

Nam Theun 2 Hydroelectric Project

Project Implementation Plan

Part C: Environmental Activities

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1 Introduction

1.1 Issues

The environmental impacts associated with the construction and operation of the Project, and the proposed mitigation measures, have been identified in detail in chapter 3 of the EAMP.

1.2 Proposed measures

A range of programmes will be implemented to mitigate the potential impacts identified in the EAMP. As at FC, the various programmes to implement NTPC's proposed measures are at different stages of development, with some being implemented, and some still to be developed.

In this Part C:

- **“plans”** are the programmes that are to be developed in order to define appropriate activities. these plans will be dealt with as Additional Plans under Sch 11 of the CTA; and
- **“activities”** are programmes that have been defined or developed, and are being implemented.

The major environmental programmes to be developed and implemented are as follows:

- The Wildlife Management and Protection Programme (WMPP), includes the following Additional Plans:
 - Fish Impacts in Upstream and Downstream Rivers Additional Plan;
 - Terrestrial Animals in the Inundation Area Additional Plan;
 - Asian Elephant Programme Additional Plan;
 - Transitional Strategy for Reservoir Impoundment Additional Plan;
 - Wetland Conversion and Formation Additional Plan;
- The Water Quality Monitoring and Assessment Programme (WQMAP).

The nature and the conduct of the WMPP requires an iterative approach to refine the programme itself during its lifetime. As discussed above, the WMPP will be made of both “plans” and “activities”. “Plans” will become “activities” but could also generate “plans” based on the results of the studies and the implementation of the WMPP.

For most of the components of the WMPP, the approach will be the following:

- Initial surveys of species and their habitat will provide information such as areas in which they are present, the size of their population, the status of such species (ie. is it a global, national, local specie) and on their biological requirements;

- These initial surveys will recommend the development of management plans at the level that will be found appropriate by the biologists (key species, habitat approach) and which are not known at FC;
- The development of such plan might require additional surveys that will be developed accordingly and implemented and which are not known at FC;
- The management plans will be then implemented, and this will include monitoring of a number of parameters (habitats, species, population, resources, etc) during the implementation of the plan; and
- The various elements of this approach will then be reviewed by the Adaptive Management Committee for potential review and change.

It is therefore expected that the WMPP will continue to be developed during its implementation, with new activities emerging during its life, and which cannot be foreseen at FC. The PIP will be updated on a regular basis to incorporate new plans and new activities, necessary for the good implementation of the WMPP.

NTPC will also provide assistance with the procurement of a technical assistance for the preparation of the salvage logging operations on the Nakai Plateau, which will be undertaken by GOL. This technical assistance is expected before the start of the logging operations in the fourth quarter of 2005.

1.3 Budget

Activity/Plan		Budget (US\$)			Limited by	
		To COD	After COD	Total	Scope	Cost
WMPP						
1	Fish Impacts in Upstream and Downstream rivers	126,200	50,800	177,000		✓
2	Terrestrial Animals in the Inundation Area	388,000	34,000	422,000		✓
3	Asian Elephant Programme	175,000	25,000	200,000		✓
4	Transitional Strategy for Reservoir Impoundment	175,000	175,000	350,000		✓
5	Wetland Conversion and Formation	387,000	34,500	421,500		✓
WQMAP		390,000	300,000	690,000	✓	

1.4 Reporting and Monitoring

Progress of preparation of the various plans will be reported regularly by the responsible contractor or organization to NTPC and key indicators will be included in the plans which will be monitored by NTPC.

2 WMPP: Fish Impacts in Upstream and Downstream Rivers

2.1 Objectives

This will establish a monitoring programme targeting fish species and their aquatic habitats and will be undertaken in the sections of the Nam Theun and XBF rivers impacted by the Project.

The monitoring programme will consist of:

- species and habitat inventories;
- monitoring of fish migrations; and
- monitoring of fish productivity.

In addition to the monitoring programme, the modifications of the morphology of the Nam Theun river downstream of the Nakai Dam to the confluence with the Nam Phao river will be reviewed as an activity.

Mitigation measures such as restriction of capture, establishment and use of captive stock for stocking and supporting the wild population and protection of pools will be recommended by the monitoring programme.

2.2 Obligation Per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 part 2 Clause 13	Wildlife Program Element B-Fish Impacts in upstream and downstream rivers
<i>Sch 4 Pt 2 Cl 13</i>	Adaptive Management Committee develops detailed recommendations for mitigation measures from the results of Monitoring Program and the monitoring results of the external monitoring agencies and consult with GOL in relation to their implementation.
<i>Sch4 Pt 2 Cl 13</i>	Adaptive Management Committee shall review suggestions for the modification of the morphology of the Nam Theun river downstream of the Dam to the confluence with the Nam Phao river
<i>Sch4 Pt2 Cl 13</i>	GOL to take over the responsibility of monitoring of fish species and habitats from NTPC one year after the Commercial Operating Date
<i>Sch4 Pt2 Cl 13</i>	Monitoring Programme for fish species in the Nam Theun and Xe Bang Fai

2.3 Milestones

Plan/ Activity	Task	Start	Finish
	Fish impacts in upstream and downstream rivers	Q4 05	Q4 13
Plan	Procurement of Contractors to implement programme	Q4 05	Q4 05
Plan	Inception report. This report will include draft initial data on species and habitat inventories, fish migration, fish productivity	Q1 06	Q1 06
Plan	Additional Plan issued covering (a) species and habitat inventories, (b) monitoring of fish migration and fish productivity and (c) modification of morphology of the Nam Theun (if results of previous relevant study are positive)	Q1 07	Q1 07
Activity	Implementation of Additional Plan	Q2 07	Q4 13
Activity	1 st quarterly report	Q2 07	Q2 07
Activity	Issue of quarterly reports in March, June, September, December of each year	Each quarter	
Activity	Annual meetings to discuss iterative review and implementation of the programme	June each year	
Activity	Study of the benefits of modifying the morphology of the Nam Theun river downstream of the Nakai Dam	Q4 05	Q4 05
Activity	Modification of the morphology of the Nam Theun river if results of the study are positive	Q2 07	Q2 07

Comment [K1]: Can this be done before the additional plan is signed off in Q1 07?

Further milestones may be based on the results of the first phase of investigations.

2.4 Arrangements for Procurement and Implementation

The performance and implementation of the Additional Plan will be contracted out by NTPC to individual specialists. It is expected that some of the activities will be undertaken by Lao institutions.

The responsibility for undertaking species and habitat monitoring in the NPA and the NPA corridor will be handed over to the WMPA one year after COD.

Comment [K2]: Should there be some cross linkage to the livelihood programs? FO: Could be considered, in particular through the information to be provided on fish productivity.

3 WMPP: Terrestrial Animals in the Inundation Area

3.1 Objectives

The objectives are to establish, develop and implement a specific programme for mammal species (excluding the Asian Elephant) found in the inundation area. It is not possible at FC to indicate what group of species will be focused on under this Additional Plan as the pre-impoundment inventories will determine important species in the inundation area.

The programme will consist of:

- pre-impoundment species and habitat inventories with the objective to collect information on distribution and movements of such species on the Nakai Plateau;
- development of a post-impoundment species management programme; and
- implementation of this programme from the beginning of the construction phase, including post-impoundment monitoring of a number of species to determine how the reservoir has affected wildlife populations.

3.2 Obligations per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 part 2 Clause 14	Wildlife Program Element C-Terrestrial animals in the inundation area
<i>Schedule 4 part 2 Clause 14 (a)</i>	Pre- impoundment species inventory programme for terrestrial mammals (except Asian elephant)
<i>Sch 4 Pt 2 Cl 4 (a)</i>	Post impoundment species management program

3.3 Milestones

Plan/Activity	Task	Start	Finish
	WMPP - Terrestrial animals in the inundation area	Q2 05	Q4 14
Plan	Procurement of Contractors to implement programme	Q2 05	Q2 05
Plan	Inception report	Q4 05	Q4 05
Activity	Preliminary surveys	Q4 05	Q2 06
Activity	Mid term report	Q3 06	Q3 06
Activity	Review of the programme by AMC	Q3 06	Q3 06
Activity	Report at end of first phase	Q1 07	Q1 07

Plan	Additional Plan issued covering the pre and post impoundment issues referred to above at 3.1	Q1 07	Q1 07
Activity	Implementation of Additional Plan	Q2 07	Q4 14

Further milestones will be established based on the results of the first phase of investigations.

3.4 Arrangements for Procurement and Implementation

The performance and implementation of the Additional Plan will be contracted out by NTPC to individual institutions and specialists.

The responsibility for undertaking species and habitat monitoring in the NPA and the NPCA corridor will be handed over to the WMPA one year after COD.

4 WMPP: Asian Elephant Programme

4.1 Objectives

The objectives are:

- to develop and implement a management plan addressing the seasonal movements of the Asian Elephants and their habitat requirements;
- to manage the Asian Elephant population affected by the Project; and
- to help prevent any increase in human-Asian Elephant conflicts.

During the construction phase, this will focus on the following aspects:

- development and implementation of a survey and management programme to determine the current population of Asian Elephants on the Nakai Plateau;
- determine seasonal movements of Asian Elephants on the Nakai Plateau;
- development of an understanding of the ecological role and importance of Asian Elephant habitat use, including mineral licks;
- test of various passive and active crop protection methods;
- implementation of crop protection methods to help prevent human-Asian Elephant conflicts; and
- determine feasibility to alter Asian Elephant movement prior to inundation (collectively, the "AEP components").

The Additional Plan will be developed prior to the filling of the reservoir.

4.2 Obligations per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 part 2 Clause 16	Asian Elephant Program :
<i>Schedule 4 part 2 Clause 16 (a)</i>	Survey to determine the current population of elephants on the Nakai Plateau,
<i>Schedule 4 part 2 Clause 16 (b)</i>	(b) Determine seasonal movements of Asian Elephants on the Nakai plateau;
<i>Schedule 4 part 2 Clause 16 (c)</i>	Develop an understanding of the ecological role and importance of elephant habitat use, including mineral licks
<i>Sch 4 Pt 2 Cl 16 (d)</i>	Test various passive and active protection methods and implement the successful ones to help prevent human-elephant conflicts

4.3 Milestones

Plan/Activity	Task	Start	Finish
	Asian Elephant Programme ¹	Q2 04	Q2 14
Plan	1 st phase of the programme, mid-term report	Q2 05	Q2 05
Plan	1 st phase of the programme, final report	Q4 05	Q4 05
Activity	Procuring of Contractors for the second phase of the programme	Q4 05	Q4 05
Activity	Start of the second phase of the programme	Q4 05	Q4 05
Plan	Additional Plan issued in relation to all AEP components	Q1 07	Q1 07
Activity	Implementation of Additional Plan	Q2 07	Q2 14

The first phase of the elephant programme is made of preliminary surveys. The second phase is made of more detailed surveys which are based on the results of the first phase, and will lead to the development of the management plans.

4.4 Arrangement of Procurement and Implementation

The performance and implementation of the Additional Plan will be contracted out by NTPC to individual institutions and specialists in elephant management surveys, studies and preparation of management programmes. The first phase of the Additional is being undertaken in partnership with GOL and WCS.

4.5 Monitoring

The monitoring of the development and the implementation of the Additional Plan will be done by NTPC. NTPC will annually monitor, evaluate and make recommendations for the development and implementation of the Additional Plan.

¹ Activities already commenced include:

- Development and implementation of a survey programme to determine the current population of Asian elephants on the Nakai Plateau.
- Development of an understanding of the use of natural resources, including mineral licks.
- Test of various passive and active crop protection methods.
- Implementation of crop protection methods to help prevent human-elephants conflicts.

5 WMPP: Transitional Strategy for Reservoir Impoundment

5.1 Objectives

The objective is to minimise impacts on animal populations during construction and impoundment of the Nakai Reservoir.

This consists of:

- development, and implementation, of a strategy/ measures targeting wildlife during salvage logging of the Nakai Reservoir;
- development, and implementation, of a transitional strategy for reservoir impoundment;
- training of local authorities in wildlife emergency response;
- establishment and implementation of an emergency response team;
- conduct of a public awareness programme; and
- prevention and the prohibition of wildlife trade.

5.2 Obligations per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 part 2 Clause 15	Wildlife program element D – Development of a transitional strategy for reservoir impoundment
<i>Sch 4 Pt 2 Cl 15 (a)</i>	Appointment of competent/expert wildlife specialist to undertake an analysis of potential threats to animal population during impoundment
<i>Sch 4 Pt 2 Cl 15(b)</i>	Develop a plan to minimize impacts on animal populations during impoundment of the reservoir and during the operating phase, and to deal with emergency responses
<i>Sch 4 Pt 2 Cl 15(c)</i>	Implement the Plan during the Construction Phase and for the first year of the Operating Phase
<i>Sch 4 Pt 2 Cl 15 (d)</i>	Train GOL personnel in the implementation of the plan so that they can effectively take over the implementation of the plan starting one year after the Commercial Operations Date

5.3 Milestones

Plan/Activity	Task	Start	Finish
	WMPP - Transitional strategy for reservoir impoundment	Q2 05	Q4 14
Plan	Procurement of Contractors to implement programme	Q2 05	Q2 05
Plan	Inception report	Q4 05	Q4 05
Plan	Mid term report	Q1 06	Q1 06
Plan	Issue Additional Plan	Q4 06	Q4 06
Activity	Implementation of Additional Plan	Q1 07	Q1 07
Activity	Dedicated component targeting wildlife during salvage logging	Q4 05	Q4 05
Activity	Prevention and Prohibition of Wildlife Trade, first phase	Q2 05	Q4 05

Further milestones will be established based on the results of the first phase of investigations.

5.4 Arrangements for Procurement and Implementation

The performance and implementation of the Additional Plan will be contracted out by NTPC to individual institutions and specialists.

The responsibility for undertaking species and habitat monitoring in the NPA and the NPCA corridor will be handed over to the WMPA one year after COD.

6 WMPP: Wetland Conversion and Formation

6.1 Objectives

The objective is to establish a programme for fish, birds, reptiles and mammal species associated with the swamps and rivers currently located in the area to be inundated will be implemented. This also includes the monitoring of how the new swamp areas will be used by those species.

This consists of:

- pre-impoundment species and habitat inventories;
- development of a post-impoundment species management programme;
- implementation of the programme from the beginning of the construction phase; and
- a special component of the programme will be dedicated to the white winged duck should its presence be confirmed during the initial surveys.

6.2 Obligations per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 Part 2 Clause 17	Wetland conversion and formation
<i>Schedule 4 part 2 Clause 17</i>	Development and implementation of a programme for fish, birds, reptiles and mammal species associated with the swamps and rivers currently located in the areas to be inundated, and the new wetlands created by the project, consisting of : <ul style="list-style-type: none"> • (a) Pre impoundment species and habitat inventories : • (b) Development of a Post impoundment species Management Programme including the Special Conservation Areas • (c) Implementation of the Programme from the beginning of the construction phase
<i>Schedule 4 part 2 Clause 17</i>	The programme will have a dedicated component for the white-winged duck (for monitoring, establishing threats and potential release and captive sites) if its presence is confirmed during the initial surveys.
<i>Schedule 4 part 2 Clause 17</i>	The company will be responsible for assessing Project Impacts on animals pre and post impoundment
<i>Schedule 4 part 2 Clause 17</i>	Coordination between NTPC and GOL to develop plans for post impoundment management of wetland species and fish spawning grounds in Special Conservation Areas

<i>Schedule 4 part 2 Clause 17</i>	GOL to take over post impoundment species management plan for the NPA and Corridors and the Special Conservation Areas one year after the Commercial Operations Date
<i>Schedule 4 part 2 Clause 17</i>	GOL Responsible for patrolling the Special Conservation area of the reservoir pre and post impoundment, and for implementing their licensing and permitting program, some of which have conservation implications, in the area of the reservoir outside of the Special Conservation areas.

6.3 Milestones

Plan/Activity	Task	Start	Finish
	WMPP - Programme for Wetland conversion and formation	Q4 06	Q3 11
Activity	Conduct of Pre Impoundment Species and habitat inventories	Q4 06	Q1 08
Plan	Preparation/Development of Post Impoundment species Management Programme including Special Conservation Areas	Q4 06	Q1 08
Plan	Development of a Component dedicated to white-winged duck to be implemented after completion of survey and confirmation of their presence	Q4 06	Q1 08
Plan	Issue Additional Plan covering all components referred to above at 6.1	Q2 07	Q2 07
Activity	Implementation of Additional Plan	Q3 07	Q3 07
Plan	Post Impoundment Species Management Plan for NPA and corridors	Q1 08	Q3 11

Further milestones will be established based on the results of the first phase of investigations.

6.4 Arrangements for Procurement and Implementation

The performance and implementation of the Additional Plan will be contracted out by NTPC to individual institutions and specialists.

The responsibility for undertaking species and habitat monitoring in the NPA and the NPCA corridor will be handed over to the WMPA one year after COD.

7 Water Quality Monitoring and Assessment Programme (WQMAP)

7.1 Objective of WQMAP

The objective of WQMAP is to monitor water quality in the Nam Theun and XBF, and some of their tributaries, and the Nakai Reservoir, and to monitor groundwater in the Project area during the construction and the operation of the Project pursuant to the objectives set out in the EAMP at chapter 3.

The overall aims of the WQMAP are to:

- achieve effective collection, analysis, interpretation and presentation of water quality data for surface water and groundwater;
- monitor whether NTPC is fulfilling its obligations under the CA; and
- assist in the formulation of appropriate mitigation measures and adaptive management strategies to help reduce the impact of any deterioration in water quality that may result from Project activities.

7.2 Components of the Programme

The main components of WQMAP are as follows:

7.2.1 Developing WQMAP

Which includes:

- developing a WQMAP that provides adequate information on the pre-construction, preliminary construction, construction and operation phase groundwater and surface water quality;
- evaluating potential impacts resulting from construction and operational activities, with tailoring of the WQMAP to monitor for these potential impacts;
- developing a Standard Operating Procedures Manual for sampling, preserving and analyzing surface water and groundwater; and
- provide training and technical support to the Lao agency conducting the collection and analysis of samples.

7.2.2 Data collection and reporting

Which includes:

- baseline data acquisition in the pre-construction phase of the Project, then in the construction and operation phases;
- an assessment of water quality, identification of variations, trends and abnormal levels, and investigation of cases where trigger levels are exceeded;
- development of a coherent reporting system; and
- development² of a database for long-term storage and acquisition of water quality data.

7.2.3 Mitigation measures and evaluation

Which includes:

- preparing an evaluation and recommendation of appropriate management and mitigation measures that could be implemented to prevent/ nullify any adverse changes in water quality from pre-existing conditions; and
- identification, via adaptive management, of measures which may improve WQMAP through ongoing evaluation during the implementation phase.

7.3 Obligations per CA

<i>CA Reference</i>	<i>Description of Environmental Measure to be implemented</i>
Schedule 4 Part 2 Clause 10	In stream degradation of the downstream channel during operation of the facility
<i>Clause 10 (b)</i>	The Monitoring Program ...to detect any erosion of consequence... of the banks and bed of the excavated channels of the downstream channel from turbined flows
Schedule 4 Part 2 Clause 11	Scouring at the confluence of the Xe bang Fai River and the Downstream Channel and increased erosion of the banks of the Xe Bang Fai River below the confluence.
<i>Clause 11 (d)</i>	Monitoring Program to determine natural rate of erosion of the banks of the Xe Bang Fai river below the proposed Confluence Area, beginning in 2002 and until downstream Channel first becomes operative.
<i>Clause 11(e)</i>	Monitoring program to monitor erosion of the banks of the Xe Bang Fai River below the proposed confluence Area and to obtain the rate of erosion once the Downstream Channel becomes operative compared with the natural rate of erosion established

² In this context, "development" means to coordinate WQMAP with other ongoing and future monitoring programmes.

	under item 11(d).
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7.4 WQMAP Parameters

Parameters monitored for *surface* water are listed below:

Temperature	Silica	Conductivity	Magnesium	Ammonia
pH	Total Iron	Alkalinity	Mercury	Sodium
Total Suspended Solids	Lead	Nitrite	Biological Oxygen Demand	Manganese
Nitrate	Fecal Coliforms	Total Phosphorus	Climatic conditions	Arsenic
Calcium	Dissolved Oxygen	Potassium	Turbidity	Chemical Oxygen Demand

Parameters monitored for *groundwater* include the following: pH, odour, total hardness, turbidity, conductivity, nitrate, iron, manganese, fluoride, arsenic, number of thermo-tolerant coliforms.

Additional parameters, including pesticides and other synthetic chemicals, petrochemicals and heavy metals in fish tissue, will be monitored as required.

7.5 Milestones

Task	Start	Finish
Water Quality Monitoring and Assessment Programme (WQMAP)	1/10/04	End of Concession Period
<i>Inception phase (one month)</i>	26/12/04	31/01/05
<ul style="list-style-type: none"> Development and finalization of the WQMAP 	Q1 05	Q2 05
<ul style="list-style-type: none"> Provide a Standard Operating Procedures Manual 	Q1 05	Q2 05
<ul style="list-style-type: none"> Provide Training to Lao Department of Irrigation Analytical Chemistry Laboratory (DOI) laboratory to carry out sample collection and analysis. 	Q1 05	Q2 05
<i>For the first six month period (for each month)</i>	Q1 05	Q2 05
<ul style="list-style-type: none"> Sample collection and analysis. 		
<ul style="list-style-type: none"> Collection, interpretation and reporting of data. 		
<ul style="list-style-type: none"> Identify potential emerging problems, and recommend mitigation measures. 		
<ul style="list-style-type: none"> Ongoing technical support to the DOI 		
<ul style="list-style-type: none"> Evaluating the WQMAP effectiveness 		
Tendering and contracting for the second phase of the programme	Q2 05	Q2 05

Task	Start	Finish
Regular activities (sampling, analysis, interpretation, reporting)	Q3 05	End of Concession Period
Monthly reports during the entire period		

7.6 Arrangements for Procurement and Implementation

United Analyst and Engineering Co. Ltd have been contracted by NTPC to undertake and implement the WQMAP in collaboration with the DOI. A core component of the WQMAP is to provide sufficient training and technical support to strengthen the capacity of the DOI laboratory with a view to continuing involvement in this long term monitoring programme. There are provisions in the above arrangement for the period of collaboration to be extended.

The responsibility for undertaking species and habitat monitoring in the NPA and the NPCA corridor will be handed over to the WMPA one year after COD.

7.7 Evaluation and Monitoring

Periodic review of sampling techniques, site selection, analytical techniques and other elements will be carried out to assess the effectiveness of the WQMAP and to check whether it is successfully addressing its specific objectives. On the terms of the adaptive management principles, continual evaluation of methodologies and data outputs shall be made and recommendations given.