Addenda to the EAMP November 04 version with supplementary information

25 January 2005

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SET OF STUDIES INCLUDED IN THE EAMP AND ROLE OF INDEPENDENT

PREFACE

Set of studies included in the EAMP and role of independent studies.

This paragraph is to be inserted in the Preface of the EAMP, under the "Development of the EAMP" section, before the last paragraph of the right column, page xxii.

The Annex A, References, presents the 236 main references used during the preparation of the EAMP. This list is made of reports that have been commissioned by NTPC, but also mainly of independent studies that are referenced in the EAMP. These independent studies have been published by the authors and, for some of them, in international magazines and journals, and most of them are available to the interested public.

INCORPORATION IN THE PROJECT DESIGN OF LESSONS LEARNED FROM OTHER HYDROPOWER PROJECTS

The following section is to be incorporated in **chapter 2** of the EAMP, between the "Evaluation of Alternative Configurations" and the "Description of Project Infrastructure" sections.

Incorporation in the Project Design of lessons learned from other hydropower projects

The experience from two recent hydropower projects in Lao PDR, the Theun-Hinboun 210 MW trans-basin project and the Nam Leuk 60 MW trans-basin project, and from the Pak Mun 136 MW run-of-river project in Thailand, but also the experience reflected in the report of the World Commission on Dams has been incorporated in the development of the Nam Theun 2 Project.

Table 1 describes how these experiences and some of the key lessons learned have been taken into account in the design of the Project.

Table 1. Lessons Learned

Lessons Learned	How Incorporated into Project Design
Consider project alternatives and design options and consider environmental and social impacts in an integrated manner with the economic and technical dimensions of the project.	• Two comprehensive analyses of alternatives have been carried out (in 1999 and 2004) to consider different options for power generation in Thailand as well as feasible hydropower development in Lao PDR for export of power to Thailand. • These analyses of alternatives also looked at alternative configurations for the project site on the basis of social and environmental impacts (dam and reservoir size, the number of persons to be resettled) and technical and economic analysis. •
Carefully consider downstream environmental and social impacts, collect adequate baseline data, identify those directly and indirectly impacted by the project, and create adequate mitigation and compensation programs covering all project areas, with associated financial commitments, ahead of	• Downstream impacts in the Nam Theun, Nam Kading, Nam Kathang and Xe Bang Fai drainage areas have been identified and quantified as part of the environmental impact assessment. • Operational measures to reduce impacts include a provision in the PPA to suspend power generation during flood periods. Design features include an outlet structure, regulating pond, aeration devices and a downstream channel to minimize erosion and improve water quality; and provision of predictable and consistent environmental flows. • Where feasible and economical, baseline data has been collected during the development of the EAMP. Long-term studies of fisheries impacts in the XBF, in the Nam Theun and upstream of the Nakai Dam will collect data throughout the construction period.

Lessons Learned	How Incorporated into Project Design
construction.	• A proactive mitigation and compensation programme is being developed with a dedicated budget and contingencies for the resettled population on the Nakai Plateau and in the downstream areas. Mitigation measures are expected to compensate fisheries impacts, loss of riverbank structures and gardens, and other effects. The specific level of funding is indicated in the SDP. • Project financing includes contingency funds to cover cost over-runs, costs of unanticipated impacts, and failure to achieve agreed programme targets.
Identify, prepare and implement development and mitigation measures in consultation with project-affected people. Involve concerned civil society through participatory dialogue and be pro-active in response to issues raised; periodically disseminate project-related information.	• Formal and informal public briefings have taken place throughout the project preparation period. Major public consultations and workshops took place in 1997. New local consultations began in May 2004, followed by international workshops with civil society. The views expressed have been documented and are being taken into account in project decision making. • Sitting of resettlement villages has reflected the preference of affected people. Citizen concerns led to a change from relocation on the Gnommalath plain to relocation on the Nakai Plateau and so that relocated villages are generally within "spirit village" areas. Village layout design has also been changed based on stated preferences. • GoL and NTPC have provided considerable project information on their respective websites to engage civil society in dialogue on the Project. • Informed and meaningful participation of project affected persons, and outreach to local populations, will continue throughout the remaining preparation and implementation periods.
Clearly define the roles and responsibilities of all entities involved in implementation; address capacity gaps; develop adequate monitoring arrangements with task plans, budgets and sufficient long-term funding for all tasks to be certain that supervision continues long after project completion so that careful attention is paid during construction and operations to ensure sound engineering	• Project includes establishment and strengthening of GoL institutions for conservation, social and environment oversight. The project has been instrumental in establishing the NNT WMPA for watershed management, which will be funded by project revenues over a 30 year period. • Extensive monitoring, including GoL, NTPC, IFIs, IAG, DSRP and PoE, and independent monitors, is an integral part of the project design. • An independent professional firm will monitor key project issues for the lenders throughout construction and into the operational period, potentially until the commercial debt has been fully repaid, a period of about 17 years from financial close.

Lessons Learned	How Incorporated into Project Design
and construction and proper compliance with environmental and social mitigation measures.	
Carefully scrutinize procurement aspects to minimize the risk of cost and time overruns and inferior long-term operational performance. Scrutinize contractor selection.	• Specialist consultants completed a review of the procurement process and the structure and cost of the head construction contract (HCC) and subcontracts in April 2004. • Review concluded that there was adequate competition for two of the three civil works subcontracts and the two electromechanical subcontracts and that the agreed prices of all six contracts were generally consistent with, or better than, the prices which might have been expected from greater competition. • Supervision of the entire procurement process by an independent engineering firm reporting to GoL and another independent engineering firm reporting directly to the lenders will help to ensure procurement transparency and efficient implementation. • Thorough staff supervision by IFIs involved. • Qualifications of HCC and subcontractors have been vetted. Financial institutions will need to approve qualifications of key operational personnel.
Hydrological uncertainties have plagued past hydro projects in Lao PDR and elsewhere.	• Project preparation has included detailed hydrological modeling, dam safety planning for a 1000 year flood, and protection of the watershed to prevent sedimentation. • The PPA includes clauses to shelter NTPC from output losses due to XBF flooding and dry years. • Active monitoring and timely warning of XBF flooding is an important feature of NT2 operations.
Geological uncertainties, due both to the paucity of investigations undertaken and the rigors of the terrain, have been the single largest cause of cost and time overruns in past projects.	• Extensive, in-depth geological investigations have been carried out; geological risks in the near-vertical water conduits from the reservoir to the power house have been well catalogued and provisions made in the contract documents for accommodating design changes. • Power house design has been changed from under- to above-ground at some additional cost. • Target pricing has been included in the HCC to shift a portion of the added cost to the project sponsors from the subcontractor in the event of unforeseen problems in the underground works.
Where governance and expenditure management systems are weak, specific	• Proposed revenue management arrangements will target NT2 revenues to eligible priority programs in the GoL's NGPES. • Parallel PEMSP is being designed to strengthen commitment to PEM reform

Lessons Learned	How Incorporated into Project Design
arrangements may be needed to ensure that project revenues are targeted and used transparently, while efforts continue to strengthen national systems.	program and improve implementation with multi-donor financial support.

LOWER XE BANG FAI

This section replaces the text of the Lower Xe Bang Fai section of the EAMP page 51 of the November 04 EAMP version.

Lower Xe Bang Fai

Background
The region of the Xe Bang Fai between the Road 13 bridge and the Mekong River is referred to as the lower region of the Xe Bang Fai. Discharge in this region will also be increased by approximately 220 m3/s, as averaged over the entire year. Under normal conditions, this area is flooded every year due to backwater effects of the Mekong and flooding in the Xe Bang Fai. According to the 36-year hydrologic record obtained at Road 13 Bridge, the Xe Bang Fai flooded in 31 years – without any supplemental discharge from the Project. Because the Project will affect discharge of water from the Nam Theun/Nam Kading into the Mekong, it is estimated that there will be a fall of about 15 cm in the Mekong during flood events (SMEC, 1996). This should allow for quicker drainage of the lower Xe Bang Fai during times of flooding, and consequently partially offset the impact of the increased flows in this portion of the river.

SMEC hydrological modeling
In order to quantify the impacts of the Project discharge on the existing flood regime in the lower Xe Bang Fai area two mathematical models were constructed by SMEC, a hydrologic model of the whole Xe Bang Fai up to the Mekong, and a hydraulic model of the Mekong and of the Lower Xe Bang Fai (SMEC, 2004). A number of surveys were carried out to collect data on river cross-sections, floodplain topography, river bank profiles and flood control structures for input to the hydraulic model. The hydrologic and hydraulic models were calibrated and verified using the data recorded for floods that occurred in 1994, 1995 and 2000 for which records were readily available. Flood frequency analysis carried out on the historic flood records of flows and levels recorded on the Mekong and Xe Bang Fai during other investigations (SMEC, 1996 and SMEC, 2004a) were utilized to determine the appropriate design flood conditions in the Mekong to be applied in conjunction with flood events in the Xe Bang Fai, for the assessment of design flood cases.
It has to be noted that the results of the SMEC report can be considered as a worst case scenario as the release of water from the regulating pong will be stopped before the natural flow reaches 2,270 m3/s at Mahaxai, thereby preventing any additional flooding caused by the Project.

Overall results of the SMEC modeling
The main results of the hydraulic model were as follows: A release of 315 m3/s will increase by 3.75% the extent of the area flooded when added to the maximum flood flow allowed in the Xe Bang Fai immediately before discharges from the Regulating Dam are reduced. Figure 3.26 shows the increased extent of the flooded area, from 324 km2 without the Project to 335 km2 with a project discharge of 315 m3/s. The flood levels in the river and floodplain are expected to increase by approximately 0.5, 0.4 and 0.2 m in the upper, middle and lower reaches of the lower Xe Bang Fai respectively when combined with floods exceeding the bankfull flow. Velocities in the river channel are expected to increase by 20% along the Xe Bang Fai for a 1 year ARI flood that is confined within the banks, and up to 7% for the over-bank floods. The hydraulic model showed that the duration of overtopping of the flood levees was increased on average by 3.6 days each year.

Quantification of the impacts

The results of the SMEC study were then further analysed in terms of impacts on agricultural lands only.

It was considered that the areas under more than 1 m of water during the 1.6 ARI flood events, without the additional release from the Project, will not be further impacted in terms of agricultural production, as, even without the additional release from the Regulating Pond, they are already under too much water to enable such production. The focus is therefore put

on the areas that are currently subject to a flood of less than 1 m, and represented on figure 1.

The model indicates that 5,230 ha of land will be put under more than one meter of water because of the additional release of 315 m3/s for an average duration of 3.6 days per year. The agricultural production on these areas might be impacted.

In addition the model indicates that 1,530 ha of land will be flooded during an average of 3.6 days per year when they are not without the release from the regulating dam. However these areas will be under less than 50 cm, therefore not threatening rice paddy production. The extent of the areas is shown on figure 2.

In addition, it is possible that the extended duration of the flood event on average by 3.6 days per year, could put at risk some of the 2,497 ha of land, which will be under a depth of water varying from 0.75 m to 1 m if the flood takes place before the paddy has been able to grow sufficiently in height.

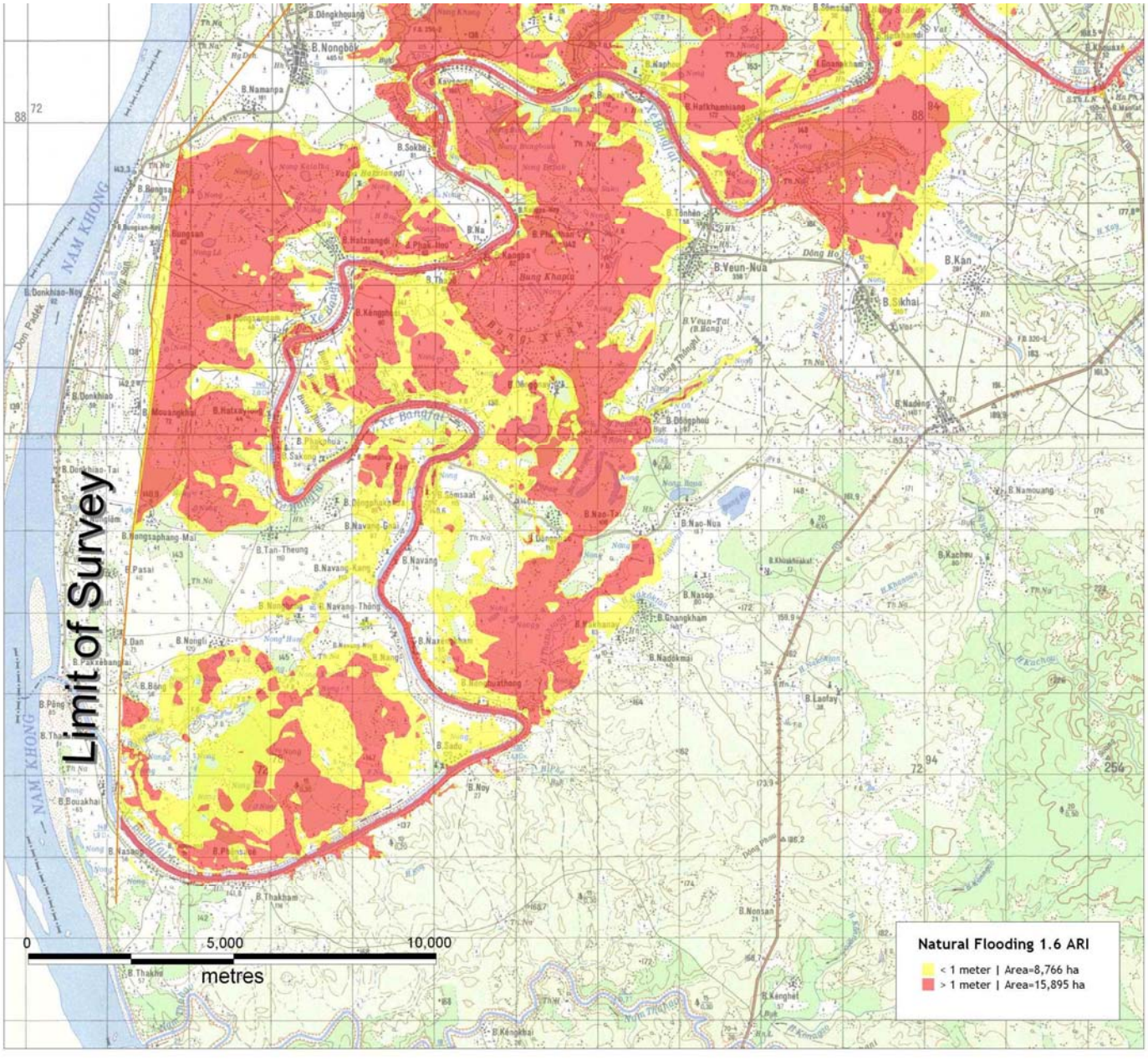
The current use of the land will have to be confirmed as productive agricultural land during the rainy season.

The increased flood plain created because of the additional release of water could impact positively fish production in the area.

Mitigations measures

Several measures could be considered to mitigate the impacts:

- Optimisation of the use of the existing irrigation schemes, including the timing of the opening/closure of the various gates.
- Use of rice varieties that are tolerant to flood episodes, in terms of duration of flood and depth of flood.
- Development of fisheries production.


Limit of Survey
0
5,000
10,000
metres
Natural Flooding 1.6 ARI
< 1 meter | Area=8,766 ha
> 1 meter | Area=15,895 ha
NAM KHONG
B.Veun-Nua
B.Kan
B.Sikhai
B.Nongbok
B.Namanpa
B.Sokbi
B.Halkhamhiang
B.Nao-Nua
B.Nao-Tai
B.Changkham
B.Nadokmai
B.Laofay
B.Nonsan
B.Thakham
B.Kénghet
B.Kénghai

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