environmental Impacts of Hydropower Projects Since 1994	46	2,5
4	Batang Ai Hydropower Project Case Study	52	2,7
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6	Lingjintan Hydropower Project Case Study	72	2,7
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8	Participatory Rapid Appraisal Methodology	99	3,7
9	Checklist of Environmental and Social Impacts of Hydropower Projects	100	19,63
10	Summary Environmental Impacts and Suggested Mitigation	103	18,63
11	Documents Reviewed by the Special Study Mission	108	28,84
12	Asian Development Bank Documents Relating to Environmental and Social Concerns	114	32,100
13	Asian Development Bank Policy Guidelines Related to Hydropower Development	118	32,100

SUPPLEMENTARY APPENDIXES

(available on request)

- A Selected Photographs from the Case Study Projects
- B Examples of Applicable Environmental and Social Tender Contract Clauses

C	Generic Construction Impact Monitoring Guidelines
D	Construction Compliance Monitoring Procedures for a Generic Project Environmental Management Unit
E	Data on the Asian Development Bank Review Missions
F	Legal Clauses from Project Documents

A. Appendix 1

PROJECT SELECTION

During 1980-1994, the Asian Development Bank approved 22 loans to finance 18 hydropower generation projects¹⁰⁶ in 11 countries. Four case studies were selected for the special study from within countries with multiple hydropower projects, from among projects that are relatively large within the context of the country in which they are located, and have (or could have) significant environmental or social impacts (Table A1). The four countries in which the case studies were selected (People's Republic of China, Indonesia, Lao People's Democratic Republic, and Malaysia) have borrowed 66 percent of the total loan amount approved for hydropower generation between 1980 and 1994. The Batang Ai Hydropower Project is completed, and the loan is closed. The Singkarak (Power XX) Hydropower Project was commissioned in August 1998. Work was ongoing on the Hunan Lingjintan Hydropower Project at the time of the Mission. The Theun-Hinboun Hydropower Project was commissioned in March 1998, and the loan was closed on 14 October 1998. This selection provides a range of projects at different implementation stages.

Table A1: Hydropower Generation Projects Approved During 1980-1994

Loan No.	Name and Country Code	\$ million	Year Approved	Loan Status as of Dec 1997	Reason for Selection or Nonselection
536	Third Power (FIJ)	16.0	1981	Closed	Third stage
569	Second Sulawesi Power (INO)	41.4	1982	Closed	Rehabilitation and extension only
674	Power XVIII (INO)	135.0	1983	Closed	Too small
1032	Power XX (INO)	235.0	1990	Active	Selected
465	Samrangjin Pumped Storage Power (KOR)	52.6	1986	Closed	Single project in the Republic of Korea
698	Xeset Hydropower (LAO)	1.0	1984	Closed	More recent project selected
846	Xeset Hydropower (LAO)	15.5	1987	Closed	More recent project selected
1063	Xeset Hydropower (Supplementary) (LAO)	3.0	1990	Closed	More recent project selected
1214	Nam Song Hydropower Development (LAO)	31.5	1992	Closed	More recent project selected
1329	Theun-Hinboun Hydropower (LAO)	60.0	1994	Active	Selected
521	Batang Ai Hydropower (MAL)	40.4	1981	Closed	Selected
605	Mini-Hydropower Sector (MAL)	24.0	1982	Closed	Too small

¹⁰⁶ Projects such as Xeset Hydropower in the Lao People's Democratic Republic, Tarbela Hydropower Extension in Pakistan, and Afuilo Hydroelectric Power in Samoa that were financed by several Asian Development Bank loans at multiple stages are considered as single projects.

713	Sungai Piah Hydropower (MAL)	64.2	1984	Closed	No significant environmental and social impacts
1152	Egiin Hydropower (MON)	3.8	1992	Closed	Single project in Mongolia
512	Mini-Hydropower (NEP)	8.3	1981	Closed	Too small
601	Tarbela Hydropower Extension (9 & 10) (PAK)	29.0	1982	Closed	First stage financed by WB
701	Tarbela Hydropower Extension (11 & 12) (PAK)	137.2	1984	Closed	First stage financed by WB
702	Tarbela Hydropower Extension (11 & 12) (PAK)	42.1	1984	Closed	First stage financed by WB
760	Tarbela Units 13 and 14 and 500 kV (PAK)	117.8	1985	Closed	First stage financed by WB
1242	Guangzhou Pumped Storage Stage II (PRC)	200.0	1993	Active	Stage 2
1318	Hunan Lingjintan Hydropower (PRC)	116.0	1994	Active	Selected
813	Afulilo Hydroelectric (SAM)	5.4	1986	Closed	Too small
1228	Afulilo Hydroelectric Power (Suppl) (SAM)	2.0	1993	Closed	Too small
613	Second Power System Expansion (THA)	81.6	1982	Closed	Second stage only

FIJ = Fiji, INO = Indonesia, kv = kilovolt, KOR = Republic of Korea, LAO = Lao People's Democratic Republic, MAL = Malaysia, MON = Mongolia, NEP = Nepal, PAK = Pakistan, PRC = People's Republic of China, SAM = Samoa, THA = Thailand, WB = World Bank.

B. Appendix 2

COMPARISON OF PROJECT TIMETABLES WITH TIMING OF POLICY IMPLEMENTATION

Policy and Approval Date	Project Timetable			
	Project and Country Code	Design and EIA Stage	Construction Period	Operations
Agriculture and Natural Resources (Nov 1995)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced Mar 1998
Energy Initiatives (Jan 1995)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced Mar 1998
Fisheries (Sep 1997)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced Mar 1998
Forestry (Feb 1995)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced Mar 1998
Indigenous Peoples (Apr 1998)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced 1998
Nongovernment Organizations (Apr 1998)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced 1998
Involuntary Resettlement (Sep 1995)	Batang Ai (MAL)	Approved Sep 1981	1981-1985	Commenced Sep 1986
	Singkarak (INO)	Approved 1990	Completed in 1998	Aug 1998

COMPARISON OF PROJECT TIMETABLES WITH TIMING OF POLICY IMPLEMENTATION

Policy and Approval Date	Project Timetable			
	Project and Country Code	Design and EIA Stage	Construction Period	Operations
	Hunan Lingjintan (PRC)	Approved Sep 1994	1995-1999	2000
	Theun-Hinboun (LAO)	Approved Nov 1994	1996-1998	Commenced 1998

C. Appendix 3

PROGRESS IN ADDRESSING SOCIAL AND ENVIRONMENTAL IMPACTS OF HYDROPOWER PROJECTS SINCE 1994

153. This appendix briefly highlights some of the significant and rapid strides that the Asian Development Bank (ADB) has made to strengthen the assessment, preparation, and oversight of environmental and social considerations related to hydropower projects since the approval (up to 1994) of the case study projects that were reviewed under the study. Among the major reasons for these advances are the strong emphasis given to social and environmental objectives in ADB's Medium-Term Strategic Framework,¹⁰⁷ 1995-1998; increased hiring of new ADB staff with skills in social and environmental fields; and preparation of a host of new ADB policies that give guidance for improving the social and environmental design of projects in general.

154. The following discussion is categorized according to the major stages of the project cycle, with attention given to those areas that were identified in the study's case study projects as particularly weak. Three major hydropower projects that were processed by ADB after 1994 (Kali Gandaki "A" in Nepal,¹⁰⁸ Khimti I in Nepal,¹⁰⁹ and Nam Leuk in the Lao People's Democratic Republic [Lao PDR])¹¹⁰ are used to illustrate the advances that ADB has made in social and environmental management of hydropower projects since the case study projects were processed.

A. Project Identification Stage

155. Traditionally, the initial consideration of social and environmental impacts has been done at the prefeasibility stage and more detailed consideration at the feasibility stage. ADB is moving toward earlier consideration of potential social and environmental implications to determine whether ADB financing of hydropower projects is justified on social and environmental grounds, and whether the government should proceed with certain proposed hydropower projects. Two recent initiatives illustrate this.

156. Technical assistance (TA) 2734-LAO: Nam Ngum Watershed Management¹¹¹ was completed in mid-1999. The Nam Ngum basin is the site of the Lao PDR's largest hydropower project, constructed in the 1970s. The Government has plans to construct at least four additional hydropower plants on the Nam Ngum River. The implications of this ambitious program on water resource management along the Nam Ngum River itself and downstream along the Mekong River are significant. TA 2734-LAO introduced an integrated bioregional approach to development planning that considered potential impacts of proposed development at the level of individual projects and at the level of cumulative impacts. This approach will allow the Government and ADB to identify social and environmental issues that should be considered prior to taking a decision to move forward on project planning and implementation.

157. In the case of the proposed Nam Ngum hydropower development program, the TA assisted the Government in evaluating potentially serious social and environmental impacts of the proposed development program at a watershed level while also highlighting actions that can be taken to use hydropower development to improve the socioeconomic and environmental conditions in the Nam Ngum watershed. Recommendations were made to discontinue consideration of one proposed hydropower project and to reconsider the design of two other proposed projects based on social and environmental as well as economic considerations. The TA study also indicated major activities that should be undertaken as prerequisites for the design of proposed projects (such as early public consultation with communities likely to be most affected

¹⁰⁷ Office of the President. 1995. *The Bank's Medium-Term Strategic Framework* (1995-1998). Asian Development Bank. Manila.

¹⁰⁸ Loan 1452-NEP: *Kali Gandaki "A" Hydroelectric Power Project*, for \$160 million, approved on 23 July 1996.

¹⁰⁹ Loans 1430-NEP and 1431-NEP: *Himal Power Limited*, for a total of \$36.5 million, approved on 23 January 1996.

¹¹⁰ Loan 1456-LAO: *Nam Leuk Hydropower Project*, for \$52 million, approved on 10 September 1996.

¹¹¹ TA 2735-LAO: *Nam Ngum Watershed Management Project*, for \$1,200,000, approved on 23 December 1996.

by the projects, and further consideration of resettlement implications). Furthermore, the TA study proposed a system whereby the components of the hydropower development program that were likely to proceed would contribute funds from power generation to maintain critical watershed functions (e.g., soil protection) and support general socioeconomic development and environmental conservation in the watershed.

158. In summary, the ADB-supported TA has demonstrated to the Government of the Lao PDR how early integrated planning and assessment of hydropower projects (and other associated development) can serve as an early warning system in terms of potential social and environmental impacts. If warned early enough, viable alternatives to the program or project design can be considered at the earliest stages, if necessary, to minimize potential impacts and maximize local socioeconomic and environmental benefits.

159. A second example is the ongoing TA 5783-REG: Strategic Environmental Framework for the Greater Mekong Subregion.¹¹² This TA is using a strategic environmental assessment to determine the potential social and environmental implications of development proposed under the Greater Mekong Subregional Program. Once again, the objective is to provide an early warning system that can be used by ADB and governments to assess the social and environmental implications of proposed hydropower development and other major infrastructure development at a stage of the project cycle where design changes can most easily be made and at the least cost.

160. Also worthy of mention is a study currently under way that is examining the potential use of strategic environmental assessment as a tool that can be used in regular ADB operations. The study is exploring, among other options, the potential use of strategic environmental assessment in ADB's country and sector programming. If adopted for use, strategic environmental assessment during country programming will have clear implications for how ADB selects and guides the design of future hydropower projects, as well as other major development projects.

161. In addition, ADB has begun to anticipate the need for institutional strengthening prior to the provision of major investment support for hydropower development. A case in point is the Lao PDR, where TA is being provided to the Science, Technology, and Environment Agency to strengthen national environmental impact assessment procedures. Concurrently, support is being provided to the Hydropower Planning Office and Électricité du Laos to strengthen their capacity for social and environmental assessment, monitoring, and coordination.

162. Early screening of hydropower projects has, in at least one case, resulted in the rejection of a request for ADB support due to environmental considerations. For a proposed hydropower project in Indonesia, ADB decided not to proceed with support after studies done under a separate project (but in the same area) indicated that the potential environmental impacts on a protected area were too high in relation to expected project benefits. While this decision was not reached through a strategic environmental assessment per se, it does illustrate the possible benefits of proceeding with a strategic approach to project selection in terms of early identification of social and environmental impacts.

163. Finally, ADB's emerging water policy is providing a framework for comprehensive basinwide planning that is expected, among other benefits, to help rationalize hydropower development in ADB's developing member countries where the framework is put into practice. Initial work has started in Sri Lanka and Viet Nam.

B. Prefeasibility and Feasibility Stage

164. Significant strides have been made in addressing the social implications of proposed hydropower development during project processing. In 1994, ADB began to require preparation of initial social assessments (ISAs) for all projects, followed by detailed social assessments for projects (such as hydropower development) that are expected to have significant social impacts. ISAs are required to be done as early as possible, preferably during the project preparatory TA. While there is as yet little empirical evidence to precisely determine how effective these tools have been during the past five years, it is reasonable to state

¹¹² TA 5783-REG: *Strategic Environmental Framework for the Greater Mekong Subregion*, for \$1,900,000, approved on 20 March 1998.

that the social design and participatory nature of hydropower projects have been strengthened over the intervening years as ADB staff and concerned government agencies have become increasingly acquainted with ISA and social assessment.

165. Also in 1994, ADB issued policies on involuntary resettlement and on confidentiality and disclosure of information. These introduced state-of-the-art processes and procedures to ensure that the full range of compensation and resettlement requirements and public involvement associated with hydropower and other projects were adequately addressed during project processing. Once again, this has been a learning experience for developing member country governments as well as ADB staff. While problems certainly remain in implementing these policies, some recent ADB-supported hydropower projects illustrate how rapid learning has occurred.

166. The Kali Gandaki "A" Hydropower Project (footnote 2) in Nepal, which has been under implementation for almost three years, demonstrates how ADB's 1994 policies on involuntary resettlement and confidentiality and disclosure of information has been put into practice. Public participation during ADB's processing of the Project was extensive and intensive. Several public hearings were conducted at Kathmandu and in villages near the project site. These public hearings primarily aimed to gain perceptions from stakeholders on all aspects of the proposed project and were not simply informational in the sense of providing information about the Project to stakeholders. Some changes in project design, although comparatively minor, were made in response to issues raised at the public hearings. Communication with international stakeholders, primarily nongovernment organizations, was similarly extensive. Public consultation continues apace during the ongoing construction period.

167. As part of the upcoming project preparatory TA for the proposed Se San 3 Hydropower Project in Viet Nam, a detailed plan for public consultation and participation that is appropriate for the level of literacy and ethnic considerations at the project site will be required before the start of field work. In addition, ADB will provide the Executing Agency with technical support to develop and maintain a web site on the Project and on the Executing Agency's activities in general. ADB's web site will link visitors to the Executing Agency's web site.

168. Programs for resettlement and compensation for loss of assets in the Kali Gandaki "A" Project have gone beyond simply one-to-one compensation packages for the losses incurred. The design of compensation programs also included training so that local people can work in skilled and semiskilled positions on the Project and so that they have opportunities for future employment. A small scholarship facility has been established that offers gifted students an opportunity to further their education. A community development program has also been supported.

169. Kali Gandaki "A" was exceptional in terms of the amount of financial resources provided for social and environmental analysis and assessment during project processing by ADB and other institutions.¹¹³ Not surprisingly, social and environmental investigations, analysis, and assessment were in-depth, extensive, and of high quality. Unfortunately, the allocation of sufficient resources for social and environmental assessment of hydropower projects during project design does remain a problem area, as stated in the main text of this study.

170. ADB's Environment Division, which provides input to project divisions in the design of project preparatory TAs, in 1998 adopted the practice of recommending that translation of the summary environmental impact assessment (at minimum) into the local language in the project preparatory TA terms of reference and budget for all category A projects which require a full environmental impact assessment.

171. Where there is more than one source of financing for a project, ADB has been careful to include all project components in its social and environmental assessment regardless of whether ADB is providing support for those components. An example is the Yunnan Dachaoshan Power Transmission Project¹¹⁴ approved in 1998. Although ADB was financing only the construction of a transmission line and ancillary facilities, an evaluation was done by ADB of the Dachaoshan Hydropower Project, for which construction was

¹¹³ Although exact figures are unavailable, it has been estimated that about \$500,000 was provided.

¹¹⁴ Loan 1644-PRC: *Yunnan Dachaoshan Power Transmission Project*, for \$100 million, approved on 27 November 1998.

well under way, to determine whether social and environmental issues related to the hydropower project were being addressed in a manner acceptable to ADB. As a direct result of this evaluation, ADB recommended, and the Government accepted, revisions to the planning and implementation of the resettlement program associated with the hydropower project.

172. The design of the Nam Leuk Hydropower Project in the Lao PDR (footnote 4), approved in 1996, included TA to the management team of a protected area within the project area that was suffering from widespread poaching and other destructive practices. In addition, the project design includes provision for the allocation of one percent of the annual proceeds from power generation for environmental conservation and development activities in the protected area.

C. Implementation (Construction) Stage

173. ADB is giving increasing attention to social and environmental monitoring by ADB staff during project construction. Early project monitoring by ADB staff during the Nam Leuk Project contributed to identification of systemic engineering (and potential environmental) problems with the civil works contractor's program, leading to a temporary halt to most construction activities. This was followed by a senior-level mission from ADB that prepared a detailed action plan for addressing these problems, resulting in improved performance by the contractor.

174. Several measures have been taken to strengthen compliance with social and environmental mitigation during project construction. One notable procedure, which is becoming increasingly prevalent in ADB-supported hydropower projects, is the establishment of independent panels of experts or advisory panels comprised of social and environmental specialists recognized for their professional experience in their respective fields as related to hydropower development. These panels have been employed both during project preparation and construction. During construction, the panels for Kali Gandaki "A" and Nam Leuk have proved effective as an instrument for monitoring compliance with social and environmental programs, and highlighted weaknesses requiring attention from the Government and/or ADB. The Khimti I Project (footnote 3) has two outside monitoring teams that have played a major role in measurably improving social and environmental compliance. The latest review indicates that, after a slow start, the level of "fair to good" compliance has increased to approximately 90 percent of all required mitigation measures as prescribed in the Project's environmental impact assessment (EIA) and related documents.

175. The EIA and initial environmental management plan (EMP) are feasibility-level documents with the same limitations that are inherent in all assessments done for projects where detailed design is yet to be accomplished. EIA practitioners in Asia and elsewhere are giving increasing attention to the need for adaptive environmental management in major infrastructure projects, recognizing that prescriptions made for mitigation during the feasibility stage will invariably need revisions, and sometimes extensive revisions, as detailed design is done and conditions change during construction.

176. The Nam Leuk Project provides a good example of how adaptive environmental management can be implemented in hydropower projects supported by ADB. A key step has been the retention of a highly experienced international consultant to assist local staff in updating, revising, and expanding on measures recommended in the EIA and EMP that were prepared as components of project feasibility studies. This has been done throughout the construction phase, resulting in several "mini-plans" that fit current conditions and take advantage of additional knowledge gained since completion of the feasibility study. Examples include preparation and periodic revision of a social action plan, preparation of detailed plans for biomass clearance in the reservoir, preparation of fish capture studies, and so on. In an interesting example of how adaptive management can lead to creative solutions to problems and concurrently benefit project-affected people, the Project's environmental staff invited local people to perform most of the biomass clearance instead of having outsiders do this work as was originally planned. The environmental staff, after developing close relations with communities in the project area, realized that local residents could do the work more efficiently than outsiders, at less cost, and also gain significant cash benefits. In an additional adaptation of the original plan, the local residents suggested, and the project authorities approved, a program to allow local farmers to plant rice on the cleared areas for the one growing season that preceded inundation of the reservoir.

177. As pointed out in the main text of the study, one very important constraint to achieving full environmental compliance during the implementation phase is the failure to adequately incorporate social and

environmental measures in contractual documents, such as tenders and bills of quantity. This remains a serious constraint. The Kali Gandaki "A" Project has perhaps done the most in this regard and consequently has helped to keep environmental compliance at a reasonably good level during implementation. However, Kali Gandaki "A" remains the exception rather than the rule. ADB's Office of Environment and Social Development has commissioned a study to look at this issue in more detail with a view to making recommendations to strengthen this important aspect of project environmental management.

D. Project Operation Stage

178. There has recently been discussion among ADB staff as to what level of involvement might be appropriate during the project operation stage. Traditionally, this has been limited to postconstruction evaluations of selected projects, and logically so, as the end of construction also marks the approaching loan closure. The current study is an example. However, the case of the Theun-Hinboun Hydropower Project¹¹⁵ indicates that ADB is willing to continue substantive involvement beyond loan closure where there may be lingering concerns about social and environmental impacts. A special review mission was conducted for the Theun-Hinboun Project in November 1998, several months after loan closure, to further investigate reports of social and environmental impacts that were not being adequately mitigated. This Mission resulted in ADB requesting the company and the Government to take several remedial measures. ADB is continuing to follow-up on the response to its requests, with a second special review mission scheduled for November 1999, more than a year after the loan was closed.

E. Conclusion

179. In summary, significant steps have been and continue to be taken since the case study projects were reviewed during the study. These steps include important procedures that have become standard practice for hydropower projects, such as ISA/social assessment, improved monitoring during construction, and strong resettlement and compensation procedures. The challenge to ADB, as to all other institutions that support hydropower development, remains the need to continuously improve on these measures and to ensure that the best of these measures are applied consistently in all hydropower projects.

¹¹⁵ Loan 1329-LAO: *Theun-Hinboun Hydropower Project*, for \$60 million, approved on 8 November 1994.

D. Appendix 4

BATANG AI HYDROPOWER PROJECT CASE STUDY

I. INTRODUCTION

A. Project Description

180. The Batang Ai Project¹¹⁶ featured the construction of a main dam and three saddle dams to harness the hydropower potential of the Batang Ai catchment area (1,200 square kilometers [km²]). The other components included a surface 108 megawatts power station,¹¹⁷ 275 kilovolt transmission line, consulting services for construction supervision, and a panel of experts to review project design and implementation. The Project is the earliest of the four case studies to be reviewed under the study. The Project was approved in 1981 prior to the stipulation of detailed environmental and social guidelines by either the Asian Development Bank (ADB) or Government of Malaysia (Map 2, p. vi).

181. The Executing Agency was Sarawak Electricity Supply Corporation (SESCO). The total project cost amounted to \$228 million, which is 20 percent below appraisal estimates. Of the total ADB loan of \$40.4 million, \$7.5 million was canceled in 1985, and the loan was closed in February 1986, 10 months ahead of schedule. All power generation units were commissioned by September 1985, about six months ahead of schedule. The project completion report was finished in December 1986.

B. Study Methodology

182. Prior to the Mission, the study team reviewed project files and selected locations for participatory rapid appraisals (PRAs). The first part of the Mission was spent in Sarawak, and the second part in Kuala Lumpur. In Sarawak, the Mission visited government departments, the Sarawak museum, and the project site; held discussions with affected persons, university personnel, project officials, and representatives of the state and district governments; and reviewed available literature and monitoring data. The visit included physical inspection of the (i) construction site and related structures (dam, saddle dam, gates, and powerhouse) and access road; (ii) reservoir and shoreline, Batang Ai and Engkari River upstream land and longhouses, and downstream riverine area up to Lubok Antu; (iii) transformer yard and segments of the transmission line along the highway from Kuching; (iv) Fishmart fish hatchery, rearing, and processing facility; and (v) resettlement site and related public infrastructure, and adjacent rubber and oil palm cultivations. Five PRAs were held among resettlers, host community, and Iban longhouses in the partial danger zone area of the Batang Ai and Engkari rivers. PRAs focused on the social, psychological, economic, and environmental impacts of the Project on its affected persons. The preliminary findings of the Mission were discussed with the relevant state departments and agencies in Kuching and Kuala Lumpur. These discussions helped the study team verify PRA findings, probe the main issues, and develop preliminary recommendations.

183. Several nongovernment organizations (NGOs)¹¹⁸ brought up the issue that the resettlement of 34 Iban families from Batang Ai area to the Bukit Peninjau Miri (BPM) plantations (some 800 km away) in 1972 by the state government was the first phase of the resettlement scheme of the Batang Ai Hydropower Project. In the Mission's opinion, based on the documents examined; findings of the fieldwork at Batang Ai and BPM; and interviews with NGOs, state, and district government officials that the 1972 resettlement did not constitute the first phase of the resettlement scheme of the Batang Ai Project. Although the two resettlement schemes, BPM (1972) and Batang Ai (1981-84), involved relocating people from Batang Ai, they are two distinct, unrelated resettlement schemes. The first was a part of a statewide economic development program started in the late 1960s in Malaysia. The resettlement of the 34 families from Batang Ai to BPM was primarily a voluntary relocation program, which received the government's encouragement and support. On the other hand, the second resettlement scheme was specifically for displacees of the Batang Ai Project. BPM resettlers were affected by a statewide economic development program, while the Batang Ai resettlers were affected by a public hydropower development project.

184. The NGOs also argued that the state government knew about the future need for resettling the Batang Ai people to construct the Batang Ai project reservoir and started relocating them under various development programs as early as

¹¹⁶Loan 521-MAL: *Batang Ai Hydropower Project*, for \$40.4 million, approved on 17 September 1981.

¹¹⁷The Project's planned power output of 4 x 23 megawatts was changed to 4 x 27 by increasing the full supply level of the reservoir by 4 meters, with ADB approval.

¹¹⁸International Rivers Network, Integrated Development for Ecofriendly and Appropriate Lifestyle, and Borneo Resources Institute.

1972. The state government does not accept this view, which the Mission also finds weak for several reasons. If the government had planned to remove people from Batang Ai to create space for the proposed hydropower project, it would have attempted to remove more people on a more systematic manner starting from the so called "danger zone," which was to be inundated by the reservoir. But as the Mission found in BPM, only 34 families from three longhouses scattered in the upper stream of the Batang Ai River were relocated. Two of these longhouses were in the area currently known as the "partial danger zone" of the Batang Ai Project, and the third, far away from the reservoir and "partial danger zone." The state steering committee of Batang Ai Project established in 1978 had the sole authority to study, plan, and execute activities pertaining to the Batang Ai Project. It is, therefore, hard to believe that prior to the establishment of the state steering committee some officers in Lubok Antu and Sri Aman districts planned and executed a resettlement program and combined it with BPM plantation development. The detailed socioeconomic surveys carried out by the Sarawak Museum in the late 1970s in Batang Ai District did not refer to such a resettlement program.¹¹⁹ The Batang Ai PRAs indicated that some of the families had voluntarily left the Batang Ai area in the early 1970s to join their relatives and friends in trying out new economic opportunities opened up by the oil palm plantations in the Miri District. In 1973, for example, five of 13 families of the Palanthong longhouse in upstream Batang Ai moved to Miri District. They went there because they could not find sufficient fertile land in the Batang Ai area to cultivate. Land resources had deteriorated due to the shortening of the swidden agricultural cycle, and they needed new land resources.

II. FINDINGS OF THE MISSION

A. Status of the Resettlement and Rehabilitation Program

185. The reservoir of the Batang Ai Project displaced 21 Iban longhouse communities consisting of 422 extended families.¹²⁰ The total number of displaced persons were about 3,600. Most of the families were relocated below the reservoir in two phases (1982 and 1984). Two civil assemblies were held prior to land acquisition (footnote 3). Several longhouse leaders were sent to Thailand to observe a similar hydropower project. But improper communication between longhouse leaders, project personnel, and affected persons resulted in confusion and dissatisfaction (para. 14). Housing and public infrastructure in the resettlement area is satisfactory. The Housing Commission built the longhouses for most resettlers. In some cases, the commission used as a down payment the compensation of RM8,000 that was assigned to each resettler family as compensation for their ancestral longhouses and stipulated that each family should pay the remaining cost over 25 years at the rate of RM120 a month. Almost all the resettlers have not signed a contract with the Housing Commission. Resettlers interviewed informed the Mission of their reluctance to pay the housing loan as they believe that RM8,000 from each family was sufficient to build longhouses.¹²¹ Access roads, schools, a clinic, and shops provide satisfactory services to both resettlers and their hosts. Household amenities, such as electricity and treated water, have improved their living conditions.

186. The state acquired 3,077 hectares (ha) of native customary rights (NCR) land in the downstream area of the Batang Ai reservoir and distributed it among resettler families. No titles have been given, so the land remains as NCR land. Each family has received the right to cultivate about 3.3 ha of land in the resettlement area according to an agricultural plan prepared by the Department of Agriculture. Each resettled family was promised 0.8 ha of rice land. As suitable land for terraced hill rice cultivation was not found in some areas, compensation of RM4,940 per ha was determined by the state in 1992 but has not yet been paid.¹²² Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) introduced a plantation economy to the resettlements to cultivate rubber and cocoa on the resettlers' land. However, plantations were delayed by several years due to the lack of staff and labor and difficulties in obtaining planting material. Cocoa plantations failed before 1989, and the area was planted with oil palm. Currently, there are about 1,215 ha of rubber and 1,012 ha of oil palm in the resettlement plantations. Rubber plantations are not well cared for or tapped, as current prices are low. Some profits from oil palm plantations have been shared with the resettlers from 1993. Until then, they earned wages from the plantations, that belong to them. At present, vegetable and fruit gardens are well developed and cash crops, such as pepper, are becoming popular due to high prices.

B. Status of Environmental Mitigation Measures and Monitoring Plan

¹¹⁹ Ethnology Group of Sarawak Museum. 1979. Batang Ai Hydroelectric Project Survey on the Attitudes of the Affected People Toward the Project and Resettlement. Kuching.

¹²⁰ Occupants of 4 of the 25 longhouses originally planning to move stayed back in their ancestral lands in the partial danger zone as those were only partially submerged. The extended families resettled comprised 522 individual families with separate cultivation requirements (project completion report, para. 94).

¹²¹ For example, the members of one longhouse the Mission interviewed had received notice for payment of RM54,952, amounting to arrears and accrued interest.

¹²² A 12 May 1994 Department of Land and Survey letter recommended this was reasonable compensation, referring to a previous communication issued on 10 September 1992 in this regard. Compensation-related documents appear to have been misplaced during the transfer of these from Department of Land and Survey and SESCO. Funds in lieu of not meeting the 0.8 ha of rice land promised were not paid as there were several other cases of compensation payments that were pending.

187. The Project was funded and constructed before ADB or the Government of Malaysia had fully developed or implemented their environmental guidelines and established agencies to implement related policies.¹²³ As a result, no environmental impact assessment, environmental management or mitigation plan, or environmental monitoring plan was completed. These are now required by ADB and the Government. Environmental monitoring is currently restricted to water quality testing designed for other purposes, which is an inadequate arrangement. As the construction was carried out nearly two decades ago, the Mission cannot comment on the environmental mitigation measures taken at the time. A survey of the area found an abandoned batching plant and areas that had not been properly restored. However, sufficient time has elapsed for spoil areas to become vegetated on their own.

C. Compensation

188. The standard compensation rates for NCR land near the reservoir danger and partial danger zones was RM864 per ha. Land acquired for the downstream resettlement scheme was compensated at the rate of RM1,482 per ha. Resettlers think they did not receive fair compensation due to their poor contacts, illiteracy, and lack of experience in the money economy. The compensation payments ranging from a few thousand to RM400,000 per family in a previously egalitarian community caused suspicion and jealousies. Twelve years after the Project's construction, there are still unresolved compensation claims over lost land, crops, and property. According to information from SESCO, 439.97 ha are in dispute (valued at RM382,778).

189. The agricultural development plan had two objectives. The first objective was to provide a "satisfying way of life" for resettled families, and the second was to "sustain a level of income significantly higher than they previously achieved in their former longhouse." SALCRA obtained state loans to develop land on behalf of resettlers. The average cost of land development per family was about RM20,000. Long delays in the development of agricultural land were caused by poor soil conditions, labor shortages, delays in planting, lack of an access road, shortage of skilled personnel, and aversion among resettlers to becoming laborers of plantations. When the first batch of resettlers moved into the resettlement area in 1982, land development had not started. Rather than work as laborers, most resettlers who were not used to supervised work spent their compensation money to survive. The first cash crop, cocoa, was transplanted in 1985. Rubber nurseries were started in 1985, and transplanting was completed in 1987, five years after the arrival of the first batch of resettlers. In 1988, SALCRA found that the cocoa plantation was a failure and replanted the area with oil palm. In recent years, resettlers have lost interest in tapping rubber due to low prices. Total losses of these two crops in the resettlement area amounted to RM23 million by the end of 1997. The liability for this debt (about RM30,000 per family) has not been settled yet, and a policy decision regarding this debt settlement is pending.

190. Resettlers' average income from their plantations is significantly lower (about RM230 a month) compared with the income (RM523 a month) that was envisaged from plantations after 10 years. The reservoir cage fisheries project started in 1993 by Fishmart, a subsidiary company of the Farmers' Organization, in the Batang Ai reservoir provides extra income to some resettlers. Families in five longhouses in the resettlement area participate in the cage fisheries project as indicated in the PRAs. Fisherfolk are given a generous subsidy to raise fish in lieu of selling all their fish harvest to Fishmart at a predetermined price. Although land and plantations have failed to restore or improve resettlers' income for the last 15 years, at the time of the Mission, the resettlers were not poorer than those who opted to live in their ancestral longhouses or members of their host community. Resettlers cultivate pepper in their gardens, which provides good income twice a year.¹²⁴ Several others still cultivate their uninundated land in the partial danger zone. Employment in Kuching and other towns, and at industrial locations, has enabled them to restore or exceed their previous income levels.

D. Resettlement Management

191. The state steering committee had brought various government departments together to plan and implement the resettlement scheme. One major shortcoming of this organizational structure was that there were too many subcommittees with overlapping functions and activities. There were also conflicting goals, objectives, and priorities. For example, the Department of Agriculture was expected to prepare the agricultural development plan for the resettlement scheme and SALCRA was mandated to implement it. It appears that SALCRA opted to grow oil palm, which it believed was more suitable to the soils in the area, but it had to follow the agricultural development plan prepared by the Department of Agriculture.¹²⁵ Heavy emphasis on organizational autonomy has intervened in coordinated works, which

¹²³ Malaysia's Environmental Quality Act was in place in 1974, and the National Resource and Environment Board was established in 1994.

¹²⁴ The two longhouses the Mission visited in the resettlement scheme do not presently cultivate pepper. This may be due to the lack of suitable land for pepper cultivation or to the limited capacity of the Department of Agriculture to accommodate all applicants who wish to cultivate pepper within its subsidy program.

¹²⁵ The Department of Agriculture denied it was responsible for the plan.

has left many actions and omissions unaccounted for. The atrophy of the state task force soon after the completion of the Project's physical works created a vacuum in resettlement administration and progress monitoring.

192. Education, mobility, and connections with the outside world helped the host community accommodate resettlers in their ancestral lands. But some of the elderly felt unhappy about the shrinkage of their ancestral land and thought that the resettlers were "imposed" on them by the state. At the time of the arrival of resettlers, the host community already felt land shortage pressures. They expected that the surrounding NCR lands would remain vacant for their use. On the other hand, resettlers found that while their hosts were not hostile, they were unhappy about their arrival. The host community sometimes did not allow resettlers to enter their newly developed lands on the grounds that the state had not yet paid compensation for such lands. Thus, their relationship is still "frictional." The applicability of Adat laws regarding the collection of ferns and other jungle fruit and vegetables irritates resettlers. On several occasions, resettlers were fined by their hosts for breaking taboos. The relationship between the young generation of both hosts and resettlers has been friendly and cooperative. However, few marriages between resettlers and host community members have taken place. On important occasions and during the ritual cycle, the two groups act as different communities. Older resettlers feel that they live on others' land, and as a result, their ritual status is severely damaged. Although some resettlers are very successful in their new businesses and have better public amenities, they generally feel that they do not have any room for expansion into others' territory.

E. Resettlers' Satisfaction

193. Resettlers were unhappy that they had to leave their ancestral land and become plantation laborers. They found it difficult to adjust their carefree lifestyle to a disciplined and regimented estate-type of living, which they had never experienced before. They had to cope with many difficulties in addition to the stress they underwent due to forced displacement. For example, they had to undergo the traumatic experience of living in temporary sheds before their longhouses were built. Upon arrival in their resettlement, they found that they did not have any source of income except compensation money. This, and the access they maintained to some of their ancestral land, rescued many of them from falling into abject poverty. Compared with the host community and the longhouses upstream, resettlers were worse off with regard to social security and social acceptance by others. In particular, old resettlers did not prefer to work as laborers or employees of SALCRA plantations. They were confused as to their land tenure status. Land belonged to them but was managed by SALCRA. They have not received titles for land or longhouses. They rank their perceived needs in the following order: hill rice, employment opportunities, and better farm schemes. Health and education were not among their priorities as they had better access to school and medical facilities. The members of the younger generation of resettlers were happy to receive cash income from plantations and nonagricultural work so that they could spend it on consumables. The youth are mobile and those who are educated have left their longhouses, either temporarily or permanently, in search of better living conditions. Some of them have entered "protected" lands and have attempted to recreate their traditional living forms with little success.

F. Impact on Fisheries and Aquatic Life

194. The preproject aquatic communities were riverine communities with good water quality and dominated by species adapted to fast-moving water. The communities included several large species of fish, such as river carp and semah (*Tor tamboides*), that appear to have been migratory and were favored high-quality food. Fish were abundant and used for subsistence purposes. Many riverine species have now declined and larger migratory species appear to be rare or nonexistent in the reservoir and the upper reaches. Parties interviewed report large concentrations of fish below the dam shortly after it was built, indicative of blocked migratory spawning runs. Others report large runs of migratory fish in the upper rivers as the reservoir was flooded. This was possibly caused by riverine fish concentrating in the remaining habitat in rivers with less discharge and cover. Causes for decline in migratory fish may include inappropriate fishing techniques, such as snorkeling, spearfishing, and use of fish toxins; over harvesting for commercial purposes; logging and pollution; and hydropower development. Aquatic life in the reservoir is also affected by monthly and seasonal drawdowns that can cause reproduction failure for fish spawning along the shoreline. In addition, this varial zone will typically have no vegetation, few invertebrates, and be of low biological value. Present nonmigratory fishery resources in the reservoir appear to be generally abundant, as the Department of Agriculture has released several species adapted to lake and reservoir conditions.

195. Floating cage aquaculture appears to have been successfully introduced into the lake and production is currently estimated at close to 20 tons per month. The Department of Agriculture now licenses aquaculture in the reservoir. Distribution of aquaculture cages is unclear, as only some resettlers have accessibility to aquaculture. Several of the relocated longhouses are reported to be involved in aquaculture. Three of the longhouses the Mission interviewed stated that they had applied to become participants in fish aquaculture but had not received a reply.¹²⁶ The sale of

¹²⁶As per the Department of Agriculture, the reason for delays in approval may be due to insufficient quotas. The authority to approve rests with the Department of Aquaculture Project Appraisal and Approval Committee.

aquaculture products appear to have some problems, especially in the upstream areas. A longhouse visited had marketable fish, yet they had not been collected for more than six months.¹²⁷ The escape of exotic tilapia from the cage aquaculture may pose a long-term risk to the fishery in the reservoir and downstream, as these species can overpopulate and become stunted.

G. Water Quality

196. The reservoir appears to be anoxic and is characterized by layers of turbid waters with concentrations of metals. Hydrogen sulfide (H₂S) is typically produced in anoxic conditions near the bottom of reservoirs. Lack of proper clearing of vegetation from the reservoir has contributed to the anoxic conditions. The organic loads produced by the vegetation left standing have contributed to the existing limnology. This will probably be a long-term problem as there are still many areas with standing dead trees. The fish cage cultures, which generate some 20 tons of fish per month, provide ongoing organic loading. Conditions for aquatic life in the Batang Ai River below the dam are poor due to a lack of minimum flow releases during the dry season and periodic bouts of poor water quality characterized by H₂S, and possibly reduced dissolved oxygen. The Mission observed the strong odor of H₂S on visits to the tailrace of the power plant.¹²⁸ Water quality data collected does not include dissolved oxygen or H₂S. The data collected by SESCO shows no apparent decreases in pH, although low pH conditions are typically associated with H₂S generation. The reservoir data does indicate the increase in metal ions, particularly iron, at or near the bottom. The Fishmart processing facility does not adequately treat offal and wastewater, and it drains water from a small settling basin into a stream course that flushes directly into the Batang Ai River.¹²⁹

H. Catchment, Slope Stability, and Sedimentation

197. Several landslides were observed along the shoreline and signs of turbidity were observed up the Engkari arm of the reservoir. In some places, newly cleared agricultural land was observed very close to the reservoir. Project records indicate fluctuations of water surface elevations by as much as 10 m within a year, with reduced elevations associated with the end of the dry season. In addition, it is not clear who has management responsibility for land that is adjacent to the reservoir.

I. Wildlife and Vegetation

198. There was no environmental baseline survey conducted for the Batang Ai Project. Based on the site inspection, informal interviews with indigenous people, and reports of the investigators who visited the site prior to inundation, the area was largely used for shifting agriculture, with some spots maintained as primary forests for religious or community uses. As a result, most of the area viewed was secondary forest with the associated wildlife and plant species. However, this included several species that are now either fully protected or partially protected under Malaysian law. There appeared to be ample wildlife for subsistence purposes. In addition, many species of plants were used for subsistence, medicine, and other purposes. The Batang Ai National Park (24,040 ha) was gazetted in 1991¹³⁰ and was in the planning stages prior to the construction of the Project. Protection of the Project's upstream watershed probably contributed to its rapid approval. The adjacent Lanjak Entimau Wildlife Sanctuary (168,758 ha) and Bentuang Karimun Nature Reserve (1.2 million ha) add to the area's wildlife resources. Establishment of the Park has made a significant contribution to conservation of biodiversity, development of ecotourism, and protection of the largest population of orangutans in Sarawak. In addition, other measures, such as the "Honorary Wildlife Ranger" Program, the Integrated Conservation and Development Program, and plans to expand parks and sanctuaries to 10 percent of the Sarawak land base (1.2 million ha), contribute to the long-term preservation of biodiversity and protected species. Visits to two longhouses bordering the reservoir indicate that wildlife populations are increasing and abundant in the reservoir area. Cultural, adventure, and nature tourism have increased on the reservoir (Batang Ai Hilton) and upriver. Over the long-term, this will have beneficial impacts to natural resources and local communities.

J. Navigation

199. Creation of the reservoir has improved navigation, communication, and transportation for longhouses upstream of the main dam. However, the Mission encountered a log jam when visiting the Engkari arm. Apparently, logs are from

¹²⁷ Department of Agriculture, Sarawak suggest that this may be an isolated incident. It has also advised cage culture participants to relocate cages downstream nearer to the Fishmart processing center to save transportation cost and preserve quality. This suggestion has not yet been widely adopted.

¹²⁸ H₂S is toxic to most forms of aquatic life, as well as to humans.

¹²⁹ Since the Mission, Fishmart is reported to be seriously considering adequate treatment for offal and wastewater from fish processing houses.

¹³⁰ There is a current proposal to extend Batang Ai National Park by 8,630 ha and Lamau Entimau by 18,414 ha that would further the extent and biological value of this protected block of land.

upriver sources and from drowned trees from the reservoir. These logs pose a navigational nuisance to those attempting to travel on the main tributaries to the reservoir.

K. Regulation and Institutional Strengthening

200. It appears that SESCO manages the reservoir,¹³¹ flow releases, and power generation with no other regulatory body to oversee operations or dam safety. The dam is independently reviewed by the design engineers (approximately every five years), and they provide reports to SESCO. In most other hydropower projects, safety reviews are not conducted by the designer, and reports are reviewed by regulating bodies separate from the generating entity. SESCO has created an environmental department that appears to be largely staffed by civil engineers.

III. Conclusions and Recommendations

A. Minimizing Displacement

201. Room for more energy generation capacity and economic gains should be evaluated against the social and environmental impacts that they bring about. The decision to increase the inundation line of the Batang Ai reservoir by 4 m created many difficulties for some longhouses. Hasty and incomplete surveys, inadequate funds, and reduced rates of compensation adversely affected the resettlement strategy, particularly the restoration of resettler income.

B. Baseline Surveys

202. When a development project necessitates involuntary resettlement of people, it is necessary to carry out a baseline survey to record the preproject physical, socioeconomic, and environmental conditions in the area, and also to identify the potential project affectees. Once the physical survey is completed, socioeconomic surveys can be conducted. This survey needs careful planning and execution, as its findings could be used as the basis for compensation, resettlement planning, and agricultural development. Local universities, colleges, and NGOs, as well as local persons, could actively participate in these surveys. Findings should be analyzed and published for public use and future reference. The surveyors should be careful to distinguish project affectees from others who may attempt to claim resettlement benefits.

C. Communication and Consultation

203. Early communication with the affected persons to explain how the project will affect them and what mitigation factors are likely to be introduced is essential to obtaining their support for the Project and to reduce the trauma and stress associated with displacement. Empty promises, rumors, and political rhetoric can confuse the affected persons about the true objectives of the Project.

D. Economic Rehabilitation of Resettlers

204. Economic rehabilitation is the weakest aspect of resettlement planning. The planners either fail to address the operating constraints adequately or avoid the issue until it is too late to implement an optimal strategy. One way to avoid this pitfall is to develop agricultural land before the arrival of resettlers if they are to receive land-for-land. It is essential to be realistic about the resource base; the activities it can support; and, especially, the skills and traditions of resettlers. Developing land would provide time for resettlement planners to experiment with cropping patterns, irrigation needs, and extension. It would also address the cardinal issue in resettlement: the resettlers' income and living standards should not be lowered as a result of their involuntary resettlement. If a suitable land base is difficult to develop for all resettlers, they should be informed well in advance and suitable livelihood planning should be initiated with their support. This planning should be done by a group of specialists that possesses an appropriate skill-mix in designing livelihood and rehabilitation programs. The most enterprising resettlers do best on their own and reduce the economic and management burden of the resettlement operation. Tied-cash options, with installment payments, joint accounts, and specialized training programs to steer the "excess" families away from the land are options.

E. Compensation

205. Compensation rates should reflect the current market value of land as well as the degree of development for the land that will be acquired. These rates should be widely publicized and objections and revisions suggested by the affected persons should be noted. Land surveys, checking of the title deeds, and payment of compensation should be done in a transparent manner. Affected persons should be informed of how their land was valued and the rate of

¹³¹ At the design stage, SESCO was owned by the state government. SESCO does internal annual reviews and routine surveillance on operations and dam safety.

compensation. Compensation calculations, and the method and manner in which compensation is paid, should be closely monitored and recorded by a competent authority. Appeal boards should be established to decide disputed claims. Representatives of affected persons, as well as local knowledgeable institutions (such as universities) and NGOs, should be members of such agencies. Delays and partial payments should be minimized. If sufficient funds are not available for compensation payment, the proposed project implementation should be delayed until they are available.

F. Host-Resettler Relations

206. Before resettlers are transferred to their new sites, they should be given a thorough orientation at the new resettlement centers. If possible, they should be given a chance to make decisions about their housing and the land development with project personnel. Such discussions and a role in resettlement planning and implementation would reduce the unhappiness created by displacement and help develop resettlers' confidence. Many of the host community members' fears about the resettlers could be reduced if the hosts were informed about the proposed resettlement program and the need for their cooperation.

G. Monitoring and Evaluation

207. Monitoring and evaluation has to be adopted by project managers as an integral part of planning and implementation. Resettlement and agricultural development monitoring agencies should be adequately staffed with qualified professionals, and sufficient funds and facilities need to be made available to monitor the changes over at least 15-20 years after project completion. Such agencies need to address the employment and housing issues of the second generation in resettlements. Independent monitors (such as NGOs), with clearly defined terms of reference, can play a significant role in assessing the Project's progress, and its commitment to project assurances and covenants.

H. Review of Resettlement Schemes

208. As the expected results have not been achieved by the Batang Ai resettlement scheme after 15 years of operation, it may still be useful for the government to revive the resettlement task force to resolve unpaid and disputed compensation and land development issues. The task force should introduce a monitoring program, with agricultural and socioeconomic indicators, to record progress.

209. In resettlement planning, it is necessary to check whether communities or households from the proposed project areas have already been relocated elsewhere. If such resettled communities exist, as in the case of Batang Ai, it is useful to examine them to check whether they had received the resettlement package as promised, and whether there was a resettlement plan. If the resettlement and compensation documents and schedules are missing, if income levels are poor, and if resettlers are vulnerable to the local elite and to plantation managers, resettlement planners should take such observations into consideration when preparing a resettlement plan for the future relocation of persons from the same area.

210. The state, district, and resettlement management agencies should maintain comprehensive records of resettlement process: benchmark survey, compensation payment, detailed components of the resettlement plan, and monitoring data for inspection. The nonavailability of such records weakens the legal rights of indigenous people and enhances the room for mismanagement of resettlement resources. For example, the issue of compensation is still not resolved.

I. Environmental Audit and Mitigation

211. The Mission suggests that an environmental audit of the Project be conducted to assess the ongoing impact of the Project, evaluate possible solutions, and design an environmental management and monitoring plan per current regulations.¹³² The audit should at least address the issues discussed. Due to the poor water quality and the degraded conditions of the downriver reach, a thorough limnological survey of the reservoir and tailwaters should be conducted as part of the audit. Minimum flow releases should be considered as part of this analysis.

J. Monitoring Environmental Impacts

212. At a minimum, the monitoring plan should include substantial limnological monitoring and should add temperature, dissolved oxygen, and H₂S to the existing parameters collected by SESCO and the State Water Authority. Water quality data collection needs to be coordinated to reduce redundancy. In addition, the Mission suggests that fish populations be monitored in the reservoir, upper reaches, and downstream of the dam. Monitoring could be done by electroshocking, snorkel surveys, and surveys of subsistence and commercial fisherfolk. Fish populations well downstream of the Project should also be monitored for possible effects due to expansion of tilapia populations. Bathymetric transects should also be monitored. These should be placed in major tributaries and monitored, at a minimum, before and after every wet season and more frequently for the first year of operations. To augment sedimentation monitoring, remote sensing could be used to monitor landslides and erosion areas surrounding the reservoir. If this is not possible, biannual boat surveys along the reservoir perimeter can be used to demarcate erosion and landslide areas, and these can be mapped using the Global Positioning System technology.

K. Catchment and Water Management

213. Clear responsibility, authority, and management of lands surrounding the reservoir (at least up to 115 m) must be given to an institution. This does not necessarily have to preclude agriculture, but specific controls, buffers, and mitigation measures may be required to protect the reservoir from unnecessary sedimentation. The Mission suggests better integration and coordination between SESCO, Natural Resources and Environment Board, Department of Agriculture, Forestry Department, State Water Authority, and other agencies with interests in the reservoir. For example, the Department of Agriculture permits fish cage culture that may have adverse impacts on water quality conditions that are the responsibility of SESCO. If SESCO has principal responsibility for managing the reservoir, it needs to have a voice in actions by others that affect its operations or the environmental conditions for which it is responsible.

L. Fisheries and Aquatic Life

214. Given the apparent decline of some freshwater migratory species and many indigenous fish, the Mission suggests that Inland Fisheries establish a reasonable review procedure for adding species to Schedule 5 of the Fisheries

¹³²Subsequent to the Mission, the Natural Resources Environment Board of Sarawak informed ADB (through the Economic Planning Unit of Malaysia) that SESCO has been required to undertake environmental auditing as recommended by the Mission.

Ordinance of 1994. Sarawak has taken a very active role in protecting its wildlife species. Additional attention to aquatic species would be prudent. An approach that parallels the Integrated Conservation and Development Program and incorporates the traditional longhouse oversight of river reaches should be explored. Longhouses in the catchment already fine fisherfolk who use poisons. It would be easy to expand the "Honorary Wildlife Ranger" responsibility to include fish. The inadequate treatment of effluent at the Fishmart processing facility can be addressed by (i) separation of the solids that can be processed into chicken feed, fish feed, or fertilizer; (ii) aeration; and (iii) increasing the size of the settling pond, along with regular water quality monitoring.

M. Institutional Strengthening and Regulation

215. The Mission suggests that institutional oversight of SESCO be put in place regarding project operation. Concerns beyond power generation should be considered (including flood control, water quality, and aquatic resources), when managing or regulating operations. The State Water Authority may have this responsibility but will need input from the Natural Resources and Environment Board, the Department of Agriculture (Inland Fisheries), and others. We suggest that SESCO should add nonengineering disciplines to its environmental staff and further the training of staff in social, physical, and natural resource issues surrounding power generation.

E. Appendix 5

SINGKARAK HYDROPOWER PROJECT CASE STUDY

I. INTRODUCTION

A. Project Description

216. The Project provides for the construction of the 175 megawatt (MW) Singkarak Hydropower Project in West Sumatra and engineering of the 19 MW Tanggari II hydropower scheme in North Sulawesi. The case study selected for the special study only includes the first component for which the Asian Development Bank (ADB) provided a loan from its ordinary capital resources amounting to \$185.8 million.¹³³ The Project's Executing Agency is the State Electricity Enterprise (PLN). Prior to the Singkarak Project, Singkarak, a natural lake (112 square kilometer [km²]), had one effluent to the Ombilin River, which flows eastward to the straight of Malacca. The Project diverts a major part of the lake water westward, after using it for power generation in an underground powerhouse cavern, and then discharges this water to the Anai River, which flows westward into the Indian Ocean near Padang. The Project also diverts and uses the flow from Buluh River, a tributary of the Anai River (Map 3, p. vii).

217. The main components of the Project include a gated weir at the origin of the Ombilin River, water intake on the western shore of the lake, diversion intake on the Buluh River, powerhouse cavern with four turbines and accessories, headrace tunnel, tailrace tunnel, access roads, adits, and other structures for power generation and transmission. The water diversion from the lake was expected to create a net head of more than 300 meters (m) and discharge, on average, 47 cubic meters per second (m³/s) (77 m³/s at peak). The discharge from the lake to the Ombilin River was projected to be reduced from an average of 51 m³/s to a sanitary flow of 2 m³/s. The project operations began in August 1998. The operations were expected to create impacts on the upper stretch (about 29 km long from the lake outlet down to the confluence of the Selo River), in terms of restraints on irrigation, human water use, and riverine fisheries. Resettlement of population was not expected or required. Since the Project was expected to have significant environmental impacts, mitigation measures were determined based on several studies.¹³⁴ The environmental monitoring program was prepared (Attachment 2, appraisal report, Appendix 22) and the cost of mitigation measures was included under the preparatory works in the project cost estimate and covenanted in the Loan Agreement.

B. Study Methodology

218. The special study team spent the first part of the Mission in West Sumatra, where the Singkarak Project is located, and the second part in Jakarta meeting with the relevant government and nongovernment institutions. In West Sumatra, the Mission visited the project site and met with affected persons, neighboring facilities, officials of PLN, and the representatives of the provincial and district governments. The visit included (i) physical inspection of the project facilities and related structures (powerhouse, intake structures, construction camps, access roads, borrow pits, muck disposal sites, adits, transmission line, Ombilin weir, and the access to the Buluh River tunnel); (ii) snorkeling to inspect the lake bed near the Sumpur village; (iii) visual examination of irrigation canals and drainage facilities along the Anai River, waterwheels in the Ombilin River, Selo confluence, outfall near the private coal-fired thermal power plant, alahan traps near the lake and rice fields in the surrounding area; and (iv) participatory rapid appraisals (PRA) in seven villages.

219. By reviewing the project files, the study team identified main issues and selected locations in the project area where the issues could best be studied through PRA and field observations. With the assistance of the domestic consultant, seven villages, a thermal power plant, and a coal-washing plant were selected from the Ombilin River downstream and Anai River Irrigation System (ARIS) areas, and around Singkarak Lake. The main issues discussed at the PRAs were environmental and social impacts of the Project, including villagers' perceptions of the Project and their future expectations. The main preliminary findings of the PRAs and the physical inspection were discussed with the relevant authorities in the district, provincial, and national bodies in West Sumatra and Jakarta.¹³⁵ These discussions helped the study team verify the PRA findings, probe the main issues, and develop preliminary recommendations.

¹³³ Loan 1032-INO: *Power XX Project*, for \$235 million, approved on 25 September 1990.

¹³⁴ Environmental impact analysis of Singkarak Hydroelectric Power Project (parts I and II). See Appendix 11 for details.

¹³⁵ These included representatives from PLN, Provincial Fisheries Office, Environmental Affairs Bureau, Forestry Services Office, Water Resource Development Service, district governments, District Development Planning Body, National Land Body, Ministry of Public Works, Ministry of Mines and Energy, National Development Planning Agency, Environmental Impact Management Agency, Ministry of Finance, and Ministry of Home Affairs.

II. FINDINGS OF THE MISSION

A. Status of Environmental Mitigation Measures and Monitoring Plan

220. Project construction work and testing has been completed. The cost of construction increased significantly as a result of problems with the underground work on the tunnels. At the time of the Mission, the project construction staff of the Singkarak Project was preparing to completely hand over its management to the operations staff by the end of 1998. The project completion report was expected to be finished in the next few months. The mitigation measures implemented include provision of public health facilities during construction, provision of sanitary flows,¹³⁶ modification of waterwheel bypasses,¹³⁷ industrial pollution control at the coal-washing plant, construction of weirs for water supplies for Salak thermal power plant, intake facilities for coal washing facilities and Sawahlunto drinking supply, and construction of flood control works on the Anai River. Although some physical flood control structures have been put in place on the Anai River, it may not be adequately protected farther downstream.¹³⁸ Measures that did not appear to have been implemented include lengthening of the Sumani Pump intake, installation of the flood warning system, and provision of washing, bathing, and sanitary facilities through riverbed modification.¹³⁹ According to mitigation plans,¹⁴⁰ these were to be implemented prior to project construction or commissioning.

221. Monitoring measures that were implemented include partial monitoring of discharges at the Ombilin weir,¹⁴¹ water surface elevations, and fisheries yield in the lake. Monitoring yet to be implemented includes that of the groundwater levels around the lake, flood warning system, and regular water pollution control. The project environmental group is currently staffed by two civil engineers and a high school graduate with extensive experience. The Singkarak Project is one of five projects within the group's area of responsibility. However, this group does not necessarily compile and maintain all the monitoring or impact information. Some data is collected by other agencies and maintained separately. West Sumatra Fisheries Services (WSFS) is responsible for monitoring fish yield data and the director general of geology in the Ministry of Mines and Energy is generally responsible for monitoring the groundwater levels.

B. Impact on Fisheries and Aquatic Life

222. The reduction of fish yield and the number of fisherfolk affected around the Singkarak Lake and downstream rivers were underestimated in the environmental impact assessment (EIA) and other environmental studies.¹⁴² WSFS estimates a 25 percent reduction in the fish yield¹⁴³ near the lake since the Project began. Villagers reported a loss of daily income from Rp90,000 to Rp310,000 per night per *alahan*¹⁴⁴ in the peak season. Five out of six villages using these methods were reported to have similar declines. PRA estimates indicate that in one village alone, about 200 traditional fisherfolk were affected. In addition, harvest reductions ranging from nearly 100 percent at the Ombilin weir to 70 percent near the confluence with the Sinamar River were reported in the PRAs. WSFS could not verify this as it does not monitor the fish yield in this area. WSFS has not effectively propagated bilih as planned in the mitigation measures due to the occurrence of a fish parasite (*Olitropus typhus*) in the lake and the inadequacy of research on traditional fishing techniques. On the other side, increased water downstream from the Anai River has resulted in the opening of several fishponds (some of which are converted rice fields), which has increased fish production in this area.

¹³⁶ The specified sanitary flows of 2 m³/s or more were released, although there seem to be some periods when no releases occurred as per the data sheets provided by the Singkarak Project.

¹³⁷ Bypasses implemented at only a few waterwheels, and unsuccessful in the upper reach at the time of the Mission.

¹³⁸ Dataran Anai Feasibility Study for the Development of Water Resources.

¹³⁹ PLN informed the Mission in July 1999 that sanitation facilities have been provided and that the Sumani Pump intake will be put in when the water level goes down. Flood warning system is delayed due to lack of counterpart funds. Since the Mission, a 24-hour notice prior to a planned flood is given through village leaders.

¹⁴⁰ Engineering Design: Environmental Management Plan and Engineering Design: Environmental Monitoring Plan.

¹⁴¹ The data is partial and not continuous as specified in the operations manual. Some data is provided for periods through the bypass, but flows through the gates are given as dimensions. Rating curves data available does not generate discharge data but allows its calculation.

¹⁴² The project appraisal document (para. 116) estimated partial loss of yield for 180 fisherfolk and indicated that the decrease of 1 percent could be easily offset by introduction of efficient fishery methods.

¹⁴³ The team believes that this percentage reduction is significant based on information provided by the 1988 Institute for Regional Economic Research study about harvest of 886 kilograms of fish/day from the lake and the estimates of income loss given by the PRAs. However, the entire adverse impact on the fishery may not be attributed to the Project.

¹⁴⁴ Indigenous fishing technique of trapping fish in channels built along the river. It is not effective at high water levels. PLN reported in July 1999 that recent studies indicate that best results are achieved when two types of fish are joined in one net. In November 1998, the exchange rate was Rp7,900 per \$.

223. Fish and other aquatic life are threatened in the lake and Ombilin River. Two causes related to the Project exacerbate the situation: the decline in fish migration from the lake into the river during high flows and fish not being able to travel upstream for spawning; and the reduction in reproduction success of shoreline spawners caused by fluctuating water surface elevations. Fisherfolk report, and WSFS confirms, that at least three species are no longer in the river and that the populations of the soft-shell turtle (*Lab*) have declined significantly. Further, long-term threats are the (i) decline in habitat suitability due to the degraded water quality conditions resulting from reduced flows and continued pollution loads in the Ombilin River, and (ii) potential risk to aquaculture along the Anai River due to the fish parasite (*Oitropus typhus*) in the Singkarak Lake.

C. Impact on Water Quality, Health, and Sanitation

224. As anticipated, there has been little or no long-term impact on the water quality of the Singkarak Lake as a result of the Project.¹⁴⁵ Measures to reduce pollution loading at the coal-washing facility have been implemented. Three weirs have been placed in the river to provide additional water surface elevation for intake structures for a power plant, the coal-washing facility, and water supply. However, indirectly, the reduced flow regime has caused problems such as increased incidences of skin and intestinal sickness and rapid movement of waterborne disease vectors. A drop in groundwater levels (reported to be 2-3 m) resulted in dysfunctional wells and the increased use of the river for bathing and defecation.¹⁴⁶ Water quality deteriorates rapidly after the Selo confluence due to increased sedimentation and higher densities of households and industrial users.

D. Impact on Irrigated Agriculture

225. Although the Project did not displace any of its affected persons, its impact on irrigated agriculture appears to be widespread. The release of water from Singkarak Lake to the Anai River has augmented ARIS,¹⁴⁷ enabling farmers (in the phase 1 area) to cultivate about 6,000 hectares (ha) of previously rain-fed land and to build more fishponds. For example, in one subvillage, during the last six months, farmers have constructed 32 new fishponds. But the partially developed phase 2 area of ARIS now experiences more floods, which damage crops and dwellings.¹⁴⁸ The Project's impact on irrigated agriculture in the surrounding areas of the Lake and Ombilin downstream is negative. According to the PRA, water-level fluctuations and inadequate water planning at the Ombilin weir cause floods and droughts downstream of the river. In three large villages on the Ombilin River, about 300 ha of irrigated rice is affected in the dry season,¹⁴⁹ as farmers cannot use their waterwheels for irrigation due to the low water level on the river. Several villages on the lakeshore reported experiencing floods, and others complained about the reduction in the groundwater since 1993. The reduced water surface elevations in the lake may possibly reduce the elevation of groundwater, thereby affecting local wells and springs and surface flows for rivers and streams flowing into the lake.

E. Floods and Income Losses

226. Floods destroy crops and damage dwellings, local irrigation facilities (waterwheels and associated weirs), and fishing infrastructure. Sudden floods caused by the opening of Ombilin weir is reported to have destroyed or damaged more than 100 waterwheels and weirs on the Ombilin River in 1998. The cost of replacing a waterwheel was reported to be about Rp2 million. The Singkarak Project has agreed in principle to pay Rp0.5 million for each waterwheel that it believes was damaged due to the fluctuations during the testing of operations.¹⁵⁰ At the time of the Mission, farmers preferred that the Singkarak Project substitute waterwheels with water pumps, which can operate with the current low water levels. Farmers were willing to operate and maintain the pumps with their own resources. One of the villages by the lake reported that it lost four rice harvests since 1993 due to heavy flooding. The farmers report, and the Singkarak Project confirms, that the farmers become eligible for insurance payments only if the water level in the lake reaches 367 m. However, the lake area is flooded when it goes above 363 m.¹⁵¹ Floods are said to have caused more income losses

¹⁴⁵ The lake is in the process of nutrient enrichment independent of the Project, which may result in additional changes in water quality and aquatic ecosystems.

¹⁴⁶ PLN informed the Mission that it plans to provide about 50 drinking water wells for the use of 500 households.

¹⁴⁷ Phase 1 of ARIS was partially funded by ADB, only the main canal is built under phase 2.

¹⁴⁸ The Department of Public Works managed ARIS.

¹⁴⁹ Singkarak Project has agreed to pay compensation for 170 ha, and PLN has informed that after the Mission, compensation has been paid as agreed.

¹⁵⁰ PLN has informed in July 1999 that compensation for these have been paid.

¹⁵¹ PLN is reported to have paid an insurance premium. PLN has agreed to compensate for 100 ha of one crop in this village when water level reaches 363 m. Subsequent to the field work, the Mission was informed that about 85 percent of this compensation was paid. The district government is currently responsible for settlement of the remaining 15 percent using PLN funds handed over to them.

among fisherfolk than among farmers.¹⁵² Many of the fisherfolk had invested a lot of money in fish cages and fishponds by the river. Those structures were washed away by floods. In the area downstream of ARIS and at several villages by the lake, floods have damaged houses.¹⁵³

F. Impact on Surrounding Environment

227. Road access and rural electrification have improved conditions for several villages along the roads. Positive impacts have been generated in terms of employment generation and enhanced incomes. Expansion of activities such as brick manufacturing has adverse implications on subsequent ecological degradation resulting from uncontrolled removal of sands and clay materials and increased collection of necessary firewood from the adjoining forests. Illegal harvesting of primary rain forests along the access road from the bridge across the Buluh River to the tunnel entrance was evident to the Mission.¹⁵⁴ This could also result in loss and degradation of habitat for several listed (endangered, threatened, or rare) species in the vicinity of the access road, including the Sumatra tiger.

G. Impact from Construction and Muck Disposal

228. The area disturbed by the Project is fairly limited and amounts to borrow areas, muck disposal areas, lay-down areas, construction camps, workshops, and the Project's permanent offices and supporting residences. The intake structure and weir take up relatively little space. A number of areas disturbed by the Project need to be rehabilitated. The muck disposal piles at each of the adits have been compacted and substantially treated for drainage control but remained unvegetated and barren. A large borrow area on the Anai River had not been rehabilitated or converted to a designated borrow area. Several buildings and other structures were partially removed but concrete slab floors and some construction materials were yet to be cleared. Local villagers have requested several buildings that have been abandoned for village meetings and other purposes.¹⁵⁵

H. Employment Generation

229. The Project generated employment opportunities for local villagers and outsiders. Many villagers worked as laborers at project construction sites. Drivers and work supervisors were also recruited, mostly from the project area.¹⁵⁶ Project hires were employed from six months to four years (under contract arrangements) and earned wages that were comparable with local wage rates for similar jobs. A few young villagers with higher educational qualifications were recruited by the Singkarak Project as its employees. There were no major clashes between the local workers and others recruited (mainly from rural Java), who stayed in labor camps and were provided project vehicles for transportation. On average, each new fishpond created from the water from the lake channeled through ARIS produced Rp3 million-worth of fish in six months.

I. Land Acquisition

230. At the design stage, the Project was expected to acquire about 80 ha of unpopulated and nonfarming land for the labor camps, powerhouse, and borrow areas. However, in addition, PRAs indicated that irrigated rice, dry cultivation land, and some fishponds were also acquired for project purposes. From the villagers' point of view, compensation paid for their lands was quite low compared with their economic values.¹⁵⁷ The Singkarak Project consulted district administration, agricultural, and tax departments in deciding compensation rates. Villagers expect PLN to include the value of standing crops and the estimated income for 10 years in determining the compensation for land. They expected PLN to apply this principle in compensating fishponds as well. Some of the acquired lands have been handed over to villages at the completion of construction works. There are still disputes about ownership of land reclaimed from the lake adjacent to the tunnel intake area.

J. Collective Action by Affected Persons

231. Some form of collective action was observed in most of the villages where PRAs were conducted. Villagers have formed their own farmer groups, water users associations, wheel owners associations, and fisherfolk associations.

¹⁵² In one study village, about 200 fisherfolk used to earn Rp10,000-100,000 a night by fishing.

¹⁵³ The lack of secondary and tertiary irrigation canals in ARIS downstream areas affects both crops and houses. Many farmers have built houses on their rice lands due to pressure on homesteads in the area downstream of the Anai River.

¹⁵⁴ Since the Mission, PLN has informed ADB that the access road has been closed to wood and log transportation.

¹⁵⁵ Since the Mission, PLN has handed over the responsibility of implementing this request to the local government.

¹⁵⁶ For example, 20 drivers/workers were recruited from a village in ARIS and another 60 from a village near the lake.

¹⁵⁷ There was a dispute regarding the land ownership in the lakeshore area (6 ha).

These associations have their own rules, bank accounts, and specific functions. This capacity among villagers to mobilize group efforts can be used as an interface between the Singkarak Project and affected persons. Advance public warning of floods, compensation payment and procedures, and various extension programs could be channeled through these organizations.

III. CONCLUSIONS AND RECOMMENDATIONS

232. The Project was beneficial in terms of low-cost power generation from renewable energy sources. In addition, it neither required physical relocation of residents nor did it create substantial land disturbances for plant construction. The Project has provided for enhanced economic opportunities and human conditions in the Anai basin. However, the adverse socioenvironmental impacts in the lower Ombilin River are a cost that was not adequately mitigated at the time of the Mission.

A. Operations Management

233. The operations manual (and the Mission assumed the operations plan) was developed with an assumption of a 2 m³/s release at the Ombilin weir. The proposal at the time of the Mission was to increase releases to 6 m³/s during the six-month dry season. This will change the proposed rule curves (lake elevation goals) and operating procedures. In addition, the operating manual provided little guidance about the control of downstream spills or operational requirements when the Anai River floods. Operations in 1997 and 1998 did not appear to meet the proposed rule curves for the lake. The conditions have changed and the operations plans need to be modified,¹⁵⁸ the Mission suggests developing a revised operations management manual that considers the project profitability and costs, evaluation of physical engineering solutions,¹⁵⁹ and the minimum flow release needed by the competing downstream users, water quality, and aquatic life.¹⁶⁰ To do this, real-time monitoring needs to be done of the (i) discharges at the Ombilin weir,¹⁶¹ (ii) inflows of Sumpur and Sumani rivers, (iii) environmental and social conditions along the Ombilin River to the confluence with the Sinamar River, and (iv) water surface and discharge conditions along several points of the Anai River. The plan should include input from other users including the villages, their representatives, the appropriate reviewing agencies, and nongovernment organizations. The local government has proposed a water resources board structure as a consultative committee of various stakeholders, including PLN, thermal and coal power companies, and representatives of waterwheel owners, farmers, and fisherfolk. It will plan the allocation of the lake's water among competing stakeholders and resolve disputes arising from the allocation plan. Rigorous control, quality assurance, security at the weir, and implementation of the spill warning system will also be needed. The plan should be revisited after five years of operation.

234. Restructuring the minimum flow releases will be the most difficult constraint for the Project due to potential costs. The least-cost solution to some of the downstream problems may be simply increased minimum flows. This alternative should be considered along with other solutions to the downstream problems. Sumatra's provincial government and the Singkarak Project are in particularly good positions to consider releasing additional flows due to the prevailing excess supply of power.¹⁶² However, the planning should take a long-term view of economic, social, and environmental trade-offs.

B. Communication and Public Relations

235. PLN should take prompt action to mitigate adverse impacts of the Project. The consultation process slowed as project managers and engineers began to concentrate on physical construction. As a result, the Singkarak Project failed to win the continuous support and approval of the affected persons. This has created some "distrust" among villagers about the Singkarak Project's plans and actions. Villagers believe that the Singkarak Project has alienated itself from them by not honoring its promises, delaying compensation, and placing less importance on affected persons' socioeconomic well being. The Singkarak Project could still develop a healthy relationship with affected persons by becoming more transparent and accountable in its affairs and involving the affected persons in project management through community organizations. A policy of being a good neighbor toward affected persons would certainly enhance the Singkarak Project's image among the affected persons which, in turn, would facilitate the Singkarak Project operations in

¹⁵⁸ An ordinance for sharing water among competing stakeholders is being prepared.

¹⁵⁹ Examples include providing water supplies through deep wells or drinking water treatment facilities.

¹⁶⁰ The Water Resources Committee of West Sumatra, which primarily deals with irrigated agriculture, has issued guidelines on meeting water requirements of the Ombilin River, and these are to be implemented by the Singkarak Project. Currently, attempts are being made on a pilot basis to develop specific laws on water rights (based on existing customary and statutory laws), along with organizational structures and procedures to translate these general laws into specific regulations.

¹⁶¹ Discharge data should be generated as gate dimensions and as m³/s.

¹⁶² A PLN-owned 200 MW coal-fired thermal power plant located 40 km downstream from the Ombilin weir was completed in 1997, but is not in operation due to an excess supply of power.

the project area. Consideration should be given to villagers' requests for water pumps, spill warnings, and the use of abandoned buildings to the extent possible.

C. Need for Representation and Advocacy

236. Although villagers belong to clans and have elected administrators and various farmer and other associations in their villages, they often fail to articulate their needs, aspirations, and complaints at higher levels, and to have a "voice" in local and regional development matters. This vacuum could be filled in by agencies such as local universities. These agencies could articulate and negotiate their clients' rights over limited resources, such as water. An example is the intention to have the proposed water board decide the distribution of Ombilin River waters among different stakeholders, including the Singkarak Project. Future projects of this nature need to provide for meaningful public consultations and local nongovernment organization involvement at an early stage in the EIA process, preferably prior to determining the terms of references for EIAs and the social impact assessments.

D. Preservation of Natural Resources

237. The Mission suggests that a fisheries management plan be developed for Singkarak Lake and Ombilin River. The plan needs to be integrated with the operations plan and model development described above. Key issues will be minimum flows to the Ombilin River, management of water surface elevation of the lake, and ramping. The goals of the plan should be maintaining fishery production (harvest) at preproject levels, biodiversity, and the number of species (with special consideration for the endemic fish named Bilih). The plan should evaluate fish passage at the Ombilin weir, screening, and other devices (lights and sonar) used to reduce entrainment; artificial propagation (hatchery); and research on disease control, control of watershed contaminants, and controls on harvest methods and periods.¹⁶³

238. A key issue for terrestrial ecosystems is the appropriate revegetation or reclamation of muck disposal and construction areas. Another very important issue is controlling illegal logging in the protected forests along the access road to the Buluh River diversion structure. This could be done by policing and enforcing the existing laws, augmented by placing a gate and check station at the Buluh River bridge.

E. Monitoring of Impacts

239. The Mission recommends that the Singkarak Project use staff with training in environmental and associated fields to work on environmental management issues of the Project and that their responsibilities in terms of mitigation management and monitoring be clearly defined. The Singkarak Project should also coordinate and house information on mitigation actions and monitoring done by other government institutions. The addition of other softer solutions to community relations and preservation of agricultural and biological resources should be considered as alternatives to engineering solutions. The monthly data collection on fish yield should be modified to also reflect catch per unit effort as fisherfolk often increase their efforts with declining stocks and still maintain yields until populations crash. Sampling should include independent surveys by a fishery biologist in addition to fisherfolk surveys. Fisheries surveys should be done both around the lake and downstream of the Ombilin River. Frequency of water quality monitoring is inadequate¹⁶⁴ and unfocused. The Mission recommends that monitoring efforts be done at key points in the river more frequently and focus only on key parameters. The efforts would enable the proposed water resources board to regulate polluters of the river and avoid the need for the Project to shoulder this responsibility. Groundwater monitoring needs to be done not only near the lake but also downstream of the Ombilin River (see other recommendations on monitoring included under operations management in para. 18).

¹⁶³ According to PLN, this is the responsibility of the local government of West Sumatra.
¹⁶⁴ Only three or four samples have been collected in three years.

F. Appendix 6

LINGJINTAN HYDROPOWER PROJECT CASE STUDY

I. INTRODUCTION

A. Project Description

240. The Project includes the construction of a 240 megawatt (MW)¹⁶⁵ run-of-the-river hydropower plant on the Yuanshui River in Hunan Province. The Project will serve as a reregulating station for the 1,200 MW Wuqiangxi hydropower scheme located upstream. The Lingjintan Project is the most downstream development of 17 proposed hydropower schemes on the main stream and tributaries of the Yuanshui River. The Project is under construction, and the first turbine began operation in December 1998. The resettlement program began in 1992. The Asian Development Bank is financing \$116 million out of a total cost of \$367 million. Hunan Electric Power Company was selected as the Executing Agency, and Wuling Hydropower Development Company appears to be managing the Project (Map 4, p. viii).

B. Study Methodology

241. The Mission visited the People's Republic of China in November 1998. Prior to the Mission, the study team reviewed project files, identified main issues, selected locations for participatory rapid appraisals (PRAs), and collected the relevant policy and strategy documents. The first part of the Mission was spent in Hunan and the second part in Beijing meeting with the relevant government institutions. In Hunan, the Mission visited the project site and met with affected persons, resettlers, neighboring facilities, project officials, and representatives of the provincial and district governments. The visit included (i) physical inspection of the construction site and related structures (dam, ship lock, gates, powerhouse, and riverbank fortification); (ii) gravel and sand dredging facilities; (iii) reconnaissance-level physical inspection of the Yuanshui River upstream to the Wuqiangxi rapids and downstream river to Tao Hua Yuan; and (iv) physical inspection of fishponds and freshwater pearl facilities; new land; and roads, bridges, drainage, and other public facilities in the resettlement area.

242. PRAs focusing on social, economic, and environmental impacts were held in four villages where a substantial amount of land will be inundated and displacement of people is expected. The preliminary findings of the Mission were discussed with the relevant provincial bodies in Changsha and in Beijing. These discussions helped the study team verify the PRAs' findings, probe the main issues, and develop preliminary recommendations.

II. FINDINGS OF THE MISSION

A. Status of Resettlement and Rehabilitation Program

243. A total of 4,753 persons in 830 rural households was to be moved from agricultural and residential land. About 70 percent of these persons had been resettled at the time of the Mission; the rest were to be resettled before May 1999. The revised compensation and land development fund (Y227.8 million) was reported to be sufficient to finance the entire program. It intended to resettle people as close as possible to their original homes, making the physical shift less traumatic. The objective of the resettlement and rehabilitation program (RRP) was to rebuild the lost property, mostly on flattened hilltops and terraces. By July 1998, a total of 509 hectares (ha) (7,633 mu) of land had been developed through rice land adjustment and reclamation and development of hilly land, which benefited 2,238 persons. The main occupation would continue to be cultivating land. Cash crops, animal husbandry, and aquaculture was to become important sources of livelihood in the area. Local industries such as bamboo products and freshwater pearl culture would supplement these incomes. Household income of both resettlers and their hosts would decrease initially, but the resettlement fund and social insurance mechanisms would continue to support them to improve their livelihood.

244. The administrative structure in the project-affected counties plays an important role in the resettlement process. According to the County Resettlement Bureau, a steady increase in the average household income among the resettlers had been noticed, from Y928 in 1993 to Y1,361 in 1996 to an expected Y1,800 in 1998. Documentation to support this trend was not available.¹⁶⁶ Various cushioning mechanisms, such as a later-stage-support-fund of Y811,000 from the Lingjintan Project's operational revenue, infrastructure subsidies, support from the Hunan Women's Federation for

¹⁶⁵ This has been changed to 270 MW with nine turbines instead of eight as planned.

¹⁶⁶ In November 1998, the exchange rate was Y8.2775 per \$.

educating poor children, and National Civil Affair Department funds for natural calamities, were expected to support resettlers during their initial hard times. Monitoring of the RRP is the responsibility of Mid-South Design and Research Institute and Resettlement Work Monitoring Corporation. Although careful investigation of income, land, and housing was carried out in the villages, monitoring of the resettlement process and resettler income and adjustment problems appeared to receive little attention. There was a lack of a comprehensive database of affected persons, their socioeconomic conditions, and changes in income sources. Without such a database, it was difficult to support or refute claims of increasing income among resettlers.

B. Status of Environmental Mitigation Measures and Monitoring Plan

245. The monitoring is done periodically for air and water quality by collecting tissues from some aquatic organisms. The design is a broad approach that provides a reasonable baseline for standard air and water quality parameters. However, monitoring of aquatic organisms or other biological indicators is neither in place nor planned. The design does not adequately focus on the Project's construction or operational impacts. Procedures are not in place to sample for accidental spills or toxic substances or point-source sampling at the Project's effluent locations. During the visit to the construction site, the Mission found some deficiencies and problems with the implementation of environmental management and mitigation measures, including unsatisfactory control of toxic substances, such as petroleum products; lack of control of solid domestic and construction waste; and inadequate management and treatment of domestic and construction wastewater. Daily inspections of the site to enforce mitigation measures do not seem to be done. In addition, there was no clear line of responsibility to solve environmental problems that might become apparent with inspections.

C. Fisheries and Aquatic Life

246. Four rivers effecting Lake Dong Ting are slated for extensive water development for flood control, hydropower, and other purposes. The Lingjintan Project is one such development. Although it is a run-of-the-river facility, it will change the character of the Yuanshui River area from a free-flowing riverine system to a lake-like condition with subsequent changes in velocities, depths, and temperature conditions. These changes will be most apparent in inundated tributaries that are far from the main through flow of the river. The reach below Wuqiangxi is already impacted by its peaking operations, and subsequent to the Lingjintan Project completion, the water surface elevation changes in the reservoir area can reach 1.9 meters in one day. This will result in a varial zone where daily inundation and desiccation will eliminate most biological activity and subject fish fry to stranding and increased predation. Documentation on the existing Wuqiangxi conditions were not available. The Lingjintan Project's environmental documentation does not describe the elevation changes that can be expected downstream of its dam after operations. As there are many shallow shoals with low gradients downstream and upstream of the Lingjintan dam, this impact will occur over a large area.

247. The Lingjintan Project, Wuqiangxi, and 15 other proposed projects along the Yuanshui River will also have adverse impacts on migratory fish in the river and possibly Lake Dong Ting.¹⁶⁷ The available environmental documentation for this Project neither adequately addresses the significance of this impact nor does it propose sufficient mitigation. Although the fishery community will be changed, the postproject productivity for commercial fish may be as high as preproject conditions due to the extensive aquaculture mitigation program that is under construction. However, it is not clear that traditional fisherfolk will be the parties involved in the new aquaculture development.

D. Slope Stability

248. The Project has taken major efforts to stabilize the shoreline of villages and industrial areas. In addition, efforts have been made to protect agricultural areas from inundation. However, some areas in the reservoir shoreline that remain may be subject to increased landslides after project operation. One large landslide on the left bank, approximately one half the distance from the dam to the Wugzidong rapids, may be further destabilized by project operations. However, the slide area does not endanger any agricultural land or structures.

E. Wildlife and Vegetation

249. Forest riparian communities along the shoreline will be inundated by the Lingjintan Project. Research in other temperate areas indicates that these communities are important to aquatic communities and provide key habitat for passerine birds, amphibians and egrets, herons, and some raptors. The Mission saw several large stick nests on riparian

¹⁶⁷ Wuqiangxi hydropower plant, built in 1996 (not financed by the Asia Development Bank) prior to the Lingjintan dam, is 41 kilometers upstream on the Yuanshui River (1,050 kilometers). Although Wuqiangxi Project has greater potential to adversely impact migratory fish, the Lingjintan facility is the most downstream and, without fish passage, all upstream areas would be potentially adversely impacted. The cumulative impacts of both projects are substantial, but navigation locks provide an opportunity to reduce impact. The suggestion made regarding the operation of the Lingjintan boat locks should be applied to Wuqiangxi as well (Appendix 6, para. 26).

trees that will probably be inundated. Most of the area is fairly well developed, and the forests are disturbed and heavily used. In some areas, small tributaries have cut steep canyons in the river edge where good wildlife habitat will be lost. Species specialized to river conditions, such as mergansers, may be eliminated or drastically reduced in the inundation area. The backwaters formed by the reservoir should improve conditions for several waterfowl species. However, the varial zone effects will reduce the value of these areas.

F. Secondary Impacts

250. The relocation of affected persons and the creation of new economic activity will increase the impacts of the Project. For example, some 516 ha are planned for mitigation development, exclusive of housing areas and new roads. In many cases, these were adjacent shrublands or forestlands that will be removed. In some cases, stream courses will be inundated with check dams to produce fishponds with additional impacts on existing aquatic communities. The creation of fishponds within stream courses may have the most impact. In many areas, the creation of new lands, rice fields, and upland farming areas requires extensive movement of soils and excavation. The newly disturbed areas will be subject to erosion and have concomitant local impacts on vegetation and ecosystems. The areas do not appear to be in primary forests or prime wildlife areas.

251. The Project requires transmission lines (including two 120 kilovolt lines totaling 220 kilometers and two new 4,000 square meter substations). Consequently, the transmission line construction and operational impacts are indirect impacts of the Lingjintan Project. Another indirect impact would be the ability of the Wuqiangxi plant to operate as a peak facility given the reregulating capability of the Lingjintan Project. However, this would contribute to water level fluctuations in the Wuqiangxi reservoir and to associated impacts.

G. Communication and Public Relations

252. During the resettlement planning stage, agencies dealt intensively with township and village leaders, thus indirectly drawing the individual households into the planning framework. Villagers knew about the Lingjintan Project in 1989 and cooperated with officials during the inundation index surveys. Officials of resettlement agencies had met with them several times a year since 1994 to identify new resettlement sites and cultivation plots. In these meetings, they were told about land compensation, reclamation, and readjustment. Village leaders listened to the officials' opinions and took action. In one instance, some villagers (of Xing Longjie Village) were opposed to the building of an embankment to safeguard low-lying lands. Eight households in the same village refused to sign the consent to the Project. Such different ideas were heard and tolerated.

253. Resettlers reported that during the implementation stage of the RRP, they did not get sufficient information about resettlement and production ways from their leaders. They had to hear about such matters from others. Village leaders sometimes appeared to be selectively informing those who will be affected by a particular decision, which leads to misunderstandings and confusion among the others. For example, resettlers had no knowledge about the subsidy of Y70 during the relocation and resettlement, or the "returned" benefit of Y300 per year per person from the Lingjintan Project revenues after operation of the plant begins. They believed the subsidy and the benefit may have already been spent on land development programs.

H. Changes in Production Ways

254. Major changes in traditional production ways were being introduced in the affected area, including (i) redistribution of the remaining cultivated land among villagers, (ii) allocation of newly rehabilitated slopeland among resettlers and others who lost theirs by sharing with resettlers, and (iii) provision of technical and financial assistance for developing economic crops and fishponds. However, given the limited land resources in the project area, these land-based economic rehabilitation measures could only provide an initial production basis or minimum food supply for most resettlers. Resettlers and village leaders had doubts about whether these land-based economic rehabilitation measures were sufficient to restore their income and livelihood, especially during the initial years of resettlement.

I. Income Restoration and Improvement

255. Although persons who lost their farmland receive assistance to develop new lands or find other occupations, resettlers generally felt that the Project will impoverish them for a substantial period. The average rice land holding per villager decreased by about 50 percent, from 1.3 to 0.7 ha in the project area. This 0.7 ha of rice land would provide resettlers' subsistence but was not sufficient to restore or surpass their previous income levels. Other income-generating activities, such as animal husbandry or fishponds, needed substantial initial investments. As one woman pointed out, a household needs to first restore its grain production level for consumption before it embarks on animal husbandry. Land readjustment programs, fishponds, and new houses have occupied most of the grassland and vegetable gardens. As other income-generating activities were rare in the area, some resettlers reported that they would have to migrate seasonally out of their villages in search of supplementary employment.

256. A substantial part of the new production plans constituted medium- to long-term plantations (including tea, chestnut, bamboo, and timber), which take 5-20 years to generate income. These lands are reported to be distributed on a contract basis among villagers who have initial investment and skills. Resettlement agencies believed that those who

lose all or part of their productive lands could earn additional income by cultivating temporary cash crops in newly developed lands and on some of the original agriculture land that were not yet used for construction or inundated.

J. Relocation and Recovery

257. In the Lingjintan Project, there was a widening gap between relocation of affected persons and the recovery of their livelihood. In principle, physical relocation should be preceded by investments establishing new production systems for individuals in anticipation of their move. Thus, the terraces should be leveled and fruit trees planted long before the houses are constructed to minimize the period between the move and production. In the Lingjintan Project, this scheduling has apparently broken down. Although more than 70 percent of relocatees have been resettled at the time of the Mission, most of them earned their livelihood on their original lands. The plan of starting the operation of the hydropower plant by mid-December 1998 hardly allowed sufficient time to complete the development of new agricultural land before inundation.

258. Each relocated household received a standard-size house plot with infrastructure. About 70 percent of the total cost of a new house was provided by the Government as compensation. Household savings, borrowings, and donations in-kind or money from relatives and friends financed the rest. Household members were responsible for constructing their new dwellings. Vulnerable households (e.g., those of the elderly, disabled, or others) without able-bodied workers, received government support to build the homes. In PRAs, out of about 100 participants, only one or two previously had houses that qualified as class I houses. The rest were classified as class III. The new houses were generally superior to the old class I houses. On average, a new house costs Y50,000. Responsibility for rebuilding public infrastructure rested with the functional departments of local government, such as those of education, public health, and social welfare. In addition to the compensation received for the demolished structures, these departments provided their own resources to rebuild some access roads and utilities. Newly constructed community centers (two PRAs were held at village community centers) were of better quality than the old ones, with better facilities (electricity, water, and toilets). There was a significant improvement in the facilities provided and the construction materials used. Yet, obtaining safe drinking water after the inundation remained a problem, especially because new resettlements were located at high points of the village land, making digging of wells difficult.

K. Resettlers' Satisfaction

259. Resettlers were happy with their new houses. Physically, these households indicated that they achieved a superior lifestyle compared with their former timber houses. However, a dissatisfaction was observed among all resettlers due to worries about their shrinking land-based income sources. Some resettlers believed that it would take at least five years for them to recover their former level of income and, therefore, they had to find new livelihoods outside their villages and townships to survive. This sense of dissatisfaction was aggravated by other concerns, such as losses in fisheries not being compensated and loss of income from gravel and sand collection¹⁶⁸ from the riverbed.

260. Many villagers also feared that floods will damage their newly developed lands. PRA participants repeatedly pointed out their concerns about the inundation line of the reservoir, and some wanted to raise the new rice land by one meter. Others were worried that if their new houses were damaged by project-related floods, they may not get compensation. There were plans to relocate the whole Xing Longjie town (2,500 people), in case of a major flood. As one villager said, if the inundation level rises, there would be no land to develop, as practically all hilly and other uncultivated lands in the villages had already been developed to meet the relocation caused by the Lingjintan Project.

261. Despite the economic worries, relations between resettlers and their host communities were generally satisfactory. Given the additional pressures and scarcities that an influx of resettlers created, host communities responded with sympathy and understanding. The host community sometimes helped its new neighbors by supporting them in building their new houses or providing temporary lodging for them. Occasionally, there has been some friction. One main reason for this is the resettlement of relocatees within their own village boundaries despite the fact that scarcity of land affects both groups. For example, a resettler pointed out that because of his relocation, his current neighbor lost his vegetable garden. While appreciating his neighbor's loss, the resettler also wishes to have a piece of land to cultivate vegetables for consumption rather than having to buy them.

¹⁶⁸ The Government considers this to be an illegal activity.

III. Conclusions and Recommendations

A. Environment Mitigation Management

262. The outline translation of the mitigation management plan available to the Mission does seem to address most of the major issues surrounding hydropower construction projects. There appears to be a shortfall on the implementation and enforcement of construction-related mitigation. As described, there is inadequate control, management, and treatment of solid waste, liquid waste, and toxic substances. There seemed to be apparent misunderstandings on responsibilities and reporting of the various parties' monitoring, implementing, and enforcing. This needs to be rectified. The Mission strongly suggests that the current institutional structure be reevaluated to reduce potential conflicts of interest and facilitate mitigation implementation. The Mission also suggests that enforcement measures, such as penalties, fines, or other measures, be used as leverage to ensure compliance. Measures can be contractual or regulatory but require incentive or punishment (typically financial) such that necessary mitigation and management measures are taken.

B. Monitoring Environmental Impacts

263. The Mission suggests the monitoring be revamped with less emphasis on air quality, a narrowing of the parameters in water quality, and more frequent sampling. Continuous monitoring of parameters such as pH, dissolved oxygen, and temperature can be implemented at a low cost. As a run-of-the-river hydropower facility, the Project will have minimum impact on water chemistry, except for possible modest seasonal increased temperatures, and no impact on air quality. Point-source monitoring of water quality on the stream flowing through the construction camp should be initiated and monitored until water quality parameters meet standards. The Mission also suggests that an accidental spill-sampling program be implemented in the event of a spill. Air quality monitoring should be restricted to particulates and possible checking of emissions of project equipment, mostly during construction. Since biological organisms will be the most likely to be impacted by project construction and operation monitoring, biological impact is essential. Monitoring of fish yield through surveys of fisherfolk and sampling for key invertebrates, such as freshwater shrimp, clams, and benthic invertebrates, are recommended. The Mission urges that a fish biologist or an aquatic ecologist be added to the environmental staff per the suggestion in the summary environmental impact assessment so that necessary expertise is available.

C. Reservoir Water Service Elevation

264. Given the anxiety surrounding the reservoir inundation line and the recent experience of floods in 1996 and 1998, the Mission suggests that the analysis done to determine water surface elevation expected for 5-, 10-, 20-, 50-, and 100-year flood events be reexamined. The modeling and the analysis should be checked against recent floods, and the quality of topographic and hydrological data on which the model is based should be reexamined. Actual flood data can be used to recalibrate the model as needed. Once the reexamination is done, the resettlers should be informed about the results so as to alleviate their worries.

D. Fisheries and Aquatic Life

265. The Lingjintan and other projects constructed (Wuqiangxi) or planned for the Yuanshui River will have adverse impact in the riverine communities in place. Although they may be replaced by equally productive or more productive reservoir communities, the fish adapted to free-flowing water and the migratory fish will be adversely impacted. This issue is particularly important here as there are plans for extensive water development in adjacent river systems, such as the Qing, Yangtze, Lei Shui, and others. In other systems where there has been extensive hydropower development, many of the species are extirpated and have become endangered. As a result, the Mission suggests the following items.

- (i) Conduct a study (as indicated in the 1993 summary environmental impact assessment) on the ecology, migratory behavior, and economic value of migratory fish in the Lake Dong Ting, particularly in the Yuanshui River.
- (ii) Research, if needed, or document the artificial propagation methods for the migratory and riverine species of the Yuanshui River.
- (iii) Use the shipping lock at Lingjintan dam for fish passage based on the research in (ii). Additional information on the specific timing of migration (daily and seasonally) would be required. Boat locks are used successfully in other systems to move migratory fish past dams.

266. Given the plans for extensive water development in the Lake Dong Ting watershed, the Mission suggests (consistent with the national regulations on nature reserves) that free-running river systems be included as a representative natural ecosystem, as species have become endangered over time. The Mission further suggests that water and energy planning agencies and the State Environmental Protection Agency explore the identification of rivers (or river reaches), for protection as representative natural habitats. The United State's Wild and Scenic Rivers Act may be a model worth considering. Without similar measures and water development plans implemented, many species will become endangered or at least extirpated from major portions of their historic ranges and there will be few examples of free-flowing larger rivers. This should be part of an overall planning effort.

E. Developmental Resettlement

267. In the Lingjintan Project, the RRP is considered as a development "challenge" rather than a "burden" on project resources and the state. As a result, the Project takes income restoration and development as seriously as physical relocation. The RRP aims at securing bases for household income and welfare, which would take them beyond their traditional occupations such as subsistence farming. The unique land tenure patterns in the People's Republic of China; active involvement of county, township, and village leaders; and the provision of sufficient resources for resettlement facilitate rapid restoration of resettlers' well being. The attempt at relocating resettlers in their own villages in a way redistributes their hardship and loss of income among all villagers. However, the RRP, gave scant attention to host communities: basic data on their socioeconomic conditions, their attitudes toward resettlers, and their coping strategies with resettlers are not carefully considered. In developmental resettlement, it is necessary to emphasize the need for, and the strategy of, income restoration and improvement of both resettlers and their hosts.

F. Involvement of Local Government in the Resettlement Process

268. Elected leaders of local governments take special interest in local development, including resettlement. This is evident in their persistent interest in developing land, searching alternative income sources for villagers, securing more compensation investment funds, and monitoring the progress of resettlement programs. Often, village leaders are also resettlers. Personal contacts with villagers, recognition as benevolent leaders, and control over development funds make them ideal catalysts in resettlement programs. Their role in integrating resettlers with host communities is well noted in the Lingjintan Project.

G. Relocation Distance

269. A noteworthy element in the RRP is its serious attempt at resettling relocatees within their original village boundaries. If it is impossible, then resettlement will be done within their original township. This reduces resettlers' displacement trauma and facilitates their integration into host communities. The financial and emotional costs of resettlement in such instances are much lower than that of complete displacement and relocation in far away places.

H. Land-for-Land Option for Income Restoration

270. The land-for-land option is sometimes not the most appropriate option for income restoration. In the Lingjintan Project, resettlers and hosts may not even be able to restore their preinundation income levels through new agricultural

production techniques. Although it is better to invest compensation than to make payments, the funds could also have been invested in developing nonagricultural employment opportunities, for example, in the light industries sector.

I. Income Restoration and Improvement

271. The current trend, which appears to be gradual impoverishment of some affected persons, is not satisfactory.¹⁶⁹ With the inundation of productive land, some villagers appear to be worse off than others due to the disproportionate allocation of benefits, and they are left with about 50 percent of their initial income. Without diversifying the local economy, it is difficult to absorb new entrants to the labor market, and it may take several years to diversify the local economy through establishing new plantations and developing industries and trade. A useful lesson in this regard is that in appraising economic rehabilitation options, the Project should have thoroughly examined them for their feasibility and acceptability to the affected persons. A wider mix of technical skills in preparing diversified and feasible income restoration programs and in supervising their implementation is vital.

¹⁶⁹ See project assurances no. (vi) in the Lingjintan Project's report and recommendation of the President: "The Borrower will ensure that persons displaced by the Project will not face reduction in incomes, deterioration in living conditions..." (p. 33, para. 107).

J. Monitoring

272. The Mission found it difficult to assess income and other developmental indicators without the availability of proper benchmark databases and periodical and systematic data gathering and analysis. Assertions of increases in average incomes and in fish production over the past few years cannot be verified objectively without such databases. Resettlement and agricultural development monitoring agencies and cells should be adequately staffed with qualified professionals, and sufficient funds and facilities need to be made available to monitor the changes over time. Independent monitors with clearly defined terms of reference can play a significant role in assessing the Project's progress, commitment to project assurances, and compliance with covenants.

G. Appendix 7

THEUN-HINBOUN HYDROPOWER PROJECT CASE STUDY

I. INTRODUCTION

A. Project Description

273. The Theun-Hinboun Project is a transbasin run-of-the-river hydropower project that diverts a major part of the water from the Nam Theun River, channels it through an underground tunnel, uses it for power (210 megawatts [MW]) generation in a surface powerhouse, and then discharges this water to the Nam Hai River (a tributary of the Nam Hinboun River, flowing west to the Mekong River at the border of the Lao People's Democratic Republic [Lao PDR] and Thailand) (Map 5, p. ix). The objective of the Project is to support economic growth through the enhancement of foreign exchange earnings by exporting 95 percent of the electricity generated to Thailand. The Executing Agency for the Project is a joint venture company named Theun-Hinboun Power Company (THPC), of which 60 percent is owned by Électricité du Laos (EdL), 20 percent by MDX Lao Company Limited, and 20 percent by Nordic Hydropower AB. The nonequity funding for the Project (\$130 million out of a total cost of \$240 million) was provided through a combination of commercial lending, export credit, and a Government loan. The Asian Development Bank (ADB) provided a \$60 million loan facility to the Government of the Lao PDR.¹⁷⁰ The Government re-lent \$51.5 million to EdL and the balance of \$6.88 million directly to THPC.

274. The feasibility study for the Project was completed in 1994, and construction of the Project commenced at the end of 1994. Operations testing began in January 1998, and commercial operation commenced in March 1998. The feasibility study included a detailed environmental impact assessment (EIA) that was completed in May 1993. A summary environmental impact assessment (SEIA) was prepared by March 1994. The license agreement between THPC and the Government stipulated that THPC shall bear the costs of compensation, resettlement, and environmental mitigation up to \$1 million. However, due to concerns raised by various parties, several studies were prepared. A more detailed agreement was signed by THPC and the Government in 1996,¹⁷¹ increasing the funds available for mitigation up to \$2.59 million. THPC also consented to a schedule of environmental and social requirements in its correspondence with the Asian Mezzanine Infrastructure Fund dated 5 August 1998.¹⁷² Following a review mission in November 1998, THPC and ADB agreed to redefine the project area and monitoring area to include the Nam Kading to the confluence of the Mekong River and similarly on the Nam Hinboun to the confluence with the Mekong River. This increases the project-impact area by about 100 percent to 53 villages, with an estimated 4,283 households containing about 25,000 persons. The Mission confirmed this need to expand the project area. A survey was proposed to be carried out in all villages of the newly defined area. The draft questionnaire for the survey was under preparation at the time of the Mission.¹⁷³

B. Study Methodology

275. Prior to the fieldwork, the Mission reviewed THPC files and other relevant literature, identified main issues, and selected locations for participatory rapid appraisals (PRAs). The visit included (i) conducting a reconnaissance-level physical inspection of the power plant and related structures; (ii) inspecting the headpond, access roads, downstream

¹⁷⁰ Loan 1329-LAO: *Theun-Hinboun Hydropower Project*, for \$60 million, approved on 8 November 1994.

¹⁷¹ The agreement includes (i) local information, (ii) resettlement compensation fund, (iii) minimum water release, (iv) flushing of sediments past the dam, (v) clearing of obstructions at the Nam Hai River Channel, (vi) reregulating pond at the tailrace canal, (vii) treatment and protection of spoil heaps, (viii) crossing possibilities and restricted access to the tailrace canal, (ix) monitoring program, (x) irrigation study, and (xi) rural development and fish management studies.

¹⁷² These are (i) dam safety inspection; (ii) environmental monitoring program to be continued; (iii) riverbank erosion monitoring of the headpond, Nam Hai, and Nam Hinboun immediately below the confluence with the Nam Hai through the life of the Project; (iv) headpond fishery monitoring for a minimum of three years and additional eight social commitments.

¹⁷³ At the time of the Mission, a socioeconomic survey and a health survey (including testing of malaria using immunochromatographic test kits) were to be completed by the end of March 1999-April 1999. A nutrition survey was to commence by the end of March 1999. THPC reports that the socioeconomic survey was undertaken in April-May 1999 in conjunction with health and nutrition survey work, and that it has taken measures to address the findings. The Mission did not have the opportunity to review this work.

areas, transmission line, and the substation at Thakek;¹⁷⁴ (iii) meeting with project operation staff, Environmental Management Committee Office (EMCO) staff, and government authorities at the district, provincial, and federal levels; and (iv) conducting six PRAs. The PRAs focused on the socioeconomic, psychological, and environmental impacts of the Project. The preliminary findings of the Mission were discussed with THPC and local authorities. These discussions helped the study team verify PRA findings, probe the main issues, and develop preliminary recommendations.

II. FINDINGS OF THE MISSION

A. Status of Environmental Mitigation Measures and Monitoring Plan

276. The fisheries, forestry, and biodiversity issues were inadequately addressed in the initial EIA. Although the Project was funded and constructed before ADB had fully developed its policies on these issues, the Project Loan Agreement stipulates that the Borrower (the Government) shall complete an environmental audit of the Project with an emphasis on downstream fisheries. It further stipulates that the Borrower shall consult with ADB on the results of such an audit so that appropriate mitigation measures are undertaken to reduce the impacts to fisheries. In addition, the draft agreement requires the Borrower to implement an environmental management program satisfactory to ADB for areas affected by construction.¹⁷⁵

277. THPC has conducted an environmental audit and either has conducted or planned various monitoring efforts that meet ADB's requirements. A fisheries monitoring report was being prepared at the time of the Mission, and that will further fulfill the Loan Agreement requirements.¹⁷⁶ Areas where the Borrower has not been in compliance are (i) mitigation of any negative environmental impact the Project may have on fisheries, (ii) appropriate and acceptable site rehabilitation, (iii) management of protected areas, (iv) fisheries management,¹⁷⁷ and (v) compensation of local residents.¹⁷⁸ The Loan Agreement is with the Borrower and not necessarily THPC. Both EdL and THPC have verbally committed to mitigating impacts that are caused by the Project and have made reasonable efforts to remedy environmental problems as they become apparent.

B. Social Impacts and Mitigation Attempts

278. The EIA proposed several community programs in the project area. The improvement of public infrastructure (roads, community health, and educational facilities) and compensation for loss of rice land in the tailrace canal area were among them. The EIA supported the relocation of people of the headpond area to rice land that might be opened up in the Nam Hai area as a result of state agricultural development programs. The local communities were to benefit from the Project by having access to employment opportunities during the construction period. Headpond communities were expected to benefit from the Project through increased fish production that, in turn, would help them to develop a more secure livelihood by replacing their dependence on a declining agricultural base. The Nam Hai area was to secure better quality water in larger quantities, enabling farmers to cultivate irrigated rice. No resettlement plan was prepared.

¹⁷⁴ A visual inspection of the headpond, shoreline, and adjacent upland areas was completed. This inspection included the immediate vicinity of the dam; area from the bridge at Ban Thabak upriver to the first rapid impassable by outboard-driven canoe; and Ban Thasala on the Nam Gnouang arm of the reservoir. The Nam Kading (the lower reaches of Nam Theun) was inspected 3 kilometers below the dam by foot and canoe into the Nam Kading protected area. The river was also observed from Ban Pholngam downriver to the confluence with the Mekong River. The Nam Hinboun was inspected by boat from above the confluence with the Nam Hai to Ban Paktuk. In addition, the Nam Hai was inspected at five locations between the reregulating pond outfall and the confluence with the Nam Hinboun. Inspection of aquatic life was completed from several shoreline areas. The transmission line was inspected from the powerhouse to the border of the Khammouane limestone protected area and a few kilometers north of the second crossing of the protected area, and the southern segment to the substation and Mekong River crossing. In addition, the power station, switchyard, and operator's camp were inspected. The penstock area, some access roads, adits, and a quarry were also examined.

¹⁷⁵ Measures include (i) environmental protection; (ii) site rehabilitation; (iii) management of protected areas; (iv) fishery management; (v) compensation of local residents; (vi) community safety, health, and education; (vii) worker health/safety; and (viii) monitoring.

¹⁷⁶ At the time of writing this report, a draft final fisheries monitoring study was made available to ADB.

¹⁷⁷ A fisheries management plan has been prepared by a consultant group, but there appeared to be questions about the plan's acceptability. No measures had been implemented at the time of the Mission, and there appeared to be no schedule for modifying the plan or its implementation. THPC does not have the implementation obligation for this plan.

¹⁷⁸ Unanticipated project impacts principally related to peaking operations and accelerated erosion along the Nam Hai have resulted in project-induced impacts that require compensation consistent with ADB's policy.

279. The construction and improvement of roads have increased people's mobility and access to market centers, opening opportunities for new commercial activities. The efforts also created several roadside settlements. However, unless strict enforcement of rules is in place, increased exploitation of timber and wildlife resources¹⁷⁹ may become an indirect adverse impact of the new access roads. River navigation has become easier since small rapids at several locations have been drowned by increased water level in the Nam Gnouang-Hinboun area. Bridges, culverts, and a ferry also have facilitated transportation in that area. But high water levels and the collapse of dry season river crossings and some roads in the Nam Hai area restrict communication and transportation.¹⁸⁰ THPC has constructed a first-aid station as part of the Project and given the local people access to it as needed. In addition, two new schools were built and another was refurbished.¹⁸¹ The temporary employment opportunities at the dam and powerhouse area provided attractive additional income for local people during the construction period. Increased and fluctuating water levels have damaged vegetable gardens on riverbanks and, in some locations, deprived livestock of grazing lands. Water level fluctuations in rivers apparently have changed the nature of the fishery, both in terms of species composition and methods of fish harvesting. Most communities in the downstream Nam Kading, headpond area in Nam Theun and Nam Gnouang, Nam Hai, and Nam Hinboun areas report that their fish catches have significantly dropped during the last year,¹⁸² although a few report temporary increases, especially during inundation.

280. The agreement on environmental mitigation measures signed in October 1996 addressed some of the above issues. Unfortunately, the agreement does not recognize the need for a long-term comprehensive social mitigation plan. However, the agreement established a resettlement compensation fund to settle compensation for relocation, the loss of agricultural land, and structures. A survey of the entire project-impact zone proposed to evaluate, among other things, the resettlement compensation needs of the villages affected by the Project.

C. Environmental Impacts and Issues

1. Fisheries in the Nam Theun/Nam Kading Basin

281. Prior to the Project, the aquatic communities in the headpond area were riverine communities with good water quality and an abundant fishery dominated by species adapted to fast-moving water. Several rapids interspersed with gravel and sandbars were inundated by the headpond on the Nam Theun. The area below the dam includes areas of deep pools and rapids until the river reaches the Mekong plain, where substrates become finer and the character of the river changes.¹⁸³ The communities included many species that are migratory (for reproductive and/or feeding purposes) and are important to the fishery. Fish were abundant and used for subsistence and, in some cases, commercial purposes. Fishery resources were exploited from above the headpond area to the confluence with the Mekong River. The river has high biodiversity value with 70-100+ species, some of which have restricted ranges or are undescribed.

282. Along the Nam Theun-Nam Kading River, fish are an important and dominant portion of the protein intake of villagers, similar to many other villages in the Lao PDR. As reported by many authors and some villagers, fish numbers along the lower Mekong River system have been declining for reasons unrelated to the Project. Factors such as reduced long-term flows of the Mekong, increased fishing pressure, and inappropriate harvest methods may have contributed to the declines. Harvests are reported to have decreased substantially this year due to drought conditions. Project-related fish yield declines need to be evaluated in this context.

283. Project-related impacts are predicted by a number of studies, including the Norpower feasibility EIA, 1995 Warren report, 1996 Norplan report, and fish management plan. Other regional literature addresses the hydropower development impact conducted for the former Mekong Secretariat and others. Literature is extensive on the impacts of hydropower development on fisheries. As stated previously, in the Mission's opinion, the earlier reports underestimated project-related fishery impacts. Unfortunately, the Mission was unable to document mitigation measures concerning fisheries except the minimum release of 5 cubic meters per second (m³/s), improved scheduling of reservoir desanding, and the building of four "natural" fishponds.

¹⁷⁹ Extensive logging is still going on in the project area along the transmission line from the powerhouse to the limestone protected area. Heavy vehicles used for this purpose have caused some damage to the transmission line access road. THPC reports that although it has attempted to restrict access to the bridge, a logging company has built its own bridge.

¹⁸⁰ THPC has reported in August 1999 that it has built new all weather bridges in most downstream villages and will complete the task in the next dry season.

¹⁸¹ A third new school would be ready by September 1999.

¹⁸² 1998 was reportedly a year that had severe drought impacts caused by El Niño phenomenon.

¹⁸³ This is the first of the proposed hydropower projects in Nam Theun.

284. There is still considerable uncertainty as to the long-range impacts of the Project, and an adequate monitoring effort will better document impacts. During the field visit, the Mission could not review the most recent fishery monitoring report that was due in December 1998.¹⁸⁴ Impacts observed or reported during this Mission are summarized as follows:

- (i) insufficient flows below the dam;
- (ii) absence of provisions to address entrainment and mortalities to species migrating downstream;
- (iii) absence of fish passage for upstream migration, obstructing normal upstream migration that affects populations in the headpond area and likely populations farther upstream in the mainstem and tributaries;
- (iv) at least a short-term decline in the ability to capture fish in the headpond area;
- (v) increased harvest pressure downstream of the dam (but at the time of the Mission continued good catches);
- (vi) large concentrations of migratory fish downstream of the dam observed during May and June 1998;
- (vii) illegal harvesting below the dam;
- (viii) a reported decline in harvest of up to 10 percent of preproject levels in the lower reach approaching the mouth of the Mekong River;
- (ix) increased difficulty in accessing traditional fishing grounds in the lower reach during the dry season;
- (x) increased access and mobility for fisherfolk in the headpond area, including upper reaches;
- (xi) short-term increases in fish volumes in the upper margins of the headpond as riverine fish seek suitable habitat during inundation; and
- (xii) reduced productivity of periphyton¹⁸⁵ and invertebrate fauna with subsequent reduction in fish forage.

2. Fisheries in the Nam Hai/Nam Hinboun Basin

285. The Nam Hai was an intermittent system that had no through flows during the dry season. The mainstem Hinboun was perennial. The rivers were reported as running clear during the dry season. The systems are like the Nam Kading after it reaches the Mekong Plain, where fine materials dominate substrate and banks, slopes are reduced, and rapids are nonexistent. Fish communities are more closely akin to mainstem Mekong communities. These rivers supported an apparently abundant fishery that was an important protein source for villages along the rivers. The biodiversity values in these rivers are not as high as they are in the Nam Theun-Nam Kading system.

286. Project impacts to the fishery related to intermittent power generation, increased erosion, and sedimentation were not adequately addressed. This assessment of impacts should be viewed in the overall fish population decline previously discussed and do not reflect the findings of the 1998 monitoring report unavailable at the time of the Mission. The project impacts observed or reported include the following:

- (i) the Mission's interviews indicated that harvest rates are 10 percent or less of the preproject rates in some areas;
- (ii) reduced fish harvests are a result of flow fluctuations, higher flows, increased turbidity, and possibly reduced fish numbers (which may or may not reflect reduced populations as the increased flows, increased turbidities, and discharge fluctuations may result in decreased efficiency of traditional methods and not in reduced fish populations);
- (iii) reduced primary productivity, with macrophytes and algae observed in the Nam Hinboun above the confluence with the Nam Hai and not below;

¹⁸⁴ The draft of the report had been submitted to THPC management and was subsequently forwarded to EMCO and other relevant institutions. It was sent to ADB after the Mission and preparation of the first draft of this special evaluation study.

¹⁸⁵ Periphyton are algae that grow attached to substrate.

- (iv) degradation of the riparian community as a result of project-induced flow fluctuations;
- (v) over a longer range, the Mission expects fish populations to decline as a secondary impact of the degradation of the riparian community and reduced primary productivity;
- (vi) intensive and extensive bank erosion and sloughing with linked impacts on shoreline vegetation, particularly along the Nam Hai;
- (vii) increased suspended loads and bedloads with deep holes being filled; and
- (viii) species migration may be affected by the altered chemistry and scent of the Nam Hinboun as runs destined for the Nam Kading are attracted to the Nam Hinboun and unsuitable spawning conditions.

287. Based on the Mission's site inspection, reviews of existing information, and interviews, project impacts to fishery resources and dependent villagers were incorrectly assessed in the EIA and had not been adequately mitigated at the time of the Mission. Without adequate mitigation in conjunction with improved fishery management measures, the long-term decline of fishery values will continue and will accelerate in and around the newly defined project area.

3. Wildlife and Vegetation

288. The project-impacted area and surrounding areas are of high ecological, biodiversity, and scenic value. The area includes habitat for many species that have declined throughout their range or are endangered with extinction. These resources are of concern to ADB, as described in its current policies on biodiversity and forestry and reflected in the Loan Agreement (Schedule 5), where management of protected areas is stipulated. The impacts on the Nam Kading Protected Area¹⁸⁶ immediately downstream of the dam (and affected by the reduced flows) and on the Khammouane limestone protected area, traversed by the project transmission line, are of particular concern.

289. Many areas surrounding the Project are covered by primary tropical rain forests known to be rich in biodiversity and addressed in ADB's policy on forestry. They include flora and fauna that are not completely described or known. Many orchids and hardwood species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora occur in these forests. Even without the Project, the wildlife resources in the area would be under considerable pressure. When questioned, villagers denied hunting for anything other than birds, as they stated hunting for other animals is illegal. However, the Mission many times observed people carrying large caliber military weapons that would not likely be used to hunt small game or birds.¹⁸⁷ These statements were substantiated by the Mission's observations of harvested birds, the scarcity of birds easily shot, and flight distance.

290. The forests within the limestone protected area are not significantly impacted by the construction of the transmission line. The towers were put in by helicopters and access is by foot. The valley surrounded by the protected area includes a large tin mining operation that has existed since 1918 but does not include substantial primary forests. There is an old road from that valley along the alignment southward through the protected area. Several villages settled along the road prior to project construction.

291. Project impacts on wildlife, vegetation, and biodiversity were not considered in the earlier reports. The Mission believes the Nam Kading area will be more heavily impacted by the Project than other areas. A summary of project impacts observed or reported include the following:

- (i) increased human populations in the vicinity of the protected areas due to improved access resulting in increased exploitation, harvest, and slash-and-burn agriculture;¹⁸⁸
- (ii) the creation of the headpond-facilitated access to the periphery of the reservoirs, with likely increased exploitation and disturbance of wildlife resources;¹⁸⁹
- (iii) increased hunting and trapping pressure as a result of the reduced availability of fish in protected and

¹⁸⁶ The International Union for Conservation of Nature and Natural Resources has been developing plans for the Nam Kading Protected Area.

¹⁸⁷ THPC informed the Mission that military personnel do not always wear uniform although carrying weapons.

¹⁸⁸ The limestone protected area will not be as severely impacted by slash-and-burn or harvesting activities as it includes limited forest resources and agricultural soils.

¹⁸⁹ However, due to the Government ban on shifting cultivation, there is pressure for people to move out of this area.

other areas;

- (iv) reduced prey base for species dependent on the fishery and benthic invertebrate production; and
- (v) the access road along the transmission line south from the operator's village is being used for an extensive logging operation associated with the Hinboun Valley Rural Development Plan.¹⁹⁰

4. Site Rehabilitation

292. Spoil, adit, tailrace, and disturbed areas along temporary access roads have not been adequately rehabilitated. In many cases, these areas were not covered with stockpiled topsoil (as specified in the contract) and remain bare and erodible. Many backfill areas have been covered with sod and some areas were seeded. However, more bioremediation remains to be done. The access road to the dam has several areas with gully erosion on fill material. Similar problems exist on the spoil material adjacent to the switchyard and observable from the operator's office. The penstock area has been treated on the fill areas, but no treatment has occurred on the cut banks and no natural succession is observable. Muck disposal areas at adits have been leveled and, to some degree, drained but are not revegetated. These sites are not rehabilitated.¹⁹¹

5. Institutional Strengthening

293. EMCO's role in representing THPC in terms of implementing mitigation, negotiating compensation, and reporting on compliance conflicts with EMCO's to monitor compliance and protect the Lao PDR's natural and cultural resources. As a result, EMCO is viewed as having divided interests and does not have a clear mandate. Both roles are required but should be separated.¹⁹² The operator needs a group that implements mandated mitigation and monitoring and reports to a Lao PDR agency or agencies for oversight. The operator also needs a party that will negotiate fair and reasonable compensation on its behalf, subject to policy, rules, and regulations.

294. On a broader scale, the Government needs to develop strategies and plans for the surrounding protected areas. These efforts require institutional strengthening. Likewise, improved regulations and enforcement of harvest and area closures are required for fish and wildlife resources. These efforts also require institutional strengthening.

D. Social Impact and Issues

1. Relocation/Resettlement

295. People in the project-affected area are mostly shifting cultivators who traditionally move from one place to another to maintain their food security. Some of these people in the Nam Theun and Nam Gnouang areas are willing to relocate themselves to the Nam Hai plain¹⁹³ if irrigation and other facilities are provided. In addition, some villages in the hilly areas moved to the roadside in search of employment and state assistance. These diverse processes of relocation in the project-affected areas have been accelerated by the project impacts, such as increased and fluctuating water levels, riverbank erosion, and decreased fish harvests.

296. The expansion of the definition of project-impacted zones to 53 from 21 villages might increase the number of village communities and individuals that may need to be considered for relocation in the project area. Field visits, discussions with project officials, findings of PRAs, and the review of project documents indicate that the relocation/resettlement of entire or parts of village communities will become necessary in some villages of the "project-impacted zones." Several village communities in the Nam Hinboun and Nam Hai areas are vulnerable to heavy bank slumping and frequent water-level fluctuations. Riverbank erosion is likely to continue for several years, scouring the

¹⁹⁰ THPC has tried to control this with poor success. The logging is supported by the Lao PDR and Hinboun District and is included as part of the Hinboun Valley Rural Development Plan.

¹⁹¹ THPC has requested the civil works contractor to inspect and list the areas that do not have adequate cover and attend to them before the expiration of the defect liabilities period (April 2000).

¹⁹² THPC reports that since the Mission, EMCO has been reorganized to separate monitoring and mitigation.

¹⁹³ The Land Law of 1992 restricted the villagers' customary access to forests for the purpose of slash-and-burn cultivation. The law stipulates that land cannot be left fallow for longer than three years. The Government can claim such land for reforestation or plantations. This is a far shorter period than the normal cycle of slash-and-burn cultivation that takes 8-15 years to return to the original status. The 1996 Law entrenches state allocation of land rights to households for permanent agriculture only.

riverbed, widening the rivers, and slumping riverbanks. As a result, it would be difficult to predict precisely the extent of relocation of communities that may occur.¹⁹⁴

297. The Project needs a comprehensive social mitigation plan to address the above issues, including compensation and income restoration. As found in the PRAs, villagers' household income levels have been affected adversely by the Project. The impacts may be short term. But it is necessary to have a strategy and income restoration/improvement program to assist the affected persons in a fair and systematic manner in the form of a timebound plan. The survey of the project-impacted area provided a good opportunity to formulate such a plan in consultation with the affected persons, taking into consideration their skills, resources, and traditional practices.¹⁹⁵

2. Compensation

298. Although compensation payments made so far under the Project have been quite generous, it lacks fixed rates, clear objectives, and detailed procedures.¹⁹⁶ From November 1995 to January 1999, THPC has paid, under the resettlement compensation fund, a total of KN80,308,649 (\$47,000) as compensation for lost properties and crops in 17 project-affected villages. Compensation payment is of two types: individual and community. Individual compensation was paid for 12.6 hectares (ha) of rice fields and 8.44 ha of "bush" fields acquired for the Project for the tailrace canal, fences, houses and shops, and rice storage buildings.¹⁹⁷ Community properties included spirit houses, a cemetery, and schools. In addition, community drinking water wells were constructed as compensation for the "impact from fluctuation in water level" in eight villages in the Hinboun and Khamkeuth districts. The Asia Tech-Co received compensation of KN1,035,000 for the loss of a eucalyptus plantation cut down for the transmission line.

299. The affected persons expect compensation for several other losses:

- (i) **Land Losses Due to Riverbank Erosions.** Nam Hai, Nam Theun, and Nam Hinboun have seriously eroded riverbanks at several locations. In some areas, bank erosion and slumping have spread 5-10 meters or more inland. As a result, many villages now do not have landing areas for boats and bathing places.¹⁹⁸ Steep and weak riverbeds already threaten some perennial crops, such as jackfruit, mango, and orange trees.
- (ii) **Loss of Vegetable Gardens.** Almost all villages on riverbanks cultivate vegetable gardens. Frequent fluctuation of water level in the rivers has forced them to move their gardens further inland. At the time of the initial dam/power station testing, most of these gardens were affected. People were informed, but they did not have sufficient time to relocate the gardens as they had to harvest the vegetables.¹⁹⁹ This problem was reported mainly from villages in the Nam Hai and Nam Hinboun areas. Riverbank erosion and high water level in the rivers have also affected livestock rearing in some villages. As riverbank erosion continues, agricultural and grazing lands could be adversely affected. THPC has agreed to consult those villagers who lost their vegetable gardens and garden lands and to work out a compensation scheme.
- (iii) **Compensation for Damaged Fishnets.** When the water level rose due to the initial testing of the power generation, the water flow dislodged or damaged many gill fishnets. The fisherfolk in villages wanted compensation, and THPC has paid compensation to those fisherfolk who reported lost or damaged nets. THPC worked out a compensation scheme with district authorities, and village leaders

¹⁹⁴ In cases where soil erosion necessitates the relocation (not changing over from slash-and-burn), THPC indicates it will first protect the villages with riprap, channeling, or planting of vegetation. If the least-cost solution is to relocate, THPC will help undertake that. THPC has reported that it has begun the riverbank protection program and will continue to do so in the next few years.

¹⁹⁵ The survey results were under review by THPC at the time of writing.

¹⁹⁶ In the absence of a Government policy on compensation, the Project obtains the appropriate baseline values from the provincial governments on a case-by-case basis. For items such as crops, boats, and gear, the Project reportedly uses replacement values.

¹⁹⁷ THPC informed ADB that subsequent to the Mission, it was in the final stages of negotiation to acquire seven properties in front of the Project for about KN22 million and had negotiated a \$16,800 assistance package for the villages of Nam Sanam to move across the tailrace.

¹⁹⁸ EMCO expects to provide floating docking areas or steps to landing areas. Where crops are lost, THPC expects to pay replacement value.

¹⁹⁹ Women cultivate vegetable gardens. The time they have to spend on the gardens has increased, as now they have to prepare new land, carry water to higher ground, and often travel away from their homes to new plots.

were informed to send lists of affected persons to EMCO, indicating their estimated losses. THPC intends to extend this scheme to villages falling within the newly defined "project-impact zones" as well.²⁰⁰

3. Income Restoration and Nutrition

300. People depend on rice cultivation for their subsistence in upland slash-and-burn plots of lands and permanent rice fields. Several other subsistence activities also play a significant role in household income and nutrition. These activities include fishing, gardening, animal husbandry, collecting forest products, and occasional hunting.

301. **Rice.** The cultivation of rice in slash-and-burn upland plots or permanent rice fields is the main economic activity of the people. Rice is predominantly a rain-fed crop cultivated once a year during the wet season. Most of the farmers in Nam Theun and Nam Gnouang areas practice shifting agriculture, who cultivate rice for subsistence and cash crops, such as chilies and tobacco. On the Nam Hai plain and along the Nam Hinboun, on the other hand, rice cultivation is mostly done in permanent fields supplemented by shifting cultivation of vegetables. In the Nam Hinboun area, the state has introduced an irrigation project to promote irrigated agriculture. This will enable farmers to cultivate two crops of rice a year, and also to abandon shifting cultivation. The average yield of rice is 0.8-1.2 tons/ha in upland plots, and about 3.5 tons/ha in permanent fields. With better irrigation and extension facilities and appropriate technology, rice yields can be increased to 5 tons/ha.

302. In the Nam Hai area, potential rice lands are plentiful. During the wet season, the area is flooded for short periods. On average, every 8-10 years severe rice crop losses have resulted from flooding. Although an additional volume of water is discharged to Nam Hai from the Nam Theun and it only marginally increases the flood risks, still the Project will be blamed for increasing the flood risk.²⁰¹ If an integrated irrigation and agricultural extension program is launched, it is possible to encourage village communities that depend primarily on upland shifting cultivation in the Nam Theun and Nam Gnouang areas to migrate to the Nam Hai plains. This would reduce the flood risk and also the impact of the shifting cultivation. Under the agreement of 1996, THPC commissioned an irrigation feasibility study in the Nam Hai plain. The study has pointed out the possibility and desirability of an irrigated agricultural system in the plain. Currently, the state is reviewing the proposal. When funds are available, the Khamounane and Blikhamxai provincial rural development committees may implement it.

303. **Fisheries.** In the project-affected areas, villagers identify themselves as farmers. With few exceptions, they consider fishing as a secondary income source, especially on an opportunistic basis or when additional cash is required. They fish mostly for home consumption. They usually eat fish at least twice a day. In all six PRA villages, people reported decreased fish catches, and the difficulties in using their traditional fishing techniques such as cast nets and hooks. The implication of this is that there has not yet been a severe impact on the villagers' fish protein intake, but their ability to catch fish to supplement their cash income has been directly affected by project operation. As mentioned earlier, the fisheries management plan is not yet properly in place. The government needs to further develop the fisheries resource as part of overall rural development efforts. It is the Mission's understanding that THPC is committed to funding mitigation of direct fisheries impacts caused by the Project. The socioeconomic survey could identify any immediate mitigation measures required to overcome impaired fishing opportunities. THPC has already constructed four out of six planned fishponds. Culverts/Irish crossings at Ban Kapap and Ban Sognouang constructed by THPC will be used as fish traps. THPC is also expecting to establish demonstration fishponds, perhaps based on successful local technology, in areas identified by the socioeconomic survey as most in need of such assistance.

4. Public Infrastructure

304. **Drinking Water Wells.** According to the PRAs, one of the Project's main adverse effects has been on drinking water. Backwaters of the headpond have widened Nam Theun and Nam Gnouang. Water is mostly muddy on their banks. As a result, villagers have to go halfway to the middle of the river to collect drinking water with buckets. Water is said to be more polluted with oil spills near Ban Thasala, where the ferry crosses.²⁰²

305. The Health Department of Bolikhamxay Provincial Authority commenced a water supply project with the assistance of United Nations Children's Fund in the Nam Theun area. This water supply project has been suspended due to the contractor's alleged poor quality of work. THPC will ensure the completion of the water wells program in seven

²⁰⁰ Subsequent to the Mission, THPC informed ADB that it has paid an additional KN8.5 million to villagers in three villages for loss of fishing nets and boats, and KN13.7 million for 4.7 ha of land that was flooded by the Project.

²⁰¹ THPC informed the Mission that the estimated project contribution is about 2 centimeters to the flood level on the plain.

²⁰² The ferry routinely transports logging trucks, buses, and tractors.

villages in the Nam Hai and Nam Hinboun areas and in 10 more villages in the headpond area. The survey is expected to identify the need for wells in the new project-impact areas as well.

306. **Rural Electrification.** One main reason that villagers agreed to support the hydropower project was because they believed it would bring them better public infrastructure. Villagers held their own meetings to discuss how many would like to obtain electricity, how to finance the required 30 percent contribution by the village, and how to pay bills. Village councils in two PRA villages pointed out that electricity would bring "civilization" to their villages. So far, four villages in the project area have received electricity after the completion of the project construction. Although the provision of electricity is the responsibility of EdL and provincial authorities, villagers expect electricity from THPC. The provincial authorities have informed villagers that their policy is to give priority in distributing power to the irrigation sector as agricultural development is paramount from the province's point of view.

5. Communication and Community Liaison

307. The preliminary information about the Project was distributed to the 21 villages, which are located in the initial "project-impacted zone." Other impacted villagers heard about the Project. In the Nam Kading downstream areas, villagers have observed decreased water flow in the river, which has affected their fishing. EMCO has launched a program to create awareness among affected persons about the Project through leaflet distribution, radio programs, and group consultations with village leaders. Compensation payment ceremonies are used to communicate with affected persons. A community liaison officer was appointed in September 1998 on a temporary basis to work with EMCO on the public information program.²⁰³

III. CONCLUSIONS AND RECOMMENDATIONS

A. Impact on Fisheries and Aquatic Life

308. Initial studies did not sufficiently address potential project impacts relating to fisheries and aquatic life. Mitigation measures were not adequately explored. For example, the SEIA does not propose any minimum release, measures to pass fish, or measures to reduce entrainment. The SEIA does propose a fish enhancement and management plan for the headpond as a mitigation effort. The SEIA incorrectly states that "for aquatic life, compensation release would have little effect on mitigating the situation, as this would only increase flows through the deeper water areas where the fish are already seeking refuge" (pp. 4-9). This statement and others are simply not defensible and are not supported by any analysis or evidence.

309. Recent studies have more accurately described conditions and potential impacts. They have resulted in improved riparian releases, the building of a few natural fishponds, and the publication of a fish management plan that unfortunately does not appear to have any institutional support. The studies have not resulted in improved passage or reduced entrainment mortalities.

310. Given the apparent project impacts described above and by others, the Mission offers the following suggestions.

1. Monitoring²⁰⁴

311. The Project should expand the fish monitoring to the headpond²⁰⁵ area and to the Nam Theun mainstem upriver area of the headpond with some sampling along major tributaries. Existing studies for Nam Theun 2 may cover some of these requirements. In addition, some sampling farther downstream on the Nam Kading and Nam Theun is suggested, as fisherfolk report sharp declines in these areas. The Mission also suggests that monitoring in a nonimpacted comparable river be considered to address regional trends and whether perceived changes are related to the Project. The program should at least cross-reference the catch-per-unit effort approach, with one or more quantitative population stations using visual or electroshocking techniques. This could be implemented effectively in the reach below the dam.

312. The Project should ensure that monitoring of entrainment mortality commences as soon as possible and sampling should be initiated prior to the downward leg of the annual hydrograph. Monitoring can be as sophisticated as the use of acoustical equipment, which allows targeting of the intake structures, or as simple as a fyke net in the tailrace canal.

²⁰³ As the arrangement has not worked out, THPC was at the time of the Mission expecting to find another suitable candidate for this purpose.

²⁰⁴ The Mission did not have access to the 1998 Fish Monitoring Report at the time this report was written.

²⁰⁵ Currently, monitoring is reportedly done in two areas: below the dam on the Nam Kading and on the Nam Hai.

313. The information base on fish migration is poor and an opportunity to improve this knowledge base exists.²⁰⁶ At a minimum, tagging studies using pit or floy tags should be considered by the Government in conjunction with a reward system for returned tags. Telemetry studies on a few key species would also begin to document the extent that fish travel in these systems and provide important ecological information that would assist in assessing impacts of future projects and the need and design for fish passage.

2. Minimum Flow Release

314. Recommendations for minimum flow release have ranged from 0 to 6 m³/s, 10 m³/s, and more.²⁰⁷ Unfortunately, there is little analytical basis for these recommendations. Generalized curves for anadromous species in temperate areas should be used with caution as their requirements differ, and the overall shapes of hydrographs differ.

315. Having observed velocity conditions and habitat configuration directly below the dam at 5 m³/s, the Mission is of the opinion that 10 m³/s or more is needed to maintain the downstream fishery in a reasonable condition. This is based on the observed concentration of fish (including juveniles), benthic invertebrates, and periphyton in areas of moving water that were not observed in still waters that prevail under the 5 m³/s release. In addition, water movement will better protect against oxygen depletion and will improve oxygen concentrations in riffles and rapids. The wetted perimeter will not change much in pools but should increase markedly in riffles, some rapids, and gravel tailwaters.

316. It would be preferable to conduct a study that uses quantitative analysis such as HEC or IFIM. In the absence of such studies and analysis, a professional opinion must suffice. This recommendation should be reviewed in the context of the economic costs of foregoing the power generation.²⁰⁸

3. Fish Passage

317. At the time of the Mission, there were no measures in place to pass fish migrating upstream. Various studies have suggested ladders and/or trapping. The argument against the use of a ladder is that not all species may be able to use it. Many species, particularly migratory catfish, will not jump and no guarantee can be made as to the success of the ladder. The argument against trapping and lifting above the dam is one of feared poaching and illegal harvest. As a result, no actions have been taken.²⁰⁹ The logic of the "no action" option is not supportable and is the least desirable of the three alternatives. Many fish were reportedly observed at the base of the dam attempting to go upstream by leaping during May-June 1998.

318. The dam is very small with little head and is a good candidate for a fish ladder. A Denil fish ladder, with one or two resting ponds, can be put in place at a low cost with reasonable expectations of success. The Denil does not require fish to jump and simply requires fish to move in bursts, simulating conditions found in rapids in the Lao PDR. The ice harbor modified-notched weir with ports would also probably work, allowing for the passage of nonjumping fish. However, it would require a great deal more engineering and expense. We suggest the implementation of a Denil be explored in greater detail. Alternatively, a trapping and trucking program should be initiated.

4. Entrainment

319. A fishery biologist should begin to explore the use of acoustical and visual deterrents to downstream migrants entering the intake structure. In some cases, these techniques have been successful and, at a minimum, should be explored. A physical solution should be considered if monitoring results warrant the expense. Solutions include a range from simple grates that are the least effective to the state-of-the-art modular inclined screen that is expensive and would be difficult to put in place after headwork construction. Louver systems that use turbulence as a behavioral deterrent can also be explored.

5. Management Plan

320. A management plan that is not implemented is of little value. The Mission hopes that the fishery monitoring report modifies the recommendations made in the proposed monitoring plan, as appropriate. More importantly, there

²⁰⁶ The Government should ensure that the needed research is conducted either by providing funding or arranging with project proponents so that informed decisions can be made regarding the impacts and acceptable mitigation measures can be provided.

²⁰⁷ The 1995 Norwegian Institute of Water Research report (Annex B1, 1996 Norplan report) recommends 6-15 m³/s. The Wildlife Conservation Society (Annex D, 1996 Norplan report) suggests 15 m³/s.

²⁰⁸ The 1996 agreement between the THPC and the Government estimated this to be \$1 million per year.

²⁰⁹ THPC has informed that it is looking into the cost estimates of a fish ladder.

needs to be institutional support for implementing measures. Measures should include some control of harvest methods, closed seasons for specific species in specific seasons, and areas and measures to enforce rules and regulations. Given the dependence of many of the villages on fisheries, community based-programs that use villagers as part of the management development and policing efforts are recommended.

6. Changing Operations

321. Currently, the Project is operated as a modified run-of-the-river facility with some peaking capability during the driest periods when inflows are less than 110 m³/s. During these periods, the Project runs as a peaking facility. Given that moving to a baseload plant does not appear to be an option for the plant, the study suggests that the Project try to dampen the surges by making the turbines start up and shutdown as gradual as possible.²¹⁰ This operational approach would reduce adverse impacts to the receiving waters of Nam Hai and Nam Hinboun. Erosion will be reduced and riparian vegetation will have a better chance of surviving and stabilizing shoreline areas. In addition, many of the complaints of fisherfolk regarding peaking impacts on harvest would be eliminated. The stabilized flows would allow the stream system to stabilize more quickly.

7. Shoreline Stabilization

322. Plans to stabilize shoreline areas along the Nam Hai should be accelerated and considered to be of the highest priority. Where at all possible, this should be done in conjunction with softer practices that include planting of hydrophilic vegetation and other bioengineering approaches. Stabilization should try to minimize additional impacts to riverine areas and should be cleared in advance by EMCO. All the work necessary will not likely be completed by the onset of the 1999 wet season.

B. Site Rehabilitation

323. As per the Loan Agreement, all disturbed sites, such as construction camps, laydown areas, spoils, cuts, and cut-and-fills along temporary and permanent access roads, are in need of bioengineering and soil stabilization. The spoil area adjacent to the switchyard has gully erosion and is overgrazed. Revegetation efforts should use native species adapted to local conditions if at all possible.

C. Wildlife and Vegetation

324. In general, impacts on wildlife and vegetation and biodiversity (one of their measures), were inadequately treated in the earlier environmental documents. The documents provide the impression that there would be minimal impacts on these resources. The Mission offers the following recommendations in addition to implementing the fishery mitigation previously suggested to improve riverine conditions.

- (i) THPC needs to take measures to close temporary access roads.²¹¹
- (ii) The Government needs to consider eco- and adventure-tourism in regional development plans.
- (iii) The relevant government institutions need to build their capacities to enforce regulations regarding harvesting of forest resources, carrying out of slash-and-burn agriculture, and hunting of protected species in protected areas.
- (iv) The Government should develop protected area management plans and provide funding that protects biodiversity and provides economic benefits to local villages. The areas surrounding the Project provide excellent scenic and recreational opportunities for tourists if the appropriate infrastructure is developed and tourism is marketed.
- (v) The Government should also plan to minimize the exploitation of primary forests and do so where there is a sustainable and integrated development strategy. ADB should try to facilitate such a development strategy by helping the Government to obtain financing avenues. For example, an integrated plan for irrigation development should include not only land clearing and construction of canals, but also water management strategies, agricultural training and extension services, and rural credit systems. Land on which standard logging was practiced (which leaves stumps and slash) can only become agricultural land with extensive treatment. If areas are identified as long-term forestry areas, selected harvest

²¹⁰ The study was informed that under the project performance agreement, it was not possible to switch the plant to a baseload plant.

²¹¹ THPC informed ADB in August 1999 that it was closing as many of the access roads as possible.

should be considered. Buffer areas should be left around all perennial watercourses, protected areas, and areas of high scenic value.

D. Rural Electrification

325. At the time of the Mission, the surrounding areas of the Project in the Lao PDR use marginal amounts of electricity (5 percent of the potential). Although the current supply available for local consumers is about 9 MW, the current demand is less than 0.5 MW. The rural electrification process should be accelerated in coordination with the rural development plan. Improving rural electrification in affected villages would help improve community relations and the attitude of the villagers toward the Project.

E. Institutional Strengthening

326. THPC, possibly through EdL, needs environmental staff members who act on the behalf of the project operator. As discussed, negotiating compensation, environmental impact monitoring, implementation of mitigation, and negotiating mitigation requirements would be the kind of activities that would be expected by a project's environmental group. Enforcing stipulated environmental mitigation and monitoring requirements, reviewing compliance, and ensuring that compensation is consistent with Government and funding agency or ADB policies would be the purview of the Science, Technology, and Environmental Organization or other licensing or reviewing agencies. With such a structure, the chain of responsibility becomes clear and loyalties are transparent.

327. THPC and EdL have provided verbal statements that project-induced impacts will be mitigated as they become documented. We suggest that this be developed formally as a joint policy statement with well thought-out and careful language. This could become part of an environmental mitigation plan that clearly documents project commitments to mitigation, project policies and procedures on compensation, monitoring programs, and how monitoring programs will be used to modify mitigation. Community relations activities should be reported in detail.

328. In addition to the monthly reports and compliance reports, the Mission suggests that annual reports should summarize EMCO's activities for the year, including mission visits, training, mitigation, compensation, community relations (record of meetings), and monitoring activities. Trend data on monitoring information should be highlighted. Organization or staffing changes, and the budgets allocated should also be included.

F. Resettlement/Relocation

329. The Ministry of Industry and Handicrafts, in consultation with other concerned Government departments, should prepare a comprehensive policy and strategy document on hydropower projects in the Lao PDR. The experiences gained at THPC and other hydropower projects could be used in preparing this document, which should outline the mitigating measures that the provincial and local authorities should take regarding resettlement, compensation, income restoration of the project-affected communities and individuals, and who should be responsible for their implementation. The current practices of case-by-case decisions are undesirable to address issues such as relocation. The policy and practices should formally be recorded and implemented.

330. At the appraisal stage, the project-impacted zones were narrowly defined. This has caused many difficulties and anxieties among the project-affected persons, as the scope of the mitigation efforts initially planned was limited to less than half of the project-affected villages. The findings of the socioeconomic survey of 53 villages will provide an excellent opportunity to review the need for a comprehensive resettlement/relocation program.

G. Baseline Surveys

331. Comprehensive baseline data on affected persons should be collected before the appraisal report is prepared. The locations and numbers of households and individuals likely to be affected by the Project should carefully be recorded, as such data will provide the basis for resettlement planning, compensation, and agricultural development. Local universities, colleges, and nongovernment organizations, as well as local people, could actively participate in the surveys. Results of the surveys should be analyzed and published for public use and future reference. The surveyors should distinguish affected persons from others who may attempt to claim resettlement benefits. The recent decision to expand the number of villages affected by the Project to 53 would provide an ideal opportunity to review the EIA's conclusion that there is no resettlement requirement for any of the project components and to prepare a comprehensive mitigation plan.

H. Communication and Consultation

332. Early communication with affected persons to explain how the Project could affect them and what mitigation factors are likely to be introduced is essential to obtain their support to a proposed project and to reduce trauma and stress associated with displacement (if any). If such consultations are seriously undertaken, project personnel could solicit affected persons' views on project planning and how to mitigate its adverse effects on them. An independent catalyst in this regard is useful. Those who have conducted the surveys could be employed for this purpose. With their local knowledge, they could create awareness among vulnerable and minority groups about the Project, discuss the groups' specific problems and worries, and report these accurately.

I. Compensation

333. A comprehensive program to disburse resettlement compensation funds for lost property, crops, and income sources is needed. Compensation rates and a payment procedure needs to be widely publicized, and the objections and revisions suggested by affected persons should be noted. Land surveys, checking of entitlements to land, and payment of compensation has to be done in a transparent manner and well before a Project starts. Affected persons have to be informed how their land and other properties were valued and the rates of compensation. Compensation calculations and the manner in which compensation is paid have to be closely monitored by a competent authority. Appeal boards have to be established to settle disputed claims. Representatives of affected persons, as well as local knowledgeable persons, should be the members of such bodies. Delays and partial payments should be minimized. If sufficient funds are not available for compensation payment, the proposed project implementation should be delayed until sufficient funds are available.

J. Monitoring and Evaluation

334. Monitoring and evaluation has to be adopted by project managers as an integral part of planning and implementation and should be considered not as accessories but as the basis for efficient management. Environmental, resettlement, rural, and agricultural development monitoring agencies should be adequately staffed with qualified professionals and provided with sufficient funds. Such agencies should be employed for at least 15-20 years after the project's completion. Independent monitors, such as nongovernment organizations, with clearly defined terms of reference can play a significant role in assessing the project's progress, its commitment to project assurances, and covenants.

H. Appendix 8

PARTICIPATORY RAPID APPRAISAL METHODOLOGY

335. At each study project, several participatory rapid appraisals (PRAs) were held to discuss the impacts on village communities and individuals. The PRA is a fieldwork technique to discuss specific topics in-group sessions. Participants discussed ideas, issues, and experiences among themselves with minimum guidance from the interviewer. Each participant is free to comment, criticize, or elaborate on the views expressed by others. The presence of project or government officials at PRAs sometimes curtailed free discussions in Lingjintan and Singkarak. But the contribution of those officials to elaborate and translate the Mission's questions and participants' views far outweighed the disadvantage of their presence.

336. By reviewing environmental impact assessments, surveys, and the Asian Development Bank's operation and supervision reports, the study team identified several affected persons groups for PRAs. Several criteria were used to select a few groups based on their location, the amount of land lost and compensation promised/paid, and employment. Downstream and upstream communities of projects were also included in PRAs to understand the "with" and "without" project situations. In the study projects, where some affected persons are resettled (Batang Ai and Lingjintan), PRAs specifically focused on compensation, income restoration, housing, their relationship with hosts, and resettler satisfaction. Local consultants of the study team reconnoitered the project areas to identify suitable and representative communities for PRAs.

337. Each PRA group was limited to 15-20 participants with the average of 15, as small groups tend to facilitate the free flow of discussions. The study team presented the questions/issues in the course of interviews. The atmosphere was informal, resembling a conversation. On many occasions, conversation was interspersed with tea and short breaks. The interviewer took extensive notes that were developed later.

Number of Participants in PRAs

Project	No. of PRAs	Number of Participants in PRAs			Participation Index (range) ^a %
		Men	Women	Total	
Singkarak	8	82	11	93	72-84
Lingjintan	4	52	29	81	67-92
Batang Ai	5	62	32	94	45-72
Theun-Hinboun	6	67	35	102	54-72
Total	23	263	107	370	

PRA = participatory rapid appraisal.

^a Participation index is the participation percent of PRA participants in group discussions. (Number of participants who talked at least once/total number of PRA participants; the "range" is the minimum and maximum participation percent in each study project. When more women participated, the index tended to become low as most of them did not talk during PRAs, except in Lingjintan).

338. A PRA session generally lasted for two hours. With the assistance of local consultants, the study team managed to keep the PRA discussions focused on one impact at a time using subtle probing techniques, and also to prevent a few participants dominating the discussions. PRAs focused not only on project impacts but also on affected persons' fears, worries, and expectations.

I. Appendix 9

CHECKLIST OF ENVIRONMENTAL AND SOCIAL IMPACTS OF HYDROPOWER PROJECTS

Item	
A.	Project Siting
1.	Resettlement ? Loss of income sources trade ? Loss of housing ? Loss of community properties ? Social inequities due to resettlement
2.	Encroachment into Historical/Cultural Sites ? Destruction, inundation of cultural sites, resettlement, loss of ecological value, loss of trade
3.	Fishery Resource Changes ? Decrease in fish catch, loss of potential mining
4.	Changes to Other Ecology ? Changes to indigenous ecology ? Changes in wildlife migration routes, sensitive population considerations ? Location of national park, wilderness areas, protected areas ? Location of primary old growth forest ? Endangerment of sensitive species ? Degradation/loss of primary forest and wilderness values
5.	Others ? Inundation of mineral resources ? Impairment of navigation
B.	Project Design
1.	Impacts on Water Flow and Volume ? Flooding risk due to wide seasonal flow variations ? Water rights conflicts
2.	Impacts on Water Quality ? Changes in watershed level sediment transport ? Erosion of riverbanks
3.	Impacts on Fisheries and Aquatic Life ? Impairment of fish migrations ? Decrease in reservoir life span
C.	Construction Related
1.	Impacts on Sediment Levels from Heavy Equipment Use and Road Building Due to Excavation ? Increase in turbidity and lowering of overall water quality ? Loss of shoreline habitat

Item

- ^a The checklist of environmental and social impacts should be considered at the different stages of the project cycle. Possible prevention and mitigation measures are indicated in the background reports to the special evaluation study.
- ? Impacts to mammals and other shoreline dwellers
 - ? Destruction of in-stream habitat
- 2. Waste Management**
- ? Potential for fuel spills from fuel delivery and storage
 - ? Increased solid waste load from worker housing
 - ? Contamination from improper disposal of construction wastes, chemical spills from tool cleaning and maintenance
- 3. Worker and Community Safety**
- ? Injuries to workers or community members
 - ? Potential for introduction of waterborne diseases such as cholera, increase in water use, and impacts
 - ? Pollution from dust, odors, fumes, and noise to nearby towns
- 4. Construction Monitoring**
- ? Monitoring to maintain schedule and regulation of compliance
 - ? Documentation of results and submission
 - ? Existence of a feedback loop to project implementation
- D. Facility Operation**
- 1. Downstream Flow and Temperature Fluctuations**
- ? Impacts to fisheries and to nearshore activities
 - ? Loss of natural pulse flows and related ecological processes
 - ? Decrease in flood-dependent fisheries
 - ? Loss of fish that breed in inundated fields
 - ? Potential introduction of new species and/or contaminants
- 2. Changes in Aquatic Ecology**
- ? Loss of wildlife habitat and natural filtering processes
 - ? Possible fish entrapment and water quality degradation
 - ? Large stage fluctuations can degrade the riparian community through draining of wetlands
 - ? Fluctuations can destroy shorebird nesting nets
- 3. Downstream Erosion/Downcutting and Deposition**
- ? Bank destabilization
 - ? Increased development near the reservoir and riparian changes can reduce habitat
- 4. Changed Hydrology**
- ? Changes in groundwater erosion
 - ? Effects on whitewater recreation
 - ? Degradation of benthic invertebrate production
 - ? Stranding of juvenile fish
- E. Reservoir and Tailwater Management**
- 1. Water Quality Management**
- ? Potential for contamination from boat operation, fueling, maintenance
-

Item	
	<ul style="list-style-type: none"> ? Declines in water quality due to introduced contaminants and sediments ? Aquatic weed problems ? Impairment of facility operation ? Disease outbreaks and health hazards, vector organisms (snails, mosquitoes, worms) ? Decrease in food value of fishery
2.	<p>Community Use Management</p> <ul style="list-style-type: none"> ? Control of reservoir access ? Reservoir use conflicts ? Community safety ? Increase in development along shoreline ? Reservoir bank stability
3.	<p>Fish Community Changes and Wildlife Impacts</p> <ul style="list-style-type: none"> ? Displacement of wildlife ? Habitat modification and food source changes ? Loss of riparian forage and refugia for wildlife
4.	<p>Operations Monitoring</p> <ul style="list-style-type: none"> ? Monitor outflow ? Minimum flow ? Integrated land use and development plans ? Other appropriate monitoring and reporting
F.	<p>Other</p>
1.	<p>Socioeconomic Changes</p> <ul style="list-style-type: none"> ? Temporary increase in population during construction ? Changes in subsistence agriculture/fishing ? Stimulation adjustments in community organization ? Cultural impacts ? Boom and bust syndrome ? Temporary increase in employment opportunities ? Potential increase for rural electrification
2.	<p>Health and Safety</p> <ul style="list-style-type: none"> ? Decline in sanitation and hygiene
3.	<p>Power Plant Accessories</p> <ul style="list-style-type: none"> ? Transmission lines and potential for electrocution of birds and wildlife ? Fencing and restriction of wildlife movements ? Access roads and impacts to ecology, decrease in scenic value, traditional character of the region ? Deforestation by laborers ? Increased timber harvest and hunting pressure on wildlife species

J. Appendix 10

SUMMARY ENVIRONMENTAL IMPACTS AND SUGGESTED MITIGATION

339. Tables A10.1-A10.4 summarize the environmental impacts and mitigation measures from the case study reports provided in Appendixes 4-7.²¹² The impacts provided in the tables are only those seen or learned about by the Mission through the participatory rapid appraisals, meetings with officials, and reviews of project documentation. The mitigation measures identified in the tables are additional recommended mitigation to address outstanding issues and concerns.

Table A10.1: Batang Ai Hydropower Project, Malaysia

Impact Area	Environmental Impacts ^a	Suggested Mitigation
Fisheries and Aquatic Life	<ul style="list-style-type: none"> - Declines in many riverine species, especially larger migratory species in the reservoir or upper reaches - Aquatic life affected by seasonal and monthly drawdowns <ul style="list-style-type: none"> - Adverse habitat conditions due to lack of operational constraints and poor water quality + Aquaculture program is productive <ul style="list-style-type: none"> - Escape of tilapia could outcompete native local fish - Lack of minimum flow releases impact aquatic life in dry season 	<ul style="list-style-type: none"> ?? Conduct an environmental audit ?? Conduct research on migratory fish species ?? Conduct limnological surveys and monitoring ?? Develop reservoir fisheries management plan ?? Develop operational management plan to include minimum flow releases to protect aquatic life, downstream water quality, and flood control
Water Quality, Health and Sanitation, and Erosion/Floods/Sedimentation	<ul style="list-style-type: none"> - Reservoir is anoxic due to lack of proper cleaning of vegetation - Organic loading from the fish cages <ul style="list-style-type: none"> - Lack of minimum flow releases during dry season has caused impacts on aquatic life, degraded downstream reach <ul style="list-style-type: none"> - Bouts of poor water quality (hydrogen sulfide, possibly reduced dissolved oxygen, Fishmart processing) - Shoreline landslides - Turbidity up the Engkari arm of the reservoir - Newly cleared lands near reservoir, not under any apparent management 	<ul style="list-style-type: none"> ?? See above ?? Improve waste treatment at Fishmart ?? Monitor bathymetry in major reservoir tributaries ?? Control land use in shoreline areas
Wildlife and Vegetation	<ul style="list-style-type: none"> - Listed/protected species impacted (nearby protected areas [national park, nature reserve, wildlife sanctuary] have enabled wildlife populations to increase in reservoir area) - Approximately 90 square kilometers was flooded, resulting in changed ecological communities from riverine and secondary forest with some primary forest to a reservoir 	<ul style="list-style-type: none"> ?? No additional mitigation identified
Disturbed Areas	(Difficult to determine because the Project was constructed in 1988) <ul style="list-style-type: none"> - Some access road areas show ongoing landslide problems 	<ul style="list-style-type: none"> ?? Monitor and treat as needed
Indirect and Secondary Impacts	(3,600 people [about 520 families] required relocation) <ul style="list-style-type: none"> - Transmission line construction and operation causes increased potential for bird 	<ul style="list-style-type: none"> ?? Nonchemical treatment for right-of-way maintenance

²¹² Developments that were reported to the Mission subsequent to the fieldwork has also been included as footnotes to Appendixes 4-7.

Impact Area	Environmental Impacts ^a	Suggested Mitigation
	hunting, visual values, and loss of forest habitat - Transmission line right-of-way requires ongoing maintenance	

^a + = beneficial impact, - = adverse impact.

Table A10.2: Singkarak Hydropower Project, Indonesia

Impact Area	Environmental Impacts ^a	Suggested Mitigation
Fisheries and Aquatic Life	<ul style="list-style-type: none"> - 25 percent fish yield reduction near Singkarak Lake, 70-100 percent reduction in Ombilin River (downstream); subsequent loss of fishery income - Entrainment of bilih and other fish^b - Reduction in bilih^c propagation + Creation of fishponds on the Anai River^d - Fish migration declines in the Ombilin River <ul style="list-style-type: none"> - <i>Reduction in reproductive success of shoreline spawners in Singkarak Lake</i> - <i>Local extirpation of three fish species in the Ombilin River and declines in other species, including a soft shell turtle in the Ombilin River and Singkarak Lake</i> - <i>Degraded water quality conditions, reduced velocities, and habitat related to insufficient; minimum flows in Ombilin River (long term)</i> - Fish parasite observed in the lake, risk of impacting aquaculture in the Anai River (long term) 	<ul style="list-style-type: none"> ?? Further develop fish management plan, including research on biology and artificial propagation of native fish particularly bilih ?? Revise operations management plan that includes an integrated lake rule curve and justifiable minimum flow releases for beneficial downstream uses, including aquatic ecology, waterwheel irrigation, domestic and industrial water supply, and water quality standards ?? Evaluate the feasibility and necessity of fish passage at the Ombilin weir ?? Evaluate the degree and significance of entrainment on Singkarak Lake fish ?? Conduct research on fish parasite (<i>Olitropus typhus</i>) ?? Continue long-term monitoring program and extend to Ombilin and Anai rivers
Wildlife and Vegetation	<ul style="list-style-type: none"> - Illegal harvesting of primary rainforests - Loss/degradation of habitat for sensitive species (Sumatra tiger) (long term) 	<ul style="list-style-type: none"> ?? Control illegal primary forest harvest along access road to Buluh River diversion
Water Quality, Health and Sanitation, and Erosion/ Floods/Sedimentation	<ul style="list-style-type: none"> - Reduced flow regime and drop in groundwater levels have led to dysfunctional wells, resulting in increased use of river for defecation and bathing, causing skin and intestinal disorders - Damage of >100 waterwheels and weirs due to the opening of Ombilin weir - Loss of rice harvests in some houses due to increased flooding in the phase II area of the Anai River Irrigation Scheme 	<ul style="list-style-type: none"> ?? As part of operation plan revision, account for downstream water quality and water supply needs ?? Monitor public health ?? Provide health education regarding risks related to defecation in water bodies ?? Develop alternatives to defecating in water bodies ?? Provide groundwater wells or assistance in improving (deepening) existing wells ?? Control discharge of solid waste on riverbanks ?? Monitor water quality and discharge ?? Modify operations to reduce spills and flooding risk ?? Provide ramping restrictions on Ombilin weir releases ?? Document procedures taken in the event the Anai River is at flood stage ?? Warn downriver communities of possible flood events ?? Monitor lake inflows
Disturbed Areas	<ul style="list-style-type: none"> - Degraded areas in need of rehabilitation 	<ul style="list-style-type: none"> ?? Treat and revegetate with local flora, as needed ?? Monitor success and replant, as needed
Indirect and Secondary	(No resettlement required)	<ul style="list-style-type: none"> ?? Work with brick manufacturing

Impact Area	Environmental Impacts ^a	Suggested Mitigation
Impacts	- Brick manufacturing led to sand removal, firewood collection (secondary)	communities to rehabilitate and treat excavation areas

^a + = beneficial impact, - = adverse impact.

^b Bilih range is restricted to Singkarak Lake.

^c Since the Mission, a large die-off of bilih was reported in the San Francisco Chronicle related to the release of volcanic toxic gases in the bottom of the lake. Similar fish die-offs have occurred in nearby lakes.

^d The Project diverts water from Singkarak Lake and the Ombilin River basin to the Anai River basin.

Table A10.3: Hunan Lingjintan Hydropower Project, People's Republic of China

Impact Area	Environmental Impacts ^a	Suggested Mitigation
Fisheries and Aquatic Life	<ul style="list-style-type: none"> - Change from free-flowing river to lake-like condition; changes in velocities, depths, and temperature conditions - Fish stranding, increased predation - Impacts on migratory fish + Aquaculture development (but, while postproject productivity may remain the same, the fisherfolk involved may not be the same) - Cumulative impacts related to extensive development of hydropower and flood control projects 	<ul style="list-style-type: none"> ?? Conduct fish migration studies ?? Evaluate use of locks for fish passage ?? Monitor total dissolved gases ?? Develop monitoring program on aquatic life by using catch-per-unit effort methods and direct collection of indicator species ?? Monitor impacts of peaking ?? Monitor the aquaculture programs ?? Consider identifying free-running river reaches for the preservation of biodiversity and native aquatic communities
Water Quality, Health and Sanitation, and Erosion/Floods/Sedimentation	<ul style="list-style-type: none"> - Communities fear increased flood risk - Shoreline landslides 	<ul style="list-style-type: none"> ?? Independently reevaluate the flood risk and water surface elevation probabilities as a result of the Project. Communicate findings to potentially affected communities ?? Monitor shoreline erosion areas and treat as needed
Wildlife and Vegetation	<ul style="list-style-type: none"> - Inundated riparian communities, habitat loss - Loss of species dependent on river conditions (e.g., mergansers) + Backwaters created (but limited, reduced by varial zone impacts) 	<ul style="list-style-type: none"> ?? Develop programs to protect and enhance wetlands and riparian communities
Disturbed Areas ^b	<ul style="list-style-type: none"> - Improper control in managing toxic materials, such as petroleum products, concrete accelerators - Lack of adequate disposal of solid and human waste 	<ul style="list-style-type: none"> ?? Remedy as near end of Project^c
Indirect and Secondary Impacts	<ul style="list-style-type: none"> - (4,753 persons [830 rural households] required resettlement) - Removal of shrub and forest lands due to resettlement and creation of fishponds - Rice land, upland farm area creation has led to erosion, impacts on vegetation and ecosystems (No impacts on primary forests or prime wildlife areas) - Transmission line construction and operational impacts - Wuqiangxi plant operations cause water level fluctuations 	<ul style="list-style-type: none"> ?? Develop mitigation and offset habitat acquisition ?? Establish acceptable solid and human waste programs at construction and housing areas

Impact Area	Environmental Impacts ^a	Suggested Mitigation
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^a + = beneficial impact, - = adverse impact.

^b The Project was under construction at the time of the Mission so site rehabilitation efforts could not be evaluated.

^c Construction is to be completed in a few months; therefore, the Mission only suggests remediation. Otherwise, the Mission would have required development of a plan for the control and proper disposal of toxic, human, and solid waste.

Table A10.4: Theun-Hinboun Hydropower Project, Lao People's Democratic Republic

Impact Area	Environmental Impacts ^a	Suggested Mitigation
Fisheries in the NamTheun/Nam Kading Basin	<ul style="list-style-type: none"> - Reduced and insufficient flows below the dam - Absence of provisions to address entrainment and mortalities to species migrating downstream - Absence of fish passage for upstream migration, obstructing normal upstream migration affecting populations in the headpond area and likely populations farther upstream in the mainstem and tributaries - At least a short-term decline in the ability to capture fish in the headpond area - Increased harvest pressure downstream of the dam, but continued good catches - Large concentrations of migratory fish appearing downstream of the dam observed during May and June - Illegal harvesting below the dam - A reported decline in harvest up to 10 percent of the preproject harvest levels in the lower reach approaching the mouth of the Mekong River - Increased difficulty to access traditional fishing grounds in the lower reach during the dry season - Increased access and mobility for fishermen in the headpond area, including upper reaches - Short-term increases in fish in the upper margins of the headpond as riverine fish seek suitable habitat during inundation - Reduced productivity of periphyton and invertebrate fauna with subsequent reduction in fish forage 	<ul style="list-style-type: none"> ?? Increase minimum flows to 10 m³/s ?? Add a Denil fish ladder ?? Extend monitoring downstream and to the reservoir and upstream areas ?? Evaluate entrainment and mitigate, as appropriate ?? Conduct research on migratory fish ?? Conduct research on propagation of native fish ?? Further refine and implement fisheries management plan
Fisheries in the Nam Hai/Nam Hinboun Basin	<ul style="list-style-type: none"> - The Mission's interviews indicated that harvest rates are 10 percent or less of preproject rates in some areas - Reduced fish harvests are a result of flow fluctuations, higher flows, increased turbidity, and possibly reduced fish numbers - Reduced harvest may or may not reflect populations as the increased flows, increased turbidities, and discharge fluctuations may result in decreased efficiency of traditional methods and not reduced fish populations - Reduced primary productivity as macrophytes and algae were observed in the Nam Hinboun above the confluence with the Nam Hai but not below - Degradation of the riparian community as a result of project-induced flow fluctuations - Over a longer range, fish populations expected to decline as a secondary impact of the degradation of the riparian community and reduced primary productivity - Intensive and extensive bank erosion and sloughing with linked impacts to shoreline vegetation, particularly along the Nam Hai 	<ul style="list-style-type: none"> ?? Operate facility to dampen surges and minimize flow fluctuations ?? Develop reregulating pond for aquaculture ?? Implement bank protection measures along Nam Hai and Nam Hinboun ?? Use soft riparian revegetation measures as much as possible for habitat rehabilitation and improved erosion control along shoreline ?? Monitor fish populations and harvest to the extent of the new study area ?? Continuous monitoring of discharge at several points downstream of the reregulating pond, including the reregulating pond weir ?? Continue monitoring of shoreline erosion ?? Monitor suspended sediments or turbidity above and below confluence of Nam Hai and Nam Hinboun ?? Consider developing aquaculture programs or increasing the number of fishponds

Impact Area	Environmental Impacts ^a	Suggested Mitigation
m^3/s = cubic meter per second. ^a + = beneficial impact, - = adverse impact.		
	<ul style="list-style-type: none"> - Increased suspended and bedloads with deep holes being filled - Species migration may be affected by the altered chemistry and scent of the Nam Hinboun as runs destined for the Nam Kading are attracted to the Nam Hinboun and unsuitable spawning conditions 	
Water Quality, Health and Sanitation, and Erosion/Floods/Sedimentation	<ul style="list-style-type: none"> - Increased sedimentation of water downstream in Nam Hai and Nam Hinboun - Some erosion in headpond area due to increased water level 	?? Rehabilitate and revegetate disturbed areas; monitor success and take corrective action as needed
Wildlife and Vegetation	<ul style="list-style-type: none"> - Impacts to sensitive species - Nam Kading Protected Area affected by reduced flows - Increased human populations in the vicinity of the protected areas resulting in increased exploitation, harvest, slash-and-burn agriculture^b - Increased hunting and trapping pressure as a result of the reduced availability of fish in protected and other areas - Reduced prey-base for species dependent on fishery and benthic invertebrate production - Khammouane Limestone Protected Area not affected by transmission lines 	<ul style="list-style-type: none"> ?? Minimum release of 10 m^3/s ?? Control forest clearing, agriculture, and hunting in Nam Kading Protected Area ?? Provide funding for biodiversity protection and ecotourism development ?? Develop sustainable forestry plans that include the preservation of wildlife resources ?? Eliminate illegal forest harvest in protected areas
Disturbed Areas	<ul style="list-style-type: none"> - Exposed construction work sites are prone to erosion 	(see water quality entries)
Indirect and Secondary Impacts	<ul style="list-style-type: none"> - The access road along the transmission line south from the operator's village is being used for an extensive logging operation associated with the Hinboun Valley Rural Development Plan 	<ul style="list-style-type: none"> ?? Conduct an environmental review of the Khoonkham Konglo ?? Close temporary access roads

m^3/s = cubic meter per second.

^a + = beneficial impact, - = adverse impact.

^b The limestone area will not be as severely impacted by slash-and-burn or harvesting activities as it includes limited forest resources and agricultural soils.

K. Appendix 11**Documents Reviewed by the Special Study Mission**

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M. Appendix 13

**ASIAN DEVELOPMENT BANK Policy Guidelines Related to
Hydropower Development**

Guiding Principles	ADB Policy as Relates Directly and Indirectly to Hydropower Development
Policy Area: Energy	
Document: ADB. 1995. <i>Bank Policy for the Energy Sector</i>	
?? Enhance private sector participation in funding large-scale energy investments	?? (re: environmental protection) "ADB should actively pursue environmental protection by giving high priority to power projects with minimum environmental impacts and insisting on adequate mitigation measures and monitoring for projects with significant environmental impacts." (para. 87, item vii, p. 31)
?? Encourage energy efficiency both on supply and demand sides	?? (re: export of electricity) "ADB should support regional trade in electricity between neighboring countries from projects where this meets environmental standards and is cost effective for all parties." (para. 87, item viii, p. 31)
?? More closely integrate environmental considerations in all energy sector activities and enable sustainable development (para. 2, p. 1)	?? (re: incorporation of environmental costs into benefit-cost analysis) "ADB should encourage power utilities to incorporate into their planning models IRP ⁵ with its key elements of... environmental cost internalization..." (para. 87, item iv, p. 30)
	?? (re: rural energy systems) "ADB should provide technical assistance to DMCs to assess in an unbiased manner the economic viability of... minihydropower..." (para. 89, item iv, p. 33)
Policy Area: Agriculture and Natural Resources	
Document: ADB. 1995. <i>The Bank's Policy on Agriculture and Natural Resources Research</i>	
?? "Research outputs will be used in the design of future ADB projects...including projects aimed at natural resources conservation and sustainable use." (para. 61, item ii, p. 16)	?? (re: sustainable management of agriculture and natural resources) Research will focus on "development of participatory approaches and management practices... promoting conservation of land and water resources, ... conservation of forests, biospheres, and natural watersheds; ... sustainable management ... and preservation of...riverine ecosystems (including fishery resources)." (para. 63, item ii, p. 17)
?? Research projects will be funded to cover conservation of forests, biosphere reserves, and natural watersheds	
?? Research projects in fisheries resource management will include preservation, rehabilitation and management of riverine resource systems, development of inland aquaculture systems, sustainability, and environmental conservation	
Policy Area: Biodiversity	
Document: King, Peter N. 1998. <i>Discussion Paper: The Bank's Role in Biological Diversity</i>	
?? (vi) Establish the value and significance of biodiversity for local communities	?? Recommendations Not Approved Policy
?? (ix) Move toward a more interactive model of project development, involving community participation	?? Priority biodiversity projects should include
?? (xii) Develop project evaluation and selection criteria that identify biodiversity costs and benefits	-Rapid biodiversity assessment
	-Support to Species 2000
	-Development of biodiversity information systems
	-Facilitation of increased private sector and NGO

Guiding Principles	ADB Policy as Relates Directly and Indirectly to Hydropower Development
<p>?? (xv) "Review existing policies, procedures, plans, and projects, with the objective of integrating biodiversity support elements into present investments." (para. 81, item xv, p. 25)</p>	<p>involvement in biodiversity conservation -Support to national protected area systems -Institutional strengthening and public education ?? Policy and legislative reform. (para. 98, p. 29)</p>

ADB = Asian Development Bank, DMC = developing member country, ISA = initial social assessment, NGO = nongovernment organization, TA = technical assistance.

^a Integrated Resource Planning "incorporates and internalizes environmental costs and benefits more fully than in conventional least-cost analyses." (p. ii, ADB. 1995).

Policy Area: Fisheries

Document: ADB. 1997. *The Bank's Policy on Fisheries*

<p>?? Three basic objectives: sustainability, equity (for competing resource users), and efficiency (in the development and management of aquatic resources)</p>	<p>?? (re: artisanal fisheries) "ADB will...assess the desirability and implementability of multisectoral projects that integrate the fisheries sector into or link it with the larger economy in terms of access to markets, government services, and employment opportunities in rural and urban centers. The effect will be to increase the geographical and occupational mobility of fishers." (para. 86, p. 26)</p>
<p>?? While encouraging the private sector to play a larger role in marketing and processing, the interests of small-scale fisherfolk and the environment "will be a major concern." (para. 80, item ii, p. 24)</p>	<p>?? (re: developing alternative occupations) "Assistance may be necessary to facilitate exit from the subsector of marginal fishers. Nonfishing employment alternatives may be provided through (i) investments in human capital through skills training; (ii) developing micro and small nonfishing enterprises; and (iii) giving access to capital, i.e., extending credit for nonfishing purposes." (para. 87, p. 26)</p>
<p>?? "ADB's environmental guidelines will be applied rigorously in developing and implementing fisheries and aquaculture projects, which will generally adopt a more holistic and precautionary approach to fully consider the fishery-environment linkages." (para. 80, item iv, p. 24)</p>	<p>?? (re: environmental impacts of fisheries projects) "ADB will apply its environmental guidelines rigorously in developing and implementing fisheries projects and will adopt a precautionary approach to interventions with potential impacts on the environment." (para. 120, item iv, p. 35)</p>
<p>?? "A participatory process will be followed in formulating fishery projects, and the active involvement of the community, NGOs, voluntary organizations, and target beneficiaries in the design and implementation of projects will be encouraged. Where possible, actual small-scale fishing and farming operations should be owned and managed by fishers and fish farmers themselves..." (para. 80, item v, p. 24)</p>	<p>?? "Projects will be designed in a holistic manner, incorporating environmental, social, and other costs and benefits not included in conventional cost-benefit analyses." (para. 120, item vii, p. 35)</p>
	<p>?? (re: environmental impacts of other sectors' projects on fisheries) "The impacts on fisheries of ADB's investments in other sectors will be analyzed and remedial measures incorporated wherever warranted." (para. 120, item xi, p. 35)</p>
	<p>?? "In the future, ADB's fisheries specialists will be asked to review and comment on projects that are considered to have potential impacts on fisheries resources, and where so indicated, appropriate remedial measures will be included in the design of the projects." (para. 117, p. 34)</p>
	<p>?? (re: linkages with forestry) "Because of the effects of deforestation on water regimes and the consequent impact on fisheries, ADB's policy on forestry, which stresses the protective functions of forests and the sustainability of forest ecosystems, is complementary to and supportive of the fisheries policy." (para. 117, p. 34)</p>
	<p>?? (re: participatory approach) "A participatory approach</p>

Guiding Principles	ADB Policy as Relates Directly and Indirectly to Hydropower Development
<p>Policy Area: Forestry Document: ADB. 1995. <i>Bank's Policy on Forestry. Revision 1</i> ?? Balance between production, protection, and participation. ?? Other sectors "should be obliged to consider the implications of their actions on forest resources." (para. 28, item vii, p. 11)</p>	<p>to project design and implementation will be adopted to ensure the acceptability of projects by their target beneficiaries." (para. 120, item vi, p. 35)</p> <p>?? (re: old growth forests) "ADB will not finance any rural infrastructure or other public investment project that contributes significantly, directly or indirectly, to deforestation or to the degradation and depletion of forests. Should any such deforestation or degradation</p>
<p>?? "The intrinsic value of old-growth forests is irreplaceable..." (para. 28, item viii, p. 11) ?? The principles and strategies outlined in the policy paper "will be ensured not only in forestry and agriculture-related projects, but in all sectoral investments of ADB that have impacts on forests." (para. 26, p. 10)</p>	<p>?? become inevitable, ADB will insist upon a compensatory mechanism to reforest or rehabilitate equivalent areas as appropriate in full consultation with affected communities. ADB will not support construction of roads in old growth forests." (para. 33, p. 13) ?? (re: degraded forest lands) "ADB will actively pursue protection and rehabilitation of degraded forest lands in its DMCs." (para. 46, p. 17) ?? (re: biodiversity protection) "ADB will also promote development of forest management systems designed to accommodate the needs of endangered species, both flora and fauna." (para. 47, p. 17) ?? (re: enforcement) "ADB will...help in the strengthening of forest regulation and enforcement agencies with respect to...control of access to forests, particularly to prevent illegal logging and unsustainable shifting cultivation, and depletion of forest resources." (para. 50, pp. 18-19)</p>
<p>Policy Area: Involuntary Resettlement Document: ADB. 1997. <i>Operations Manual Section 50/BP</i> ?? "For any project that requires relocating people, resettlement should be an integral part of project design and should be dealt with from the earliest stages of the project cycle." (para. 2) ?? "Involuntary resettlement should be avoided where feasible." (para. 2, item i) ?? "Where population displacement is unavoidable, it should be minimized by exploring all viable project options." (para. 2, item ii)</p>	<p>?? (re involuntary resettlement) ADB's support "should include assistance to the government and other project sponsors to (i) adopt and implement ADB's policy on involuntary resettlement within their own legal, policy, administrative, and institutional frameworks; (ii) build the capacity of the government and other project sponsors to effectively plan and implement involuntary resettlement in the projects; and (iii) strengthen the DMC's capacities and macro frameworks for involuntary resettlement" (para. 3) ?? "Individuals or a community should be (i) compensated for lost assets and loss of livelihood and income, (ii) assisted for relocation including provision of relocation sites with appropriate facilities and services, and (iii) assisted so that their economic and social future will generally be at least as favorable with the project as without it... compensation, comparable to the without-project situation, should be provided..." (para. 2, item iii) ?? "... resettlement plans should be prepared with appropriate timebound actions and budgets. Resettlers should be provided sufficient resources and opportunities to reestablish their homes and livelihoods as soon as possible." (para. 2, item iv)</p>

Guiding Principles	ADB Policy as Relates Directly and Indirectly to Hydropower Development
	<p>?? "The affected people should be fully informed and closely consulted on resettlement and compensation options. Where adversely affected people are particularly vulnerable, resettlement and compensation decisions should be preceded by a social preparation phase to build up the capacity of the vulnerable people to deal with the issues..." (para. 2, item v)</p> <p>?? "... Resettlers should be integrated economically and socially into host communities so that adverse impacts on the host communities are minimized..." (para. 2, item vi)</p>
<p>Policy Area: Indigenous Peoples</p>	
<p>Document: ADB. 1998. <i>The Bank's Policy on Indigenous Peoples</i></p>	
<p>?? "... ADB must recognize and respect the sovereignty of its member countries, including national legislation and policy relating to indigenous peoples and, at the same time, recognize a responsibility for ensuring equality of opportunity for indigenous peoples and that its operations and assistance to developing member countries do not negatively affect the welfare and interests of indigenous peoples. If an ADB intervention does affect indigenous peoples negatively, adequate measures must be taken to mitigate the negative impact or make certain that a compensation plan ensuring that project-affected people are as well off with the project as without is prepared and implemented." (para. 4, p. 2)</p> <p>?? "Initiatives should be compatible in substance and structure with the affected peoples' culture and social and economic institutions, and commensurate with the needs, aspirations, and demands of affected peoples." Initiatives should have the informed consent of affected communities, and include respect for indigenous peoples' dignity, human rights, and cultural uniqueness." (para. 31, p. 7)</p>	<p>?? "...an initial social assessment (ISA) is required for every development project." (para. 34, p. 8)</p> <p>?? "The ISA should be undertaken as early as possible in the project development process, preferably by the time of the project preparatory TA fact-finding or other preparatory studies, to ensure that all relevant social concerns will be addressed in project design." (para. 34, p. 8)</p> <p>?? If the ISA finds that indigenous peoples are likely to be affected significantly "a specific indigenous peoples plan addressing indigenous peoples and their concerns, that is time bound and that has appropriate budget provisions, must be developed. This plan would be incorporated as an integral part of project design." (para. 35, p. 8)</p> <p>?? Key issues that should be considered include "(i) legal recognition of ancestral domain and the traditional rights of indigenous peoples over land and resources; (ii) recognized legitimacy of the indigenous social and legal institutions of indigenous peoples; and (iii) recognition of the right of indigenous peoples to direct the course of their own development and change." (para. 43, p. 10)</p> <p>?? "Institutional strengthening and capacity building support for indigenous peoples communities should be provided as necessary and appropriate." Also to government entities "when such support would increase the effectiveness and efficiency of such entities." (para. 44, p. 10)</p> <p>?? "...ADB will ensure that affected populations and persons are at least as well-off as they would have been in the absence of the intervention, or that adequate and appropriate compensation be provided. Policy should ensure equality of opportunity for indigenous peoples." (para. 58, p. 12)</p>
<p>Policy Area: Nongovernment Organizations</p>	
<p>Document: ADB. 1998. <i>Cooperation Between the Asian Development Bank and Nongovernment Organizations</i></p>	
<p>? The main objectives of ADB-NGO cooperation are to address "the basic needs of disadvantaged groups in DMCs, and support improved natural resource management and conservation." (para. 22, p. 5)</p>	<p>? "...provide necessary and appropriate institutional and capacity building support to the NGOs. ...provide necessary and appropriate institutional development and capacity building support to DMC</p>

Guiding Principles	ADB Policy as Relates Directly and Indirectly to Hydropower Development
<p>? "An expanded program of cooperation with NGOs in its member countries will be pursued. Such cooperation with NGOs would be with a view to strengthening the effectiveness, sustainability, and quality of the development services ADB provides. The objective of ADB's cooperation with NGOs should be, where appropriate, to integrate NGO experience, knowledge, and expertise into ADB operations, such that the development efforts ADB supports will more effectively address the issues and priorities reflected in ADB's development agenda." (para. 80, p. 20)</p> <p>? "ADB will seek to cooperate with competent NGOs that have substantial knowledge in their areas of focus and with which cooperation would be appropriate and</p>	<p>governments toward the creation of a policy environment that would foster government-NGO relations and support NGO contributions to development processes. ADB would not be a mediator in this regard but a facilitator." (para. 38, p. 10)</p> <p>? NGOs with sufficient capacity can be engaged as executing or implementing agencies; implement or manage selected subcomponents of projects; serve as community organizers or as grassroots-level delivery agents of project benefits; can provide training related to specific aspects of projects to beneficiaries; facilitate communication between project authorities and governments; and participate in monitoring loan project and technical assistance implementation and in benefit</p>
<p><i>mutually beneficial. Such cooperation ... would relate to the type of NGO, the issue or interest being addressed, and country-specific considerations."</i> (para. 81, p. 20)</p> <p>? <i>"Cooperation with NGOs at the country level would be a dynamic process involving ADB, governments, and NGOs, and ADB would work to foster tripartite relationships involving ADB, NGOs, and governments."</i> (para. 82, p. 20)</p> <p>? "Institutional development and capacity-building support for NGOs will be pursued, consistent with overall strategies and existing policy and practice. Institutional development and capacity building for governments in NGO-related matters similarly also will be pursued." (para. 85, p. 21)</p>	<p>monitoring and evaluation and postevaluation activities. (paras. 49 and 50, p. 12)</p>