# VOLUME 3 – CHAPTER 8
# MITIGATION, RESETTLEMENT AND LIVELIHOOD RESTORATION

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# 1 MITIGATION AND COMPENSATION PROGRAMME

## PART 1: INTRODUCTION

As explained in Chapter 1, the NT2 Projects Xe Bangfai and downstream program has the following 6 main components:

- the incorporation of engineering design features to minimize environmental impacts, such as design of the intake channel transferring water from the reservoir to the intake structure (enabling the water from the epilimnion to be withdrawn preferentially), the regulating pond (avoiding most variable flows into the XBF which would otherwise have resulted from the peak load operation of the powerhouse), the downstream channel (avoiding discharge into a small watercourse), the aeration weir in the downstream channel and the riverbank protection at the confluence of the downstream channel and the Xe Bangfai;
- the conduct of studies, and surveys in order to define current livelihoods that may be impacted and predict the type of level of impacts;
- the implementation of mitigation in and along the XBF itself, where (a) selected sections of the riverbank will be protected against erosion, (b) village water supplies will be improved, if required, and (c) resolution of the problem of decrease dry season river crossing due to increased dry season flows;
- livelihood compensation, whereby all and any negative impacts on villagers socio-economy - mainly in fisheries and riverbank gardens - will be fully compensated; the exact method of compensation, and the compensation options implemented will depend on the results of the feasibility study that will be launched after FC, and on the ongoing consultations with affected villagers. This compensation program will be fully coordinated with the planned Xe Bangfai development program;
- the conduct of on-going consultations in which (a) villagers are fully informed of predicted impacts and their rights to compensation, (b) villagers are encouraged to voice their concerns and forward proposals for mitigation and compensation approaches and activities, and (c) the villagers are fully involved in pilot compensation implementation and then the monitoring of impacts;
- participatory monitoring to observe and measure the environmental impacts of the Project and any resultant socio economic impacts, and adjust the compensation and development program accordingly.

Mitigation and compensation are thus crucial features of this program, and are the aspects of the program of most concern and importance to the potentially affected people living along the Xe Bangfai.

In the development of the Projects strategy and program for the Xe Bangfai, the following distinction has been made between mitigation actions, which aim to avoid or lessen the occurrence of environment impacts and address physical impacts that still do occur, while compensation aims to address those residual livelihood impacts which are unavoidable, as explained below.

### 1.1 DEFINITION AND COMPONENTS OF MITIGATION

Mitigation refers to two aspects. Firstly, it refers to engineering design features that are incorporated into project constructed in order to avoid or lessen environmental impact - in order to limit impacts related to water quality and erosion - which would otherwise occur due to the increased discharge in the Xe Bangfai from the NT2 project. Such proactive investments in engineering designs and structures include;

- Clearance of biomass in the Nakai Reservoir to mitigate bad water quality;
- Design, construction and operation of a large regulating pond (8 million $m^3$) to mitigate daily fluctuations in discharge (due to fluctuations in power house discharges) and thus fluctuations in the levels of the Xe Bangfai;
- Construction of the 27 km long downstream channel - instead of discharging into the the Nam Kathang - which will mitigate against erosion that would occur in the smaller Nam Kathang, which would then affect both Nam Kathang riparians, and Xe Bangfai water quality and fisheries;

- Construction and Operation of an aeration weir (in the downstream channel); and
- Agreement in the PPA to progressively reduce then shut down the power plant during over bank flooding, to mitigate against flooding in the wet season.

In addition to the design engineering features of the NT2 Project, mitigation also refers to physical mitigation of impacts that may still occur along the Xe Bangfai, and that will be carried out as and when these impacts occur, such as:

- Protection of the Xe Bangfai riverbank in its upper reaches, and where fixed assets occur;
- An alternative to river bank protection will be the relocation of buildings, if required;
- The protection of irrigation supply pipe footings, if required (if they are eroded and undermined);
- improvements to dykes and water gates; and
- Improvements in village domestic water supplies.

## 1.2 DEFINITION OF COMPENSATION

Compensation in the current document is defined as resettlement and/or livelihood restoration where and when applicable. This implies that the Project aims at providing new houses where current houses will not be habitable in the future (e.g. due to river bank erosion) and restoring livelihoods where these have been negatively impacted by the Project.

Compensation relates to assistance to be provided to PAPs and/or PAVs for any negative socio-economic impact caused by the change in Xe Bangfai and Nam Theun flows and water quality due to the NT2 Project. Thus, compensation will be applicable to impacts such as

- reduction in mainstream fisheries catch;
- inability to establish dry season riverbank gardens and fields due to increased river levels and erosion; and
- difficulties in dry season crossing of the XBF river.

The level of actual compensation required will be confirmed before project commissioning and actually assessed regularly after project commissioning. As a general rule, the type of compensation to be given will be identified by community review and consensus, on a household by household basis for riverbank gardens and on a village by village basis (or household by household basis whenever needed) for fisheries and crossing of the Xe Bangfai.

However, it is possible to present the compensation options as having three general types, as follows;

- direct restoration or rehabilitation of impacted livelihoods, such as 'fish for fish', 'gardens for gardens' and the like;
- restoration of impacted livelihoods in terms rehabilitation of incomes or protein - for example the development of cattle raising programs to compensate for loss in fish catch;
- thirdly, the community may decide that they do not require income or food-based livelihood restoration as such, but more community development type activities.

# PART 2: MITIGATION PROGRAMME

## 1.3 MITIGATION OF POOR WATER QUALITY

The overall objective of mitigation for water quality is to

(a) maintain the current beneficial uses of the water, mainly for irrigation and domestic purposes; and

(b) avoid, as much as possible, water quality impacts on the fisheries in the Xe Bangfai.

There are numerous engineering works and mitigation measures designed or planned to help ensure water of adequate quality is discharged into the Xe Bangfai.

### 1.3.1 Biomass Reduction

During the initial inundation period of a reservoir the inundated terrestrial biomass decomposes, and in doing so it consumes dissolved oxygen in the water. This can result in water quality problems. In the initial years after Project commissioning, the water quality in the reservoir, and therefore water quality discharged into the Xe Bangfai, will be influenced by the amount and nature of biomass flooded. While the current amount of biomass in on the Nakai plateau is not extensive, the Project will seek to further improve the future water quality in the reservoir by reducing biomass in two ways. Firstly, the Project will encourage salvage logging for sawn timber, plywood and chip board. Secondly, there will be promotion of firewood collection and/or charcoal production by villagers and construction camps. Both these mitigation measures will reduce the amount of biomass able to decompose and thus reduce the impact of biomass decomposition on water quality.

It will not be possible to remove all the biomass from an inundation area of approximately 450 km$^2$. Therefore in the initial two to four years after inundation there is likely to be short periods of problematic water quality associated with the decomposition of residual biomass.

### 1.3.2 Engineering Works

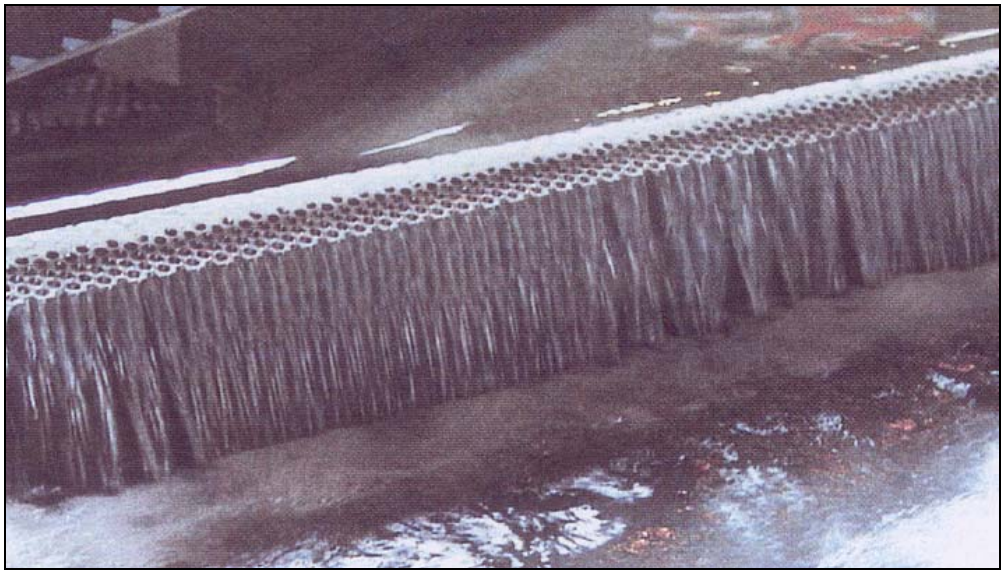
Engineering works will be designed and constructed to mitigate for these periods of poor water quality in order to maintain existing uses of water by the communities along the Xe Bangfai and to avoid excessive impacts to aquatic life.

The design of the reservoir intake for the power station will help reduce the impact of any potentially poor water quality periods. The Intake Channel, through which the water will be conducted to the intake structure, will be designed so that in the dry season Reservoir water for the power station will be taken from the full water column, not just the bottom water, therefore any potentially oxygen poor bottom (hypolimnion) water will mix with oxygen rich surface (epilimnion) water, thus improving the overall water quality of the power station discharge.

An aeration weir designed to provide maximum aeration and thus mitigate anoxia in water discharged into the Xe Bangfai will be located across the entire width in the downstream channel, approximately 8 km downstream of the regulating dam. Water will drop from a higher level to a lower level by falling over the structure; this action will increase turbulence and entrap much more oxygen than occurs by normal transfers through a non-turbulent water surface. The holes in the grid system allow the formation of more air bubbles and create a larger surface area for oxygen to diffuse into the water, and at the same time degasify the water of oxygen-consuming compounds such as methane. The aeration structure thus acts like natural rapids. Physical scale models of the aeration weir in the downstream channel have been developed to test the efficiency of the aerating structure. Figure 1-1 illustrates a possible configuration for the downstream channel aeration weir.

Thus aeration weir will help aerate the NT2 water with oxygen and degasify the NT2 waters of oxygen consuming compounds. This will help ensure that water discharge into the Xe Bangfai will be of adequate quality, in terms of dissolved oxygen, for aquatic life.

**Figure 1-1: A Possible Design of the Aeration Weir**



### 1.3.3 Water Temperature

Water discharged from the NT2 turbines will have lower concentrations of nutrients, and will be about 3°C colder than the water from the Xe Bangfai (at the confluence of Nam Phit and Xe Bangfai). However, water from the power station is first retained in the regulating pond and then it flows 27 km in the Downstream Channel, including flowing over the aeration structure. Throughout this process the water will be in contact with air temperatures of the Xe Bangfai area, and this is expected to help reduce the difference in temperatures. It is predicted that temperature shocks of no higher than 1.5 °C will occur, and this will have minimal impact on fish at the confluence of Nam Phit and Xe Bangfai, and less so downstream.

## 1.4 PROJECT DESIGN MITIGATION OF EROSION AND SEDIMENTATION

There have been various downstream engineering works (downstream of the powerhouse) designed specifically to mitigate - to avoid as much as feasible - problems with erosion and sedimentation along the Xe Bangfai, particularly the construction of the regulating pond and the downstream channel

### 1.4.1 The Regulating Pond

The Regulating Pond and associated retention of 8 million $m^3$ of water is planned to minimize level fluctuations and fluctuation gradient in the Downstream Channel (DC) and thus in the Xe Bangfai, by being able to continue to release water regularly during one full day when the operation of the Plant is stopped. Thus, during the week, even when the powerhouse shuts off every night, the discharge to the downstream channel and thence the Xe Bangfai will be constant. The powerhouse shut down over late Saturday and Sunday cannot be fully regulated by this Pond. However, it can ensure a slow and relatively benign drawdown on the weekend, and the maintenance of a minimum flow in the DC on the weekends. The lack of such a serious Regulating Pond in similar cross-basin transfer hydropower rejects has resulted in serious downstream erosion in these projects, and this will be very considerably avoided by the NT2 investments in this structure.

### 1.4.2 Downstream Channel

The purpose of designing and constructing the 27 km long downstream channel is to avoid discharging turbinated waters into the Nam Kathang, which is too small and would have to be seriously rearranged to be able to accommodate the additional flow of the Project. Discharge directly into the Nam Katang would also have resulted in considerable erosions and impacts along the Nam Kathang, which would have serious impacts to riparian along this small river, and also the fisheries in the Xe Bangfai.

### 1.4.3 Downstream Channel (Nam Phit) – Xe Bangfai Confluence

The confluence where the Downstream Channel enters the Xe Bangfai has been designed and will be constructed to minimize bank erosion, with the addition of rocks in concrete grout to strengthen the banks. Thus, erosion at this area, which is generally a zone where significant erosion would occur, will be largely avoided. This will be monitored and if erosion that puts the structural stability of the confluence at risk does occur, then the Company shall further protect the area with appropriate bank protection measures.

### 1.4.4 Construction Phase Related Erosion and Sedimentation

To mitigate any impacts associated with construction site erosion and sedimentation, the construction contractor will prepare and implement an erosion and sediment control plan. This plan will require the contractor to take appropriate measures to control erosion of construction sites and minimize the sedimentation of the Xe Bangfai.

Mitigation measures will include development of drainage works, sediment traps, diversions, culverts and other structures designed to treat water to an acceptable quality before discharge into the Xe Bangfai. All runoff from the construction areas will be directed to sediment settling areas designed to accelerate sediment removal. The contractor will maximize the use of working in the dry season, as construction is easier in the dry season, and this will further minimize the erosion impacts. Therefore erosion impacts due to construction are not expected to be significant with implementation of these adequate mitigation measures and good monitoring practices.

## 1.5 MITIGATION OF EROSION

### 1.5.1 XBF Riverbank Erosion

Rivers such as the XBF have a natural instability with alternating sequences of erosion of the river bed and banks and then downstream deposition of sediments. On the XBF, bank collapses are evident, as is sand deposition. The XBF riverbanks are mostly steep and of dense silty sandy soils with only the occasional rock bars. The river bank erosion is increased on the outside of bends. Here, river flow velocities are higher and the river channel is deeper and near the toe of the bank and scouring of the toe occurs. Sand deposition is increased on the inside of river bends, where velocities are less, but on the XBF, deposition is also observed along straight reaches.

Another significant cause of erosion is by seepage of groundwater through the riverbank, particularly when river water levels recede and there is flow from the saturated riverbank to the lower river level. This seepage can scour fine material from the bank causing instability. In addition to natural erosion, the banks erode because of human use at village landing places and riverbank gardens and cattle seeking access to the river and grazing riverbank vegetation. Erosion is also caused by surface runoff down the banks and by waves generated by wind or boats.

Releases from the Nam Theun 2 Reservoir will increase the discharge of the Xe Bangfai (XBF) River by an average of 220 cumecs ($m^3/s$). The maximum increase is 330 $m^3/s$, however on weekends there will be lower increases between 30 and 80 $m^3/s$. This is a major change to the river regime and there will be a modification to the river geomorphology resulting with increased erosion and possible slumping of the riverbanks, especially during the early Project years. In addition, the erosion rate of the Upper XBF riverbanks will be increased as a result of flow velocities. The river widening will be initially significant just downstream of the Nam Phit and the first few kilometers of the river. Subsequently the degradation will extend downstream, but the erosion will decrease with distance. It is predicted that the there may be as much as 20 meters of extra erosion in the initial active period in the Mahaxai District, and 10m in the Xe Bangfai District. Eventually a new river cross section will be established and the rate of erosion will decrease.

For important, permanent structures or structures with community or cultural value whose relocation would be difficult or not desirable, then protection of the river bank around these structures will be undertaken by the NTPC, as described below.

In other cases, and where building relocation is feasible, the Project will assist in the relocation of buildings that are under threat from the increased erosion (see Section 8.2).

#### *1.5.1.0 Types of Riverbank Protection*

Types of riverbank protection are generally grouped as follows:

- Natural bank protection. This can include turf, grass reinforced with synthetic materials, timberwork and reeds.
- Vertical bank protection. This can include steel sheet piling, gabion structures (wire baskets filled with rock), concrete or masonry gravity walls, precast units and reinforced earth structures.
- Sloping bank protection, known as revetments. This can include rip-rap, gabion mattresses, concrete blocks or slabs and geo-textile mats and grids.

The type of protection used in the Xe Bangfai will depend on several considerations, for example whether the finished riverbank should have a vertical or sloping profile. Other considerations include the availability of construction materials, the time available during dry season low river water levels to complete the works and maintenance requirements. Access to the river and incorporating boat landings is also an important consideration.

In Lao PDR, the most common method of protection on larger rivers is by rock filled gabion baskets or mattresses in front of a geo-textile filter fabric. The use of gabions enables drainage through the entire structure with the filter fabric being necessary to prevent fine materials from being washed out from behind the gabions during receding water levels. Gabions are flexible and the structure can stand some settlement and intolerances during construction. In the long term, the siltation of the gabions enables grasses and other vegetation to grow and further protect the bank. The baskets and geotextile are available from Thailand and rock is available in the Project area. For the XBF, this is the recommended method of bank protection.

There are more expensive methods of protection along the Mekong River, particularly around ports. Gabions do have the disadvantage of increased maintenance requirement as the wire baskets can become damaged by boat collision and vandalism (children may use the wire for other purposes). Trees cannot be allowed to grow out of the structures.

Whether to use sloping or vertical bank protection is largely dependent on the availability of land. Sloping protection is of lower cost but the banks have to be cut and/or filled to a slope of, for example, 1:2 or 1:2.5 (vertical: horizontal). If there is no room available to cut the bank to the required slope because of steep banks and a building is located close to the edge of the bank, then vertical protection is required.

**Length of Protection**
Riverbank protection works must extend both upstream and downstream of the Temple that it is intended to protect. If the protection is restricted to immediately in front of the Temple, erosion occurring upstream of the protection will cause undercutting of the structure and future collapse. The protection must begin at a suitable location upstream of the Temple. Similarly, if the protection is not continued a suitable distance downstream, downstream erosion will cut back under the protection.

**Protection at the Bank Toe**
The toe of the bank protection must be adequately protected from undermining by stream flow scour and, to a lesser extent, seepage. Toe scour can occur if the main stream channel is located at the bank toe, which typically occurs on the outside of a bend.

This protection is provided by extending the protection away from the bank into the river bed. This is known as an armor skirt. Flexible gabion mattresses are useful in this regard. The armor skirt can be extended at the same revetment slope into the bed or be extended horizontally on the bed.

**Site Access**
There has to be adequate site access for the delivery of the construction materials. Many truck loads of rock and wire baskets will be required. For construction, there should be adequate working space.

There is a significant problem with site access at the two rural villages located downstream of old Mahaxai. The roads to the villages are not good and impassable during the wet season. There is a problem with working space at all the sites as the Temples are all located close to the top of the river bank.

#### *1.5.1.1 River Bank Protection Works for Temples*

Among the impacts of the increased erosion are that buildings located on the banks of the Upper XBF will be undermined and some will eventually fall into the river unless they are relocated farther from the riverbank. However, in the cases of Buddhist Temples and other spiritual sites, the villagers would prefer not to move the Temples and that riverbank protection works be undertaken.

A description of the three temples in the upper Xe Bangfai which may face erosion and require protection works is presented in Annex 1. The basis of how the preliminary cost estimates were prepared is discussed in section 1.5.1.2 below.

It is uncertain whether the temples of the two villages located in the Xe Bangfai district will be impacted by the increased discharges or not, and are not currently included in the estimates. The lengths of protection and costs have been provisionally estimated as similar to Ban Pong. Road access to the two villages is from Road 13 South, but the villages have not been visited by road and the road condition is uncertain.

#### *1.5.1.2 Preliminary Cost Estimates*

NTPC have surveyed XBF cross-sections in 1995, 2001 and 2002 so that rates of bank erosion can be monitored. Some of the cross-sections are located close to the Temples and a Ban Pong, the cross-section is at the Temple itself. Therefore approximate heights and widths of the protection works could be evaluated. The preliminary cost estimates are based on:

- A width of gabion mattress protection of 48-m from the river bed to the top of bank. This is further based on an average height of 14-m from the bottom to the top of the bank cut and filled to a 1:2.5 slope. This equates to a 35-m slope length plus an extra 12-m at the bed for toe scour protection and an extra 1-m at the top of the bank.
- Rock is available at a quarry located about 12-km from the new Mahaxai District Center. To the XBF villages this is an average haul distance of 30-km. A unit price of US$ 10 per cubic meter delivered at the sites has been used.
- Gabion mattresses, 6 x 2 x 0.3-m thick, at US$ 130 each delivered to site.

The above, plus the necessary earthworks required, equates to around US$ 1,000 per meter length of protection for the works at Mahaxai Tai. For the works at the two Temples on the opposite bank, this cost per meter has been increased by 10 % to allow for the more difficult access and working space problems. At all sites, an extra US$ 5,000 has been included for stairway access within the protection works to lower water elevations. A summary of the preliminary estimated costs is presented in Table 1-1.

For the four villages of Pha Nang, Pong, Keng Pe and Tha Kor it is estimated that main buildings will not be affected. Thus, the total preliminary estimate for the three villages in the upper Xe Bangfai where river bank protection will be carried out is US$ 450,000.

**Table 1-1: Estimated Cost of Riverbank Protection for 3 Temples along Xe Bangfai.**

| No. | Village | Estimated Cost US$) | Remarks |
|---|---|---|---|
| 1 | Mahaxai Tai | 150,000 | |
| 2 | Pova Neua | 135,000 | |
| 3 | Pova Tai | 165,000 | Further investigations may show that less protection may be required |
| | **Total** | **450,000** | |

### 1.5.2 Irrigation Pump Installations

Any increase in river bank erosion may affect irrigation pump supply pipe footings. Efforts to protect or strengthen these footings against erosion will be made immediately after Project Commissioning, or at a time that regular monitoring indicates that such protection is required. Therefore, the integrity of the

communities' irrigation systems will not be compromised. However, in cases where protection is not feasible and erosion damages the pumping pipe line, then NTPC will assist in the re-establishment of the pumping system and supply pipes.

## 1.6 MITIGATION OF FLOODS

### 1.6.1 Powerhouse Shutdown

It is planned, and there is commitment in the PPA, to shutdown the Powerhouse, and thus the release of turbinated waters, when there is a risk of overbank flooding along the Upper Xe Bangfai. This will avoid any flooding due to the Plant operation and will let overbank flooding, if any, occur in a natural manner. This measure implies an average reduction in the production of 44 GWh/year, which is equivalent to a cost of approximately US$ 1.8 million per year, or a cost of US$ 10 million in NPV for NTPC over the 25 years of operation.

### 1.6.2 Flood Control Structures – Water Gates and Levee Dykes

The expected impact of the increased flooding in the Lower Xe Bangfai due to the Project, which is more pronounced in the upper section of the Lower Xe Bangfai will be mitigated and managed by targeted construction of flood protection dykes and construction of more water gates and improved function and management of all water gates.

Of the 22 tributaries in the Lower Xe Bangfai, there are currently water gates established on 12 of these (see Table 2-15 in Chapter 2). The Project will upgrade these in order to improve their function for both flood control and fish migration. For the ten locations, where there are currently no structures in place, the Project will construct gates where this is found to be the best solution for optimal flood management.

**Table 1-2: Cost Estimate of Earth Works for Levee Dykes, Lower Xe Bangfai**

| Bank | Dyke Length (km) | No. of Reaches | Earthworks Volume (m3) |
|---|---|---|---|
| Right Bank | 26.5 | 17 | 91,000 |
| Left Bank | 16.8 | 5 | 33,000 |
| **Totals** | **43.3** | **22** | **124,000** |

## 1.7 MITIGATION OF POTENTIAL HEALTH IMPACTS

An analysis of the possible impacts on heath in the area (Health Impact Assessment) and the Project's commitment to health is detailed in Chapter 5 of this SDP. The Regional Health Program is designed to directly mitigate any adverse health effects due to (a) the increased construction population or (b) any environmental impacts of the NT2 Project.

The objective is to combine the Project's support to health care activities with the GOL Provincial and countywide programs. Part of the programs activities will be to:

- monitor the health impacts, if any, of the projects discharge in the Xe Bangfai;
- inform communities about endemic diseases, control programs and correct health care measures;
- ensure a sufficiency of essential drugs;
- train and transfer appropriate technology among health workers and practitioners; and
- provide support to disease control programs, if required.

## 1.8 RIVER SAFETY AND AWARENESS

Changes in the current flow regimes of the Xe Bangfai and tributaries may cause some initial safety problems, especially the draw down on Sundays and raising in water levels on early Mondays. This change in flows, especially the rise, may catch people and buffalos unaware; an awareness raising program will be an integral part of the continuous public disclosure and consultation.

## 1.9 ELECTRICITY

The electricity transmission facilities developed by the NT2 Project include two transmission lines and a substation. The first transmission line is a 138 km long 500 kV double circuit transmission line to deliver

electricity from the power station to the transfer point on the Lao-Thai border near Savannakhet. The second is a 32 km long 115 kV double circuit transmission line terminating in Mahaxai which will deliver electricity from the power station to EDL, for use within the Lao electricity network.

The additional electricity will strengthen the existing electricity supply in the Xe Bangfai region, where there is currently an insufficient and intermittent supply. More specifically the additional electricity supply will improve the economics and stability of using electric pumps for irrigation, especially if used at night when cheaper off-peak electricity is available. The GOL with World Bank support (SPRE project) has, and will continue to extend the rural electrification network in the whole downstream area and along the Xe Bangfai. By COD nearly all the villages in the region of the Xe Bangfai will already be provided with electricity connections.

## 1.10 PROJECT BENEFITS

### 1.10.1 Irrigation - Reliable Water and Lower Pumping Costs

The discharge of the turbinated NT2 discharge will provide additional 7,000 MCM of water to the Xe Bangfai, and much of this will be available for a greater irrigation potential in the dry season.

The NT2 Project will improve the potential and economics of irrigated agriculture development through the provision of a reliable water resource in the Xe Bangfai during the dry season. The additional water resource offers potential both as supplemental wet season water and, more significantly, a source of assured dry season irrigation water. During the dry season, the constant NT2 Project discharges will also reduce energy requirements for irrigation pumps due to the increased water levels and therefore the distance, which water is lifted. This reduction in pumping costs will be especially beneficial for communities utilizing expensive diesel pumps, compared to electric pumps, for their irrigation schemes.

Assurance of water in the dry season and the reduction in cost of dry-season irrigation will increase the potential of irrigation in all three reaches of the Xe Bangfai. Besides 5,245 ha currently irrigated in the dry season, an estimated 1,000 ha along the upper and middle reaches of the Xe Bangfai and up to 4,000 - 5,000 ha in the lower Xe Bangfai have irrigation potential.

Because the Xe Bangfai floods almost every year result in damage to wet season crops, communities are trying to move towards dry season irrigation and the food security this provides. The benefits from the additional water are potentially greater for the Upper and Middle Xe Bangfai communities where currently their pumps run dry during the dry season.

Analysis has been carried out on savings in pumping costs on the basis that all dry season paddy is irrigated by pumps and on the assumption that all pumps will be transferred to be electric pumps (see Table 1-3). It is estimated that during week days (Monday-Saturday) in the dry season, with a water level increase of 4 m (as in the Upper Xe Bangfai near Mahaxai), the average power saving would be greater than 28 %. On Sundays, with a water level increase of only 2 m the average power saving is still significant, at 16 %. Estimation of the actual financial savings involved will be verified when a second survey is undertaken of current and future irrigation systems, and costs. Current indications are that annual savings to PAVs of at least US$ 50,000 per year will be made, based on current irrigated areas only.

**Table 1-3: Estimated Savings in Dry Season Pumping Costs due to Increase in XBF Levels**

| | **Upstream** | **Upper** | **Middle** | **Lower** | **Total** |
|---|---|---|---|---|---|
| Dry season irrigated area (ha) | 302 | 390 | 202 | 4,351 | 5,245 |
| Assumed decrease in pumping head (m) | 5 | 5 | 4 | 3 | |
| Estimated power savings due to decrease in pump head (%) | 35 | 35 | 28 | 22 | |
| Estimated savings, assuming current electricity cost of US$40/ha per crop (US$/ha) | 14 | 14 | 11.2 | 8.8 | |
| **Total savings per year : current irrigated areas** | **US$4,228** | **US$5,460** | **US$2,262** | **US$38,289** | **US$50,239** |

The NT2 Project will encourage the GOL, in conjunction with its partners in development (IFIs and NGOS) to develop this beneficial water resource for current and future irrigation systems.

### 1.10.2 Household Water Supply

The additional water in the Xe Bangfai will increase the ground water level in areas adjacent to the river. Increases would be most notable in the dry season when the NT2 contributions to total river discharge are more significant. This increased groundwater level will facilitate access to groundwater for domestic use, especially for those communities extracting domestic water supplies from wells.

### 1.10.3 River Navigation

In the dry season, the depth of water in the Xe Bangfai will be increased by the addition of NT2 discharge. Dry season river transportation will be made easier as rocks, rapids and shallow areas, currently constraining river navigation in the dry season, will be covered by the increased water level. Thus, navigation along and across the river and access to villages by boat will be improved.

# PART 3: COMPENSATION, RESETTLEMENT AND LIVELIHOOD RESTORATION

## 1.11 ASSESSMENT OF COMPENSATION NEEDS

The type and level of compensation to be applicable to villagers in affected villages along the Xe Bangfai will be determined by a combination of:

- Review and analysis of the impacts as identified and measured, either directly or indirectly (see Chapter 9); and
- Reviews and consultations between affected villages, GOL agencies and NTPC with regard to the best means to effect compensation.

The District Compensation Committees formed in each District will work closely with the Resettlement Committee, the RMU and NTPC's RO, to collate, review and discuss:

(a) the findings of the baseline surveys, and
(b) the results of special studies and monitoring programs in each village,

… with a view to determine more precise understanding of:

- predicted impact of the NT2 Project on village infrastructure, livelihoods and economies;
- actual impacts of the NT2 Project (following COD) on village infrastructure, livelihoods and economics; and
- opinions and responses of villages with regard to these predicted impacts and the actual findings.

The DCCs, RMU and NTPC will together maintain a constant dialogue with PAVs in order to review and discuss these results with villages, and especially to elicit ideas and final consensus from villages as to proposals to address the impacts. There are three general types of compensation , as follows;

- direct restoration: Rehabilitation of an impact livelihood, such as fish for fish, garden for garden
- indirect restoration Rehabilitation of livelihood in terms of imputed incomes, or protein - for example the development of cattle raising programs to compensate for loss in fish catch;
- community development: The community may decide that they do not require income or food-based livelihood restoration as such, but more development type activities.

## 1.12 FISHERIES – COMPENSATION STRATEGY – DOWNSTREAM AREAS

### 1.12.1 Introduction

The NTPC and the GOL will use the results from:

(a) the baseline socio-economic monitoring surveys for the Xe Bangfai and Nam Theun;
(b) a study on the size and relative importance of fishing in Xe Bangfai and Nam Theun mainstream by villagers from 'hinterland' villages; and
(c) the fishing effort and catch studies and monitoring program;
(d) a pre-appraisal of fisheries compensation options through studies in selected villages and district level workshops with village leaders and GOL staff;
(e) a post Financial Close feasibility and implementation planning study; and
(f) pilot fisheries and alternative livelihood programs

… to facilitate informed discussions in each village as to how the Project is predicted to impacts fisheries, and then following COD and monitoring, reviews and discussions as to how the Project is actually impacting the fisheries catch in the Xe Bangfai and Nam Theun.

Activity (e) above, the post FC feasibility and implementation planning study will define the compensation program which will be the basis on which pilot programs will be implemented from about COD-4 to COD-2. These programs to test and measure the feasibility (both technical and social sustainability and

productivity) of the compensation options piloted. Annex 2 provides an indicative draft of the feasibility and implementation planning study (FIPS).

Based on the outcome of these pilot activities, and reviewed with villages the activities will be scaled up in COD-2 to COD+1. However, it must be understood that the results of the pilots and ensuing scaling up implementation prior to COD can only be indicative, and not a test of the real future situation, because neither the Xe Bangfai or the Nam Theun have yet been impacted and thus there may be little incentive for riparian peoples to be fully involved in the pilot activities.

Following COD, and a better understanding of the actual impact on fisheries, the compensation programs will be adjusted to restore and rehabilitate those components of livelihoods affected by the fisheries impacts.

At this stage, and for planning purposes, the following models have been used in a pre-feasibility study:

- 'Fish for Fish': Aquaculture Compensation;
  - Integrated rice-fish farming,
  - Fish pond culture,
- Integrated livestock-fish farming;
- Livestock raising;
- Development of Alternative Livestock Production;
- Improved Natural Fisheries Management;

During the Feasibility study, these and other models, will be considered by the villagers, and the implementation of these in pilots and then full activity implementation will depend on a set of factors, including:

i) the extent of current irrigation for wet and dry season;
ii) the potential for further development of the irrigation systems and opening of new agricultural lands;
iii) the risk of flooding in the wet season;
iv) access to markets (especially for chicken and pigs);
v) the cost and benefit of the various options (in terms of protein as well as net value produced);
vi) the amount of fisheries loss to be compensated;
vii) the productivity gains from of improvements in natural fisheries (wetlands) management; and
viii) the preferences of villagers

### 1.12.2 'Fish for Fish': Aquaculture Compensation Options

It is expected that many of the affected communities will suggest that the impacts on fish catch are compensated by programs to produce or catch fish by other means. Thus, the objective of such a fisheries replacement options is to develop systems for the raising of fish which could replace the loss of those fish currently caught in the Xe Bangfai. Compensation options currently under investigation include:

**a) Integrated rice-fish farming:**

Fingerlings (fish seeds, 10 to 15 cm) are placed in a rice field, in which they can move for most of the growth period. Roughly 10 % of the field should be allocated to a refuge pond and/or trenches to allow fish to escape from predators and heat. Rice benefits from the fish as they eat weeds and small insects plus fertilize the soil. Fish benefit from access to a large area plus natural feed in the field.

A typical rice-fish combination would consist in a 1600 $m^2$ field, with a 1 m wide trench in the inner perimeter and a refuge pond of 40 $m^2$. A more extensive model for one season (5 months) would involve a narrower trench and a smaller pond.

Three options have been considered in the model:

- Rice-fish farming, semi-intensive, 10 months in dry and wet season irrigated area (Option 1);
- Rice-fish farming, extensive, 5 months in dry season irrigated area (Option 2);
- Rice-fish farming, semi-intensive, 10 months with introduction of irrigation in dry and wet season (Option 3).

**b) Fish pond culture**

Fish are stocked in a pond; fish can be managed extensively (no or only little feed and manure), semi-intensively (using on-farm by-products, i.e. rice bran and broken rice, livestock manure and a steady water supply) or intensively (fish pellets). Farmers without past experience in fish farming would not go beyond semi-intensive level, as it becomes too expensive and risky. A typical pond would be 1.5 m deep, with an area of 500 m².
Three options have been considered in the model:

- Pond culture, semi-intensive, 10 months with access to irrigation (Option 4);
- Pond culture, extensive, 5 months in rainfed area (Option 5);
- Pond culture, semi-intensive, 10 months with introduction of irrigation in dry and wet season (Option 6).

**c) Integrated livestock-fish farming**

Chicken is kept in a hut above the fish pond or on the dike. This saves space and labor, and allows droppings to automatically fall in the pond and fertilize the water and stimulate plankton production for the fish. Typically, this option would associate a chicken house for 100 animals and a 500 m² fish pond. Chicken could be exchanged with duck involving similar cost and revenues.

The two options considered in the model are :

- Integrated chicken-fish farming, semi-intensive, 10 months in dry and wet season irrigated area (Option 7);
- Integrated pig-fish farming, semi-intensive, 10 months in dry and wet season irrigated area (Option 8).

In villages, where irrigation is not available or only to a limited extent, water supply will be provided in order to facilitate rice-fish farming and/or pond culture (Options 3 and 6).

### 1.12.3 Development of Alternative Livestock Production Option

As mentioned above, rather than fish for fish loss compensation strategy, it might be technically more feasible, or socially preferred in some villages and/or some communities or households to opt for a combined protein for protein compensation and income for income compensation, in which case the development of livestock raising, especially cattle, may be the preferred option.

As required, the NTPC will support develop of cattle raising (preferred, as they graze grass, herb and shrub lands as opposed to requiring a more intensive feeding program of pig and chickens). Most likely, however, this will require the development of improved forage programs. Goat husbandry is another option.

### 1.12.4 Improved Natural Fisheries Management Option in Rivers and Wetlands

It is the shared opinion of (a) fisheries experts, and (b) local villagers, that there is currently, or certainly will be in the near future, 'over-fishing' in Xe Bangfai river. While over fishing refers partly to numbers of fishers and fishing effort, it also refers to inappropriate fishing practices and fishing gear, and lack of fisheries management (management of brood and spawning grounds, management of catch of fry etc). Experience in the region has demonstrated that with the planning and implementation of participatory natural fisheries (river and wetland) management, natural fisheries yields can increase significantly. Relevant GOL agencies have made some efforts to promote such management, but are hampered by lack of knowledge of fish biology and lack of extension funding.

Thus, another option for compensation of fisheries loss in the mainstream Xe Bangfai is to develop improved management of natural fisheries, both in those wetlands fisheries connected to the Xe Bangfai,

and the fisheries in the mainstream itself. It is likely that such a compensation program would be most effective when communities require fisheries compensation at the community rather than at the household level.

The types of activities to be supported will include TA to investigate and formalize indigenous understanding of fish and aquatic ecology, and community development to ensure the participatory development of, and sustainable implementation of management strategies.

### 1.12.5 Integration of Compensation Options

The actual combination of the compensation options will depend on the technical feasibility of these options in each village, villagers' preference, and the actual fish loss to be compensated.

The current pre feasibility study has outlined a possible scenario making use, to various degrees, of the nine options described above, in the 70 affected Xe Bangfai mainstream villages. The irrigated area, potential area for irrigation and market access of each of these villages is taken in account when allocating a spread of each of these 9 options in each village. The net benefit for each option is also included in the calculations of exactly how much of each option is required, in each village, to replace the fish loss that is predicted to be experienced by each village.

In the current model, which will be tested and improved in the feasibility study, suggests that in the Upper XBF zone where the expected fish loss is highest, all households will be involved in rice-fish culture and more than half in fish pond culture. Furthermore, there is also is high emphasis on buffalo/cattle raising.

This pre-feasibility desk study is intended to give (a) a general framework for the compensation measures that could be implemented and (b) an overall budget for this programme.

It should not be considered as an action plan per se, as a feasibility study involving technical assessments and consultations with villagers in the mainstream and hinterland villages will be undertaken in conjunction with implementation planning through the first year of the Fisheries Compensation Programme to start after Financial Close. This will determine the extent of which options can be applied in each village. It is likely that more options will be identified as relevant, technical feasible and preferred by communities. This diversification will be welcomed as long as options suggested meet agreement of villagers and fall within the compensation budget for each village.

Similar and more options will be offered to the villages in the Nam Phit area and to Xe Bangfai hinterland villages.

Development, promotion and sustainable maintenance of such production systems depend in part on a serious extension effort on the part of relevant GOL agencies – especially the local DAFO (District Agriculture and Forestry Office) – and the development of key private sector enterprises. Facilitation of visits to farmers who have successfully adopted the activities and have similar background as the target villagers is an important part of promoting the compensation activities. NTPC is committed to ensure that such extension services are developed and maintained (see Section 8.4).

The availability of land for the fisheries replacement program has been discussed with the villages. Some villages have identified this as an issue, i.e. that some fisheries compensation options may not be possible because of land limitations. For example, some fishers do not have paddy land for the integrated rice-fish option. The villages have agreed that where sufficient land is not available for a particular option, other options will be possible – for example, (i) the project will irrigate to enable dry season paddy to be grown; (ii) fish ponds will be developed on otherwise unproductive land; (iii) improve management of natural fisheries in the wetlands connected to the XBF and in the XBF itself; (iv) repair and improve management of dykes at entrances to tributaries; (v) stock fish in existing natural ponds and wetland swamps; (vi) upgrade existing small dams and construction of water gates to small dams to facilitate migration of fish and fish culture. There have been considerable technical investigation and consultation already done on the existing situation and possible options in the XBF and hinterland villages. Consultation will continue to determine limitations and viable options in each community; pilots will be commenced within this first year; and viable options will be in place and operational before COD.

### 1.12.6 Budget for Fisheries Compensation Programme

The Fisheries Compensation Programme for the downstream areas will start in COD-4, and be scaled up to compensate the total loss of fish and aquatic products, soon after COD, in terms of weight of protein produced.

The initial investments will be used to support and promote the compensation options among pilot farmers who are willing to engage in these (often new) types of operation. Upon successful operation for one or two years, more farmers will be keen to adopt the activities, and investments will be scaled up accordingly. NTPC will pay operation cost for the farmers for the first year, and attention will be paid to avoid situations where subsidising costs brings the risk of dependency and non-appreciation of the effort.

In order to compensate for the loss in economic terms as well, the programme will run another five years – or until the fisheries yield has stabilised (predicted to be around COD+5). The process will be monitored closely (see below), and it is anticipated that the need for investments will gradually fall. Should the fishery in the Xe Bangfai be restored earlier than expected, then investment will be made over a shorter period.

The pre feasibility desk study mentioned above gives an estimate investment cost of 5.4 M US$ for the fisheries compensation on the Xe Bangfai (both river and hinterland) villages. In addition, US$ 830,000 of investment should be considered for the Nam Phit (Nam Phit hinterland villages) and US$ 170,000 for the 250 households on the Nam Theun downstream the Nakai Dam.

The total investment cost for the compensation options come up to US$ 6,400,000, while a further amount to US$ 1,000,000 is required to support operating cost on the initial years.

This will total US$ 7,400,000, covering the investment and one year of operating cost, with an approximately equal share before and after COD. The schedule of implementation is given in Table 1-6.

Technical assistance for the Fisheries Compensation Programme is estimated at US$ 1,600,000 over the nine years, including US$ 1,400,000 for personnel cost and US$ 200,000 for operation and administrative costs. Detail of the estimate for the personnel cost is given in Table 1-4.

**Table 1-4: Schedule of Technical Assistance for Fisheries Compensation Programme and Personnel Cost Estimate**

| Xe Bangfai / Nam Phit Fisheries Compensation Programme | 2005 (qtr) 1 2 3 4 | 2006 (qtr) 1 2 3 4 | 2007 (qtr) 1 2 3 4 | 2008 (qtr) 1 2 3 4 | 2009 (qtr) 1 2 3 4 | 2010 (qtr) 1 2 3 4 | 2011 (qtr) 1 2 3 4 | 2012 (qtr) 1 2 3 4 | 2013 (qtr) 1 2 3 4 | | monthly rate | no. mths | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FC+1 | FC+2 | FC+3 | FC+4 | FC+4½ | COD+1 | COD+2 | COD+3 | COD+4 | | | | |
| NGO/Consulting firm | | | | | | | | | | | | | |
| Int TA: Fisheries | | | | | | | | | | | 10,000 | 54 | 540,000 |
| Lao TA: senior, program manager | | | | | | | | | | | 2,000 | 93 | 186,000 |
| Thai TA: senior, aquaculture | | | | | | | | | | | 2,500 | 90 | 225,000 |
| Lao TA: senior. natural fisheries | | | | | | | | | | | 1,700 | 90 | 153,000 |
| Lao TA: junior, aquaculture | | | | | | | | | | | 750 | 81 | 60,750 |
| Lao TA: junior, natural fisheries | | | | | | | | | | | 750 | 81 | 60,750 |
| Admin and Finance: | | | | | | | | | | | 750 | 96 | 72,000 |
| Admin and Finance: | | | | | | | | | | | 400 | 78 | 31,200 |
| 2 drivers | | | | | | | | | | 2 x 250 | 500 | 96 | 48,000 |
| > various and many | | | | | | | | | | | | | |
| | | | | | | | | | | | | | **1,376,700** |

In addition, a program will monitor the impact on fisheries of the downstream areas, i.e. Xe Bangfai (Mainstream and Hinterland villages), Nam Phit, Nam Kathang/Gnom and Nam Theun, at an estimated cost of US$ 1,000,000, including US$ 650,000 for personnel cost (cf. details in Table 1-5) and US$ 350,000 for operation and administrative costs.

**Table 1-5: Schedule of Technical Assistance for Fisheries Monitoring Programme and Personnel Cost Estimate**

| Fisheries Monitoring Programme, all rivers | 2005 (qtr) | 2006 (qtr) | 2007 (qtr) | 2008 (qtr) | 2009 (qtr) | 2010 (qtr) | 2011 (qtr) | 2012 (qtr) | 2013 (qtr) | 2014 (qtr) | monthly rate | no. mths | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | 1 2 3 4 | | | |
| | FC+1 | FC+2 | FC+3 | FC+4 | FC+4½ | COD+1 | COD+2 | COD+3 | COD+4 | COD+5 | | | |
| NGO/Consulting firm | | | | | | | | | | | | | |
| Int TA: Fisheries | | | | | | | | | | | 10,000 | 36 | 360,000 |
| Lao TA: senior | | | | | | | | | | | 1,700 | 96 | 163,200 |
| Lao TA: junior | | | | | | | | | | | 750 | 96 | 72,000 |
| Lao TA: database | | | | | | | | | | | 650 | 48 | 31,200 |
| Admin & finance (with Fish Comp Prog) | | | | | | | | | | | | | |
| Driver | | | | | | | | | | | 250 | 96 | 24,000 |
| | | | | | | | | | | | | | 650,400 |

This will total US$ 2,600,000 over tentatively eight years from COD-3 to COD+5.

**Table 1-6: Budget for Compensation of Loss of the Downstream Areas Fisheries (US$)**

| | FC+1 | FC+2 | FC+3 | FC+4 | FC+4½ | COD+1 | COD+2 | COD+3 | COD+4 | COD+5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Investment** | - | 250,000 | 500,000 | 1,200,000 | 600,000 | 1,200,000 | 1,200,000 | 1,200,000 | 250,000 | - | **6,400,000** |
| **Operation (first year)** | - | 39,063 | 78,125 | 187,500 | 93,750 | 187,500 | 187,500 | 187,500 | 39,063 | - | **1,000,000** |
| **Technical Assistance** | 200,000 | 200,000 | 200,000 | 200,000 | 100,000 | 200,000 | 200,000 | 200,000 | 100,000 | - | **1,600,000** |
| **Monitoring** | - | 120,000 | 120,000 | 120,000 | 60,000 | 120,000 | 120,000 | 120,000 | 120,000 | 100,000 | **1,000,000** |
| **Total** | **200,000** | **609,063** | **898,125** | **1,707,500** | **853,750** | **1,707,500** | **1,707,500** | **1,707,500** | **509,063** | **100,000** | **10,000,000** |

## 1.13 RIVERBANK GARDENS – COMPENSATION STRATEGY

### 1.13.1 Strategy for Compensation of River Gardens

In some cases, villagers may be able to adjust to the new Xe Bangfai water levels, and relocate their riverbank fields and gardens further up the river bank.

However, in many cases this may not be not feasible or productive (at least in the initial years after COD) and thus NTPC is committed to provide assistance to re-establishing cropping and gardening activities, as requested by the communities themselves. Simple measures to re-establish gardens by villages will be taken into account, as will considerations to support irrigated fields and gardens above the river banks. In some cases, such irrigated garden development may be linked to the larger irrigation schemes for dry season paddy production.

The areas of each type of garden (garden above river bank, riverside crop fields and riverside vegetable garden) have been obtained through interviews in all villages in early 2004 and are presented in detail in Chapter 2. A pre-COD baseline study will be undertaken to establish exactly those HHs that may be impacted.

Gardens above the river bank are not likely to be affected by the increased amounts of water whereas the impact on riverside crop fields and vegetable gardens will be considerable. It is expected that the impact on riverside crop fields will be 80 % in the upper Xe Bangfai and decreasing to 40 % in the lower parts of Xe Bangfai (see Table 1-7)[1]. Similarly, the impact on riverside vegetable gardens is expected to be 100 % in the two upper Districts and 70 % in the two lower Districts of the lower Xe Bangfai. Hence, the total area of riverside crop garden to be impacted is 190 ha and of riverside vegetable garden 16 ha.

This compensation for loss of riverbank fields and gardens will be assessed on a village by village and, where required by a village or by households, on a household by household basis. The focal concern is the importance of these gardens to livelihoods and nutrition. Thus, each village will be asked to:

2 Rationally assess the level of damage to livelihoods and nutrition (assisted by data gathered by the Project surveys and studies); and

3 Consider the options for compensation jointly with the NTPC and GoL.

For planning purposes (see Section 3.1.1 below) is it assumed that each village or household may request, and are entitled to, a direct one for one replacement of lost garden land on the river bank with the same

[1] Data is presented by district, as this is the way the data is collected.

size of garden land on top of the riverbank, or elsewhere. In reality, some villagers may request other compensation options.

### 3.1.1 Budget for Compensation of River Gardens

In developing a budget for compensation for the loss of riverbank fields and gardens, it is anticipated that around 50 % of the garden area can be re-established on land currently in possession of the affected villagers. For the other 50%, the project will support purchase of new land where this is necessary. With a price of US$ 750/ha for non-irrigated land this could cost up to US$ 77,000.

In case the respective villages already have an irrigation system established, this system will need to be extended to cover the new fields/gardens. The cost for this is estimated at US$ 1,750 /ha. In case that the irrigation system can not cover the new land or that there is no irrigation in the village at all, a new water supply system such will have to be constructed. This is estimated to cost US$ 3,500 /ha.

The total compensation cost for the 206 hectare expected to be impacted, and thus replaced is estimated at US$ 617,000 (see Table 1-7 below). If the cost of pumping is internalised in order to provide a net economic compensation, then an additional 5.5 ha of gardens will need to be established, increasing the cost to US$633,287.

As the impact on riverbank gardens will be immediately at and after COD, later rainy season and early dry season of 2009, the compensation program will initiated in the dry season of 2008-09.

**Table 1-7: Estimated Loss of Riverside Crop and Vegetable Gardens and Associated Compensation Cost.**

| | Current Area | | | | | | | | Predicted Loss | | | | | Compensation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Riverside Crop Garden | | Riverside Vegetable Garden | | Total | | Total (Riverside Crop and Vegetable Garden) | | Riverside Crop Garden | | Riverside Vegetable Garden | | Total (Riverside Crop and Vegetable Garden) | Purchase of New Land, 50 % of cases (US$ 750/ha) | Establishment of New Irrigation, 50 % of area (US$ 3,500/ha) | Development of Current Irrigation System, 50 % of Area (US$ 1,750/ha) | Sub-total | Additional Area to Compensate for Pumping Cost | Total Area | Total Compensation Cost |
| District | Area (ha) | No. HH | Area (ha) | No. HH | Area (ha) | No. HH | Area (ha) | No. HH | % | Area (ha) | % | Area (ha) | Area (ha) | USD | USD | USD | USD | (ha) | (ha) | (USD) |
| **Mahaxay** | 103 | 526 | 4 | 45 | 148 | 743 | 107 | 571 | 80 | 82 | 100 | 4 | **86.4** | 32,387 | 151,138 | 75,569 | 259,094 | **2.3** | **88.7** | **266,003** |
| **Xe Bangfai** | 74 | 486 | 5 | 55 | 146 | 755 | 80 | 541 | 70 | 52 | 100 | 5 | **57.4** | 21,509 | 100,377 | 50,189 | 172,075 | **1.5** | **58.9** | **176,664** |
| **Nong Bok** | 41 | 432 | 4 | 100 | 62 | 646 | 46 | 532 | 40 | 17 | 70 | 3 | **19.6** | 7,360 | 34,347 | 17,174 | 58,881 | **0.5** | **20.2** | **60,451** |
| **Xaybouli** | 98 | 698 | 5 | 73 | 173 | 1004 | 102 | 771 | 40 | 39 | 70 | 3 | **42.3** | 15,849 | 73,960 | 36,980 | 126,788 | **1.1** | **43.4** | **130,169** |
| **Total** | **316** | **2142** | **18** | **273** | **529** | **3148** | **335** | **2415** | | **190** | | **16** | **205.6** | **77,105** | **359,822** | **179,911** | **616,838** | **5.5** | **211.1** | **633,287** |

Note: Pumping cost for the new irrigated gardens is estimated at US$ 10 per month per hectare in 8 months = USD 80. This cost has been included in the amount of land to be compensated (= 2.7 % increase).

## 3.2 DOMESTIC WATER – COMPENSATION STRATEGY

### 3.2.1 Compensation Strategy for Domestic Water Supply Programme

As noted in earlier chapters, water quality problems may result from to the breakdown of biomass in the reservoir (in the initial years only), and unsuspended solids due to erosion.

Thus, the NT2 project has undertaken a study to understand the current use of Xe Bangfai waters as a source for a range of domestic water uses (see Chapter 2). On the assumption that there may be problems with Xe Bangfai water quality, the Project is committed to the provision of alternative means of household water of appropriate quality. In those villages clearly dependant on (especially dry season) Xe Bangfai flows for household water use, a proactive approach will be taken whereby alternative sources of household water will be developed prior to the start of the Project Operations.

Annex 2-1 presented the relative importance of the various sources of water for various domestic uses of water. It is believed that drinking and cooking include the more critical uses of water, as the water is directly consumed by the users. Furthermore, Xe Bangfai is used more frequently for cooking than for drinking. Hence, the importance of Xe Bangfai for water for cooking for each village is therefore used as an indicator for the dependency of this water source. At the same time this will also indicate the scope of the compensation.

Table 1-9 shows the relative importance of water sources related to the Xe Bangfai (i.e. Xe Bangfai, springs at Xe Bangfai, wells at the Xe Bangfai riverbank and irrigation). For villages where the total values of these water sources are 75 or above, reliance of these are thought to be so high that the Project will compensate a new water system for the entire village. For villages where the total value amounts to less than 75, compensation will be made to the corresponding percentage of the population of that village.

However, a full village by village baseline survey will be undertaken again at COD-2, together with conclusions, to decide on the best way and best system to address this problem, prior to COD.

### 3.2.2 Budget for Domestic Water Supply Programme

The planning budget for domestic water supply compensation is based on the provision of two town water supply systems for the villages agglomerates of Phova Neua and Phova Tai on the left bank and Mahaxay Neua, Mahaxay Kang and Mahaxay Tai on the right bank. The unit cost of these is estimated at US$ 22,000. The remaining 78 villages will be offered open wells or deep wells depending on technical feasibility and community preference. The advantage of the open well is that is cheaper (around US$ 100 per unit) and therefore can be shared among a small group of households – in the present scenario 3. The deep well has the advantage of providing cleaner water. Due to a higher unit cost (around US$ 500), it will be shared among 15 households. Six villages do not make use of any Xe Bangfai related water source for cooking. The actual type of alternative household water source and supply system will be identified by a combination of community consultation and consensus, and technical feasibility studies in each village.

The total construction cost for the 83 villages is US$ 228,000 (see Table 1-8). Design and management cost for each of the water supply systems is estimated at US$ 29,000. The total cost of compensatory water supply schemes is therefore US$ 257,000.

**Table 1-8: Total Estimated Cost of Investment and Design Cost for Compensatory Water Supply Schemes for Xe Bangfai Mainstream Villages.**

| | | | | Construction Cost | | Design and Management of Construction | | |
|---|---|---|---|---|---|---|---|---|
| Item | No of villages /towns [a] | Unit | Number of units [b] | Cost per unit (US$) [c] | Total (US$) | Cost per unit (US$) | Total (US$) | **Total cost (US$)** |
| Open well | 39 | 3 HH | 921 | 100 | 92,136 | 10 | 9,214 | **101,350** |
| Deep well | 39 | 15 HH | 184 | 500 | 92,136 | 60 | 11,056 | **103,193** |
| Town water supply | 2 | Town | 2 | 22,000 | 44,000 | 4,400 | 8,800 | **52,800** |
| **Total** | | | | | **228,273** | | **29,070** | **257,343** |

[a] The villages of Phovaneua and Phovatay form a town unit as do the villages of Mahaxai Neua, Mahaxai Kang and Mahaxai Tay. Six villages are not impacted at all.

[b] It is assumed that 50 % of villages will have open wells and 50 % deep well. This distribution is reflecting what is in place at the moment. Consultations will determine the exact number of each type of well.

[c] Open well is estimated at US$ 100 and to be shared among 3 HHs; Deep well is estimated at US$ 500 and to be shared among 15 HHs. This makes the average cost per household the same for the two options.

**Table 1-9: Relative Dependency of Xe Bangfai Water for Household Consumption and Cost of Compensatory Water Supply.**

| | | | | Source | | | | | If 75 or | Number of HH | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District | | | Village | XBF[2] | Spring, XBF[2] | Xe bank well | Irrigation | **Total, XBF** | more. -> 100 *) | 2001 | **2009** | HH to be compensated | Solution * | **Total Cost (US$)** |
| Mahaxay | 1 | 1 | Kanggnankham | 100 | 0 | 0 | 0 | **100** | 100 | 28 | **34** | 34 | Well | 1,146 |
| | 2 | 2 | Nathandong | 100 | 0 | 0 | 0 | **100** | 100 | 36 | **44** | 44 | Well | 1,474 |
| | 3 | 3 | Nathanthong | 100 | | 0 | 0 | **100** | 100 | 32 | **39** | 39 | Well | 1,310 |
| | 4 | 4 | Vernh | 78 | 0 | 0 | 0 | **78** | 100 | 33 | **41** | 41 | Well | 1,351 |
| | 5 | 5 | Nakhay | 74 | 0 | 0 | 0 | **74** | 74 | 51 | **63** | 46 | Well | 1,545 |
| | 6 | 6 | Nongkork | 78 | 0 | 0 | 0 | **78** | 100 | 22 | **27** | 27 | Well | 900 |
| | 7 | 7 | Ilarnh | 68 | 14 | 0 | 0 | **82** | 100 | 59 | **72** | 72 | Well | 2,415 |
| | 8 | 8 | Naphong | 62 | | 0 | 14 | **76** | 100 | 56 | **69** | 69 | Well | 2,292 |
| | 9 | 9 | Darng | 100 | 0 | 0 | 0 | **100** | 100 | 58 | **71** | 71 | Well | 2,374 |
| | 10 | 10 | Vat thard | 54 | | 0 | 0 | **54** | 54 | 37 | **45** | 25 | Well | 818 |
| | 11 | 11 | Somsanouk | 80 | 0 | 0 | 14 | **94** | 100 | 45 | **55** | 55 | Well | 1,842 |
| | 12 | 12 | Nakiow | 28 | 28 | 0 | 16 | **72** | 72 | 80 | **98** | 71 | Well | 2,358 |
| | 13 | 13 | Kengsavang | 70 | 0 | 0 | 30 | **100** | 100 | 23 | **28** | 28 | Well | 941 |
| | 14 | 14 | Phovaneua | 100 | 0 | 0 | | **100** | 100 | 86 | **106** | 106 | Town water supply | 22,000 |
| | 15 | 15 | Phovatay | 100 | 0 | 0 | | **100** | 100 | 90 | **111** | 111 | | |
| | 16 | 16 | Mahaxayneua | 34 | 0 | 0 | 66 | **100** | 100 | 66 | **81** | 81 | Town water supply | 22,000 |
| | 17 | 17 | Mahaxaykang | 100 | 0 | 0 | | **100** | 100 | 99 | **122** | 122 | | |
| | 18 | 18 | Mahaxaytay | 82 | 0 | 0 | | **82** | 100 | 146 | **179** | 179 | | |
| | 19 | 19 | Phanang | 100 | 0 | 0 | 0 | **100** | 100 | 44 | **54** | 54 | Well | 1,801 |
| | 20 | 20 | Khamfeuang | 56 | 0 | 0 | 0 | **56** | 56 | 88 | **108** | 61 | Well | 2,017 |
| | 21 | 21 | Pong | 58 | 0 | 0 | 0 | **58** | 58 | 36 | **44** | 26 | Well | 855 |
| Xe Bangfai | 22 | 1 | Kengpae | 88 | 0 | 0 | 0 | **88** | 100 | 75 | **92** | 92 | Well | 3,070 |
| | 23 | 2 | Thakor | 100 | 0 | 0 | | **100** | 100 | 49 | **60** | 60 | Well | 2,006 |
| | 24 | 3 | Thahat | 100 | 0 | 0 | | **100** | 100 | 50 | **61** | 61 | Well | 2,047 |
| | 25 | 4 | Kengkhenh | 44 | 18 | 0 | | **62** | 62 | 44 | **54** | 33 | Well | 1,117 |
| | 26 | 5 | Kengkasy | 90 | 10 | 0 | | **100** | 100 | 43 | **53** | 53 | Well | 1,760 |
| | 27 | 6 | Vernsananh | 32 | 0 | 0 | 0 | **32** | 32 | 63 | **77** | 25 | Well | 825 |
| | 28 | 7 | Hatphek | 100 | 0 | 0 | | **100** | 100 | 38 | **47** | 47 | Well | 1,555 |
| | 29 | 8 | Phakse Noy | | 32 | 0 | | **32** | 32 | 85 | **104** | 33 | Well | 1,113 |
| | 30 | 9 | Nathan | 48 | 0 | 10 | 14 | **72** | 72 | 83 | **102** | 73 | Well | 2,446 |
| | 31 | 10 | Thasyda | 60 | 22 | 0 | | **82** | 100 | 32 | **39** | 39 | Well | 1,310 |
| | 32 | 11 | Khouaxe | 34 | 0 | 0 | | **34** | 34 | 285 | **350** | 119 | Well | 3,966 |
| | 33 | 12 | Dangtha | 66 | 0 | 0 | | **66** | 66 | 85 | **104** | 69 | Well | 2,296 |
| | 34 | 13 | Naphorktha | 48 | 0 | 0 | | **48** | 48 | 73 | **90** | 43 | Well | 1,434 |
| | 35 | 14 | Somsaaet | | 90 | 0 | | **90** | 100 | 43 | **53** | 53 | Well | 1,760 |
| | 36 | 15 | Ngangkham | 40 | 26 | 0 | 14 | **80** | 100 | 216 | **265** | 265 | Well | 8,841 |
| | 37 | 16 | Hatkhamhieng | 16 | 14 | 0 | 0 | **30** | 30 | 239 | **293** | 88 | Well | 2,935 |
| Nongbok | 38 | 1 | Namphou | 0 | 0 | 0 | 0 | **0** | 0 | 64 | **79** | 0 | Well | - |
| | 39 | 2 | Dongkasin | 0 | 0 | 0 | 0 | **0** | 0 | 79 | **97** | 0 | Well | - |
| | 40 | 3 | Sorkbor | 74 | 26 | 0 | 0 | **100** | 100 | 105 | **129** | 129 | Well | 4,298 |
| | 41 | 4 | Natay | 88 | 0 | 0 | 12 | **100** | 100 | 76 | **93** | 93 | Well | 3,111 |
| | 42 | 5 | Phak itou | 80 | 0 | 0 | 20 | **100** | 100 | 63 | **77** | 77 | Well | 2,579 |
| | 43 | 6 | Hardxiengdy | 0 | 0 | 0 | 0 | **0** | 0 | 204 | **251** | 0 | Well | - |
| | 44 | 7 | Dongsangam | 40 | 8 | 0 | 6 | **54** | 54 | 68 | **84** | 45 | Well | 1,503 |
| | 45 | 8 | Hardsayphong | 44 | 16 | 0 | 26 | **86** | 100 | 56 | **69** | 69 | Well | 2,292 |
| | 46 | 9 | Tharntheung | 18 | 10 | 0 | 0 | **28** | 28 | 148 | **182** | 51 | Well | 1,696 |
| | 47 | 10 | Dongphakpheua | 36 | 0 | 0 | 0 | **36** | 36 | 153 | **188** | 68 | Well | 2,255 |
| | 48 | 11 | Sadu Neua | 100 | 0 | 0 | 0 | **100** | 100 | 130 | **160** | 160 | Well | 5,321 |
| | 49 | 12 | Sadu Tay | 100 | 0 | 0 | 0 | **100** | 100 | 90 | **111** | 111 | Well | 3,684 |
| | 50 | 13 | Samnady | 58 | 0 | 0 | 42 | **100** | 100 | 30 | **37** | 37 | Well | 1,228 |
| | 51 | 14 | Navangneua | 68 | 0 | 0 | 16 | **84** | 100 | 196 | **241** | 241 | Well | 8,023 |
| | 52 | 15 | Navangkang | 82 | 0 | 0 | 18 | **100** | 100 | 73 | **90** | 90 | Well | 2,988 |
| | 53 | 16 | Navangnoy | 14 | 0 | 0 | 26 | **40** | 40 | 69 | **85** | 34 | Well | 1,130 |
| | 54 | 17 | Navangthong | 0 | 0 | 0 | 30 | **30** | 30 | 123 | **151** | 45 | Well | 1,510 |
| | 55 | 18 | Phonsao e | 56 | 0 | 0 | 30 | **86** | 100 | 66 | **81** | 81 | Well | 2,701 |
| | 56 | 19 | Thamouang | 90 | 0 | 0 | 10 | **100** | 100 | 38 | **47** | 47 | Well | 1,555 |
| | 57 | 20 | Danparkxe | 38 | 0 | 0 | 0 | **38** | 38 | 84 | **103** | 39 | Well | 1,307 |
| Xaybouli | 58 | 1 | Manilad | 50 | 0 | 0 | 0 | **50** | 50 | 41 | **50** | 25 | Well | 839 |
| | 59 | 2 | Beungse | 0 | 0 | 0 | 0 | **0** | 0 | 122 | **150** | 0 | Well | - |
| | 60 | 3 | Bouakhay | 100 | 0 | 0 | 0 | **100** | 100 | 109 | **134** | 134 | Well | 4,462 |
| | 61 | 4 | Khamsavang | 100 | 0 | 0 | 0 | **100** | 100 | 29 | **36** | 36 | Well | 1,187 |
| | 62 | 5 | Tonhaen | 0 | 0 | 0 | 0 | **0** | 0 | 175 | **215** | 0 | Well | - |
| | 63 | 6 | Kaengphosy | 83 | 0 | 0 | 0 | **83** | 100 | 69 | **85** | 85 | Well | 2,824 |
| | 64 | 7 | Kaengveang | 100 | 0 | 0 | 0 | **100** | 100 | 69 | **85** | 85 | Well | 2,824 |
| | 65 | 8 | Kangpa | 31 | 0 | 0 | 0 | **31** | 31 | 71 | **87** | 27 | Well | 908 |
| | 66 | 9 | Daangsavanh | 100 | 0 | 0 | 0 | **100** | 100 | 59 | **72** | 72 | Well | 2,415 |
| | 67 | 10 | Dongmarkfai | 0 | 100 | 0 | 0 | **100** | 100 | 91 | **112** | 112 | Well | 3,725 |
| | 68 | 11 | Lao | 63 | 0 | 38 | 0 | **100** | 100 | 29 | **36** | 36 | Well | 1,187 |
| | 69 | 12 | Souvanxai | 100 | 0 | 0 | 0 | **100** | 100 | 73 | **90** | 90 | Well | 2,988 |
| | 70 | 13 | Somsa-at | 0 | 0 | 0 | 0 | **0** | 0 | 102 | **125** | 0 | Well | - |
| | 71 | 14 | Sakong | 100 | 0 | 0 | 0 | **100** | 100 | 86 | **106** | 106 | Well | 3,520 |
| | 72 | 15 | Thabor | 31 | 23 | 0 | 0 | **54** | 54 | 57 | **70** | 38 | Well | 1,256 |
| | 73 | 16 | Thakharm | 46 | 46 | 0 | 0 | **92** | 100 | 97 | **119** | 119 | Well | 3,970 |
| | 74 | 17 | Thaphoxai | 46 | 0 | 0 | 0 | **46** | 46 | 102 | **125** | 58 | Well | 1,927 |
| | 75 | 18 | Thadorkham | 47 | 18 | 0 | 0 | **65** | 65 | 36 | **44** | 29 | Well | 953 |
| | 76 | 19 | Nasang | 86 | 0 | 0 | 0 | **86** | 100 | 121 | **149** | 149 | Well | 4,953 |
| | 77 | 20 | Naxiengkhane | 100 | 0 | 0 | 0 | **100** | 100 | 65 | **80** | 80 | Well | 2,661 |
| | 78 | 21 | Xiengkhay | 88 | 0 | 0 | 0 | **88** | 100 | 91 | **112** | 112 | Well | 3,725 |
| | 79 | 22 | Houi-hai | 91 | 0 | 0 | 0 | **91** | 100 | 76 | **93** | 93 | Well | 3,111 |
| | 80 | 23 | Hartkhamdee | 0 | 31 | 69 | 0 | **100** | 100 | 38 | **47** | 47 | Well | 1,555 |
| | 81 | 24 | Hartsaisungneua | 83 | 0 | 0 | 0 | **83** | 100 | 129 | **158** | 158 | Well | 5,280 |
| | 82 | 25 | Hartsaisungtay | 79 | 21 | 0 | 0 | **100** | 100 | 105 | **129** | 129 | Well | 4,298 |
| | 83 | 26 | Nongheuathongneua | 38 | 23 | 0 | 0 | **62** | 62 | 58 | **71** | 44 | Well | 1,461 |
| | 84 | 27 | Nongheuathongtay | 43 | 0 | 0 | 0 | **43** | 43 | 23 | **28** | 12 | Well | 403 |
| | 85 | 28 | Pahlay | 40 | 0 | 0 | 0 | **40** | 40 | 36 | **44** | 18 | Well | 589 |
| | 86 | 29 | Paksebangfai | 100 | 0 | 0 | 0 | **100** | 100 | 96 | **118** | 118 | Well | 3,929 |
| | 87 | 30 | Pong | 33 | 0 | 0 | 0 | **33** | 33 | 84 | **103** | 34 | Well | 1,146 |
| | 88 | 31 | Phakfeuatay | 100 | 0 | 0 | 0 | **100** | 100 | 63 | **77** | 77 | Well | 2,579 |
| | 89 | 32 | Phakfeuaneua | 91 | 0 | 0 | 0 | **91** | 100 | 61 | **75** | 75 | Well | 2,497 |
| | | | **Total cost** | | | | | | | | | **6,126** | | 228,273 |

*) If the sources originating in the Xe Bangfai total 75 or more, water supply compensation will be provided to the entire village. For values less than 75, the actual figure is used as a tentative percentage of HHs impacted.

## 3.3 ACCESS ACROSS THE RIVER – COMPENSATION STRATEGY

Communities living along the Xe Bangfai and its tributaries currently use several modes to cross the river in dry season, including temporary bamboo bridges (Mahaxai only), walking across rapids or shallow areas, ferries (Mahaxai only), dry season vehicle crossings, and the use of small long tail boats (see Chapter 2).

Boating along the XBF will globally be facilitated, as the increased flow will cover rapids and shallows, making navigation easier. However, crossing the river by wading across the rapids or the building of temporary bamboo bridges will become impossible.

NTPC is committed to providing assistance to resolve these issues. While the exact approaches for NTPC assistance will depend on consultations with the villagers and coordination with GOL development agencies, it could include some of the following activities:

4 In cases were villages cross the river to tend fields or gardens or look after cattle, and these villages have few canoes, then canoes (boats) with simple long tailed motors (as is common along the Xe Bangfai), will be provided to these villagers.

5 In cases where temporary bamboo bridges are erected across the river (and there is only one in the Xe Bangfai, in old Mahaxai town) then an alternative (most likely 'suspended') pedestrian bridge will be designed and constructed, at an estimated cost of US$ 70,000 (including design);

6 Along the backwater affected area if the Xe Noy, the current low level (natural crossing) will be improved by placement of 1.5 m high box culverts (with load limit - not for logging truck), at a cost of US$ 90,000 (including design).

NTPC will allocate an indicative budget of US$ 225,000 for this program component, to be confirmed closer to COD.

## 6.1 IRRIGATION PUMPING STATIONS – COMPENSATION STRATEGY

### 6.1.1 Existing Pump Stations on the XBF

There are many existing irrigation scheme pump stations on the XBF, particularly on the lower reaches. There are two types of pump stations:

7 Centrifugal pumps mounted on floating pontoons that move up and down with fluctuating river levels. At the pump discharge outlet there is a flexible rubber hose, which connects to a steel pipe that is fixed to the riverbank. The steel pipe delivers water to the scheme main canal. The steel pipe has a number of points for connection to the flexible hoses at various river elevations. These systems are known as pontoon pump stations and are the most common type. There are both electric and diesel powered pumps.

8 Inclined axial flow pumps fixed to the riverbank. The motor is installed above flood levels and the pump impellor and intake is permanently below low water level. The motor and impellor is connected by a shaft coupling fixed inside a steel pipe known as a column. The water is pumped up through this column, through the pump head to a steel pipe, which delivers the water to the canal system. All the axial flow motors are electrically powered.

Nearly all the pump stations were installed between 1996 and 1998 when the GoL embarked on an extensive installation programme to increase irrigation coverage in Lao PDR. Each station has mostly two pumps, a few with four units and one with six units. The motors are mostly 75 kW but range from 37 to 100 kW.

### 8.1.1 Problems and Solutions with Expected Impacts

**River Bank Erosion**

Both types of pump station installations have steel pipes or columns fixed to the riverbanks by reinforced concrete foundations. Most probably, most foundations will be spread foundations and not piled. River bank erosion in the Upper XBF will undermine the foundations and cause collapse of the structure fairly soon after the erosion starts. If the foundations are piled, then it will take longer for the structure to collapse.

Both types of pump station will require relocation further inland. This will be of less cost than attempting to protect the structures with river bank protection works that will have to stretch at least 20 meters

upstream and downstream of the structure. The cost of relocating the axial flow pumps will be more than the pontoon stations as the motors will also have to be moved. In both cases any electrical sub-stations will also have to be moved if they are located close to the top of the riverbank. There will also be a problem with the steel delivery pipe on top of the bank as the route will have to be adjusted. If the new location is far from the existing location, then there will also have to be a new stilling basin structure constructed at the delivery pipe outlet and the start of the main canal adjusted. It is preferable that the new location is as close to the old location as possible.

As the possible erosion of 20 m is a prediction and not certain, the structures should be relocated further from the bank than this. It is also preferable if the reinforced concrete foundations are piled in case erosion is greater than predicted. Single or double deep, wide diameter concrete piles are not necessary, they can be a series of small diameter piles.

**Water Level Fluctuations**

The fluctuations in water level will not impact the axial flow pump stations. With regard to pontoon pump installations. Each station will have a pump operator or operators who are also responsible for adjusting the location of the pontoon as the river levels move up and down. The pontoon is tied to the riverbank by wire ropes. In the dry season the river level fluctuation is small and small constant adjustment of the ropes and pipe connections are necessary. Care must be taken with electrical cables which must be kept coiled and dry on the pontoon. In the wet season, there are increased fluctuations caused by floods and the operators must be more cautious.

### 8.1.2 Budget for Relocation of Irrigation Pumping Station

Relocation of the irrigation pumping stations is recommended to be carried out to nine and possibly 11 of the Pontoon pump stations as well as one Axial pump station. The costs involved include excavations and foundations, pipes and hoses as well as installation of a new electrical sub-station. The unit cost for Pontoon pump stations is estimated at US$ 20,000 and for Axial US$ 30,000 (see Table 8-10). Hence the total cost for relocation of the 12 irrigation pump stations is US$ 250,000.

When the NT2 project starts operating there will be level fluctuations every weekend and during the week if there are public holidays and less power is required to be generated. The pump operator will be kept busier and must be warned of any abnormal fluctuations such as mid-week public holidays.

No problems are envisaged with the connections from the flexible hoses to the fixed bank delivery pipes. The flexible hoses are designed to accommodate a significant level fluctuation. Adjustment of the wire rope attaching the pontoon to the banks will be more important. Before NT2 operations there will be meetings informing XBF District Irrigation Authorities and irrigation scheme Water User Associations (WUA) of the impending river level fluctuations. An effective system of warning the WUAs of unusual fluctuations will be designed. Further investigations of the impacted irrigation schemes are required and a possible recommendation may be to provide additional lengths of wire ropes.

**Table 1-10: Cost of Relocation of Pontoon and Axial Irrigation Pump Stations.**

| Nr | Description | Unit | Quantity | Unit Rate (US$) | Amount (US$) |
|---|---|---|---|---|---|
| 1. | **Estimate for One (1) Pontoon Pump Station** | | | | |
| 1.1 | Mobilization and base camp | LS | 1 | 2,000 | 2,000 |
| 1.2 | Excavation and Foundations | | | | |
| | Excavation for new installation (incl. some rock) | LS | 1 | 4,500 | 4,500 |
| | Reinforced concrete foundations | LS | 1 | 2,000 | 2,000 |
| | Vegetation planting for bank protection | LS | 1 | 500 | 500 |
| 1.3 | Steel Delivery Pipe and Fittings | | | | |
| | Dismantle existing delivery pipe | LS | 1 | 1,000 | 1,000 |
| | New pipes, pipe bends, seals, nuts & bolts as requi | LS | 1 | 2,000 | 2,000 |
| | New flexible hoses and anchor cables as required | LS | 1 | 2,000 | 2,000 |
| | Re-install on new foundations | LS | 1 | 1,000 | 1,000 |
| 1.4 | Electrical Sub-Station | | | | |
| | Dismantle existing electrical sub-station | LS | 1 | 1,000 | 1,000 |
| | Construct new structure | LS | 1 | 2,000 | 2,000 |
| | Replacement new fittings as required | LS | 1 | 1,000 | 1,000 |
| | Install new sub-station | LS | 1 | 1,000 | 1,000 |
| | **Sub-total, One (1) Pump Station** | | | | **20,000** |
| | **Total, Eleven (11) Pontoon Pump Stations** | | | | **220,000** |

**Assumptions, Pontoon Mounted Pump Stations:**

1. Pump station relocated 20-m inland, adjacent to existing station
2. New delivery pipeline route required
3. Electrical sub-station similarly relocated (may not be necessary)
4. Stilling basin not impacted
5. Some steel pipes are damaged & many new fittings (seals, nuts & bolts) required
6. Assume 2 x 75 Kw Pumps
7. Number of pontoon pump stations impacted: 11

| Nr | Description | Unit | Quantity | Unit Rate (US$) | Amount (US$) |
|---|---|---|---|---|---|
| 2 | **Estimate for One (1) Axial Flow Pump Station** | | | | |
| 2.1 | Mobilization and base camp | LS | 1 | 3,000 | 3,000 |
| 2.2 | Excavation and Foundations | | | | |
| | Excavation for new installation (incl. some rock) | LS | 1 | 5,000 | 5,000 |
| | Reinforced concrete foundations and shelter | LS | 1 | 5,000 | 5,000 |
| | Vegetation planting & other riverbank protection | LS | 1 | 2,000 | 2,000 |
| 2.3 | Pump and Steel Delivery Pipe and Fittings | | | | |
| | Dismantle existing pumps & delivery pipe | LS | 1 | 2,000 | 2,000 |
| | New pipes, pipe bends and fittings as required | LS | 1 | 6,000 | 6,000 |
| | Re-install on new foundations | LS | 1 | 2,000 | 2,000 |
| 2.4 | Electrical Sub-Station | | | | |
| | Dismantle existing electrical sub-station | LS | 1 | 1,000 | 1,000 |
| | Construct new structure | LS | 1 | 2,000 | 2,000 |
| | Replacement new fittings as required | LS | 1 | 1,000 | 1,000 |
| | Install new sub-station | LS | 1 | 1,000 | 1,000 |
| | **Sub-total, One (1) Axial Flow Pump Station** | | | | **30,000** |

**Assumptions, Axial Flow Pump Station:**

1. Pump station relocated 20-m inland, adjacent to existing station
2. New delivery pipeline route required
3. Electrical sub-station similarly relocated (may not be necessary)
4. Stilling basin not impacted
5. Some steel pipes are damaged, some new pipe bends and mostly new fittings (seals, nuts & bolts) required
6. Only one (1) station impacted at Mahaxai Tai (2 x 90 Kw)
7. Number of Axial flow pump stations impacted: 1

| | | |
|---|---|---|
| | **TOTAL, PONTOON and AXIAL FLOW PUMP STATIONS** | **250,000** |

## 8.2 RELOCATION OF BUILDINGS

### 8.2.1 Compensation Strategy for Relocation of Buildings

As mentioned in Section 1.5 buildings located close to the Xe Bangfai face the risk of erosion. For buildings without high community or cultural value, and which are not concerned by riverbank protection measures, NTPC will offer relocation to another place in the village, which could includes purchased land and construction of a new house of a standard not less than the current structure.

The survey on assets (see Section 2.11 in Chapter 2) showed that a total of 226 private buildings in 16 villages could be affected by erosion. In addition, 6 communally owned buildings in 5 villages faced a similar risk of wearing away.

### 8.2.2 Budget for Relocation of Buildings

Relocation of these buildings involves identifying new land where the houses and other buildings can be constructed in vicinity to the current village and the actual construction of the building. Such land could cost as much as US$ 15,000 per hectare or US$ 1.50 per m². Building materials, labour and other construction cost is estimated at to US$ 4,000 per house[2]. The total cost of relocation of the buildings total US$ 615,000 (see Table 1-11).

**Table 1-11: Compensation Cost of Buildings to Be Relocated.**

| | House | | Barn | Shop / ware house | | Area of houses | Area of shops and ware houses | Area needed for new homesteads | Total compensation cost |
|---|---|---|---|---|---|---|---|---|---|
| **District** | Bamboo | Timber | | Bamboo | Timber | ($m^2$) | ($m^2$) | ($m^2$) | (US$) |
| Mahaxai | 27 | 74 | 12 | 6 | 26 | 6,171 | 1,420 | 26,104 | |
| Xe Bangfai | 17 | 26 | 41 | 2 | 1 | 2,749 | 78 | 11,074 | |
| **Total** | **44** | **100** | **53** | **8** | **27** | **8,920** | **1,498** | **37,178** | |
| **Compensation** | | | | | | | | | |
| Unit compensation cost (US$) | 2,000 | 4,000 | 200 | 800 | 2,000 | | | | |
| **Compensation cost (US$)** | **88,000** | **400,000** | **10,600** | **6,400** | **54,000** | | | **55,767** | **614,767** |

Assumptions:
Cost of constructing a new house of bamboo: US$ 2,000.
Cost of constructing a new house of timber: US$ 4,000.
Cost of relocating a barn: US$ 200.
Cost of constructing a shop / ware house of bamboo: US$ 800.
Cost of constructing a shop / ware house of timber: US$ 2,000.
Cost of land for new homestead (for houses): US$ 15,000/ha.

## 8.3 T.A. TO THE NON-FISHERIES COMPENSATION PROGRAMME

Table 1-12 below presents the schedule of required TA that will be fielded to work with the GoLs RMU in the implementation of the non-fisheries component of the downstream compensation program. The corresponding budget amounts to US$ 510,000.

**Table 1-12: Schedule of Technical Assistance to the Non-Fisheries Compensation Programme.**

| Xe Bangfai Non-Fisheries Mitigation and Compensation Programme | 2007 (qtr) 1 2 3 4 | 2008 (qtr) 1 2 3 4 | 2009 (qtr) 1 2 3 4 | 2010 (qtr) 1 2 3 4 | 2011 (qtr) 1 2 3 4 | 2012 (qtr) 1 2 3 4 | 2013 (qtr) 1 2 3 4 | 2014 (qtr) 1 2 3 4 | | monthly rate | no. mths | total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lao TA: senior, program manager | | | | | | | | | | 2,500 | 54 | 135,000 |
| Lao TA: senior, engineer (water supply, irrigation pumps, river bank protection) | | | | | | | | | | 1,700 | 60 | 102,000 |
| Lao TA: Village infrastructure engineer (relocation of buildings) | | | | | | | | | | 1,700 | 66 | 112,200 |
| Lao TA: agronomist (river bank gardens) | | | | | | | | | | 1,700 | 36 | 61,200 |
| Admin and Finance: | | | | | | | | | | 750 | 60 | 45,000 |
| Admin and Finance: | | | | | | | | | | 400 | 60 | 24,000 |
| 2 drivers | | | | | | | | | 2 x 250 | 500 | 60 | 30,000 |
| > various and many | | | | | | | | | | | | |
| | | | | | | | | | | | | **509,400** |

## 8.4 RMU SUPPORT FOR THE DOWNSTREAM AREAS

The NT2 Project has allocated US$1,560,000 funds to the GoL, thru its Resettlement Management unit, to support the implementation and monitoring of the downstream mitigation and compensation

[2] This is the current price for houses at the Nakai Plateau.

programme. The RMU, and the various downstream District Working Groups, will be provided with funds to support:

- expansion and refurbishment of District offices;
- purchase and operation of vehicles, both 4 x 4 and motorcycles;
- purchase of computers, printers and other office equipment;
- a budget for recurrent costs, such as office and field consumables, and fuel for vehicles;
- per diem allowance for a wide range and number of staff (see Chapter 6); and
- staff training.

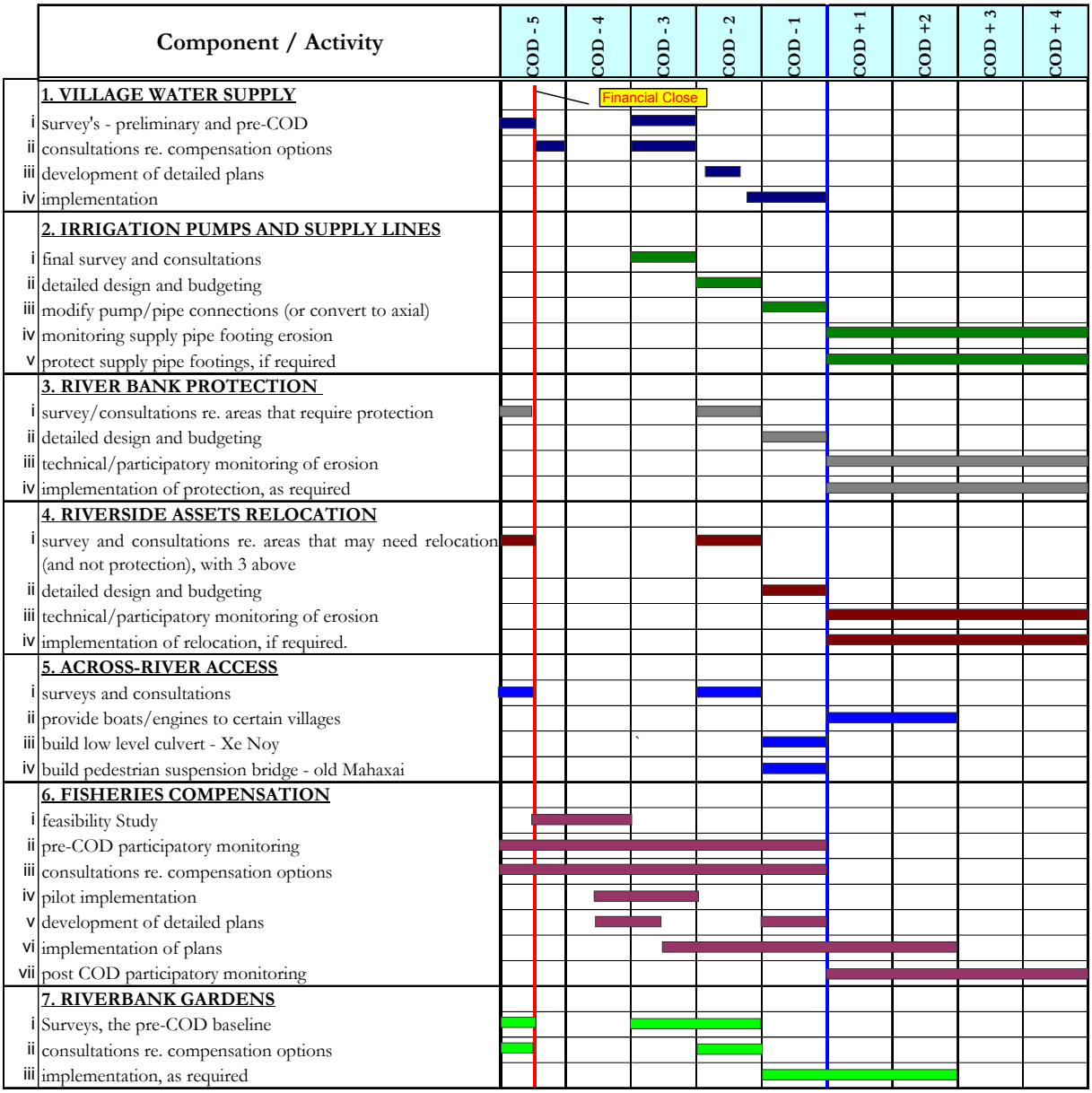
The above GOL capacity building program will facilitate the focal role of GoL agencies in staff in the conduct of the XBF and downstream programs, in collaboration with NTPC, over a period of 9 years.

## 8.5 INDICATIVE ACTIVE SCHEDULE OF ACTIVITIES

A summary, indicative schedule of the main activities required by the mitigation and compensation program is presented in Table 1-13. It shows which parts of the programs will be implemented before and after COD. Implementation of activities, in most cases, is dependant on the monitoring of actual impacts as they occur, before final decisions are made as to the site and scale of the mitigation and compensation activities to be implemented. This strategy can only be effective however, if relatively detailed surveys, plans, designs and budgets are developed pre-COD (as planned and shown in Table 1-13) so that quick response action can and will be taken, as and when required, post COD.

The activities include a significant and essential focus on the local participation of the potentially affected villagers. Firstly, there is the continuous consultations and disclosure program, whereby villagers review and analyse the (predicated) primary and secondary impacts of the Project that are explained to them. This is followed by community review and consensus of the types of compensation options favoured, and proposed to the Project. Finally, there is the participatory surveys and monitoring after COD of physical impacts and livelihoods that are actually affected, and the actual extent of impacts. It goes without saying that the participation of the PAPs in the implementation of the compensation is another crucial precursor to the successful and long term sustainable implementation of these compensation programs.

**Table 1-13: Indicative Schedule for Survey, Planning and Implementation of Mitigation and Compensation Options for the Xe Bangfai**




The schedule for the fisheries compensation program for the downstream Nam Theun will mirror that of the above fisheries compensation schedule for the Xe Bangfai (item 6 in Table 1-13 above).

## 8.6 SUMMARY TOTAL BUDGET FOR DOWNSTREAM AREAS PROGRAMME

The budget planned for the various mitigation and compensation programmes is listed in Table 1-14.

The total amount of the programme is US$ 16,000,000. The allocation between the different activities and between years will be confirmed by the Resettlement Implementation Planning Study.

The budget for the fisheries compensation programme is based on conservative estimates of the fish losses that can be expected for the first few years after COD.

The compensation measures will be implemented as an offset for all the potential negative impacts of the project on the downstream areas.

**Table 1-14: Indicative Summary Budget for Downstream Areas**

| Component | FC to FC+1 | FC+1 to FC+2 | FC+2 to FC+3 | FC+3 to FC+4 | FC+4 to COD | Total | COD to COD +1 | COD+1 to COD+2 | COD+ 2 to COD+3 | CoD+3 to COD+4 | CoD+4 to COD+5 | Total: COD to CoD+5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Studies and TA** | 550,000 | 200,000 | 235,714 | 242,857 | 121,429 | **1,350,000** | 302,500 | 302,500 | 302,500 | 202,500 | | **1,110,000** | **2,310,000** |
| **RMU** | | | | 240,000 | 120,000 | **360,000** | 300,000 | 300,000 | 300,000 | 300,000 | | **1,200,000** | **1,560,000** |
| **Fisheries Compensation** | | 289,000 | 580,000 | 1,387,500 | 693,500 | **2,950,000** | 1,387,500 | 1,387,500 | 1,387,500 | 287,500 | | **4,450,000** | **7,400,000** |
| **Compensation for other Impacts** | 50,000 | 100,000 | 350,000 | 1,000,000 | 620,000 | **2,120,000** | 32,000 | 32,000 | 32,000 | 32,000 | 32,000 | **160,000** | **2,430,000** |
| **Ext. Monitoring** | | 120,000 | 120,000 | 120,000 | 60,000 | **420,000** | 120,000 | 120,000 | 120,000 | 120,000 | 100,000 | **580,000** | **1,000,000** |
| **Contingency** | | 200,000 | 200,000 | 250,000 | 150,000 | **800,000** | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | **500,000** | **1,300,000** |
| **Total** | **600,000** | **909,000** | **1,485,714** | **3,240,357** | **1,764,929** | **8,000,000** | **2,242,000** | **2,242,000** | **2,242,000** | **1,042,000** | **232,000** | **8,000,000** | **16,000,000** |

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**Annex 1: Description of Problems and Protection Works for Temples in 3 Villages**

| **Village No. 1** | **Mahaxai Tai** |
|---|---|
| Temple | Wat Sen Sayalarn |
| Temple Description | Temple originally established 1723. Brick wall and buildings. |
| Distance Downstream of NT2 Downstream Channel | About 7 km |
| Length of Temple Wall on Riverbank | 65 meters, downstream end of wall is only 7-m from edge of riverbank |
| Location and Erosion Problem | On outside of bend on the right bank of the river. Significant erosion pocket upstream due to eddying (swirling) of river. Then consistent (classical) natural erosion along long downstream river reach. |
| Other Location and Access Problems | Upstream is pontoon pump and delivery pipe for water supply to new Mahaxai District Center. Any protection works should include this.<br>In front of Temple are many shades, shops and restaurants. These will have to be moved for works to take place.<br>No problems with access regarding the delivery of construction materials. |
| Approximate Minimum Length of Erosion Protection Required | Upstream of Temple: 50-m<br>Along Temple Wall: 65-m<br>Downstream of Temple: 30-m<br>Total Length: 145-m |
| Type of Protection | Revetment – Rock filled gabion mattresses on 1: 2.5 slope |
| Height of Riverbank | From top of bank to riverbed: 16.6-m<br>From top of bank to toe of bank: 14.2-m |
| Preliminary Estimated Cost of Erosion Protection<br>Extra Unknown Costs | US$ 150,000<br><br>Compensation for moving existing buildings located in front of Temple. |
| Other Comments | Temple location on outside of bend, therefore classical natural erosion occurring. Erosion will be increased by NT2 extra discharges. |
| Recommendation | Riverbank protection works required. |

| **Village No. 2** | **Pova Neua** |
|---|---|
| Temple | Wat Pova Neua |
| Temple Description | Old established Temple. Masonry wall, timber and brick buildings. Timber drum house and shade on riverbank |
| Distance Downstream of NT2 Downstream Channel | About 6-7 km. Just upstream and on opposite bank of Temple No. 1. |
| Length of Temple Wall on Riverbank | 55 meters. Wall is parallel to, and less than 7-m from edge of riverbank. |
| Location and Erosion Problem | On straight river reach. There is evidence of natural bank erosion, but this will be increased, and a problem if 10-m of erosion takes place as predicted. |
| Other Location and Access Problems | Small working space in front of Temple. Will have to relocate drum shade. Cannot cut the bank for sloping revetment works.<br>On left bank of river. Construction materials from Thakek and Road 12 will have to cross river by upstream ferry. This will increase rock unit price (slower delivery time, ferry fee).<br>Timber houses on both sides of Temple. |
| Approximate Minimum Length of Erosion Protection Required | Upstream of Temple: 30-m There is no "natural" start of the protection. Minimum length is considered to be 30-m.<br>Along Temple Wall: 55-m<br>Downstream of Temple: 30-m (similar comment to "upstream")<br>Total Length: 115-m |
| Type of Protection | Vertical bank protection – Rock filled gabion baskets and mattresses. There is no space to cut bank for sloping protection. |
| Height of Riverbank | From top of bank to riverbed: 16-m<br>From top of bank to toe of bank: 14-m |
| Preliminary Estimated Cost of Erosion Protection<br>Extra Unknown Costs | US$ 135,000<br><br>Relocate drum shade. |
| Other Comments | Increased unit prices because of poor access and working space. |
| Recommendation | Riverbank protection works required. |

| **Village No. 3** | **Pova Tai** |
|---|---|
| Temple | Wat Pova Tai |
| Temple Description | Old established Temple. Masonry wall, timber and brick buildings. |
| Distance Downstream of Downstream Channel | About 7- km. Downstream of Temple No. 2 and nearly opposite, just downstream, of Temple No. 1. |
| Length of Temple Wall on Riverbank | 85 meters. |
| Location and Erosion Problem | On inside of major bend with sand and gravel deposition noted in front of Temple. However there is evidence of bank erosion, near the upstream corner of the wall. This is probably mostly caused by access to a boat crossing and runoff erosion. A shade, on stilts, is located there. |
| Other Location and Access Problems | Similar to No. 2, on left bank of river. Construction materials from Thakek and Road 12 will have to cross river by upstream ferry. This will increase rock unit price. Timber houses on upstream side of Temple. |
| Approximate Minimum Length of Erosion Protection Required | Upstream of Temple: Minimum of 30-m.<br>Along Temple Wall: 85-m<br>Downstream of Temple: Minimum 30-m<br>Total Length: 145-m |
| Type of Protection | Revetment – Rock filled gabion mattresses. |
| Height of Riverbank | From top of bank to riverbed: About 11-m<br>From top of bank to toe of bank: About 15-m |
| Preliminary Estimated Cost of Erosion Protection<br>Extra Unknown Costs | US$ 165,000 |
| Other Comments | Increased unit prices because of poor access and lack of working space. |
| Recommendation | Lower priority as main erosion will take place on opposite bank. |

**Annex 2: Indicative TOR for Downstream Areas Feasibility and Implementation Planning Study for the NT2 Project's Downstream Areas Livelihood Restoration Program (DA-LRP).**

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# 1 INTRODUCTION

## 1.1 Objective of the DA Feasibility and Implementation Planning Study

The general objective of the NT2's Downstream Areas Livelihood Restoration Program (DA-LRP) Feasibility and Implementation Planning Study (FIPS) is to determine the exact extent and nature of compensation to be implemented in each Downstream Area village impacted by the NT2 Project. It will evaluate the technical, social and economic (i.e. financial and market-related) feasibility and acceptability among the affected villages of (a) the various mitigation and compensation options that have been identified to date, and (b) other compensation options identified through appraisal and especially consultations and planning with each impacted village.

## 1.2 Description of the NT2 Project[3]

The Nam Theun 2 (NT2) hydroelectric scheme in Khammouane, Bolikhamxay and Savannakhet Provinces in central Laos involves constructing a dam on the Nam Theun River, and the creation of a 450 square kilometre reservoir on the Nakai Plateau. Waer rom the reservoir will be diverted into a tunnel excavated in Phu Ark escarpment, and drop about 350 meters to the turbines located in a Powerhouse at the foot of the escarpment. Immediatly below the powerhosue, a regulating pond/dam will regulate flowss in to the into the Xe Bang Fai (XBF) river through a 27 kilometre, purpose-built downstream channel. The Project will also construct transmission lines to Thakhek and the Thai border, build or upgrade 150 km. of roads, and establish a number of rock quarries and soil deposit sites.

The NT2 Project is a Build Own Operate Transfer (BOOT) scheme to be developed by the Nam Theun 2 Power Company (NTPC), a limited company registered under Lao law. Major shareholders are the Lao Government (25% equity), EDF International (35% equity), EGCO of Thailand (25% equity), and Italian-Thai Development Public Company (25% equity).

The Nam Theun 2 Project will impound waters of the Nam Theun river ('nam' meaning river in middle and northern Lao) just below the Nakai plateau. The waters will then be diverted from the Nam Theun river basin to the Xe Bangfai river basin via a tunnel in the Phu Ark mountain. These waters will pass thru electricity generating turbines into a regulating pond at the foot of Phu Ark mountain, after which regulated flows (of about 220 cumecs on average, with maximum of up to 330 cumecs) will be released into a 27km long downstream channel which flows, via the Nam Phit, directly to the Xe Bangfai river, entering about 9.5 km upstream from Mahaxai town, and 159 km upstream from the confluence with the Mekong river. (See Volume 1, Chapter 2 for a full project description).

## 1.3 Summary Description of Impacts[4]

- **Riverside gardens:**
  There will be losses of riverbank crop fields and gardens because of higher water levels (+ 5 m in dry season and + 1.5 m in wet season at Mahaxai) and some erosion of the riverbanks in the upper reaches, in the early years. This impact will be experienced mainly by villages along the impacted stretch of the Xe Bangfai.

- **Fisheries:**
  There will be a decrease of fish catch (and aquatic product collection) due to (a) modification of aquatic habitats due to increased dry season flows and sedimentation of habitats; (b) effects of poor water quality from the Nakai Reservoir in the early years, and (c) more difficult fishing in the higher/faster waters. In terms of biodiversity, while there are no endemic fish species in the Xe Bangfai River, some species may be extirpated. This impact will be experienced by most villages in the Downstream Areas of the NT2 Project.

- **Riverbank Erosion impact on riverside assets:**
  There may be losses of some riverside buildings due to the predicted additional erosion in the upper reaches of the impacted section of the Xe Bangfai, due to the clear and fast NT2 waters picking up sediment from the river banks, and to the weekly (weekend and public holiday)

[3] A full Project Description is provided in the SDP, Volume 1, Chapter 1, and the EAMP Chapter 2.
[4] A full description of Environmental and Social Impacts is provided in SDP Volume 3, Chapters 4 and 5

fluctuations in flow. Erosion may be up to 20 m in some early stretches in the upper section, below the Downstream Channel junction with the Xe Bangfai, although over what time frame is unknown.

- **Irrigation Pumps**
  The modified water flow regime, especially the weekend and public holiday drawdown, will require modifications to the flexible pump-to-supply pipe connection. The positive benefit will be the considerably more water during dry season, allowing (a) more reliable dry season irrigation with (b) cheaper pumping cost (savings of 28% in upper section and of 15% in mid-lower sections).

- **Domestic water:**
  Poor water quality in the early years (as the reservoir eutrophication) will result in the inability to use Xe Bangfai waters for domestic uses. On the other hand, higher ground water in the dry season will make it easier and more reliable to extract well water.

- **Access across the river:**
  The higher water level in the river in the dry season will mak current dry season river crossing no longer viable.

- **Flooding:**
  The NT2 Project will increase flooding along the Xe Bangfai, except in that area very close to the Mekong river. The flooding in the Mahaxai area will be somewhat attenuated if the project agreements (to stop PowerStation discharges when the river overtops its banks in Mahaxai) are implemented

## 1.4 The Downstream Mitigation and Livelihood Restoration Programme

The Nam Theun 2 Projects Livelihood Restoration Programme in the Xe Bangfai mainstream and hinterland, Nam Phit and Nam Theun (downstream) villages will be an "offset" for the negative impacts of the Nam Theun 2 Project on the people living in villages within those zones.

The Livelihood Restoration Programme is due to be implemented between Financial Close (FC), currently scheduled for June 2005, up until about 5 years after the Commencement of Operation Date (COD), currently scheduled for October 2009, and this COD + 5 years would be October 2014. The total cost of the program is 16 million USD.

While a framework and indicative activities of this DA-LRP have been developed (see SDP Volume 3 Chapter 8) the detailed set of activities to be implemented in each village, based on impacts and consensus in each village as to how to addresses these impacts, is not yet clearly defined. Thus, the first phase of implementation of the Livelihood Restoration Programme will be the conduct of a Feasibility and Planning Implementation Study (FIPS) due to start immediately after FC and envisaged to take sixteen(16) months to complete. This FIPS will develop in detail a pan if how to implement the full Livelihood Restoration Programme until 2014.

## 1.5 Components of this Feasibility and Planning Implementation Study

There are four main components of the FIPS, as follows:

**Baseline Studies and Surveys**

Baseline Surveys and Studies are required to confirm the type, level, productivity and tenure of current activities which will be impacted by the Nam Theun 2 Project, including;

i: household fish catch and aquatic product catch or collection, in all Downstream area villages

ii: river bank cropping and gardening, mainly along the Xe Bangfai

iii: domestic water use based on the Xe Bangfai waters

iv: fixed assets on the edge of the Xe Bangfai rivers

A sub-component could be a confirmation or re-prediction of % impact of NT2 Project on each of these activities, although this will not be a mandatory component of this FIPS

The studies and surveys that will be undertaken during this one year FIPS will, in effect, be the first year on livelihood and non-livelihood monitoring in the Downstream Areas.

**Feasibility and Costing of Mitigation and Livelihood Restoration options**

A range of possible options for mitigation and livelihood restoration have been identified, as follows:

Livelihoods Restoration options

- aquaculture;
- integrated rice, livestock and fish farming;
- improved natural fisheries management;
- re-establishment of riverbank gardens; and
- irrigation and rice/crop growing.

Mitigation for Riverbank Erosion

- riverbank protection; and
- relocation of assets.

Mitigation for impacts on Irrigation Pumps

- protection of supply pipe footings; and
- provision of long flexible hosing and good connection.

Mitigation options for impacts on Domestic water:

- provision of open well;
- provision of boreholes;
- provision of alternative extraction methods;
- rainwater collection; and
- filtered and piped water supply systems.

Mitigation options for impacted Access across the river

- provision of boats, provision of bridges, other types of crossings

Mitigation or compensation options for impacts from Flooding:

- flood protection dykes - either in general or targeted, to protect villages, for example;
- water control gates - improve current gates and build new gates;
- improve water gate management; and
- develop the growing of flood tolerant rice varieties.

More options will no doubt arise following consultation with impacted villages (see component 3 below) However, the feasibility and cost of each of these options must be studied in detail before decisions can be made to support the implementation of any particular option.

**Consultations and Village level participatory planning**

There are a large number of village's potentially impacted by the NT2 Project in the Downstream Areas (see table 1) , although not all villages are affected by the same impacts, or to the same extent buy any particular impact. In addition, each village has its own geo-physical and socio-cultural setting, and thus the mitigation and livelihood restoration options, which may be appropriate, feasible and/or socially preferred, may vary from village to village.

Thus, to ensure that the DA-LRP is practical, socially acceptable, sustainable and ultimately successful in the long term, the NT2 Project will undertake participatory village level planning, in each village, as the primary tool for the finalization of the package of mitigation and livelihood restoration options to be implemented in each village.

Such participatory village level planning will include the following activities:

- review of the data on current livelihoods;
- review of the predicted impacts of the NT2 Project;
- review of the then current village development program, and needs;
- review of the geophysical potential for land based livelihood development;
- review of the feasibility studies undertaken by the Projects experts; and
- review and consensus in each village as to the level at which any particular impacts will be addressed - compensation provided at village level or at the impacted household level

The culmination of such reviews and participatory investigations will be a balanced set of options or choices in each village to address (compensate for ) the predicted impacts ob the NT 2 Project.

The village level plans that will be prepared during this one year FIPS will still be draft in as much as they can be revised at any time throughout the implementation of the DA-LRP. The livelihood programs especially, will be piloted first, and the villages plans then revised based on the success or otherwise of these pilots

**Development of an Implementation Plan in first draft**

Following the parallel conduct and results of (i) the baseline surveys and studies, (ii) the option level feasibility studies, and (iii) village level planning, the FIPS team will integrate the studies and village level plans in to a draft Implementation Plan. This Plan will likely be presented or organised along at least three axis's, as follows:.

- plans for village by village
- a plan for each impact zone or administrative zone (amalgamation of village level plans
- plans for each impact or MLR option

However, the exact format of the DA-LRP Implementation Plan will be decided by mutual agreement between NTPC and the Contractor, during the course of the implementation of the FIPS.

## 1.6 Previous Studies and Plans

Various surveys have been carried out to determine socio-economic status of impacted villages, and the current catch of fisheries and aquatic products, including:

- a recall (questionnaire based) socio-economic, health and fisheries survey in 2001, based on interviews of 15 households per village, in 89 of the Xe Bangfai mainstream and backwater affected villages (see SDP, Volume 3, Chapter 2);
- a fisheries CPUE monitoring program commenced in 2001, involving 21 households - 3 households per village in 7 Xe Bangfai mainstream villages;
- a PRA type fisheries survey of 61 XBF hinterland villages in 2004;
- a fish catch survey of 32 villages currently fishing in the Huay Khama/Nam Phit;.
- a fish catch survey of 36 villages in the tributaries of the Nam Theun below the future Nakai Dam;
- An options pre-appraisal, carried out in November 2004, to determine the technical and economical feasibility as well as the local preferences in 20 selected villages representing mainstream and hinterland villages from five different zones in Xe Bangfai and in Nam Phit; and.
- Village public consultations in all Xe Bangfai Mainstream villages under in 2004 (see SDP, Vol 3, Chapter 6). This consultations program was the first time that the NT2 Projects impacts where explained in full, to all villagers along the Xe Bangfai. While the consultations did seek to elicit proposal from villages in regard to compensation alternatives, these proposals can only be seen as

general guidelines at this stage. This FIPS program seeks to do more in-depth consultation, and to firm up the villagers proposals for mitigation and livelihood restoration, based on feasibility and other parameters.

Based on these above studies, and other specific investigations undertaken by NTPC staff and consultants, a desk study was undertaken to design potential options for compensation (see SDP, Volume 3, Chapter 8). In the case of compensation for fisheries impacts, a set of nine compensation options have been indicatively evaluated for their suitability for each of the 70 mainstream Xe Bangfai villages expected to be affected. However, there may be other options that are found to be feasible and preferable in each village, and this (a) detailed village level planning is required and (b) the compensation plan must be kept flexible.

## 1.7 Indicative prediction of magnitude of NT Project Impacts

**Predicted extent of impacts on Fisheries**

By taking into account:

(a) the environmental impact of the NT2 Project discharge into the Downstream Channel (formerly the Nam Phit) and the Xe Bangfai;);

(b) an understanding of the non-NT2 specific background environmental impacts;

(c) an understanding of the impacts of the NT2 Project on efficiency of gear and fishing techniques;

(d) an understanding of non-NT2 specific impact of fishing practices on fish productivity; and

(e) the experience of similar projects.

… a predicted % impact in fish catch has been developed for the different stretches of the Xe Bangfai river, as detailed in Table 1 below.

**Table 1: Summary of predicted % impact of the NT2 Project on current fish catch**

| | Dry season | | Wet season | |
|---|---|---|---|---|
| **Zone** | **in XBF** | **out XBF** | **in XBF** | **out XBF** |
| Upstream of Upper XBF | 0 % | 0 % | 0 % | 0 % |
| Upper XBF | 80 % | 0 % | 80 % | 0 % |
| Mid XBF** | 70 % | 0 % | 50 % | 0 % |
| Lower XBF 1 | 60 % | 0 % | 30 % | 0 % |
| Lower XBF 2 | 45 % | 0 % | 10 % | 0 % |
| Lower XBF 3 | 30 % | 0 % | 10 % | 0 % |
| Average | 60 % | 0 % | 41 % | 0 % |

** Note: fish catch of backwater affected villages on the Xe Noy are predicted not to negatively impacted.

This 'ball park' estimate of the maximum potential impact of NT2 on annual fish yields at villages located along Xe Bangfai between the confluences with Nam Phit and the Mekong River has been used to further compute an indicative impact on the kilograms of fish catch, based on the current fish catch data obtained from the 2001 socio-economic (and fisheries) survey (SDP, Volume 3, Chapter 2).

The predicted fisheries impact on Houay Khama and Nam Phit fisheries, which will become part of the Downstream channel, is predicted to be close to 100%. The predicted fisheries impact downstream of the Nam Thuen 2 dam has not yet been estimated , but may be in the order of 50 % of the tributary fish catch, and 100% of mainstream Nam Theun catch. The fisheries impact upstream if the future Nakai Reservoir has not yet been predicted.

The FIPS team will have to use an estimated prediction of impact at the village level, village by village.

**Predicted extent of riverbank fields and gardens**

The impact of the NT2 Project on riverbank gardens will be:

(a) most pronounced in the upper areas of the Xe Bangfai, and less pronounced in the lower areas, due mainly to the relatively less increase in river discharge due to the NT2 Project, in the lower Xe Bangfai;

(b) almost 100 % impact on the lower level dry season gardens, but progressively less impact on the mid and especially upper slope gardens, the impact being dependant on erosion and especially slumping;

(c) some people will try to re-establish gardens, especially vegetable gardens., on the mid and upper slopes, although this may be difficult in the early years while the river is still establishing its new morphology;

(d) even in the absence of an erosion effect on upper riverbank slope gardens and fields, there will be physically less room or area in which to establish these gardens and crops.

Based on the above prediction of what may happen after the NT2 Project, a maximum predicted impact on river bank gardens and fields is presented in Table 2 below.

**Table 2: Riverside Fields/Gardens (2004), and Possible Impact of the NT2 Project.**

| | | Riverside Crop Fields | | | | Riverside Vegetable Garden | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Current | | Possible NT2 impact | | Current | | Possible NT Impact | |
| District | Total HH (2004) | Area (ha) | No. of HH | Area as % | Area in ha | Area (ha) | No. of HH | Area as % | Area in ha |
| Mahaxay | 1,265 | 103 | 526 | 80 | 82.5 | 4.01 | 45 | 100 | 4.01 |
| Xe Bangfai | 1,651 | 74 | 486 | 80 | 59,2 | 5.25 | 55 | 100 | 5.25 |
| Nong Bok | 2,120 | 41 | 432 | 40 | 16.4 | 4.34 | 100 | 70 | 3.01 |
| Xaybouli | 2,808 | 98 | 698 | 40 | 39.2 | 4.56 | 73 | 70 | 3.19 |
| **Total** | **7,844** | **316** | **2142** | | **199.1** | **18.16** | **273** | | **15.46** |

The SDP, Volume 3, Chapter 5 provides more information on the predicted magnitude and location of each impact of the NT2 Project.

## 2 GEOGRAPHICAL AND DEMOGRAPHIC FRAMEWORK

### 2.1 Downstream Area Regions

The Downstream Area MLR Program must be conducted in all downstream (and one upstream) areas tat will be impacted the NT2 Project. The two downstream and one upstream regions are as follows:

**Region 1**: **Downstream of the Nakai Dam**
Downstream of the nakai Dam up until the Thuen Hinboun Dam, 32 km downstream of the Nakai Dam. Much of this zone is included in the NNT-PHP Corridor area and is largely bordered by Zone 2. One major tributary, the Nam Phao, joins the Nam Theun approximately 12km below the Nakai Dam site. There are no established villages or settlements along this reach of the river, principally because of the topography features and difficult access. This area will be impacted by drastic decrease in water. However, there are no villages actually located on the banks of the Nam Thuen river in this stretch. Thus, the Projects impact will be mainly on fisheries in the mainstream Nam Theun, and that part of the fisheries in its tributaries that is reliant on migratory species.

The number of potentially impacted villages in this region is about 51. Six (6) zones downstream of NT2 dam have been delineated for the purposes of fish catch assessment and impact assessment, containing about 51 villages fish, as summarized in table ??, and detailed in Annex ??.

**Region 2**: **Downstream of the Powerhouse**, in the Xe Bangfai basin
The NT2 Powerhouse discharges into the Regulating Pond and subsequently into two watercourses, a small quantity into the Nam Katang and most into the Downstream Channel, which for most of its length is The Huay Khama/Nam Phit, and then both of these flow into the Xe Bangfai.

It is possible to distinguish 9 impact zones downstream of NT2 Powerhouse (table 2), and household fish catch that will be potentially affected due the impacts in these areas will be experienced in about 201 villages which currently catch fish from these rivers and wetland areas, as summarized in table 2 below, and detailed in Annex 1.

Some of the villages are located along the mainstreams of Nam Phit, Nam Kathang, Nam Gnom, and Xe Bangfai (riparian villages). In the riparian villages, many households fish in the mainstreams. However, some villages are not actually located along these water courses , but travel to these water course to catch fish, especially the Nam Phit and the Xe Bangfai. Only some, not all households in these villages catch fish in the impacted streams/rivers, and those that do fish may be generally less reliant on fisheries in these streams/rivers than households located on the banks of the impacted rivers.

- **The Downstream Channel - and Nam Khama / Nam Phit**:
  The majority of the discharge from the power station will be transferred to the XBF via the downstream channel. This zone encompasses some of the most productive agricultural land which will be directly affected by the Project. The downstream channel will traverse rice paddy land for approximately 8km of its 27km length and will then flow in the modified Nam Phit.

  Besides physical land requirements of the NT2 Project, other social issues stem from the flow introduced to the downstream channel and the water quality profile as it changes in the channel prior to release into the XBF. Approximately 60 households, who either use or occupy the land on the channel alignment in this Zone, could be adversely affected by the Project, however, households along the channel may benefit from increased potential irrigation.

- **The Nam Kathang**:

  The Nam Kathang headwaters will become the regulating pond, and will receive waters of the same flow, but sourced mainly from the Nakai Reservoir. This area has 23 villages with approximately 1,700 households.

- **The Xe Bangfai river**:

  From the point of confluence of the Downstream Channel to the junction with the Mekong river, 4 impact zones have been delineated:

  > **XBF upper zone**
  This zone extends from the confluence of the downstream channel and the XBF to the Sayphou Xoy Ridge about 25 km downstream of district center of Mahaxai. Thirteen (13) villages are located in this zone from Ban Keng Savang down to Ban Tha Hat. The impacts of the NT2 project waters will be greatest in this zone, being the first stretch of river receiving the additional discharge. Issues are mainly related to increases in flows and river levels, changes in discharge regime, erosion of the river banks, effects on land use (river bank gardens) and effects on fisheries.

  **> XBF middle zone:**
  The Middle XBF zone extends from the Sayphou Xoy Ridge to the Road 13 crossing. There are thirteen (13) villages in this stretch, from Ban Keng Khene, just downstream of the ridge, to Ban Pa Lai. Issues relating to this zone will be similar to those outlined for the Upper XBF Zone, although the severity of some of the impacts is expected to be less due to the slightly larger size of the XBF and slightly larger natural discharge in this stretch of the XBF.

  > **XBF lower**

  From the Road 13 bridge to the confluence of the Xe Bangfai, this is the area where the Xe Bangfai run through the Xe Bangfai flood plain, It has the highest concentration of villages and agricultural development, but it will be the area of the Xe Bangfai mainstream which will experience the least impacts from the NT2 Project, and t

  > **XBF backwater affected zones**

  Two main areas Ii) the upstream of upper XBF, being that area above the confluence of the Downstream Channel and the Xe Bangfai, and (ii) the Xe Noi. The impacts in these backwater areas will be rather limited, and some may be balanced by the positive impacts .

**Region 3**: **Tributaries upstream of the future reservoir**
There 5 river valleys upstream of the Nakai Plateau, which in the future will be the Nakai Reservoir. Fish catch in these tributaries of the future reservoir will be potentially affected due changes in fish migration. These tributaries are in the NNT NPA and NT2 Watershed and NPA. There are about 31 villages in this region currently catch fish from these rivers, whose fisheries of migratory species may be impacted.

In total, there are about 305 villages in the Downstream Area, who will be differentially impacted as shown in Table 3 below. Annex 1 details populations and ethnic groups of these villages.

**Table 3: Villages Impacted and Type of Impact, by Zone.**

| | | no. villages | | | impacts | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Impact Region and Zone** | **Rip** | **H'land** | **total** | **Fisheries** | **Gardens** | **Erosion** | **Irri .Pumps** | **Access** | **Domestic Water** | **Flooding** |
| | **Downstream of Nakai Dam** | | | | | | | | | | |
| 1 | Upper Nam Phao | 9 | | 9 | 9 | | | | | | |
| 2 | Lower Nam Phao | 10 | | 10 | 10 | | | | | | |
| 3 | Nam Kata | 14 | | 14 | 14 | | | | | | |
| 4 | Nam Phiat | 7 | | 7 | 7 | | | | | | |
| 5 | Nam Kheo | 5 | | 5 | 5 | | | | | | |
| 6 | Nam Ngoy | 6 | | 6 | 6 | | | | | | |
| 7 | Nam Theun | 0 | | 0 | 0 | | | | | | |
| | **sub-total** | **51** | 0 | **51** | **51** | **0** | **0** | **0** | **0** | **0** | **0** |
| | **Downstream of Powerhouse** | | | | | | | | | | |
| 1 | DC/Nam Phit | 17 | 19 | 36 | 36 | | | | (17) | (17) | 17 |
| 2 | Nam Kathang/Gnom | 12 | 2 | 14 | 14 | | | | | 12 | 0 |
| 3 | Upstream of Upper XBF | 12 | 0 | 12 | 12 | 12 | | 12 | (12) | (12) | 12 |
| 4 | Upper XBF | 12 | 8 | 20 | 20 | 12 | 12 | 12 | 12 | 12 | 12 |
| 5 | Middle XBF | 12 | 21 | 32 | 32 | 12 | 12 | 12 | 12 | 12 | 12 |
| 6 | Lower XBF 1 | 18 | 20 | 38 | 38 | 18 | 18 | 18 | 18 | 18 | 18 |
| 7 | Lower XBF 2 | 24 | 16 | 40 | 40 | 24 | 24 | 24 | 24 | 24 | 24 |
| 8 | Lower XBF 3 | 11 | 4 | 15 | 15 | 0 | 0 | 0 | 0 | 11 | 0 |
| 9 | Xe Noi | 7 | 5 | 12 | 12 | 0 | 0 | 7 | 7 | 0 | 0 |
| | **sub-total** | **125** | **95** | **219** | **219** | **78** | **66** | **85** | **73** | **77** | **95** |
| | **Upstream of Reservoir** | | | | | | | | | | |
| 1 | Nam Sot | 9 | 0 | 9 | 9 | | | | | | |
| 2 | Nam Theun | 11 | 0 | 11 | 11 | | | | | | |
| 3 | Nam Noy | 9 | 0 | 9 | 9 | | | | | | |
| 4 | Nam Pheo | 5 | 0 | 5 | 5 | | | | | | |
| 5 | Nam On | 0 | 0 | 0 | 0 | | | | | | |
| | **sub-total** | **34** | **0** | **34** | **34** | | | | | | |
| | **grand total** | **210** | **95** | **305** | | | | | | | |

## 3 TASKS REQUIRED

While the detailed tasks required to be undertaken by the Consultants implementing the FIPS will be further refined before and during the early months of the FIPS, the indicative program of activities will likely include the following tasks:

### 3.1 Baseline Surveys

- Socio-economic and income survey, possibly undertaken as part of the VPP, to establish current Households Incomes and Production levels
- a Baseline and Registration ('cut-off') survey of riverbank along the Xe Bangfai Only, to confirm current data by recall survey

- directly measure late wet season crop area/yields
- directly measure dry season vegetable area/yields
- directly measure early wet season crop are/yields

- Baseline study of domestic water supply (XBF and Nam Katang) to confirm and correct the current data sets and collect more detailed data on a household basis
- Baseline study of access across river (XBF and Nam Phit), to confirm the current data by recall survey, and then by observation in dry season, confirm database

The fisheries baseline survey will be undertaken by anther team the Fisheries Monitoring and Survey Team

## 3.2 Feasibility Studies of Livelihood Restoration Options

The options for mitigation and livelihood restoration which are currently under consideration, and any new options raised dung village planning consultations, will need to be studied to asses their feasibility and costs. This will require the undertaking of, at least, the following tasks;

- Aquaculture feasibility studies and development of plans, including
  - Initial investigations and analysis
  - production of draft feasibility report
  - production of simplified feasibility reports
  - review with villages
  - redrafting of feasibility reports
  - Inclusion in Implementation Plans
- Natural fisheries feasibility studies and development of plans, including
  - Initial investigations and analysis
  - production of draft feasibility report
  - review with villages
  - redrafting of feasibility reports
  - Inclusion in Implementation Plans
- Cropping and Livestock development options feasibility studies and development of plans, including
  - Initial investigations: farming systems, bio-physical, land availability
  - production of draft feasibility report
  - review with villages
  - redrafting of feasibility reports
  - Inclusion in Implementation Plans
- Investigations and then Feasibility Plans and Budget for the modifications required to Irrigation Pump Installations
- Investigations and then Feasibility Plans and Budget for Options for Riverbank Protection and Flood Control
- Investigations and then Feasibility Plans and Budget for Options for domestic water supply systems. These studies and plans will be developed in full coordination with the village participatory planning process.
- Investigations and then Feasibility Plans and Budget for Options for alternative access across the Xe Bangfai and backwater affected areas. These studies and plans will be developed in full coordination with the village participatory planning process.

## 3.3 Participatory Village Level Planning

Participatory Village planning will be the core or focal activity of the FIPS, and will probably most effectively be undertaken in 4 general steps, a preparatory step and then 3 phases of village planning exercises, as follows:

- **Preparation and methods development**
  - Staff study and understand the documents and activities to date
  - Review and workshop on methods development
  - review of methods, further training etc
- **Phase 1 of Village Participatory Planning**
  - Village sensitization, review of predicted impacts
  - Initial data collection
  - Participatory review of Options potential and constraints
  - Review of Compensation approach - Village or household
  - Development of draft plans for consideration
  - Enter data, plans and maps into Database/Report
  - Provide clear copy of Plans to villages
- **Phase 2 of Village Participatory Planning**
  - Confirm baseline data, gather new data if required
  - Review of Options feasibility
  - Review of Compensation approach per Option
  - Review and revise village LR Plan
  - Enter data, plans and maps into Database/Report
- **Phase 2 of Village Participatory Planning**
  - Where required, review Compensation approach
  - Where required, review and revise village LR Plan

## 3.4 Reporting

The following reports will be submitted by the Consultants

- Inception Report;
- Brief Monthly Repots;
- A mid term progress report;
- Draft and then final Report on the Baseline Studies and Surveys ;
- Feasibility Study Reports (per group of livelihood restoration Options);
- Report of Village development plans, in draft and then final format; and
- DA-LRP Implementation Plan, in draft and then final form.

While for the purposes of this FIPS, a 'final' Implementation plan will have to be produced, it will still be a draft and a 'live' document in terms of the long term Downstream Areas Livelihood Restoration Program. The Plan may be modified in the future, according to

(i) the results and experience of the pilot and then the actual implementation of the livelihood restoration program;

(ii) any modification in the predicted impacts of the NT2 projects ;

(ii) any change in the actual NT2 impacts, post COD; or

(iv) any change in the requirements or preferences of any particular village.

The formats in which the above reports will be prepared and presented will be decided upon by mutual agreement between the Contractor and NTPC

## 3.5 Pilot Livelihood Restoration Projects

The implementation of pilot livelihood restoration projects may be initiated towards the end of this FIPS Consultancy, and the consultant team will be required to assist in planning, management and implementation as of the program by:

- Selection of pilot villages;
- Selection of pilot activities;
- Planning of the activities with village and local authorities;
- Develop a budget and proposes to NTPC;
- hiring operational staff to start this program in collaboration with local authorities; and
- Initiation of activities, which may include aquaculture, integrated aquaculture and livestock, integrated aquaculture and cropping, for example.

# 4 INSTITUTIONAL ARRANGEMENTS AND STAFFING

## 4.1 Indicative Consultant Team Profile

The indicative composition of the consultants team to implement the DA-LRP FIPS is shown in Table 4 below. The final composition of the team will be formulated following finalization of the ToR and negotiations with the selected consultants. the indicative scheduling of the TA team and local staff i shown in Table 4 below.

**Table 4: Indicative Composition of the Consultants Team to Implement the FIPS**

| Position | estimated p.m. | Indicative sourcing |
|---|---|---|
| **Project Management** | | |
| Team Leader (Participatory Rural Development Specialist) | 15 mths | Int'l |
| Deputy Team Leader (Planning specialist) | 10 mths | Int'l/Regional |
| Database and Planning Assistant | 15 mths | Lao/Regional |
| GIS Assistant | 10 mths | Lao |
| **Fisheries TA** | | |
| (core) Aquaculture Specialist | 8 mths | Int'l/Regional |
| (other) Aquaculture Specialists | 3 mths | Int'l/Regional |
| Inland Fisheries Specialist | 6 mths | Int'l/Regional/Laol |
| This group to closely coordinated with the International and National Fisheries Monitoring and Survey team | | |
| **Agriculture TA** | | |
| Irrigation Specialist | 5 mths | Int'l/Regional |
| Farming Systems / Agronomy Specialist | 6 mths | Int'l/Regional |
| Livestock and forages Specialist | 3 mths | Int'l/Regional/Lao |
| **Engineering TA** | | |
| Riverbank Protection and Flood Protection Specialist | 1.5 mths | International |
| Irrigation Pump Specialist | 1.5 mths | Regional |
| Domestic Water supply specialists | 2 mths | Lao |
| **Village Participatory Planning (VPP) team** | | |
| VPP team leader: one male and one female: 2 | 2 x 15 mths | Lao |
| VPP agriculture officer: 2 | 2 x 14 mths | Lao |
| VPP fisheries officer: 4 | 5 x 14 mths | Lao |
| VPP community development officer: 2 | 2 x 14 mths | Lao |
| VPP village irrigation officers | 2 x 6 mths | Lao |
| VPP village water supply officer: | 1 x 9 mths | Lao |
| VPP village infrastructure officer | 1 x 2 mths | Lao |
| Pilot Livelihoods restoration officer: | if required | |
| **Socio-Economic (income) Baseline** | | |
| A special purpose team | 3 mths | Lao |

## 4.2 Draft TORs for each TA position

A summary, draft description of the roles and responsibilities of each TA position is provided below. the final and detailed description will be provided in the final draft of the TOR, and then reviewed by the consultants, with any proposal for R & R modifications proposed in their Inception Report.

**Team Leader roles and responsibilities**

- management of the technical and personnel components of the program ;

- develop and improve appropriate methods and processes for (a) feasibility studies, and (b) participatory planning with villages;
- assist the Deputy TL in drafting and finalising reports;
- assist the Deputy TL in drafting and finalising the Implementation Plans;
- ensure the project database and GIS maps are up to date, accessible and managed correctly;
- fine tuning Project staff ToR, and selection of staff ;
- monitoring of the scheduling of implementation of each of the projects components, and making activity or scheduling modifications as required, upon mutual agreement with NTPC;
- ensure gender and ethnic minority perspectives and issues are addressed and fully integrated into the feasibility and village planning processes;
- liaise with the relevant NTPC task managers; and
- any other talks required.

**Deputy Team Leader roles and responsibilities**

- administration and finance (with assistance from the admin and finance staff);
- reporting (together with the Team Leader);
- production of the Implementation Plans (together with the TL);
- coordinating inputs of short term TA and consultants; and
- assist the Team leader in any task required.

**Database and Planning assistant roles and responsibilities**

- develop databases appropriate to the type of data, information and pans to be generated and produced by the program;
- modify and improve this suite of database's over time;
- Enter all of the collected survey, study, and planning data into appropriate databases, in a timely manner;
- alert team members of any inconsistencies in data gathered or provided, or in difficulties in the formats in which data is gather and provided;
- produce reports in any format required;
- ensure that the database is organised and maintained in an accessible and consistent manner; and
- any other duties as required by the Team Leaders.

**Aquaculture Specialist roles and responsibilities**

- study and understand the predicted impacts on fisheries in the Downstream Areas;
- study and understand - from both analysis of reports and from extensive field investigations - the current status and range of activities in natural and aquaculture fisheries of DA households;
- Undertake a feasibility assessment of the aquaculture options tabled to date, and any new options which are proposed by villagers during the village planning process. Such a feasibility study is likely to be undertaken for discrete regions, areas or zones;
- identify constraints and opportunities for each aquaculture options;
- summaries these feasibility studies into simplified messages which can be used in the village planning process;
- from time to time, join the village planning process, in order to fine tune the feasibility studies based on local knowledge and preferences, and to back-up the review with villagers of the simplified feasibility study messages;
- review the aquaculture component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-MLRP Implementation Plan.

**Inland Fisheries Specialist roles and responsibilities**

- study and understand the predicted impacts on fisheries in the Downstream Areas;
- study and understand - from both analysis of reports and from extensive field investigations - the current status and range of activities in natural fisheries of DA households;
- Review the activities and data of the Fisheries Monitoring and Survey program;
- Undertake a feasibility assessment of the potential to improve fish catch from natural aquatic habitats by management of these habitats, management of the fisheries effort and methods, and any other methods. Such a feasibility study is likely to be undertaken for discrete regions, areas or zones;
- identify constraints and opportunities for improved natural fish catch;
- summaries these feasibility studies into simplified messages which can be used in the village planning process;
- from time to time, join the village planning process, in order to fine tune the feasibility studies based on local knowledge and preferences, and to back-up the review with villagers of the simplified feasibility study messages;
- review the natural fisheries component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-MLRP Implementation Plan.

**Irrigation Specialist, roles and responsibilities**

- study and understand the current role irrigation in the Downstream Areas;
- understand and update the maps of the irrigation infrastructure and networks in the Downstream Areas;
- Define GOL plans for development in the Downstream area;
- develop options for changes in the management and in the design floating irrigation pumps, due to the large fluctuations in water levels in the weekends or public holidays;
- study and understand - from both analysis of reports and from extensive field investigations - the current status and range of activities in natural fisheries of DA households;
- from time to time, join the village planning process, in order to assess the feasibility of village proposals for improvement, expansion or development of irrigation schemes, as an option for livelihood restoration;
- review the irrigation component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-LRP Implementation Plan.

**Farming Systems / Agronomy Specialist roles and responsibilities**

- Undertake a general feasibility analysis of the main agricultural development options in the Downstream Areas, including study of (a) farming systems and (b) bio-physical potential for agricultural development in each region, area or zone;
- identify constraints and opportunities for agricultural development;
- summaries these feasibility studies into simplified messages which can be used in the village planning process;
- from time to time, join the village planning process, in order to fine tune the feasibility studies based on local knowledge and preferences, and to back-up the review with villagers of the simplified feasibility study messages;
- review the agricultural component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-LRP Implementation Plan

**Livestock and Forages Specialist roles and responsibilities**

- Undertake a general feasibility analysis of the main livestock development options in the Downstream Areas

- identify constraints and opportunities for livestock development;
- summaries these feasibility studies into simplified messages which can be used in the village planning process;
- from time to time, join the village planning process, in order to fine tune the feasibility studies based on local knowledge and preferences, and to back-up the review with villagers of the simplified feasibility study messages;
- review the livestock component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-LRP Implementation Plan

**Riverbank Protection and Flood Protection Specialist**

- Review the studies undertaken and published in regard to the predicted increased flooding in the Xe Bangfai
- Review the safeguards in place to partially mitigate flooding in the Mahaxai region
- Investigate on the field the flood control structures constructed to date, and review their (i) objectives, (ii) management and (iii) usefulness and (iv) physical condition
- review with the local administrations and with villages how they consider flood mitigation should be approached
- develop a range of approaches for flood mitigation, indicating (i) the usefulness or benefits, each, (ii) the drawbacks or deficiencies, and (iii) the indicative cost, of each approach

**Irrigation Pump Specialist roles and responsibilities**

- develop and cost options for changes in the management and in the design floating irrigation pumps, due to the large fluctuations in water levels in the weekends or public holidays;

**Domestic Water supply specialists roles and responsibilities**

- Undertake a general feasibility study of all the possible alternative domestic water sources and supply systems in the Downstream Areas of (i) the Nam Katang/nam Gnom, the Nam Phit and the Xe Bangfai, taking into account current systems employed and plans for development
- Develop generic costs and BoQs for each option;
- from time to time, join the village planning process, in order to fine tune the feasibility studies based on local knowledge and preferences, and to assist the VP process in the identification of the best option for each village;
- review the domestic water component of the first and later drafts of each village's mitigation and livelihood restoration plans; and
- assist in drafting of the DA-LRP Implementation Plan

**VPP Joint Team Leaders and Facilitators roles and responsibilities**

- Lead the Participatory Village Planning Process, and be responsible or the technical and personnel management of Process;
- together with the team leader, develop and improve appropriate methods and processes for participatory planning with villages;
- take the lead role, where necessary, in facilitating the village planning exercise in each village
- mange the drafting of reports from each village planning exercise, and ensure reports and data are transferred to the project s office in a timely and organised manners.
- assist in fine tuning Project staff ToR, and selection of staff ;
- ensure that gender and ethnic minority perspectives and issues are addressed and fully integrated into the feasibility and village planning processes; and
- any other talks required.

**VPP Agriculture Officers roles and responsibilities**

- gathering and confirming recall data on riverside gardens;
- assisting in socio-economic survey, agricultural production components;

- mapping of village land use;
- measuring of riverbank gardens and identifying tenure and owners of the same;
- assist in the investigations of each villages bio-physical and social potential for livelihood development;
- assist and facilitate villagers to develop feasible and appropriate livelihood restoration plans; and
- assist in development and implementing pilot livelihood restoration activities.

**VPP Fisheries Officers roles and responsibilities:**

- assisting in socio-economic recall surveys, fisheries components;
- assist in the aquaculture feasibility studies;
- assist in the natural fisheries management feasibility studies ;
- assist in the investigations of each villages bio-physical and social potential for livelihood development;
- assist and facilitate villagers to develop feasible and appropriate fisheries related livelihood restoration options; and
- assist in development and implementing pilot livelihood restoration activities.

**VPP Village Infrastructure Officers roles and responsibilities:**

- assisting in surveys and studies of (i) village domestic water systems, (ii) fixed assets on the edge of the riverbank;
- assist in the feasibility studies related to provision of alternative domestic water supplies, protection of riverbanks, provision of alternative access across rivers, relocation of endangered fixed assets and irrigation pump modifications ;
- assist in the natural fisheries management feasibility studies ;
- assist in the investigations of each villages bio-physical and social potential for livelihood development;
- assist and facilitate villagers to develop feasible and appropriate fisheries related livelihood restoration options; and
- assist in development and implementing pilot livelihood restoration activities.

**VPP Community Development Officers roles and responsibilities:**

- assisting in surveys and studies of (i) village domestic water systems, (ii) socio-economy and income;
- assist in the conduct of all feasibility studies, especially as they relate to social and cultural feasibility of any particular mitigation or livelihood restoration option;
- assist in the investigations of each villages social and cultural potential for livelihood development;
- assist and facilitate villagers in the planning of appropriate mitigation and livelihood plans; and
- ensure gender and ethnic minority perspectives are addressed and fully integrated into the feasibility and village planning processes.

**Socio-Economic Survey Team roles and responsibilities:**

- together with the FIPS team and the NTPC, develop an appropriate methodology to conduct the post-FC socio-economic survey of Downstream Area households, taking into account the impacts that are predicted to occur in a any particular area or zone;
- take the lead in the conduct of the socio-economic and incomes components of the survey;

  [Note that the fisheries component of the socio-economic survey will be undertaken by a special purposes Fisheries Monitoring and Survey Program and Team (SDP Chapter ??), while the riverbank garden area and production component will be undertaken by the FIPS team itself]
- entry of survey data into a database; and
- production of a preliminary socio-economic survey report.

## 5 WORKPLAN

The Indicative Schedule of the main activities of the long term NT2 Projects Downstream Areas Livelihood Restoration Program is shown in Table 5 below. This Plan will be revised based on the results of this FIPS, as described in this ToR.

**Table 5: Indicative Schedule of the Main Activities of the NT2 Projects DARP**

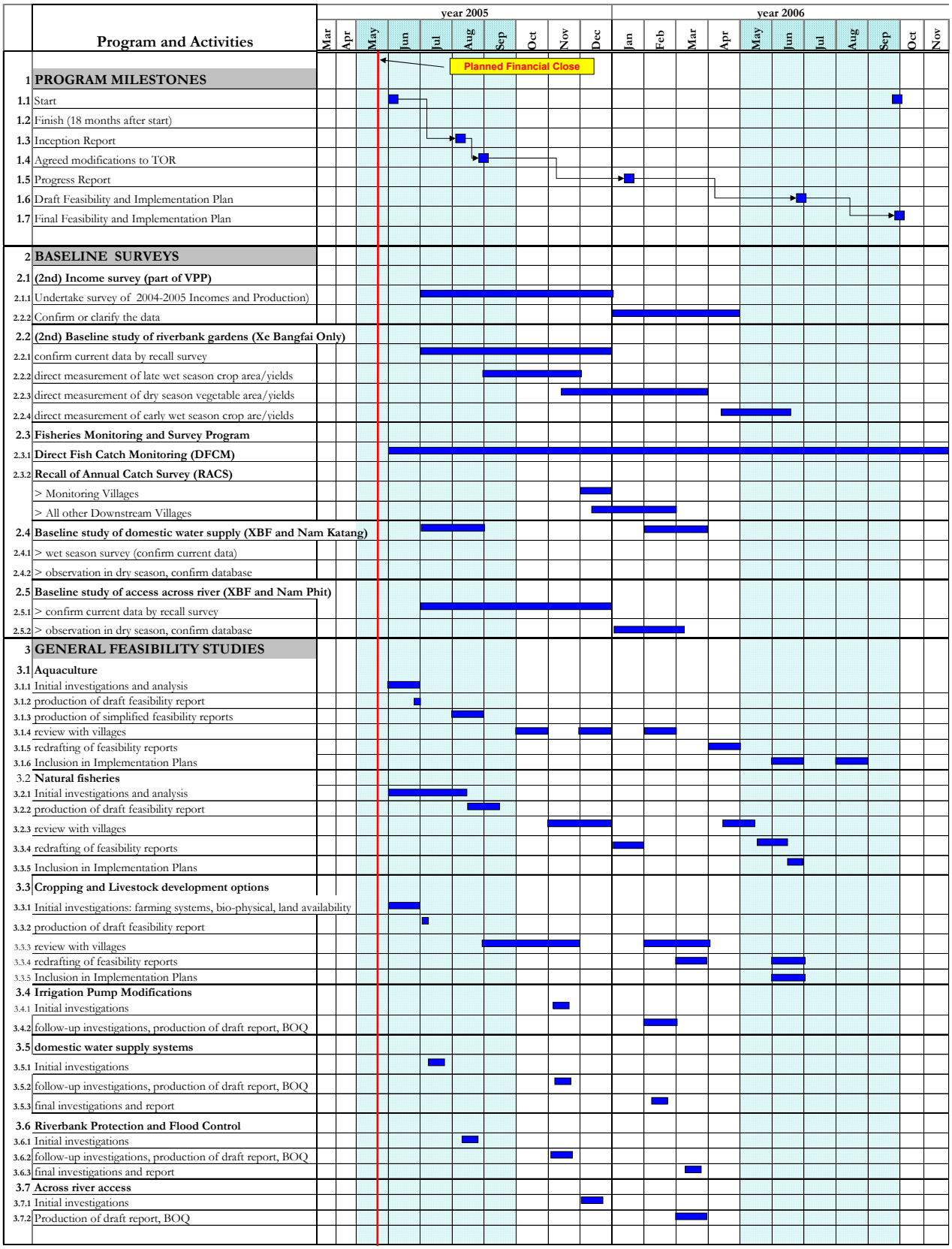
| | Component / Activity | COD - 5 | COD - 4 | COD - 3 | COD - 2 | COD - 1 | COD + 1 | COD +2 | COD + 3 | COD + 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1. VILLAGE WATER SUPPLY** | | | Financial Close | | | | | | |
| i | survey's - preliminary and pre-COD | | | | | | | | | |
| ii | consultations re. compensation options | | | | | | | | | |
| iii | development of detailed plans | | | | | | | | | |
| iv | implementation | | | | | | | | | |
| | **2. IRRIGATION PUMPS AND SUPPLY LINES** | | | | | | | | | |
| i | final survey and consultations | | | | | | | | | |
| ii | detailed design and budgeting | | | | | | | | | |
| iii | modify pump/pipe connections (or convert to axial) | | | | | | | | | |
| iv | monitoring supply pipe footing erosion | | | | | | | | | |
| v | protect supply pipe footings, if required | | | | | | | | | |
| | **3. RIVER BANK PROTECTION** | | | | | | | | | |
| i | survey/consultations re. areas that require protection | | | | | | | | | |
| ii | detailed design and budgeting | | | | | | | | | |
| iii | technical/participatory monitoring of erosion | | | | | | | | | |
| iv | implementation of protection, as required | | | | | | | | | |
| | **4. RIVERSIDE ASSETS RELOCATION** | | | | | | | | | |
| i | survey and consultations re. areas that may need relocation (and not protection), with 3 above | | | | | | | | | |
| ii | detailed design and budgeting | | | | | | | | | |
| iii | technical/participatory monitoring of erosion | | | | | | | | | |
| iv | implementation of relocation, if required. | | | | | | | | | |
| | **5. ACROSS-RIVER ACCESS** | | | | | | | | | |
| i | surveys and consultations | | | | | | | | | |
| ii | provide boats/engines to certain villages | | | | | | | | | |
| iii | build low level culvert - Xe Noy | | | | | | | | | |
| iv | build pedestrian suspension bridge - old Mahaxai | | | | | | | | | |
| | **6. FISHERIES COMPENSATION** | | | | | | | | | |
| i | feasibility Study | | | | | | | | | |
| ii | pre-COD participatory monitoring | | | | | | | | | |
| iii | consultations re. compensation options | | | | | | | | | |
| iv | pilot implementation | | | | | | | | | |
| v | development of detailed plans | | | | | | | | | |
| vi | implementation of plans | | | | | | | | | |
| vii | post COD participatory monitoring | | | | | | | | | |
| | **7. RIVERBANK GARDENS** | | | | | | | | | |
| i | Surveys, the pre-COD baseline | | | | | | | | | |
| ii | consultations re. compensation options | | | | | | | | | |
| iii | implementation, as required | | | | | | | | | |

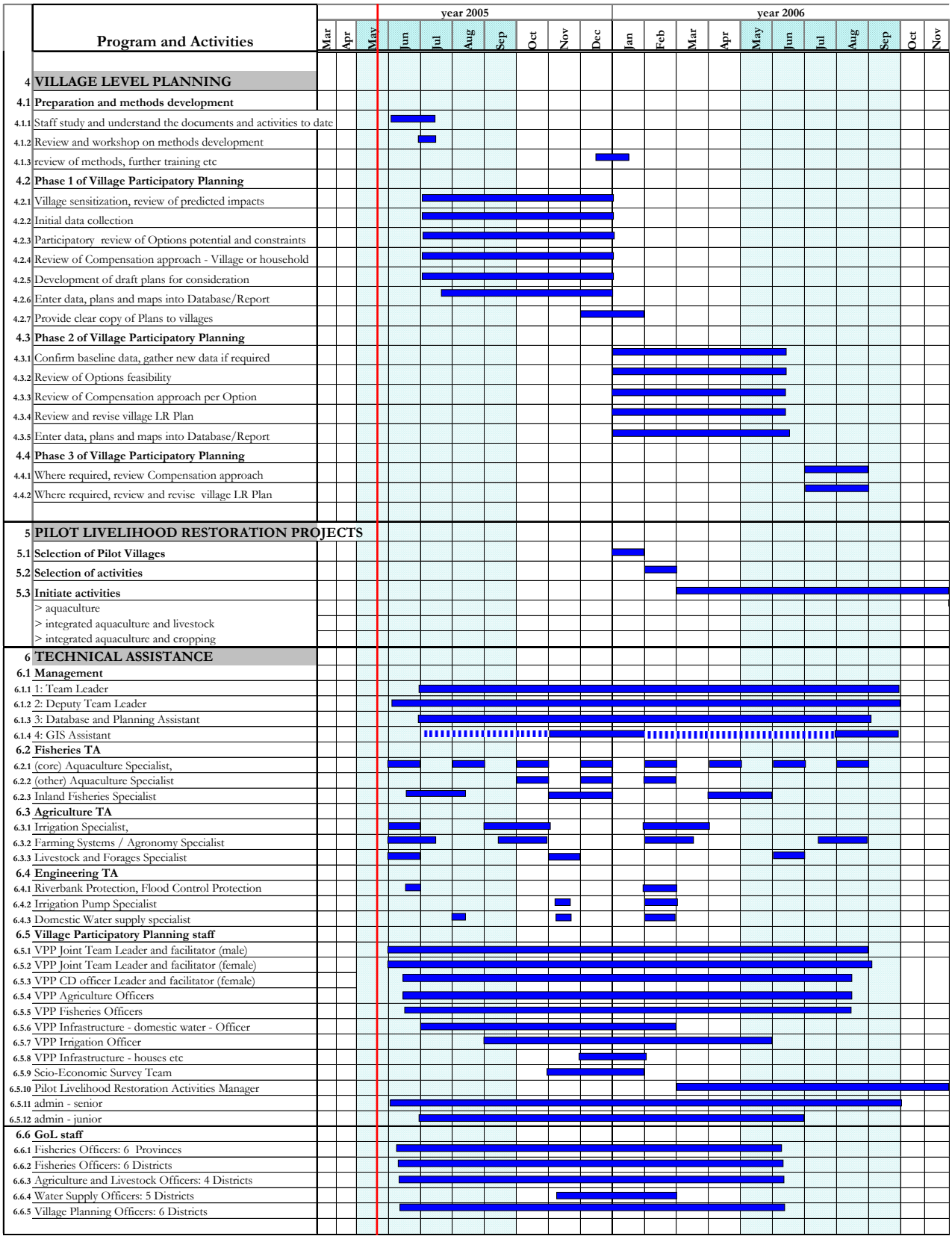
The indicative detailed schedule of activities of this FIPS is shown in Table 6. This program will be reviewed and possibly revised at least twice, as follows:

(a) during detailed negotiations with the selected FIPS Contractor; and

(b) following submission of the FIPS Inception Report

## Table 6: Indicative Schedule of the main activities of the FIPS for NT2 Projects DARP




Program and Activities
year 2005
year 2006
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
4 VILLAGE LEVEL PLANNING
4.1 Preparation and methods development
4.1.1 Staff study and understand the documents and activities to date
4.1.2 Review and workshop on methods development
4.1.3 review of methods, further training etc
4.2 Phase 1 of Village Participatory Planning
4.2.1 Village sensitization, review of predicted impacts
4.2.2 Initial data collection
4.2.3 Participatory review of Options potential and constraints
4.2.4 Review of Compensation approach - Village or household
4.2.5 Development of draft plans for consideration
4.2.6 Enter data, plans and maps into Database/Report
4.2.7 Provide clear copy of Plans to villages
4.3 Phase 2 of Village Participatory Planning
4.3.1 Confirm baseline data, gather new data if required
4.3.2 Review of Options feasibility
4.3.3 Review of Compensation approach per Option
4.3.4 Review and revise village LR Plan
4.3.5 Enter data, plans and maps into Database/Report
4.4 Phase 3 of Village Participatory Planning
4.4.1 Where required, review Compensation approach
4.4.2 Where required, review and revise village LR Plan
5 PILOT LIVELIHOOD RESTORATION PROJECTS
5.1 Selection of Pilot Villages
5.2 Selection of activities
5.3 Initiate activities
> aquaculture
> integrated aquaculture and livestock
> integrated aquaculture and cropping
6 TECHNICAL ASSISTANCE
6.1 Management
6.1.1 1: Team Leader
6.1.2 2: Deputy Team Leader
6.1.3 3: Database and Planning Assistant
6.1.4 4: GIS Assistant
6.2 Fisheries TA
6.2.1 (core) Aquaculture Specialist,
6.2.2 (other) Aquaculture Specialist
6.2.3 Inland Fisheries Specialist
6.3 Agriculture TA
6.3.1 Irrigation Specialist,
6.3.2 Farming Systems / Agronomy Specialist
6.3.3 Livestock and Forages Specialist
6.4 Engineering TA
6.4.1 Riverbank Protection, Flood Control Protection
6.4.2 Irrigation Pump Specialist
6.4.3 Domestic Water supply specialist
6.5 Village Participatory Planning staff
6.5.1 VPP Joint Team Leader and facilitator (male)
6.5.2 VPP Joint Team Leader and facilitator (female)
6.5.3 VPP CD officer Leader and facilitator (female)
6.5.4 VPP Agriculture Officers
6.5.5 VPP Fisheries Officers
6.5.6 VPP Infrastructure - domestic water - Officer
6.5.7 VPP Irrigation Officer
6.5.8 VPP Infrastructure - houses etc
6.5.9 Scio-Economic Survey Team
6.5.10 Pilot Livelihood Restoration Activities Manager
6.5.11 admin - senior
6.5.12 admin - junior
6.6 GoL staff
6.6.1 Fisheries Officers: 6 Provinces
6.6.2 Fisheries Officers: 6 Districts
6.6.3 Agriculture and Livestock Officers: 4 Districts
6.6.4 Water Supply Officers: 5 Districts
6.6.5 Village Planning Officers: 6 Districts

## 6 BUDGET FRAMEWORK

The Consultants financial proposal will specify the budget required to undertake the tasks specified in sections 3 and 5 above, and this budget proposal should include at least the following expenses.

### 6.1 Equipment

To following equipment will be purchased (under NTPC name = tax free) and then handed over to NTPC at end of project;

- Vehicle: 4 x 4 2
- Motorcycles: off road 10 (2 per district)
- Motorcycles: city 10 (2 per District)
- Desktop Computers and printers 7
- Field office renovation in 5 Districts
- Field office equipment in 5 Districts

### 6.2 TA Remuneration

Remuneration fees for the TA and staffing as a specified in Table 6 above

### 6.3 GOL counterpart Remuneration

Remuneration (as dsa) and other expenses for counterpart GOL staff, including

- Fisheries Officers: 6 Provinces
- Fisheries Officers: 6 Districts
- Agriculture and Livestock Officers: 4 Districts
- Water Supply Officers: 5 Districts
- Village Planning Officers: 6 Districts

### 6.4 Operating Cost

Operating Costs will include;

- Fuel: car and motorcycles
- maintenance : car and motorcycles
- Accommodation
- Offices running costs, in five Districts
- Field equipment
- Reporting
- Office consumables
- Village workshops
- Team meetings and workshops
- and other costs

Note that the while the Consultants team will be responsible for the planning and initiation of pilot livelihood restoration activities, if and as agreed mutually between the Consultant and the NTPC, the actual operational costs of these pilot activities are not to be included in the consultants budget proposal, as the scope of these activities has not yet been defined.

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## Annex 1: Downstream Area Villages and identification of potential NT2 Project Impacts in each village

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tot | Reg | Zone | District | Impact zone | Village | No. HH | Main ethnic groups | Riparian/ Hinterland | Fishery | Gardens | Erosion | Irrigation pumps | Access across | Domestic water | Flooding |
| **Villages along tributaries of the Nam Theun, below the Nakai Dam** | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Khamkeut | Lower Nam Phao | Senesoudom | 150 | | Riparian | yes | | | | | | |
| 2 | 2 | 2 | Khamkeut | Lower Nam Phao | Sengsavang | 120 | | Riparian | yes | | | | | | |
| 3 | 3 | 3 | Khamkeut | Lower Nam Phao | Namphuao | 178 | | Riparian | yes | | | | | | |
| 4 | 4 | 4 | Khamkeut | Lower Nam Phao | Nongdong | 174 | | Riparian | yes | | | | | | |
| 5 | 5 | 5 | Khamkeut | Lower Nam Phao | Somsanouk | 168 | | Riparian | yes | | | | | | |
| 6 | 6 | 6 | Khamkeut | Lower Nam Phao | Nongpong | 409 | | Riparian | yes | | | | | | |
| 7 | 7 | 7 | Khamkeut | Lower Nam Phao | Phonethong | 97 | | Riparian | yes | | | | | | |
| 8 | 8 | 8 | Khamkeut | Lower Nam Phao | Phonexay + Naphet | 72 | | Riparian | yes | | | | | | |
| 9 | 9 | 9 | Khamkeut | Lower Nam Phao | Namthi | 143 | | Riparian | yes | | | | | | |
| | | | | **Lower Nam Phao** | | **1,511** | | | | | | | | | |
| 10 | 10 | 1 | Khamkeut | Upper Nam Phao | Lak 20 | 126 | | Riparian | yes | | | | | | |
| 11 | 11 | 2 | Khamkeut | Upper Nam Phao | Phonemuangnoy | 167 | | Riparian | yes | | | | | | |
| 12 | 12 | 3 | Khamkeut | Upper Nam Phao | Phonehuong | 188 | | Riparian | yes | | | | | | |
| 13 | 13 | 4 | Khamkeut | Upper Nam Phao | Houaykeo | 252 | | Riparian | yes | | | | | | |
| 14 | 14 | 5 | Khamkeut | Upper Nam Phao | Phonepheng | 248 | | Riparian | yes | | | | | | |
| 15 | 15 | 6 | Khamkeut | Upper Nam Phao | Thongchalueng | 226 | | Riparian | yes | | | | | | |
| 16 | 16 | 7 | Khamkeut | Upper Nam Phao | Thaveng, Ban Phonesay | 144 | | Riparian | yes | | | | | | |
| 17 | 17 | 8 | Khamkeut | Upper Nam Phao | Samtheu | 82 | | Riparian | yes | | | | | | |
| 18 | 18 | 9 | Khamkeut | Upper Nam Phao | Nachalai | 79 | | Riparian | yes | | | | | | |
| 19 | 19 | 10 | Khamkeut | Upper Nam Phao | Nong Or | 98 | | Riparian | yes | | | | | | |
| 20 | 20 | 11 | Khamkeut | Upper Nam Phao | Napai | 154 | | Riparian | yes | | | | | | |
| 21 | 21 | 12 | Khamkeut | Upper Nam Phao | NaHat | 71 | | Riparian | yes | | | | | | |
| 22 | 22 | 13 | Khamkeut | Upper Nam Phao | Lak 5 | 95 | | Riparian | yes | | | | | | |
| 23 | 23 | 14 | Khamkeut | Upper Nam Phao | Lak 7 | 143 | | Riparian | yes | | | | | | |
| 24 | 24 | 15 | Khamkeut | Upper Nam Phao | Lak 10 | 112 | | Riparian | yes | | | | | | |
| 25 | 25 | 16 | Khamkeut | Upper Nam Phao | Thongpet | 243 | | Riparian | yes | | | | | | |
| 26 | 26 | 17 | Khamkeut | Upper Nam Phao | Naheuang | 183 | | Riparian | yes | | | | | | |
| 27 | 27 | 18 | Khamkeut | Upper Nam Phao | Hangna | 67 | | Riparian | yes | | | | | | |
| | | | | **Upper Nam Phao** | | **2,678** | | | | | | | | | |
| 28 | 28 | 1 | Khamkeut | Nam Phouang / Nam Phiat | Khammouane | 107 | | Riparian | yes | | | | | | |
| 29 | 29 | 2 | Khamkeut | Nam Phouang / Nam Phiat | Dongbang | 167 | | Riparian | yes | | | | | | |
| 30 | 30 | 3 | Khamkeut | Nam Phouang / Nam Phiat | Donesaat | 49 | | Riparian | yes | | | | | | |
| 31 | 31 | 4 | Khamkeut | Nam Phouang / Nam Phiat | Nadeua | 95 | | Riparian | yes | | | | | | |
| 32 | 32 | 5 | Khamkeut | Nam Phouang / Nam Phiat | Houaikeo | 141 | | Riparian | yes | | | | | | |
| 33 | 33 | 6 | Khamkeut | Nam Phouang / Nam Phiat | Sopphouan | 45 | | Riparian | yes | | | | | | |
| | | | | **Nam Phouang / Nam Phiat** | | **604** | | | | | | | | | |
| 34 | 34 | 1 | Khamkeut | Nam Kata | Kor Hai | 148 | | Riparian | yes | | | | | | |
| 35 | 35 | 2 | Khamkeut | Nam Kata | Phonesi | 67 | | Riparian | yes | | | | | | |
| 36 | 36 | 3 | Khamkeut | Nam Kata | Phonevilai | 133 | | Riparian | yes | | | | | | |
| 37 | 37 | 4 | Khamkeut | Nam Kata | Sophia, Nam Nian | 77 | | Riparian | yes | | | | | | |
| 38 | 38 | 5 | Khamkeut | Nam Kata | Phonesaat | 172 | | Riparian | yes | | | | | | |
| 39 | 39 | 6 | Khamkeut | Nam Kata | Vangpha | 98 | | Riparian | yes | | | | | | |
| 40 | 40 | 7 | Khamkeut | Nam Kata | Nam Deuan | 155 | | Riparian | yes | | | | | | |
| 41 | 41 | 8 | Khamkeut | Nam Kata | Nongmek | 84 | | Riparian | yes | | | | | | |
| 42 | 42 | 9 | Khamkeut | Nam Kata | Thongket | 127 | | Riparian | yes | | | | | | |
| 43 | 43 | 10 | Khamkeut | Nam Kata | Namuang | 104 | | Riparian | yes | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 44 | 44 | 11 | Khamkeut | Nam Kata | Nahai | 96 | | Riparian | yes | | | | | | |
| 45 | 45 | 12 | Khamkeut | Nam Kata | Vangkor | 67 | | Riparian | yes | | | | | | |
| 46 | 46 | 13 | Khamkeut | Nam Kata | Nagadonk, Namhouai | 99 | | Riparian | yes | | | | | | |
| 47 | 47 | 14 | Khamkeut | Nam Kata | Nathone, Ban Poungkieut | 102 | | Riparian | yes | | | | | | |
| | | | | **Nam Kata** | | **1,529** | | | | | | | | | |
| 48 | 48 | 1 | Khamkeut | Nam Ngoy | Phonelom | 32 | | Riparian | yes | | | | | | |
| 49 | 49 | 2 | Khamkeut | Nam Ngoy | Nakham | 83 | | Riparian | yes | | | | | | |
| 50 | 50 | 3 | Khamkeut | Nam Ngoy | Nongsong | 102 | | Riparian | yes | | | | | | |
| 51 | 51 | 4 | Khamkeut | Nam Ngoy | Phamuang | 98 | | Riparian | yes | | | | | | |
| 52 | 52 | 5 | Khamkeut | Nam Ngoy | Nagnoi + Navaat | 77 | | Riparian | yes | | | | | | |
| 53 | 53 | 6 | Khamkeut | Nam Ngoy | Phonegnap | 53 | | Riparian | | | | | | | |
| | | | | **Nam Ngoy** | | **3,503** | | | | | | | | | |
| 54 | 54 | 1 | Khamkeut | Theun Hinboun Headpond | Nong Kok, Latmuang | 161 | | Riparian | yes | | | | | | |
| 55 | 55 | 2 | Khamkeut | Theun Hinboun Headpond | Sabgnuang | 86 | | Riparian | yes | | | | | | |
| 56 | 56 | 3 | Khamkeut | Theun Hinboun Headpond | Thabak | 175 | | Riparian | yes | | | | | | |
| 57 | 57 | 4 | Khamkeut | Theun Hinboun Headpond | Khengbeat | 118 | | Riparian | yes | | | | | | |
| | | | | **Theun Hinboun Headpond** | | **540** | | | yes | | | | | | |
| 58 | 58 | 1 | Khamkeut | Nam Gnouang | Thongviengkham + Phonekham | 138 | | Riparian | yes | | | | | | |
| 59 | 59 | 2 | Khamkeut | Nam Gnouang | Phonetan | 120 | | Riparian | yes | | | | | | |
| 60 | 60 | 3 | Khamkeut | Nam Gnouang | Pakha | 78 | | Riparian | yes | | | | | | |
| 61 | 61 | 4 | Khamkeut | Nam Gnouang | Khouachanh | 125 | | Riparian | yes | | | | | | |
| 62 | 62 | 5 | Khamkeut | Nam Gnouang | Napavane | 122 | | Riparian | yes | | | | | | |
| 63 | 63 | 6 | Khamkeut | Nam Gnouang | Sobkoub | 164 | | Riparian | yes | | | | | | |
| 64 | 64 | 7 | Khamkeut | Nam Gnouang | Sobpon + Haileng | 103 | | Riparian | yes | | | | | | |
| 65 | 65 | 8 | Khamkeut | Nam Gnouang | Sod | 73 | | Riparian | yes | | | | | | |
| 66 | 66 | 9 | Khamkeut | Nam Gnouang | Phabang | 60 | | Riparian | yes | | | | | | |
| 67 | 67 | 10 | Khamkeut | Nam Gnouang | Poug | 67 | | Riparian | yes | | | | | | |
| 68 | 68 | 11 | Khamkeut | Nam Gnouang | Thasala | 61 | | Riparian | yes | | | | | | |
| 69 | 69 | 12 | Khamkeut | Nam Gnouang | Pong + Ban Bo | 69 | | Riparian | yes | | | | | | |
| 70 | 70 | 13 | Khamkeut | Nam Gnouang | Nonesomboun, Don | 69 | | Riparian | | | | | | | |
| | | | | **Nam Gnouang** | | **1,249** | | | | | | | | | |
| | | | | | **Total Downstream of the Dam** | **11,614** | | | | | | | | | |
| **Villages in NNT NPA (NT2 Watershed)** | | | | | | | | | | | | | | | |
| 71 | 1 | 1 | Nakhai | Nam Noy | MaKa | 47 | Kri, Phong1 | | yes ? | | | | | | |
| 72 | 2 | 2 | Nakhai | Nam Noy | Nam Noy | 50 | Sek | | yes ? | | | | | | |
| 73 | 3 | 3 | Nakhai | Nam Noy | Seuk | 17 | Brou | | yes ? | | | | | | |
| 74 | 4 | 4 | Nakhai | Nam Noy | ThongNoi | 24 | Phong 2 | | yes ? | | | | | | |
| 75 | 5 | 5 | Nakhai | Nam Noy | VangLae | 24 | Phong 2 | | yes ? | | | | | | |
| 76 | 6 | 6 | Nakhai | Nam Noy | Phoung | 28 | Phong 2 | | yes ? | | | | | | |
| 77 | 7 | 7 | Nakhai | Nam Noy | Peu | 17 | Brou | | yes ? | | | | | | |
| 78 | 8 | 8 | Nakhai | Nam Noy | Dtong | 28 | Phong 2 | | yes ? | | | | | | |
| 79 | 9 | 9 | Nakhai | Nam Noy | Vangkhouay | 21 | Phong 2 | | yes ? | | | | | | |
| | | | | | | | | | | | | | | | |
| 80 | 10 | 1 | Nakhai | Nam Pheo | HuaySarn | 27 | Sek | | yes ? | | | | | | |
| 81 | 11 | 2 | Nakhai | Nam Pheo | Beuk | 31 | Sek | | yes ? | | | | | | |
| 82 | 12 | 3 | Nakhai | Nam Pheo | NaMeo | 29 | Sek | | yes ? | | | | | | |
| 83 | 13 | 4 | Nakhai | Nam Pheo | NaMouy | 59 | Brou | | yes ? | | | | | | |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 84 | 14 | 1 | Nakhai | Nam Sot | Thameuang | 72 | Arao, Malang, Atel | | yes ? | | | | | | |
| 85 | 15 | 2 | Nakhai | Nam Sot | SongKone | 32 | Malang (Brou) | | yes ? | | | | | | |
| 86 | 16 | 3 | Nakhai | Nam Sot | NaHao | 41 | TaiSin, PhuTai | | yes ? | | | | | | |
| 87 | 17 | 4 | Nakhai | Nam Sot | Navang | 52 | Brou | | yes ? | | | | | | |
| 88 | 18 | 5 | Nakhai | Nam Sot | Kajing | 31 | Brou | | yes ? | | | | | | |
| 89 | 19 | 6 | Nakhai | Nam Sot | Huay Maxong | 24 | Brou | | yes ? | | | | | | |
| 90 | 20 | 7 | Nakhai | Nam Sot | Fangdaeng Neua | 20 | Brou | | yes ? | | | | | | |
| 91 | 21 | 8 | Nakhai | Nam Sot | Fangdaenga Tai | 30 | Brou | | yes ? | | | | | | |
| 92 | 22 | 9 | Nakhai | Nam Sot | ThongXart | 26 | Brou | | yes ? | | | | | | |
| | | | | | | | | | | | | | | | |
| 93 | 23 | 1 | Nakhai | Nam Theun | Vangjang | 38 | Brou (Themarou) | | yes ? | | | | | | |
| 94 | 24 | 2 | Nakhai | Nam Theun | Sorklek | 61 | Brou | | yes ? | | | | | | |
| 95 | 25 | 3 | Nakhai | Nam Theun | Singthong | 27 | Brou | | yes ? | | | | | | |
| 96 | 26 | 4 | Nakhai | Nam Theun | NaGhang | 44 | Brou | | yes ? | | | | | | |
| 97 | 27 | 5 | Nakhai | Nam Theun | Thaipaiban | 44 | Brou | | yes ? | | | | | | |
| 98 | 28 | 6 | Nakhai | Nam Theun | Gorbong | 39 | Brou | | yes ? | | | | | | |
| 99 | 29 | 7 | Nakhai | Nam Theun | Nava | 27 | Brou | | yes ? | | | | | | |
| 100 | 30 | 8 | Nakhai | Nam Theun | Makfeuang | 59 | Brou | | yes ? | | | | | | |
| 101 | 31 | 9 | Nakhai | Nam Theun | Peung | 23 | Brou | | yes ? | | | | | | |
| | | | | **Total Upstream of Reservoir** | | **1,092** | | | | | | | | | |
| **Villages using the Nam Phit or Houay Khama** | | | | | | | | | | | | | | | |
| 102 | 1 | 1 | Gnommalath | Nam Phit / Houay Khama | Kaun phan | 182 | Chalui, Lao, Tai Katak | Riparian | yes | | | | | | |
| 103 | 2 | 2 | Gnommalath | Nam Phit / Houay Khama | Khok svang | 41 | Brou and Lao | Riparian | yes | | | | | | |
| 104 | 3 | 3 | Gnommalath | Nam Phit / Houay Khama | Khok (Lak 5) | 12 | Brou | Riparian | yes | | | | | | |
| 105 | 4 | 4 | Gnommalath | Nam Phit / Houay Khama | Lak 7 | 144 | Lao and Brou | Riparian | yes | | | | | | |
| 106 | 5 | 5 | Gnommalath | Nam Phit / Houay Khama | Lak 9 | 25 | Phou Thay, Lao, Brou | Riparian | yes | | | | | | |
| 107 | 6 | 6 | Gnommalath | Nam Phit / Houay Khama | Muang khai | 71 | Brou | Riparian | yes | | | | | | |
| 108 | 7 | 7 | Gnommalath | Nam Phit / Houay Khama | Na khok nai | 28 | Lao and Brou | Riparian | yes | | | | | | |
| 109 | 8 | 8 | Gnommalath | Nam Phit / Houay Khama | Pa thoung | 75 | Sek and Tai Moey | Riparian | yes | | | | | | |
| 110 | 9 | 9 | Gnommalath | Nam Phit / Houay Khama | Phit sikhai | 85 | Brou | Riparian | yes | | | | | | |
| 111 | 10 | 10 | Gnommalath | Nam Phit / Houay Khama | Phon saat and Lak 6 | 305 | Phou Thay, Kaleung, and Brou | Riparian | yes | | | | | | |
| 112 | 11 | 11 | Gnommalath | Nam Phit / Houay Khama | Phone sang | 26 | Brou | Riparian | yes | | | | | | |
| 113 | 12 | 12 | Gnommalath | Nam Phit / Houay Khama | Phone thoy | 48 | Brou | Riparian | yes | | | | | | |
| 114 | 13 | 13 | Gnommalath | Nam Phit / Houay Khama | Phon kham | 49 | Lao Kaleung | Riparian | yes | | | | | | |
| 115 | 14 | 14 | Gnommalath | Nam Phit / Houay Khama | Pha chom khong | 58 | Lao Kaleung | Riparian | yes | | | | | | |
| 116 | 15 | 15 | Gnommalath | Nam Phit / Houay Khama | Tat | 130 | Brou | Riparian | yes | | | | | | |
| 117 | 16 | 16 | Gnommalath | Nam Phit / Houay Khama | Tham phuang | 50 | Lao, Brou and Sek | Riparian | yes | | | | | | |
| 118 | 17 | 17 | Gnommalath | Nam Phit / Houay Khama | Thang beng | 43 | Brou | Riparian | yes | | | | | | |
| | | | Gnommalath | | | | | | | | | | | | |
| 119 | 18 | 1 | Gnommalath | Nam Phit / Houay Khama | Boung bao | 79 | Lao Kaleung | Riparian | yes | | | | | | |
| 120 | 19 | 2 | Gnommalath | Nam Phit / Houay Khama | Done peauy | 73 | Lao Kaleung | Riparian | yes | | | | | | |
| 121 | 20 | 3 | Gnommalath | Nam Phit / Houay Khama | Fang deng | 25 | Chalui | Riparian | yes | | | | | | |
| 122 | 21 | 4 | Gnommalath | Nam Phit / Houay Khama | Gnommalat Neua | 125 | Lao Kaleung, Brou, Phou Thay, i | Riparian | yes | | | | | | |
| 123 | 22 | 5 | Gnommalath | Nam Phit / Houay Khama | Gnommalat Tai | 162 | Lao Kaleung, Brou | Riparian | yes | | | | | | |
| 124 | 23 | 6 | Gnommalath | Nam Phit / Houay Khama | Kheng lek | 80 | Chalui | Riparian | yes | | | | | | |
| 125 | 24 | 7 | Gnommalath | Nam Phit / Houay Khama | Muang | 57 | Tai Katak | Riparian | yes | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 126 | 25 | 8 | Gnommalath | Nam Phit / Houay Khama | Na mi xai | 88 | Brou , Lao Kaleung | Riparian | yes | | | | | | |
| 127 | 26 | 9 | Gnommalath | Nam Phit / Houay Khama | Nong ping | 107 | Tai Katak | Riparian | yes | | | | | | |
| 128 | 27 | 10 | Gnommalath | Nam Phit / Houay Khama | Pak phung | 34 | Brou | Riparian | yes | | | | | | |
| 129 | 28 | 11 | Gnommalath | Nam Phit / Houay Khama | Somsanouk (Gnommalat) | 112 | Brou | Riparian | yes | | | | | | |
| 130 | 29 | 12 | Gnommalath | Nam Phit / Houay Khama | Thong mang | 53 | Brou | Riparian | yes | | | | | | |
| 131 | 30 | 1 | Gnommalath | Nam Phit / Houay Khama | Phone Bok | 81 | Tai Katak | Hinterland | yes | | | | | | |
| 132 | 31 | 2 | Gnommalath | Nam Phit / Houay Khama | Si vi lai | 55 | Tai Yooy | Hinterland | yes | | | | | | |
| | | | | | | | | | | | | | | | |
| 133 | 32 | 1 | Mahaxai | Nam Phit / Houay Khama | Dang | 167 | Brou | Riparian | yes | | | | | | |
| 134 | 33 | 2 | Mahaxai | Nam Phit / Houay Khama | Na kio | 100 | Brou | Riparian | yes | yes | | | | | |
| 135 | 34 | 3 | Mahaxai | Nam Phit / Houay Khama | Somsanouk (Mahaxai) | 53 | Brou | Riparian | yes | yes | | | | | |
| 136 | 35 | 4 | Mahaxai | Nam Phit / Houay Khama | Kieng svang | 26 | Tai Lao, Phou Thay | Riparian | yes | | | | | | |
| 137 | 36 | 5 | Mahaxai | Nam Phit / Houay Khama | Mahaxai Neua | 64 | Kaleung, Lao, Tai,Brou | Riparian | yes | | | | | | |
| | | | | **Nam Phit / Houay Khama** | | **2,913** | | | | | | | | | |
| **Villages along the Nam Katang./ Nam Gnom** | | | | | | | | | | | | | | | |
| 138 | 1 | 1 | Gnommalath | Nam Kathang / Nam Gnom | Laonnagam | 130 | Brou | Riparian | yes | | | | | yes | |
| 139 | 2 | 2 | Gnommalath | Nam Kathang / Nam Gnom | Keovilay | 104 | Brou | Riparian | yes | | | | | yes | |
| 140 | 3 | 3 | Gnommalath | Nam Kathang / Nam Gnom | Koodphadang | 55 | Kaleung | Riparian | yes | | | | | yes | |
| 141 | 4 | 4 | Gnommalath | Nam Kathang / Nam Gnom | Nongsaeng | 64 | Lao Kaleung | Riparian | yes | | | | | yes | |
| 142 | 5 | 5 | Gnommalath | Nam Kathang / Nam Gnom | Vatthat | 51 | Brou | Riparian | yes | | | | | yes | |
| 143 | 6 | 6 | Gnommalath | Nam Kathang / Nam Gnom | Korbong | 60 | Brou | Riparian | yes | | | | | yes | |
| 144 | 7 | 7 | Gnommalath | Nam Kathang / Nam Gnom | Somsanook | 87 | Brou | Riparian | yes | | | | | yes | |
| 145 | 8 | 8 | Gnommalath | Nam Kathang / Nam Gnom | Namixay | 86 | Brou and Lao Kaleung | Riparian | yes | | | | | yes | |
| 146 | 9 | 9 | Gnommalath | Nam Kathang / Nam Gnom | Gnommalath Neua | 75 | Lao Kaleung, Brou, Phouthai, Tai | | yes | | | | | yes | |
| 147 | 10 | 10 | Gnommalath | Nam Kathang / Nam Gnom | Gnommalath Tay | 57 | Lao Kaleung, Brou | Riparian | yes | | | | | yes | |
| 148 | 11 | 11 | Gnommalath | Nam Kathang / Nam Gnom | Nongping | 104 | Tai Katak | Riparian | yes | | | | | yes | |
| 149 | 12 | 12 | Gnommalath | Nam Kathang / Nam Gnom | Kaenglake | 96 | Chalui (Brou) | Riparian | yes | | | | | yes | |
| 150 | 13 | 13 | Gnommalath | Nam Kathang / Nam Gnom | Naphoxay | 88 | Brou | Riparian | yes | | | | | yes | |
| 151 | 14 | 14 | Gnommalath | Nam Kathang / Nam Gnom | Boungbao | 46 | Lao Kaleung | Riparian | yes | | | | | yes | |
| 152 | 15 | 15 | Gnommalath | Nam Kathang / Nam Gnom | Donepeuang | 67 | Lao Kaleung | Riparian | yes | | | | | yes | |
| 153 | 16 | 16 | Gnommalath | Nam Kathang / Nam Gnom | Houiyeanh | 72 | Lao Kaleung | Riparian | yes | | | | | yes | |
| 154 | 17 | 17 | Gnommalath | Nam Kathang / Nam Gnom | Thaphaa | 59 | Lao Kaleung | Riparian | yes | | | | | yes | |
| 155 | 18 | 18 | Gnommalath | Nam Kathang / Nam Gnom | Naveang | 65 | Phouthai and Lao Kaleung | | yes | | | | | yes | |
| 156 | 19 | 19 | Gnommalath | Nam Kathang / Nam Gnom | Phontoum | 67 | Phouthai and Lao Kaleung | | yes | | | | | yes | |
| 157 | 20 | 20 | Gnommalath | Nam Kathang / Nam Gnom | Nahay | 40 | Phouthai and Lao Kaleung | | yes | | | | | yes | |
| 158 | 21 | 21 | Gnommalath | Nam Kathang / Nam Gnom | Nakatang | 64 | Phouthai and Lao Kaleung | | yes | | | | | yes | |
| 159 | 22 | 22 | Gnommalath | Nam Kathang / Nam Gnom | Phonsaerd | 51 | Lao Kaleung, Nyo, Phouthai, Tai, Brou | | yes | | | | | yes | |
| 160 | 23 | 23 | Gnommalath | Nam Kathang / Nam Gnom | Phonsavang | 44 | Phouthai and Lao Kaleung | | yes | | | | | yes | |
| | | | | **Nam Kathang / Nam Gnom** | | **1,632** | | | | | | | | | |
| **Villages along he Xe Bangfai, or fishing in the Xe Bangfai** | | | | | | | | | | | | | | | |
| 161 | 1 | 1 | Mahaxai | Upstream of upper XBF | Kangyangkham | 28 | Tai Lao | Riparian | yes | | | | | | |
| 162 | 2 | 2 | Mahaxai | Upstream of upper XBF | Nathanedong | 36 | Tai Lao | Riparian | yes | | | | | | |
| 163 | 3 | 3 | Mahaxai | Upstream of upper XBF | Nathanethong | 32 | Tai Lao | Riparian | yes | | | | | | |
| 164 | 4 | 4 | Mahaxai | Upstream of upper XBF | Veun | 33 | Tai Lao | Riparian | yes | | | | | | |
| 165 | 5 | 5 | Mahaxai | Upstream of upper XBF | Nakhay | 51 | Tai Lao | Riparian | yes | | | | | | |
| 166 | 6 | 6 | Mahaxai | Upstream of upper XBF | Nongkok | 22 | Tai Lao | Riparian | yes | | | | | | |
| 167 | 7 | 7 | Mahaxai | Upstream of upper XBF | Eelane | 59 | Brou | Riparian | yes | Yes | | | yes | yes | |
| 168 | 8 | 8 | Mahaxai | Upstream of upper XBF | Naphong | 56 | Brou | Riparian | yes | Yes | | | yes | yes | |

| | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 169 | 9 | 9 | Mahaxai | Upstream of upper XBF | Dangkang | 58 | Brou | Riparian | yes | Yes | | | yes | yes | |
| 170 | 10 | 10 | Mahaxai | Upstream of upper XBF | Vatthat | 37 | Brou | Riparian | yes | Yes | | | yes | yes | |
| 171 | 11 | 11 | Mahaxai | Upstream of upper XBF | Somsanook | 45 | Brou | Riparian | yes | Yes | | | yes | yes | |
| 172 | 12 | 12 | Mahaxai | Upstream of upper XBF | Nakio | 80 | Brou | Riparian | yes | Yes | | | yes | yes | |
| | | | | **Upstream of upper XBF** | | **537** | | | | | | | | | |
| 173 | 13 | 1 | Mahaxai | Upper XBF | Khaengsavang | 23 | Tai Lao, Phou Tai | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 174 | 14 | 2 | Mahaxai | Upper XBF | Mahaxayneua | 66 | Tai Lao, Brou, PhouTai | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 175 | 15 | 3 | Mahaxai | Upper XBF | Mahaxaykang | 99 | Tai Lao, Phou Tai | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 176 | 16 | 4 | Mahaxai | Upper XBF | Mahaxaytay | 146 | Tai Lao, Phou Tai, Upland Tai, Brou | | yes | Yes | yes | yes | yes | yes | yes ? |
| 177 | 17 | 5 | Mahaxai | Upper XBF | Povaneua | 86 | Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 178 | 18 | 6 | Mahaxai | Upper XBF | Povatay | 90 | Tai Lao, Upland Tai, Phou Tai, Brou | | yes | Yes | yes | yes | yes | yes | yes ? |
| 179 | 19 | 7 | Mahaxai | Upper XBF | Phanang | 44 | Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 180 | 20 | 8 | Mahaxai | Upper XBF | Khamfeuang | 88 | Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 181 | 21 | 9 | Mahaxai | Upper XBF | Pong | 36 | Brou, Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 182 | 22 | 10 | Xe Bangfai | Upper XBF | Kengpair | 75 | Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 183 | 23 | 11 | Xe Bangfai | Upper XBF | Thakhor | 49 | Tai Lao | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 184 | 24 | 12 | Xe Bangfai | Upper XBF | Thahant | 50 | Brou | Riparian | yes | Yes | yes | yes | yes | yes | yes ? |
| 185 | 25 | 1 | Mahaxai | Upper XBF | Khamfeungnyai | 92 | | Hinterland | yes | | | | | | |
| 186 | 26 | 2 | Mahaxai | Upper XBF | Khampenyai | 54 | | Hinterland | yes | | | | | | |
| 187 | 27 | 3 | Mahaxai | Upper XBF | Khampena | 63 | | Hinterland | yes | | | | | | |
| 188 | 28 | 4 | Mahaxai | Upper XBF | Khampedong | 50 | | Hinterland | yes | | | | | | |
| 189 | 29 | 5 | Mahaxai | Upper XBF | Phonkham | 53 | | Hinterland | yes | | | | | | |
| 190 | 30 | 6 | Mahaxai | Upper XBF | Phonsa-at | 300 | | Hinterland | yes | | | | | | |
| 191 | 31 | 7 | Mahaxai | Upper XBF | Pachoomkong | 56 | | Hinterland | yes | | | | | | |
| 192 | 32 | 8 | Mahaxai | Upper XBF | Phonkhen | 12 | | Hinterland | yes | | | | | | |
| 193 | 33 | 9 | Xe Bangfai | Upper XBF | Some | 85 | | Hinterland | yes | | | | | | |
| 194 | 34 | 10 | Xe Bangfai | Upper XBF | Tamlay | 91 | | Hinterland | yes | | | | | | |
| | | | | **Upper XBF** | | **1,708** | | | | | | | | | |
| 195 | 35 | 1 | Xe Bangfai | Middle XBF | Kengkhean | 44 | Brou, Tai Lao | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 196 | 36 | 2 | Xe Bangfai | Middle XBF | Kengkasee | 43 | Brou, Tai Lao, Phou Tia | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 197 | 37 | 3 | Xe Bangfai | Middle XBF | Veunsananh | 63 | Tai Lao | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 198 | 38 | 4 | Xe Bangfai | Middle XBF | Hatpeak | 38 | Brou | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 199 | 39 | 5 | Xe Bangfai | Middle XBF | Paksenoy | 85 | Tai Lao | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 200 | 40 | 6 | Xe Bangfai | Middle XBF | Thasida | 32 | Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 201 | 41 | 7 | Xe Bangfai | Middle XBF | Nathane | 83 | Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 202 | 42 | 8 | Xe Bangfai | Middle XBF | Lao | 29 | Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 203 | 43 | 9 | Xe Bangfai | Middle XBF | Xiengkhay | 91 | Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 204 | 44 | 10 | Xe Bangfai | Middle XBF | Kaengveang | 69 | Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 205 | 45 | 11 | Xe Bangfai | Middle XBF | Dongmarfai | 91 | Tai Lao | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 206 | 46 | 12 | Xe Bangfai | Middle XBF | Pahlay | 36 | Brou, Phou Tai | Riparian | yes | yes | yes | yes | yes | yes | yes ? |
| 207 | 47 | 1 | Xe Bangfai | Middle XBF | Noy | 44 | | Hinterland | yes | | | | | | |
| 208 | 48 | 2 | Xe Bangfai | Middle XBF | Yangnyai | 204 | | Hinterland | yes | | | | | | |
| 209 | 49 | 3 | Xe Bangfai | Middle XBF | Dongsavanh | 35 | | Hinterland | yes | | | | | | |
| 210 | 50 | 4 | Xe Bangfai | Middle XBF | Khongkengkhene | 38 | | Hinterland | yes | | | | | | |
| 211 | 51 | 5 | Xe Bangfai | Middle XBF | Nakhomkao | 54 | | Hinterland | yes | | | | | | |
| 212 | 52 | 6 | Xe Bangfai | Middle XBF | Deung | 178 | | Hinterland | yes | | | | | | |
| 213 | 53 | 7 | Xe Bangfai | Middle XBF | Beunghuanatai | 116 | | Hinterland | yes | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 214 | 54 | 8 | Xe Bangfai | Middle XBF | Dongmakbah | 115 | | Hinterland | yes | | | | | | |
| 215 | 55 | 9 | Xe Bangfai | Middle XBF | Nongbone | 139 | | Hinterland | yes | | | | | | |
| 216 | 56 | 10 | Xe Bangfai | Middle XBF | Huaylangmeu | 66 | | Hinterland | yes | | | | | | |
| 217 | 57 | 11 | Xe Bangfai | Middle XBF | Nakhomthong | 107 | | Hinterland | yes | | | | | | |
| 218 | 58 | 12 | Xe Bangfai | Middle XBF | Beunghuanakang | 37 | | Hinterland | yes | | | | | | |
| 219 | 59 | 13 | Xe Bangfai | Middle XBF | Sang | 149 | | Hinterland | yes | | | | | | |
| 220 | 60 | 14 | Xe Bangfai | Middle XBF | Som | 141 | | Hinterland | yes | | | | | | |
| 221 | 61 | 15 | Xe Bangfai | Middle XBF | Beunghuananeua | 56 | | Hinterland | yes | | | | | | |
| 222 | 62 | 16 | Xe Bangfai | Middle XBF | Dongphang | 44 | | Hinterland | yes | | | | | | |
| 223 | 63 | 17 | Xaybouli | Middle XBF | Nathong | 48 | | Hinterland | yes | | | | | | |
| | | | | **Middle XBF** | | **2,275** | | | | | | | | | |
| 224 | 64 | 1 | Xe Bangfai | Lower XBF | Kuase | 285 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 225 | 65 | 2 | Xe Bangfai | Lower XBF | Dangtha | 85 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 226 | 66 | 3 | Xe Bangfai | Lower XBF | Naphoktha | 73 | Tai Loa | Riparian | yes | yes | | yes | | yes | yes |
| 227 | 67 | 4 | Xe Bangfai | Lower XBF | Somsa-at | 43 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 228 | 68 | 5 | Xe Bangfai | Lower XBF | Yangkham | 216 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 229 | 69 | 6 | Xe Bangfai | Lower XBF | Hatkhamhieng | 239 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 230 | 70 | 7 | Xe Bangfai | Lower XBF | Naphoktheung | 85 | | Hinterland | yes | yes | | yes | | yes | yes |
| 231 | 71 | 8 | Nongbok | Lower XBF | Namphou | 64 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 232 | 72 | 9 | Nongbok | Lower XBF | Dongkaasinh | 79 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 233 | 73 | 10 | Nongbok | Lower XBF | Sorkbau | 105 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 234 | 74 | 11 | Nongbok | Lower XBF | Natay | 76 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 235 | 75 | 12 | Nongbok | Lower XBF | Phak-eetou | 63 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 236 | 76 | 13 | Nongbok | Lower XBF | Hatxiengdee | 204 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 237 | 77 | 14 | Nongbok | Lower XBF | Dongsaangam | 68 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 238 | 78 | 15 | Nongbok | Lower XBF | Dongphakpheua | 153 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 239 | 79 | 16 | Nongbok | Lower XBF | Tanetheung | 148 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 240 | 80 | 17 | Nongbok | Lower XBF | Sumnadee | 30 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 241 | 81 | 18 | Nongbok | Lower XBF | Navangneua | 196 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 242 | 82 | 19 | Nongbok | Lower XBF | Navangthong | 123 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 243 | 83 | 20 | Nongbok | Lower XBF | Hatxaifong | 56 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 244 | 84 | 21 | Nongbok | Lower XBF | Navangnoy | 69 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 245 | 85 | 22 | Nongbok | Lower XBF | Navangtay | 73 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 246 | 86 | 23 | Nongbok | Lower XBF | Saadeauneua | 130 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 247 | 87 | 24 | Nongbok | Lower XBF | Saadeautay | 90 | Tai Llao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 248 | 88 | 25 | Nongbok | Lower XBF | Phonhsaoea | 66 | Khmu, Tai Lao, Phou Tai | | yes | yes | | yes | | yes | yes |
| 249 | 89 | 26 | Nongbok | Lower XBF | Thamoang | 38 | Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 250 | 90 | 27 | Nongbok | Lower XBF | Danepakse | 84 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 251 | 91 | 28 | Nongbok | Lower XBF | Navangkang (Tai) | 79 | | Hinterland | yes | | | | | | |
| 252 | 92 | 29 | Nongbok | Lower XBF | Khogsavang | 65 | | Hinterland | yes | | | | | | |
| 253 | 93 | 30 | Nongbok | Lower XBF | Nakham | 448 | | Hinterland | yes | | | | | | |
| 254 | 94 | 31 | Nongbok | Lower XBF | Nongli | 142 | | Hinterland | yes | | | | | | |
| 255 | 95 | 32 | Nongbok | Lower XBF | Phon | 165 | | Hinterland | yes | | | | | | |
| 256 | 96 | 33 | Nongbok | Lower XBF | Dongkhung | 93 | | Hinterland | yes | | | | | | |
| 257 | 97 | 34 | Nongbok | Lower XBF | Dongbounnoi | 49 | | Hinterland | yes | | | | | | |
| 258 | 98 | 35 | Nongbok | Lower XBF | Nongdone | 181 | | Hinterland | yes | | | | | | |
| 259 | 99 | 36 | Nongbok | Lower XBF | Dongbounyai | 210 | | Hinterland | yes | | | | | | |
| 260 | 100 | 37 | Nongbok | Lower XBF | Sibounhoung | 170 | | Hinterland | yes | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 261 | 101 | 38 | Nongbok | Lower XBF | Nongsapangthong | 78 | | Hinterland | yes | | | | | | |
| 262 | 102 | 39 | Nongbok | Lower XBF | Phonephieng | 130 | | Hinterland | yes | | | | | | |
| 263 | 103 | 40 | Nongbok | Lower XBF | Nongpham | 95 | | Hinterland | yes | | | | | | |
| 264 | 104 | 41 | Nongbok | Lower XBF | Nongsapangtha | 108 | | Hinterland | yes | | | | | | |
| 265 | 105 | 42 | Nongbok | Lower XBF | Nongbok | 202 | | Hinterland | yes | | | | | | |
| 266 | 106 | 43 | Nongbok | Lower XBF | Dongpangpao | 84 | | Hinterland | yes | | | | | | |
| 267 | 107 | 44 | Nongbok | Lower XBF | Nonchick | 56 | | Hinterland | yes | | | | | | |
| 268 | 108 | 45 | Nongbok | Lower XBF | Dongyang | 16 | | Hinterland | yes | | | | | | |
| 269 | 109 | 46 | Xaybouli | Lower XBF | Manilad | 41 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 270 | 110 | 47 | Xaybouli | Lower XBF | Khamsavang | 29 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 271 | 111 | 48 | Xaybouli | Lower XBF | Daangsavanh | 59 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 272 | 112 | 49 | Xaybouli | Lower XBF | Souvanxai | 73 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 273 | 113 | 50 | Xaybouli | Lower XBF | Hatkhamdee | 38 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 274 | 114 | 51 | Xaybouli | Lower XBF | Tonhaen | 175 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 275 | 115 | 52 | Xaybouli | Lower XBF | Beungse | 122 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 276 | 116 | 53 | Xaybouli | Lower XBF | Hatsaisugneua | 129 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 277 | 117 | 54 | Xaybouli | Lower XBF | Hatsaisugtay | 105 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 278 | 118 | 55 | Xaybouli | Lower XBF | Thadorkham | 36 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 279 | 119 | 56 | Xaybouli | Lower XBF | Kangpa | 71 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 280 | 120 | 57 | Xaybouli | Lower XBF | Thabor | 57 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 281 | 121 | 58 | Xaybouli | Lower XBF | Kaengphosy | 69 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 282 | 122 | 59 | Xaybouli | Lower XBF | Sakong | 86 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 283 | 123 | 60 | Xaybouli | Lower XBF | Phakfeuaneua | 61 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 284 | 124 | 61 | Xaybouli | Lower XBF | Phakfeuatay | 63 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 285 | 125 | 62 | Xaybouli | Lower XBF | Somsaa-at | 102 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 286 | 126 | 63 | Xaybouli | Lower XBF | Houi-hai | 76 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 287 | 127 | 64 | Xaybouli | Lower XBF | Naxiengkhane | 65 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 288 | 128 | 65 | Xaybouli | Lower XBF | Nongheuathongneua | 58 | Tai Lao, Khmu | Riparian | yes | yes | | yes | | yes | yes |
| 289 | 129 | 66 | Xaybouli | Lower XBF | Nongheuathongtay | 23 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 290 | 130 | 67 | Xaybouli | Lower XBF | Thaphoxai | 102 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 291 | 131 | 68 | Xaybouli | Lower XBF | Thakharm | 97 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 292 | 132 | 69 | Xaybouli | Lower XBF | Nasang | 121 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 293 | 133 | 70 | Xaybouli | Lower XBF | Bouakhay | 109 | Tai Lao, Phou Tai | Riparian | yes | yes | | yes | | yes | yes |
| 294 | 134 | 71 | Xaybouli | Lower XBF | Pong | 84 | Phou Tai, Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 295 | 135 | 72 | Xaybouli | Lower XBF | Paksebangfai | 96 | Tai Lao | Riparian | yes | yes | | yes | | yes | yes |
| 296 | 136 | 73 | Xaybouli | Lower XBF | Nonenakham | 80 | | Hinterland | yes | | | | | | |
| 297 | 137 | 74 | Xaybouli | Lower XBF | Donggnang | 47 | | Hinterland | yes | | | | | | |
| 298 | 138 | 75 | Xaybouli | Lower XBF | Vernneua | 159 | | Hinterland | yes | | | | | | |
| 299 | 139 | 76 | Xaybouli | Lower XBF | Naoneua | 127 | | Hinterland | yes | | | | | | |
| 300 | 140 | 77 | Xaybouli | Lower XBF | Kangmixay | 104 | | Hinterland | yes | | | | | | |
| 301 | 141 | 78 | Xaybouli | Lower XBF | Kangthong | 104 | | Hinterland | yes | | | | | | |
| 302 | 142 | 79 | Xaybouli | Lower XBF | Yangkhamtai | 100 | | Hinterland | yes | | | | | | |
| 303 | 143 | 80 | Xaybouli | Lower XBF | Dongpao | 145 | | Hinterland | yes | | | | | | |
| 304 | 144 | 81 | Xaybouli | Lower XBF | Vernxai | 126 | | Hinterland | yes | | | | | | |
| 305 | 145 | 82 | Xaybouli | Lower XBF | Dongpou | 164 | | Hinterland | yes | | | | | | |
| 306 | 146 | 83 | Xaybouli | Lower XBF | Syxiengmai | 200 | | Hinterland | yes | | | | | | |
| 307 | 147 | 84 | Xaybouli | Lower XBF | Yangkhamneua | 70 | | Hinterland | yes | | | | | | |
| 308 | 148 | 85 | Xaybouli | Lower XBF | Naotai | 166 | | Hinterland | yes | | | | | | |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 309 | 149 | 86 | Xaybouli | Lower XBF | Vernsivilai | 162 | | Hinterland | yes | | | | | | |
| 310 | 150 | 87 | Xaybouli | Lower XBF | Nakhanay | 129 | | Hinterland | yes | | | | | | |
| 311 | 151 | 88 | Xaybouli | Lower XBF | Phontan | 62 | | Hinterland | yes | | | | | | |
| 312 | 152 | 89 | Xaybouli | Lower XBF | Verntai | 157 | | Hinterland | yes | | | | | | |
| 313 | 153 | 90 | Xaybouli | Lower XBF | Beungbouathong | 130 | | Hinterland | yes | | | | | | |
| 314 | 154 | 91 | Xaybouli | Lower XBF | Laodokmai | 72 | | Hinterland | yes | | | | | | |
| 315 | 155 | 92 | Xaybouli | Lower XBF | Kangtha | 91 | | Hinterland | yes | | | | | | |
| | | | | **sub-total: Lower XBF** | | **9,854** | | | | | | | | | |
| | | | | **Total, XBF** | | **14,374** | | | | | | | | | |
| **Villages affected by flooding in Lower Xe Bangfai** | | | | | | | | | | | | | | | |
| 316 | 1 | 1 | Xe Bangfai | Lower XBF | Xenoi | 42 | | | | | | | | | yes |
| 317 | 2 | 2 | Xe Bangfai | Lower XBF | Beunghouana | 38 | | | | | | | | | yes |
| 318 | 3 | 3 | Xe Bangfai | Lower XBF | Ting | 239 | | | | | | | | | yes |
| 319 | 4 | 4 | Xe Bangfai | Lower XBF | Nabeung | 95 | | | | | | | | | yes |
| 320 | 5 | 5 | Xe Bangfai | Lower XBF | Phondeetong | 42 | | | | | | | | | yes |
| 321 | 6 | 6 | Xe Bangfai | Lower XBF | Nongphang | 42 | | | | | | | | | yes |
| 322 | 7 | 7 | Xe Bangfai | Lower XBF | Koktong | 84 | | | | | | | | | yes |
| 323 | 8 | 8 | Xe Bangfai | Lower XBF | Sokbor | 66 | | | | | | | | | yes |
| 324 | 9 | 9 | Xe Bangfai | Lower XBF | Than | 85 | | | | | | | | | yes |
| 325 | 10 | 10 | Xe Bangfai | Lower XBF | Khoksavang | 50 | | | | | | | | | yes |
| 326 | 11 | 11 | Xe Bangfai | Lower XBF | Khokkheemine | 44 | | | | | | | | | yes |
| 327 | 12 | 12 | Xe Bangfai | Lower XBF | Khapha | 65 | | | | | | | | | yes |
| 328 | 13 | 13 | Xe Bangfai | Lower XBF | Khamtear | 56 | | | | | | | | | yes |
| 329 | 14 | 14 | Xe Bangfai | Lower XBF | Pongdeng | 61 | | | | | | | | | yes |
| 330 | 15 | 15 | Xe Bangfai | Lower XBF | Nonkatea | 64 | | | | | | | | | yes |
| 331 | 16 | 16 | Xe Bangfai | Lower XBF | Vangdeunha | 41 | | | | | | | | | yes |
| 332 | 17 | 17 | Xe Bangfai | Lower XBF | Veunkhamkeio | 36 | | | | | | | | | yes |
| 333 | 18 | 18 | Xe Bangfai | Lower XBF | Donesaad | 21 | | | | | | | | | yes |
| 334 | 19 | 19 | Xe Bangfai | Lower XBF | Nachoi | 90 | | | | | | | | | yes |
| 335 | 20 | 1 | Nongbok | Lower XBF | Somsanouk | 27 | | | | | | | | | yes |
| 336 | 21 | 2 | Nongbok | Lower XBF | Mouangkhai (40% flood by XBF) | 93 | | | | | | | | | yes |
| 337 | 22 | 3 | Nongbok | Lower XBF | Beungtaneteung | 114 | | | | | | | | | yes |
| 338 | 23 | 4 | Nongbok | Lower XBF | Xiengvangthong | 94 | | | | | | | | | yes |
| 339 | 24 | 5 | Nongbok | Lower XBF | Songneuangtai | 109 | | | | | | | | | yes |
| 340 | 25 | 6 | Nongbok | Lower XBF | Songneuang | 141 | | | | | | | | | yes |
| 341 | 26 | 7 | Nongbok | Lower XBF | Phonetiew | 43 | | | | | | | | | yes |
| 342 | 27 | 8 | Nongbok | Lower XBF | Nongsaphanmouang | 68 | | | | | | | | | yes |
| 343 | 28 | 9 | Nongbok | Lower XBF | Khokkhong | 99 | | | | | | | | | yes |
| 344 | 29 | 10 | Nongbok | Lower XBF | Naongsome | 159 | | | | | | | | | yes |
| 345 | 30 | 11 | Nongbok | Lower XBF | Santisouk | 106 | | | | | | | | | yes |
| 346 | 31 | 12 | Nongbok | Lower XBF | Nongpalat (40% flood by XBF) | 64 | | | | | | | | | yes |
| 347 | 32 | 13 | Nongbok | Lower XBF | Napamane | 191 | | | | | | | | | yes |
| 348 | 33 | 14 | Nongbok | Lower XBF | Phonexay | 69 | | | | | | | | | yes |
| 349 | 34 | 15 | Nongbok | Lower XBF | Nanoi | 56 | | | | | | | | | yes |
| 350 | | 16 | Nongbok | Lower XBF | Laokhung | 43 | | | | | | | | | yes |
| 351 | 35 | 17 | Nongbok | Lower XBF | Nachampa | 121 | | | | | | | | | yes |
| 352 | 36 | 18 | Nongbok | Lower XBF | Laona | 135 | | | | | | | | | yes |

| | | | | | | | | | Potential NT2 Impacts (to be reviewed by FIPS) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tot** | **Reg** | **Zone** | **District** | **Impact zone** | **Village** | **No. HH** | **Main ethnic groups** | **Riparian/ Hinterland** | **Fishery** | **Gardens** | **Erosion** | **Irrigation pumps** | **Access across** | **Domestic water** | **Flooding** |
| 353 | 37 | 19 | Nongbok | Lower XBF | Nalak | 85 | | | | | | | | | yes |
| 354 | 38 | 20 | Nongbok | Lower XBF | Pongkiew | 112 | | | | | | | | | yes |
| 355 | 39 | 1 | Xaybouli | Lower XBF | Sikhay | 135 | | | | | | | | | yes |
| 356 | 40 | 2 | Xaybouli | Lower XBF | Naoneua | 127 | | | | | | | | | yes |
| 357 | 41 | 1 | Takhek | Lower XBF | Dongmakeak | 127 | | | | | | | | | yes |
| 358 | 42 | 2 | Takhek | Lower XBF | Naphotha | 114 | | | | | | | | | yes |
| 359 | 43 | 3 | Takhek | Lower XBF | Nadinejee (30% flood by XBF) | 128 | | | | | | | | | yes |
| 360 | 44 | 4 | Takhek | Lower XBF | Mai | 109 | | | | | | | | | yes |
| 361 | 45 | 5 | Takhek | Lower XBF | Donengai (30% flood by XBF) | 93 | | | | | | | | | yes |
| 362 | 46 | 6 | Takhek | Lower XBF | Donethong (30% flood by XBF) | 47 | | | | | | | | | yes |
| 363 | 47 | 7 | Takhek | Lower XBF | Nahea (30% flood by XBF) | 62 | | | | | | | | | yes |
| 364 | 48 | 8 | Takhek | Lower XBF | Pakbang | 176 | | | | | | | | | yes |
| 365 | 49 | 9 | Takhek | Lower XBF | Dongchok | 97 | | | | | | | | | yes |
| 366 | 50 | 10 | Takhek | Lower XBF | Phonxay | 107 | | | | | | | | | yes |
| 367 | 51 | 11 | Takhek | Lower XBF | Nontoum | 56 | | | | | | | | | yes |
| 368 | 52 | 12 | Takhek | Lower XBF | Khokpathone | 70 | | | | | | | | | yes |
| | | | | **Lower XBF flooding only** | | **4,638** | | | | | | | | | |

| | |
|---|---|
| **Grand Total** | **34,734** |