



Technical Assistance Consultant's Report

Project Number: 40514
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Lao People's Democratic Republic: Preparing the Cumulative Impact Assessment for the Nam Ngum 3 Hydropower Project (Financed by the Japan Special Fund)

Prepared by Vattenfall Power Consultant AB
in association with Ramboll Natura AB and Earth Systems Lao

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Asian Development Bank

Draft Final Report from TA-4921, “Preparing the Cumulative Impact Assessment for the Nam Ngum 3 Hydropower Project, Component A, parts 1 and 2”.

The project has been implemented during the period from mid-2007 until early 2010, with actual field work running until late 2009.

The project has been implemented in two distinctly different phases, the parts 1 and 2 in the project title.

Part 1 was the actual Impact Assessment, implemented between project start in May, 2007 and early 2008. The Final CIA Report was approved by the ADB in March of 2008 and posted to ADB’s web site. The study was implemented as a strategic impact assessment, and dealt with the basin-wide socio-environmental implications of the existing substantial plans for further hydropower development in the Nam Ngum basin. The report is appended to this cover document as digital files on CD.

Part 2 was a monitoring programme run from early 2008 through October/November of 2009. The Final Monitoring report from this phase was filed with the ADB in December of 2009 and is also appended to this cover document in digital form (CD). The monitoring programme focussed on water-quality and fish-catch monitoring in the basin. For financial reasons, the sites included in our water-quality monitoring programme were selected to be complementary to monitoring efforts already in place and run by either Government of Lao PDR agencies or by private hydropower projects already in place in the basin. The idea was to gap-fill during the monitoring period and for the Government to take over the programme at the end of our project life. The sites for the fish-catch monitoring were chosen based on the perceived key sites in terms of fish reproduction and potential clashes between the continued ecological viability of these, and the hydropower-development plans.

Given the strongly two-step nature of the overall project implementation, this Draft Final Report for the whole TA will, in addition to the *Knowledge Summary* filed separately, only reiterate the recommendations made already, and list the changes to the hydropower development programme for the Nam Ngum basin that have occurred, following the filing of our CIA report in early 2008.

Hydropower developments in the Nam Ngum basin since our CIA report was filed.

In our report from March, 2008, table 3.1.1. listed some basic data for all the plants that were considered relevant to our studies at the time. That table is presented once again below, followed by an update showing the situation in early March, 2010. As is obvious from the many yellow fields in the second table, lots of things have changed in the approximately two years that have passed. However, it is important to note that most of the changes are of comparatively minor significance and many yellow fields are marked simply because there are several different numbers given in different documents regarding, primarily, installed capacity and annual energy generation. The exceptions to this are the Nam Lik 2 (Nam Lik 1-2 is the name in use now) and the Nam Ngum 5 projects which both are under construction and are planned to start delivering electricity already this year, 2010.

Table 3.1.1 from the CIA report, dated March of 2008: Table of basic facts for relevant Nam Ngum hydropower projects.

| Name of Project | Scenario | Installed Capacity (MW) | Average Annual Generation (GWh) | Status | |
|---------------------|---------------------|-------------------------|---------------------------------|---|-------------------------------------|
| | | | | Progress and MOU Signing Date | (Planned) Commercial Operation Date |
| Nam Ngum 1 | Existing | 155 | 966 | Operation | 1971 |
| Nam Leuk | Existing | 60 | 230 | Operation | 2000 |
| Nam Mang 3 | Existing | 40 | 134 | Operation | 2004 |
| Nam Ngum 2 | Scenario 1, 2 and 3 | 615 | 2 310 | Under Construction | 2010 |
| Nam Ngum 3 | Scenario 2 and 3 | 440 | 1 919 | <ul style="list-style-type: none"> • CA under Negotiation • PPA under negotiation • (tariff concluded) | 2013 |
| Nam Ngum 5 | Scenario 3 | 120 | 400 | CA 10.4.2007 PPA | 2011 |
| Nam Lik 2 | Scenario 3 | 100 | 353 | CA 30.10.2006 PPA. Decision to go ahead in January, 2008 | 2011 |
| Nam Bak 1 | Scenario 3 | 115 | 389 | MOU 11.4.2007 | 2013 |
| Nam Bak 2 | Scenario 3 | 80 | ? | MOU 11.4.2007 | 2015 |
| Nam Lik 1 | Scenario 3 | 60 | 256 | MOU 7.7.2006 | 2013 |
| Nam Mang 1 | Outside study | 60 | 235 | MOU 8.2.2007 | 2012 |
| Nam Ngum 4 | Outside study | 250 | 277 | Planned | ? |
| Nam Ngum downstream | Outside study | 60 | ? | MOU | ? |

Source: Division of Power Sector Planning, DoE. (Information valid as of 30 August, 2007)

Follow-up of the above table, with updated information valid in February, 2010. Changes in status are highlighted in yellow.

| Name of Project | Scenario | Installed Capacity (MW) | Average Annual Generation (GWh) | Status | |
|-----------------|---------------------|---|---------------------------------|---|-------------------------------------|
| | | | | Progress and MOU Signing Date | (Planned) Commercial Operation Date |
| Nam Ngum 1 | Existing | 155 | 966 | Operation | 1971 |
| Nam Leuk | Existing | 60 | 215 | Operation | 2000 |
| Nam Mang 3 | Existing | 40 | 134 | Operation | 2004 |
| Nam Ngum 2 | Scenario 1, 2 and 3 | 615 | 2 300 | Under construction. | 2011/2013 |
| Nam Ngum 3 | Scenario 2 and 3 | 440/460 (different information in two different places) | 2 047 | CA/PPA under negotiation. The plant has started construction (but is still listed as "planned"), but work has been temporarily suspended. | 2014 |

| Name of Project | Scenario | Installed Capacity (MW) | Average Annual Generation (GWh) | Status | |
|---|---------------|--|---|--|-------------------------------------|
| | | | | Progress and MOU Signing Date | (Planned) Commercial Operation Date |
| Nam Ngum 5 | Scenario 3 | 120 | 507 | Under construction. | 2010 |
| Nam Lik 2 (now goes by the name of Nam Lik 1-2) | Scenario 3 | 100 | 435 | Under construction. | 2010 |
| Nam Bak 1 | Scenario 3 | 132/80 (different information in two different places). | No info at present. | MOU 11.4.2007, renewed 12.10.2008 to 12.5.2009 | To be determined. |
| Nam Bak 2 | Scenario 3 | 27/60 (different information in two different places). | No info at present. | MOU 11.4.2007, renewed 12.10.2008 to 12.5.2009 | To be determined. |
| Nam Lik 1 | Scenario 3 | 60 | 256 | PDA 8.4.2008, feasibility study on-going | To be determined. |
| Nam Mang 1 | Outside study | 60/57 (different information in two different places). | 262 | MOU 8.2.2007, renewed 21.4.2009. | 2012 |
| Nam Ngum 4 | Outside study | 225/255/111 (different information in three different places). | Unclear, but a number of 504 is mentioned in one place. | MoU signed on 30.3.2008, with 18 months validity. No information on extension. | To be determined. |
| Nam Ngum downstream | Outside study | 70 | A reasonable assumption is that a plant in that location would run at full capacity about 90% of the time (maintenance shut-downs and occasional droughts the only exception), yielding app. 550 GWh. | MOU signed 28.1.2008, with 18 months validity. No information on extension. | To be determined. |

Source: Department of Energy Promotion and Development's web site; www.poweringprogress.org (information as of 29 January, 2010) plus personal observation in November, 2009, in the case of Nam Ngum 3.

Original recommendations from the earlier reports

Below follows the recommendations made in the CIA report from March, 2008, with very minor adjustments, supported by the key recommendations from the Final Monitoring report from December, 2009. While there have been movements on some of the issues mentioned below – all recommendations are still considered valid by the consultant. In fact, given the very rapid rate of hydropower and other development in Lao PDR, some recommendations have taken on even greater urgency. Some developments have occurred, and these are either mentioned in the knowledge summary provided at the end of this cover text, or inserted in the text below.

Prioritised Recommendations for Urgent Implementation

The following were our key prioritised overall recommendations that came out of the study. We wrote in early 2008 that these needed regular follow-up by WREA and the ADB. The below all remain priority recommendations:

- Following the establishment of the Nam Ngum River Basin Committee, a sub-committee in the form of a co-operative management entity for the various power-station owners/operators should be formed, to ensure optimised management. If possible, this sub-committee should also include the major mine operators in the basin;
- Environmental flow management needs careful consideration as a national priority. There are lessons to be learned from outside the country and from existing projects with environmental flow releases in place (e.g. NT2, Theun Hinboun). WREA and DoE to jointly be responsible for a national study to produce binding guidelines for future dam projects. This activity could possibly be funded under the water-resources window (if and when established) of the EPF;
- A comprehensive basin-wide monitoring programme for water quality should be developed and be managed, in the long term, by WREA. The objectives would primarily be to monitor and evaluate the medium- to long-term impact of the very extensive developments planned for the basin in order to assist future management and mitigation programmes. On-going work within the WRCCS on a water-quality monitoring network is a good starting point supported by the monitoring that has been carried out during 2008-2009 as a part of this study;
- The standards for benefit-sharing between hydropower project sponsors and affected peoples could be improved. Practically, this could be done through the Environment Protection Fund. A clear focus on regional and local beneficiaries is recommended and lessons learned from the ADB-supported project on *Benefit Sharing Mechanisms for People Adversely Affected by Power Generation Projects in Viet Nam* could serve as an excellent starting point;
- A national prioritisation study for aquatic conservation. This could ideally be done in co-operation between WREA, the MRC and one or several of the major conservation NGOs (e.g. WWF, IUCN, WCS) active in Lao PDR. The goal would be to identify a few key river systems that need total protection from large-scale developments such as hydropower, irrigation dams, large mining projects etc.;
- GoL is recommended to establish independent and empowered monitoring systems (including an impartial grievance mechanism) for all hydropower projects. These monitoring systems/programmes will provide much needed quality control of the implementation of socio-economic as well as environmental safeguards. The follow-up of this monitoring should be carried out by the appropriate unit within WREA.

Water-resources recommendations

A range of management and mitigation measures can be implemented to minimise negative impacts on water resources from the development of hydropower projects and their associated reservoirs. Key management and mitigations measures include:

- Following the urgent establishment of the Nam Ngum River Basin Committee, a sub-committee in the form of a co-operative management entity for the various power-station owners/operators should be formed, to ensure optimised management. If possible, this sub-committee should also include the major mine operators in the basin;
- Environmental flow management needs careful consideration as a national priority. There are lessons to be learned from outside the country and from existing projects with environmental flow releases in place (e.g. NT2, Theun Hinboun). WREA and DoE to jointly be responsible for a national study to produce binding guidelines for future dam projects. This activity could possibly be funded under the water-resources window (if and when established) of the EPF;
- Where applicable and useful, maintain environmental flows below reservoirs during construction phase and during the dry-season during operations, to sustain habitats and other water uses downstream. This should be the responsibility of the hydro-power project developer;
- Carefully control flow releases from the power plants to prevent catastrophic pulse events which could cause danger to property and even loss of life in the down-stream areas. In case no re-regulation devices are put in place, and the amount of turbined water varies strongly and quickly, it is imperative to install warning devices in order to address the security of people in the immediate down-stream area. This should be the responsibility of the hydro-power project developer.

Water-Quality recommendations

Various strategies may be required to deal with reservoir and down-stream water quality. These mitigation and management measures may include:

- The installation of aeration structures to increase dissolved oxygen levels and reduce methane and hydrogen sulphide levels of water released from power stations. This also serves as mitigation against GHG emissions from the reservoir;
- The installation of airlift pumps in the reservoir to enhance mixing and reduce stratification. Design and operation of airlift pumps would need to consider the potential for adverse effects on surface water quality. This also serves as mitigation against GHG emissions from the reservoir. Alternatively surface water could be forced to a bottom intake by installing shaft- or screen arrangements that separate the water bodies;
- The release surface water via the spillway in the event that low-quality water released from power stations requires dilution;
- The installation of a variable level water intake structure to ensure water is released also from the epilimnion layer;
- A comprehensive basin-wide monitoring programme for water quality should be developed and be managed, in the long term, by WREA. The objectives would primarily be to monitor and evaluate the medium- to long-term impact of the very extensive developments planned for the basin in order to assist future management and mitigation programmes. On-going work within the WRCCS on a water-quality monitoring network is a good starting point, as is the monitoring described in Appendix C of this report;

- Biological control of aquatic weeds.

Suggested measures for reducing the impacts associated with reservoir-bank erosion, sediment accumulation in the reservoir, and down-stream river-bank (in)stability, are provided below. Residual impacts would need to be mitigated by compensating villagers for lost land, assets and livelihoods.

- Identify areas that are potentially sensitive to erosion before commencing construction, impoundment, and operational phases;
- Periodically survey areas that are sensitive to erosion to determine any requirement for stabilisation;
- Schedule construction during dry season (low flows), where possible;
- Minimise area of land clearing;
- Retain vegetation on river banks to filter runoff where possible;
- Divert clean runoff away from construction areas;
- Install suitable erosion and sediment control structures;
- Progressively re-vegetate cleared areas;

The responsibility for all implementation of these recommended mitigation measures lie with the hydropower-project developers/owners, in accordance with the user/polluter pays principle.

Land-Management and Land-Use recommendations

- It will be necessary to develop village and inter-village (cluster) management agreements and networking arrangements using the available spatial information to strengthen village capacity to manage natural resources;
- An issue for consideration in the future is the registration of communal village lands to ensure that villagers retain tenure rights to such areas as sacred forests, protection forests, conservation forests and defined agricultural land;
- A procedure needs to be considered and developed for integrating more clearly the IWMU village land use zoning and mapping activity and the district level land use planning activity. The current digital village land use maps produced by IWMU should be refined as the maps and information on boundaries and land use zones from the participatory village LUP-LA exercises becomes available from fieldwork;
- The use of high-resolution satellite imagery should be considered to facilitate the land zoning activity and the continuing village LUP-LA programme as this would enable greater accuracies in determining land uses for watershed management and development purposes;
- Further surveys and assessments of land carrying capacity in and around the resettlement area should be conducted to ensure that sufficient land is available for all families and that the acquisition of land will not lead to land disputes between the host villages and the new settlers;
- Backyard fodder plots should be promoted actively in all four impact zones as beef markets are assured, the introduction of the technology will help reduce shifting cultivation, and there are some benefits in soil erosion reduction and soil moisture retention;

- A range of conservation farming systems and methods, including agro-forestry, minimal tillage, contour bunding and vegetative contour strips should be actively encouraged, particularly in areas where the risks of soil loss are highest;
- Commercial tree planting is appropriate in areas with access to transportation and marketing. Caution will need to be exercised with rubber planting, to ensure that small-holders are not deprived of traditional land, and that they enter into equitable contract arrangements if they are involved with development companies. Rubber should primarily be considered an agroforestry crop, not a mono-culture plantation crop.

Since the filing of the CIA report, an improved manual on participatory land-use planning (PLUP) at village and village-cluster level has been prepared jointly by MAF and NLMA agencies, and should be used as a reference by staff who are implementing land use planning at these levels. Information on the use of more advanced tools for PLUP including satellite imagery is included to enhance the accuracy of land use plans. The document also provides guidance on land registration and land titling for rural areas.

The above recommendations should be the responsibility of MAF, possibly with the support from donor-funded activities such as the NNRBDSP.

Irrigation-Development recommendations

- The implementation of plans to rehabilitate existing large scale pumping and gravity-fed irrigation systems in the Vientiane plains should be a priority activity given that design potentials for irrigated area are not being realised yet and there are maintenance and repair issues;
- The plans for construction and or improvement to existing small scale irrigation systems as recorded in sub-basin profiles and work plans should receive close consideration to ensure that potential benefits accrue to villagers in upstream Nam Ngum and Nam Lik-Nam Xong locations;
- Irrigation extension services need to be intensified in large scale permanent schemes and village schemes in order to increase dry and wet season rice and other higher value crop yields and production;
- The development of paddy land and the provision of adequate irrigation to the resettlement area in Fuang District should be a matter of priority;
- To help ameliorate the difficulties with water use in the permanent pump and reticulation schemes it will be necessary to intensify extension efforts regarding water users groups, irrigation service fees and scheme maintenance and repair programmes;
- With regard to water quality for irrigation, particularly if the Nam Bak and Nam Lik reservoirs are constructed and natural water flows will be impeded, consideration should be given to construction of a water aeration system at the point where water is released from the NN1 reservoir for pumped irrigation in the Vientiane plains.

The implementation of the above recommendations should be the responsibility of the DOI, but in cases where the measures deal with direct mitigation of hydropower plant-induced impacts finances should be sourced from the developers, possibility through the EPF.

Policy and Planning recommendations

- We recommend that SEA is formally put into the legislation and regulations for environmental assessment in general, and hydropower in particular. The urgent assistance with

the implementation of SEAs, national and river-basin based, for hydropower planning in Lao PDR should be a priority with donors;

- The SEA for Lao PDR hydropower carried out in 2004 (Norplan, 2004), needs to be followed up. This would ideally be done on the initiative of DoE, with support from the backers of the 2004 study, i.e. the World Bank;
- It is recommended that the distinction between the widely established methodologies of EIA and SEA on one hand, and the ADB approach to CIA on the other, is avoided in the future, and that cumulative impacts from an individual project is covered as a standard aspect of the project EIA, while strategic (e.g. basin-wide) impacts are covered in an SEA. This would avoid methodological confusion;
- The standards for benefit-sharing between hydropower project sponsors and affected peoples could be improved. Practically, this could be done through the Environment Protection Fund. A clear focus on regional and local beneficiaries is recommended and lessons learned from the ADB-supported project on *Benefit Sharing Mechanisms for People Adversely Affected by Power Generation Projects in Viet Nam* could serve as an excellent starting point;
- Continued support (work funded by WB is on-going, with needs assessments etc.), to capacity-building for the regulatory authorities, both at the practical entity (DoE), and at the policy and theoretical entity (WREA).

WREA is the logical implementing agency for the above recommendations.

Current Planning Systems and Institutional Arrangements recommendations

- A national water resources strategy is needed to convert the broad national social, economic and other goals and objectives into clear and complete water resource targets and a comprehensive and co-ordinated programme to achieve these targets;
- A national water resources strategy would help to provide an official statement of water resource management objectives and targets which will support national goals and strategies and ensure better coordination of plans and strategies of various sectors and ministries;
- This process should be further developed and coordinated with river basin water resource planning in which both WREA and MAF have a role. Working with river basin organisations and provinces, WREA should set the policies and guidelines and issue general water allocations. The line ministries and their provincial departments would do sectoral planning in accordance with the policies and guidelines;
- Care should be taken to ensure that issues such as water quality and watershed management are adequately addressed in the reorganisation and subsequent policy and legal development;
- A national water resources strategy should be developed to help to orient the role of a new water agency to government-approved priorities in the water sector. Further organisational strengthening and other capacity building could be recommended in the strategy;
- This new agency should take over and centralise the water-resource management functions which are performed by various other agencies at present;
- Establishment of provincial water resource committees would allow better coordination of all departments involved in water-related activities. Data and information sharing could be improved;

- Planning of water resource projects should be brought into line with river basin plans, allowing water resource planning and the national planning system to be linked more effectively;
- Leading water resource management departments should be established at provincial level and be part of a provincial WREA office which would have a formal water resource management role;
- A basin committee or other coordination mechanism needs to be set up which would allow provinces and other stakeholders to cooperate in the development and implementation of integrated river basin plans. A river basin committee for the Nam Ngum River Basin is being set up and this may serve as a pilot for other basins.

Implementation of the above recommendations is obviously subject to GoL action, mainly within WREA.

Aquatic-Ecology recommendations

- Look to develop a fairer and more equitable distribution of benefits through appropriate fisheries Co-management systems to manage both reservoir and river fisheries. Co-management provides an opportunity for communities to collaboratively manage fisheries for sustainable benefits. A partnership must be established between local communities, local government, concession holders and other key stakeholders such as the department of livestock and fisheries. Though administrative mandates are only just emerging, it may once again fall under the responsibility of WREA in partnership with fisheries departments and supported financially through a water window as part of the concession holders contributions to Environmental Protection Funds and community development initiatives;
- Compensation for loss of fish to communities needs to be worked out in consultation with the communities themselves. One option sometimes considered is fish for fish whereas others tend to focus on support to alternative livelihood options through start up funds and capacity building/advisory support, alongside appropriate micro credit facilities. It will be important to learn from the successes of other such compensation schemes in the region and ensure that any compensation measures are carefully considered and supported long term;
- Beyond straight compensation for the loss of pre-existing fisheries, it is also important to investigate the potential of aquaculture to off-set possible losses to wild capture and other terrestrial food sources. This recommendation has been added in 2010.
- Riparian release, is another key mitigation measure in ensuring continued ecosystem services. There needs to be agreement to minimum riparian release and an adaptive riparian release strategy managed in response to emergent and actual hydrological conditions. The riparian release strategy should also ensure release into rivers and reservoirs during periods of no power generation. Responsibilities for riparian release belong to upstream concessionaires who through their power and release strategies determine the quantity of water discharged into downstream river reaches. Agreements need to be made and levels set for riparian release under the administration of the WREA for each concessionaire and monitored through the set up of Environmental Monitoring Units with financial support through concession holders' Environmental Protection Funds. These agreements could be compiled and analysed, towards the development of national standards;
- Given the social impacts, the environmental costs and the rather limited electricity-generating capacity (a combined total of only 160 MW), there would have been a clear strategic benefit to leaving the Nam Lik in its current, effectively unregulated, condition.

In light of the extensive plans for hydropower in the Nam Ngum Basin, the Nam Lik could have been used as part of an offset strategy for intact river systems suggested in the GoL's Hydropower Development Strategy Study, and the approach now taken as a national priority in many other countries. The protection of the Nam Lik river was seen by the consultant as a key priority. However, at the very end of our study period, the Nam Lik 2 project was cleared for construction, effectively making our prioritised approach impossible to implement. Therefore, we suggest a national prioritisation study for aquatic conservation. This could ideally be done in co-operation between WREA, the MRC and one or several of the major conservation NGOs (e.g. WWF, IUCN, WCS) active in Lao PDR. The goal would be to identify a few key river systems that need total protection from large-scale developments such as hydropower, irrigation dams, large mining projects etc;

- Given the impacts; environmental, social and economic (again a modest combined electricity-generating capacity of 195 MW), alongside the mitigating effect on impacts to the NN1 reservoir, there would be a clear strategic benefit to consider leaving the Nam Bak unregulated. In light of the extensive plans for hydropower in the Nam Ngum Basin, the Nam Bak could be used as part of an offset strategy for intact river systems suggested in the GoL's, Hydropower Development Strategy Study (2000) and the approach now taken as a national priority in many other countries;
- Optimisation of water levels in reservoirs should be agreed with both down stream and upstream concessionaires. These agreements need to be based not simply on power optimisation, but also from an environmental and, given its importance, specific fisheries perspective. In the case of NN2 for example, it may be beneficial to limit energy generation in the NN1 reservoir whilst NN2 is filling in order to buffer changes in inflow into, and thus water levels, in the NN1R. The same can be said of other reservoirs in the cascade. Responsibilities for optimisation of water levels lies with both upstream and downstream concessionaires coordinated through a the Water Resources and Environment Administration (WREA) particularly that organisation's Water Resources Coordination Committee (WRCC) and the Dept. of Electricity. This should ideally be done through the sub-committee suggested in section 6.3.2 above.

Terrestrial-Ecology recommendations

Short term recommendations, to be considered prior to 2013:

- Hydropower projects and other major projects should, as part of the planning, investigate the biological conditions of the lands/forests that the project intends to use/transform. It is not sufficient – as seems to be the norm today – that the general occurrence of wildlife is described but no or very limited efforts are made to find out if the areas concerned are important habitats for rare fauna and flora. Responsibility rests with the hydropower-project developer/owner;
- The terrestrial ecological surveys done in connection to major projects should be inclusive and key government staff (MAF, NUOL, STEA) consulted and invited to learn from the work – as a means to build capacity within the governmental ranks. Responsibility rests with the hydropower-project developer/owner;
- Developers and governmental entities should coordinate their projects with the purpose of minimising negative impacts on forests and biodiversity and maximising positive impacts. This is particularly relevant to the establishment of transmission lines and roads – and the actual design of the reservoir. The construction of two parallel transmission lines through

PKK is an example of lack of coordination. Responsibility rests with the hydropower-project developer/owner, the DoE and EdL;

- Developers of hydropower projects should contribute to the financing of conservation and watershed protection efforts in the river basin, preferably through the EPF;
- Developers and relevant governmental entities should collaborate in the fields of awareness raising of the general public affected by the concerned project. Topics should not be limited to biodiversity aspects but include livelihood and the environmental requirements of the concerned project (erosion, availability and sharing of water etc);
- During actual construction of reservoirs and related infrastructure, the developer should apply guidelines that avoid or mitigate negative impacts. Additionally this requires training of workers and robust internal supervision of compliance. Hunting should be forbidden – or at least very strictly regulated. Responsibility rests with the hydropower-project developer/owner;
- The Developer should include relevant terrestrial ecology aspects – and an action programme – in the Environmental Management Plan. The action programme should be followed. Responsibility rests with the hydropower-project developer/owner;
- The local WREA entity should systematically follow up the hydropower developer's actions as per environmental management plan.

Recommendations to be applied after 2013:

- DAFEOs with support from the developer should assist local farmers in the river basin to carry out conservation farming and agroforestry i.e. to enhance livelihood conditions and at the same time maintain steady environmental conditions (erosion control);
- DAFEOs should guide the management of watershed protection forests;
- DAFEO should improve the monitoring and control functions focusing on land use transformation, timber harvesting and hunting and wildlife trade;
- Low impact harvesting techniques should be promoted;
- DAFEO should provide oversight for the tree plantation projects with the purpose of securing that negative impacts are reduced and positive impacts are strengthened.

Mining recommendations

To ensure sustainable development, mining and hydropower projects must learn to co-exist and work co-operatively to address potential impacts on socio-economy and the environment. Management and monitoring of key environmental and social management include:

- Water quality monitoring and maintenance of beneficial uses;
- Management of water release to down-stream waterways during reservoir impoundment and mine water abstraction, to ensure that other down-stream water users and environmental values are not negatively affected by the development;
- Management of vegetation clearance, including the minimisation of vegetation clearance activities and rehabilitation of disturbed areas as soon as practicable;
- Monitoring of aquatic resources, including fish population, and a ban for project employees on fishing in the local rivers, to minimise pressure on aquatic resources;

- Management of hazardous materials and wastes, including the development of Environmental Emergency Response Plans to respond to incidents involving all reagents used at mines;
- Management of non-hazardous wastes, including the construction of landfill and implementation of waste reduction, re-use and re-cycling program;
- Minimise disturbances to land and water resources, including the development of alternative access routes and compensation of loss of land and water resources;

The above recommendations require far-reaching co-operation between many actors, necessitating good co-ordination of the activities. The suggested approach is to have all mining and hydropower project owners pay into the EPF, and the actual activities run as projects funded from there.

While large-scale hydropower and mining projects often develop Environmental Management and Monitoring Plans to address potential issues that might occur due to their development, these documents are generally not in the public domain. As a result, it is important for the Government of Laos, who has access to projects documents, to coordinate environmental management and monitoring of each project, ensuring that data are shared and monitoring activities do not overlap, or suffer from gaps. In the short-term, it is recommended to make all EIAs, EMPs and other key environmental and socio-economic documents on hydropower and mining projects publicly available.

The entire NNRB is in need of an environmental and socio-economic monitoring *and* evaluation programme, co-ordinated and run by WREA,. This activity could be funded through the Environment Protection Fund.

Socio-Economy and Poverty recommendations

Hydropower-sponsored development for poverty alleviation

Both ADB and the GoL give poverty alleviation the highest priority in their rural development programmes. The impact of hydropower development on the rural poor will depend largely on the existence of concrete mechanism that would guarantee that affected villagers are benefiting directly from the revenue earned by hydropower projects through formal benefit-sharing mechanisms, such as particular development programmes, truly tailored to the needs of the local, mostly ethnic-minority communities. The GoL needs to be encouraged to integrate social, economic and environmental development plans into their hydropower development planning to allow local communities to reap benefits. These development programmes and mitigating measures for hydropower-affected communities need to be requirements for development, preferably as parts of concession agreements. These agreements should have, among others, the following general features:

- Relocation of communities should be carried out under the guidance of Resettlement Actions Plans that meet international acceptable social safeguard standards, and should be disassociated from the “Focal Area Development” policy;
- Local peoples’ livelihood strategies need to be recognised from their own perspectives, valued and included into development interventions;
- Poor farmers’ interest in their own food security, before venturing into income-generating activities, should be taken seriously;

- Readjusting the present shifting-cultivation eradication policy towards “stabilisation of shifting” to better match the goal of poverty alleviation (e.g. through improved crop rotation/fallow systems);
- Supporting crop diversification that favours a balance between subsistence and cash cropping;
- Supporting productive activities that do not deplete/degrade soils, waterways, forests and;
- Supporting financially sustainable activities that do not expose farmers to critical levels of risks, such as eco-tourism endeavours.
- Avoid promoting hydropower development that severely affects on-going socio-economically positive developments such as river-based eco-tourism.

Linking development with safeguarding traditional cultures and belief systems

A not uncommon but unwanted impact from large-scale infrastructural projects is often a breakdown of traditional culture and belief systems, with disempowerment of traditional leadership, increased inter-generational conflicts, loss of community identity, disorientation and an increase of socially deviant/risky behaviour as results. To protect the rural community’s identity, it is important that the developers’ management programmes combine economic programmes for improved livelihoods with a cultural and community programme that:

- Analyses and recognises the cultural impact of development interventions;
- Recognises the inseparability of material and spiritual culture in agricultural work;
- Recognises indigenous knowledge in its full meaning to better understand the complex relationship between culture and poverty and;
- Recognises, in principle, ethnic groups’ right to their ancestral land, the basis of their culture and survival.

Gender issues

With respect to gender, the necessary livelihood improvement programmes that should be required of each project developer should:

- Recognise women as farmers, and provide them with credit and training opportunities for new production techniques to reduce their work burden and increase their labour productivity;
- Address special vulnerability related to migration (sexual exploitation, HIV/AIDS, trafficking networks);
- In education: Provide incentives to encourage female attendance and reduce girls’ dropout rates (through scholarships, school-feeding programmes, more local provision of schools and flexible timing) and;
- In health: Support to the development of appropriate health care programmes that integrate nutrition, sanitation, education and preventive measures aiming at improving women’s and children’s health status, particularly that of ethnic minorities.

Health issues

The most serious threats to long-term health status in the NNRB are malnutrition and HIV/AIDS. The responsibility for all actions rest with the project developers/owners, but it is realistic to assume that many of the health interventions needed would be more successfully

implemented if co-ordinated by a central (MoH) authority, preferably supported by money channelled through the EPF.

The most important actions to be taken in this context are:

- That all concerned development projects (specifically the hydropower ones) make early contact, well before the start of construction activities, with the Lao Ministry of Health in order to set up effective co-operation between project sponsors and the Ministry. This has to be done both at the national and at the provincial/local levels;
- It is of paramount importance that the health mitigation programmes are monitored and evaluated by a third-party organisation, which should be independent of the project sponsors;
- Regular reporting from such M&E activities should guide further work by the project sponsor and the MoH. This work should be funded from the developers' funds, and budgets should be adjusted according to repeated needs assessments;
- To maintain a preparedness for malaria outbreaks caused by new reservoirs;
- Establish a preventive health-education programme for the schools.

Planning and implementing social safeguards' programmes in line with GoL and international standards

Mitigation and compensation planning in general, and resettlement planning and implementation in particular has, until now, suffered from a lack of clear criteria for the assessment of losses of livelihoods and assets for the project-affected population. Resettlement Plans, such as the one prepared for the NN2 Project, do not meet internationally acceptable standards of social safeguarding. There is a great deal of mistrust regarding the implementation of mitigation and compensation programmes, apparently based on previous negative experiences.

- WREA is recommended to utilise the experiences provided by the NT2 project as a background for developing more detailed binding environmental and socio-economic guidelines and standards.

Improved monitoring system

GoL guidelines for socio-economic monitoring still lack a clear system of indicators and criteria for good or acceptable social practices against which implementation results can be measured.

- GoL is recommended to establish independent and empowered monitoring systems (including impartial grievance mechanism) for all hydropower projects. These monitoring systems/programmes will provide much needed quality control of the implementation of socio-economic as well as environmental safeguards.
- WREA should take the lead on the development of a set of generally acceptable indicators for monitoring.

Consultation, participation

Guidelines for the consultation and public participation process need to be more precise and comprehensive in order to meet international standards for local people's participation, with particular emphasis on the inclusion of vulnerable groups – women and ethnic minorities. Although national safeguard documents cover, to some extent, public consultation and participation, the directions they provide are formulated in only general terms, and it is left relatively open as to what type of methodology and approach shall be used during those consultations.

Little is said about the scope and extent of consultations other than that they shall provide “adequate opportunity to provide their opinions on and inputs into the planning and implementation of the project”. Moreover, the consultation process should not be carried out only for determining the actual extent of compensation, but also appraise indirect and long-term impacts as well as future development opportunities for alternative livelihood planning. (Norplan 2004).

Other stakeholder participation

More efforts are needed to extend the participation of the public sphere, and involve other stakeholders at regional, national and international levels in an open discussion of the potential environmental and social impacts of hydropower development. Involvement of such groups will enhance transparency, accountability, have feedback functions and will allow learning from other experiences. The annual Stakeholder Workshop organised by NTPC, the operator of the NT2 Project, may serve as an example.

Water Quality recommendations, from the final monitoring report

- WREA needs to urgently address the wide-spread artisanal mining occurring on the Nam Ngum river banks and even right in the river (and its tributaries) in the stretch between the future NN3 reservoir and the NN2 dam site. It is highly likely that mercury is used for extraction of the gold being mined, resulting in severe direct pollution of the river.

There are several recommendations that appeared already in the CIA report from early 2008 which can be summarised as follows:

- The team believes that in order to timely identify any adverse effects that can potentially occur as a result of hydropower and other large-scale developments in the Nam Ngum River Basin, it is important for project developers to coordinate with the Lao government, allowing individual projects' water-quality monitoring data to be accessed by responsible government agencies, as well as by projects working on behalf of the Government of Lao PDR.
- For the water-quality programme in Laos to be effective, it is important that the government establishes a central organisation that oversees the compilation of water quality. Having all water-quality data reported to one Government entity will allow data to be easily accessed and utilised. Further, it will allow the government to easily identify and remedy any potential problems with its water-quality monitoring programme, as well as with the sources of water pollution, in a timely manner.
- It is our opinion that the newly formed agency, **WREA**, Water Resources and Environment Administration, should take the leading role in the co-ordination of this water-quality monitoring and management of the data base, a data base that preferably should be made available to anyone with an interest in the field.

Fisheries recommendations, from the final monitoring report

The following recommendations are made for the use and continuation of the monitoring programme:

- The results provide a useful starting point for a continued basin-wide fish monitoring programme, which should complement the monitoring required of all the dams under construction and planned.
- ADB should encourage the Government of Lao PDR to continue the fish monitoring in the Nam Ngum Basin, and the collation of all fish monitoring reports in the basin.
- The results of the monitoring should be shared with developers of all dams under construction, who should in turn share their fish monitoring results with the Nam Ngum River Basin agency currently being established.
- The results should also be shared with interested organisations in the wider Mekong river basin, such as Mekong River Commission, World Fish Centre, Living Aquatic Resources Research Centre (LARReC) and other dam developers in the basin, especially those that have significant fish monitoring programmes such as Theun Hinboun PC and Nam Theun 2.
- The fish monitoring results are interesting enough to warrant a more detailed investigation and could be analysed more extensively as part of a student research thesis at the National University of Lao.
- The Fisheries Programme of the Mekong River Commission is in the best position to collate and analyse all the records of fish monitoring throughout the basin, and publish regular consolidated reports which could highlight the experience of fisheries impacts of hydropower dams. Funding will be required to maintain such an on-going analysis.