

# Lao PDR Development Report 2010

## *Natural Resource Management for Sustainable Development*

### BACKGROUND NOTE

## Hydro Power Background Summary Note and Sector Assessment

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This note was prepared by Julia Fraser, based on MacGeorge et al. (2010), WB (2009), and van den Toorn (2009) with inputs from Jie Tang and William Rex.

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## Introduction

**Lao PDR is exceptionally well endowed with water resources and enjoys a strategically advantageous location within the Greater Mekong Sub-region.** Surrounded by energy-hungry neighbors – including Thailand, Vietnam, Cambodia and China – the long-term management of its 23,000 MW of exploitable potential hydropower is critical to meeting the country’s development goals. The strategy of the Government of Lao PDR is to develop its hydropower resources to earn export revenues as well as to meet domestic needs. However, the Government’s plans are ambitious in light of various constraints and in particular that the sector may be being developed faster than the Government’s ability to scale up its capacity to manage it effectively. The dual challenge it faces is not only “how to do the right projects” but “how to do the projects right.”

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## Hydropower Potential and Development

**The water resources of the Mekong River and its tributaries are estimated to hold a hydropower potential in excess of 20 times the current power production.** Of the 23,000 MW of exploitable potential hydropower in Lao PDR, about 15,000 MW are internal to the country, and the remaining 8,000 MW represent the country’s share in the mainstream Mekong, jointly with one or more riparian countries. Large hydropower capacity (greater than 25 MW) represents more than a 97 percent share in the power generation mix in Lao PDR.

**To date, about 1,838 MW of hydropower generation capacity has been installed (including the 1,080 MW Nam Theun 2 project), with another 1,372 MW under construction, 3,041 MW in the advanced planning stage with commissioning targeted before 2015, and more than 3,300 with completed feasibility studies.** For the seven plants under construction, 1,145 MW will be for export to Thailand and Vietnam and 227 MW for domestic supply. There are also 17 hydropower projects in the pipeline with feasibility studies completed which will add another 4,573 MW of installed capacity by 2020 according to the latest development plan<sup>1</sup>. Of those, three are export-oriented projects at the advanced planning stage, targeting commercial operation before 2015: (i) Nam Ngum 3 (440 MW), (ii) Nam Ngiep 1 (278 MW) and (iii) Nam Theun 1 (523 MW). Once approved and completed, these three projects will account for a total of 2,241 MW of the installed capacity. In addition, some 40 other hydropower projects, with Memorandum of Understanding (MOU) signed with various developers, are at different stages of preliminary consultation and feasibility study. Tables 1 and 2 below detail the hydropower plants in operation and under construction.

**Table 1: Hydropower Plants in Operation**

Name	Location	Commissioning	Capacity (MW)	Market	Investors
Nam Dong	Luangprabang	1961	1	Domestic	EdL
Selabam	Champasak	1970	5	Domestic	EdL
Nam Ngum 1	Vientiane	1971	155	Domestic/ Export	EdL

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<sup>1</sup> This does not include the 1,800 MW Hongsa coal-fired plant which is being negotiated with EGAT for export to Thailand.

Name	Location	Commissioning	Capacity (MW)	Market	Investors
Xeset 1	Saravane	1990	45	Domestic/ Export	EdL
Nam Ko	Oudomxay	1996	1.5	Domestic	EdL
Theun-Hinboun (IPP)	Bolikhamxay	1998	210	Export	EdL (60%) Statkraft (20%) GMS (20%)
Houay Ho (IPP)	Champasak/Attapeu	1999	150	Export	EdL (20%) Suez Energy (20%) HHTC (20%)
Nam Leuk	Vientiane	2000	60	Domestic/ Export	EdL
Nam Mang 3	Vientiane	2004	40	Domestic/ Export	EdL
Nam Ngai		2006	1.2	Domestic	EdL
Nam Tha	Xiengkouang	2006	1.25	Domestic	EdL
Micro-hydro	37 locations		611.5	Domestic	EdL
Nam Theun 2 (IPP)	Khammouane/ Bolikhamxay	2010	1,080	Domestic/ Export	100
Xeset 2 (EdL)	Saravane	2009	76	Domestic	100
<b>TOTAL</b>			<b>1,837.5</b>		

**Table 2: Hydropower Plants under Construction**

Name	Location	Commissioning	Capacity (MW)	Market	Progress (%)
Nam Lik 1-2 (IPP)	Vientiane	2010	100	Domestic	65
Nam Ngum 2 (IPP)	Vientiane	2013	615	Export	80
Name	Location	Commissioning	Capacity (MW)	Market	Progress (%)
Nam Nhone	Bokeo	2009	3.5	Domestic	20
Nam Ngum 5 (IPP)	Vientiane/ Xiangkhouang	2011	120	Domestic	18
Theun-Hinboun Expansion (IPP)	Bolikhamxay	2012	280	Domestic/ Export	27

Xekaman 3 (IPP)	Sekong	2011	250	Domestic/ Export	50
Tatsalen (IPP)		2010	3.2	Domestic	5
<b>Total</b>			<b>1,372</b>		

## Domestic demand

**Domestic electricity consumption in 2008 was 1,578 GWh and is expected to grow at around 10 percent per annum.** This growth does not consider the potential emergence of large power-consuming industrial loads, such as aluminum refining and smelting, for which the development schedule is uncertain since they are driven by international market demand and investment.

**The electrification rate reached almost 70 percent as of end 2009 – a rapid increase from just 16 percent in 1995.** The Government’s goal for electrification is to reach 70 percent of households by the year 2010 (already achieved), 80 percent by 2015, and 90 percent by 2020. Affordable and reliable electricity supply from hydropower development has made critical contributions to the rapid expansion of rural electrification in the country.

**More than 75 percent of the domestic demand is in the Central Region.** There are four sub-grids in the country - the Northern Grid, Central Grid 1, Central Grid 2, and Southern Grid. Each is connected to the Thai grid although they are not interconnected internally. Due to the predominance of hydropower in the country’s power generation mix (more than 98 percent), Electricité du Laos (EdL) regularly imports electricity from Thailand to meet domestic demand when there is a shortage of supply, especially in dry seasons. In addition, an electricity supply deficit in one sub-grid of EdL may need to be filled by surplus in another, wheeling through the Thai grid. Several projects funded by ADB, the Bank, and JICA have undertaken a long-term effort to integrate these four sub-grids into one national grid, to provide stability for increased future loads. In fact, construction is underway to link the Central 2 and Southern grids through a 115 kV transmission line; commissioning is expected in 2011/12. As yet, however, there are no firm financing commitments to connect other sub-grids through high voltage transmission lines. Grid integration and extension to expand access to electricity in the country is another Government priority.

**In addition, there are plans underway to construct high voltage transmission lines to other countries in the region, notably Cambodia and Vietnam, to promote grid-to-grid power trading within the Greater Mekong Sub-region (GMS).** This includes a 230 kV line from Ban Hat, Lao PDR to Stung Treng, Cambodia under the World Bank-financed GMS Power Trade Project. The GMS Planning Group, consisting of the planning department of individual GMS national utilities, has recently completed the regional system planning for 500 kV and 220 kV links among grids of different GMS countries based on interactions with individual national power system expansion planning. However, Lao PDR faces several challenges in capitalizing on the ability to trade surplus hydropower through grid-to-grid schemes. Hydropower plants in Lao PDR are being developed by international investors who need to secure a power purchase agreement from a creditworthy off-taker before they can mobilize financing and start construction. Currently, international investors are looking to utilities such as EGAT for a “bankable” power purchase agreement (PPA) instead of EdL given its weak technical and financial capacity and given that: (i) EdL does not have the financial capacity to build the high voltage, cross-border transmission lines to secure the power evacuation; (ii) EdL system/ domestic demand are small and cannot absorb the power from the hydro; and (iii) EdL cannot afford the potential liquidated damages should EdL’s transmission lines, if built, be unavailable (under failure) for evacuating the hydropower to other countries. The transmission failure risk is high given EdL’s lack of experience in high voltage

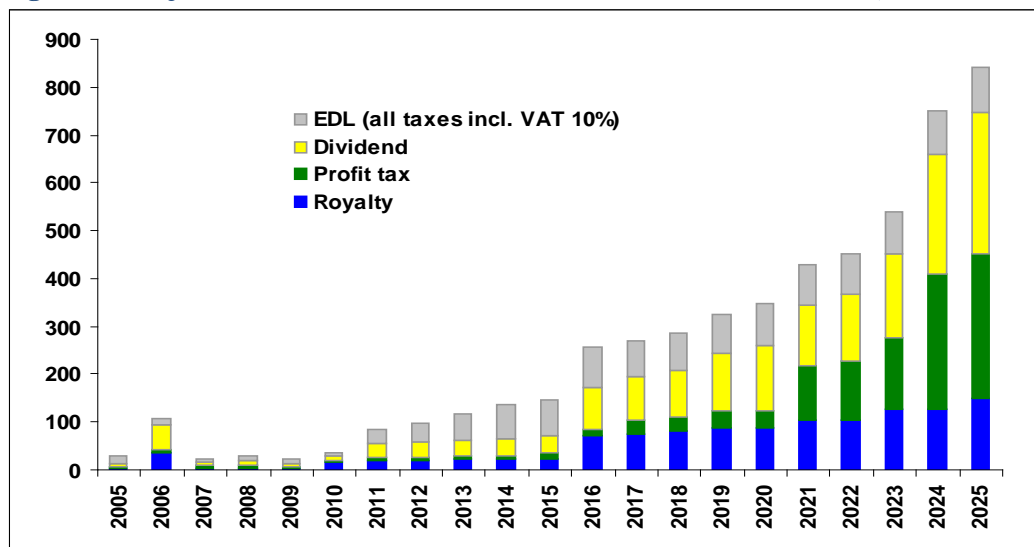
system dispatch and maintenance. (As noted earlier, EdL has neither a national grid nor a computerized dispatch system.)

## Revenue generation from hydropower exports

**While domestic demand is limited, the demand for hydropower export to the neighboring countries is significant and growing.**

**Hydropower export is driven by demands in Thailand and Vietnam and, to a lesser extent, Cambodia. The three operational IPP plants – Theun-Hinboun (210 MW), Houay Ho (150 MW), and Nam Theun II (1,080 MW) – are connected to the Thai system through dedicated transmission lines and are dispatched by EGAT, the power utility in Thailand.** With the commissioning of Nam Theun 2 in 2010, net government revenues from hydropower exports are expected to grow from US\$17 million currently to approximately US\$100 million by the year 2012 and US\$350 million by the 2020 (see Figure 1 below). To further explore hydropower potential for export revenue earning, the Government has concluded Memoranda of Understanding (MOUs) with these countries for hydropower export totaling about 11,500 MW, and there is room for further expansion of the MOUs without jeopardizing the domestic market. Most future projects are export oriented, although some may also supply the domestic grid.

**Figure 1: Projections of GOL Revenue from the Power Sector (US\$m), 2005-2025**



*Source: World Bank staff estimates*

**Revenues come from many different sources, including: land fees, royalties, profit tax, turnover tax, personal income tax, dividend withholding tax, import and export duties, fees (buying and selling of shares, license fee, technical service fee), contributions to funds (environmental protection fund, community development, human resources, sustainable development and project monitoring fund). Apart from taxes and royalties, the government also receives dividend payments from those hydropower operations in which it holds an equity stake.**

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## Proposed fiscal regime for hydropower concessions

Experience in other countries reveals that governments have had difficulty in setting tax levels for resource projects and particularly in finding the right balance in seeking rents from developers, i.e. neither to undertax so as to sacrifice rents that might be reasonably expected or overtax which may deter investment. After primary taxes such as corporate income tax have been deducted, governments ultimately need to develop a mechanism that calculates and efficiently transfers economic rents from projects, ideally based on profit rather than production. As part of the 2009 Lao PDR Country Development Report, a study (MacGeorge et al., 2010) was commissioned on the fiscal regime for hydropower concessions that recommended the following for the Government of Lao PDR's consideration:

- Ministry of Energy and Mines, supported by the Ministry of Finance, to issue a clear policy statement defining the standard method for determining fiscal benefits for export-oriented hydropower project to ensure developers are fully aware of the Government's expectations before project agreements are negotiated.
- The business turnover tax, excise taxes, profit taxes and corporate income tax to be the primary taxation of hydropower projects. These taxes may be reduced in accordance with the Law on the Promotion of Foreign Investment, but no project specific dispensations should be made.
- Secondary taxes, such as the existing royalty arrangements, to continue to apply to extract economic rents (i.e. the value of production after deductions for operating and capital costs), but the GOL should consider moving to a resource rent tax system. GOL should consider abandoning the specific ad valorem royalty tax under consideration, i.e. the USD 0.65c/kWh which would be levied regardless of the economic rents generated by the project projects.
- Alongside primary and secondary taxes, other approved sources of fiscal benefit could include: (a) an upfront concession fee; (b) dividends from investments in IPPs as specified by a GOL IPP investment policy; and (c) minimal use of a discounted electricity sales specified under a discounted electricity policy. These other sources of fiscal benefit, however, do not contribute markedly to economic rents, so their rational must depend on other criteria.

**Additional details and rationale for the proposed fiscal regime in the hydro power sector can be found in the background paper referenced in MacGeorge et al. (2010).**

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## No clear “best practice” model for private hydro<sup>2</sup>

Private hydro is in an evolutionary phase and governments are still trying to find a formula that will work in terms of risk-sharing and the level of public support to be provided. No single model is likely to be applicable to all situations due to the “special” nature of hydropower. For example, the financing of private hydropower projects faces additional difficulties to the usual issues identified in financing private infrastructure projects as a result of:

- the site-specific nature of projects,
- high construction risk and long construction periods,
- their capital-intensive nature with a high proportion of local costs,
- unpredictable output subject to river flows and broader water management constraints,
- complex concession process to achieve transparency in the award and pricing of output, and
- environmental and social impacts.

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<sup>2</sup> See Head (2000).

**Most private hydro concessions, including in Lao PDR, have been directly negotiated. However, multilateral agencies are encouraging governments to move toward a more transparent process.** But unlike thermal power IPPs, competitively bidding a hydro concession is a complicated and costly process, and there is a danger that unless it is handled carefully it will simply deter prospective sponsors. Government would need to ensure that projects offered for private funding have been adequately prepared in advance by the public sector, based upon detailed technical studies and site investigation, with a clear contractual framework and security package already in place.

**It is probably premature for Lao PDR to move to competitive solicitation process for its hydropower projects, but it should take steps to move away from the current ad-hoc nature of project development which is driven by developers in order to sequence projects based on least-cost expansion planning and using an integrated river-basin approach.** The tools with which to do this are being financed under a recently approved Bank project (see last paragraph).

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## **Institutional and legal framework**

**While the Law on Promotion of Foreign Investment provides the overall framework for concessions in the hydropower sector, confusion in mandates of the various institutions involved, the lack of clear standards and procedures for investors to follow, and the lack of capacity in the government agencies may create confusion to potential investors, resulting in a prolonged concession process and jeopardizing transparency and accountability.**

**For instance, the Ministry of Planning and Investment (MPI) is the lead agency for negotiations of concession agreements but, after that point, the departments of the Ministry of Energy and Mines (MEM), such as Department of Electricity and Department of Energy Promotion and Development for energy projects, take on responsibility for enforcement and monitoring.** However, the full details of concession agreements, particularly large or sensitive ones, are sometimes not disclosed to MEM, making enforcement extremely difficult.

**The lack of coordination amongst government agencies is compounded when one moves down to the provincial and lower levels of government where capacity is often at its weakest.** For example, the mitigation of social impacts, including resettlement, is primarily the responsibility of provincial governments. Yet there is a problematic mismatch, as the capacity and the incentives for actually undertaking this function are limited. There are cases where local communities have not been properly informed ahead of the start of work in their areas, and developers' mitigation obligations have not been clearly defined. To address this, efforts to establish local social/resettlement management units are under way, supported by the Lao Environment and Social Project (H540-LA).

**Nonetheless, the Government has had some success in responding to the influx of investors by introducing more efficient review and approval processes.** First, GOL adopted the National Policy on Environmental and Social Sustainability in Hydropower Development (NPSH)<sup>3</sup> in 2005 to ensure sustainability and equitable benefit distribution of hydropower developments, as well as replicate relevant lessons from the Nam Theun 2 (NT2) Project in other investments. Second, the line ministry was reorganized in 2007 from Ministry of Industry and Handicraft to the current Ministry of Energy and

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<sup>3</sup> The NPSH applies to projects built after 1990 and larger than 50 megawatt or inundate more than 10,000 hectares; and stipulates specific measures to be undertaken in areas of (a) Environmental assessment, (b) Project-affected population; (c) Watershed management and conservation; (d) Consultation; (e) Information disclosure; (f) Compliance monitoring; (g) Revenue sharing; (h) Existing Hydropower Projects; (i) Institutionalization; and (j) Reporting.

Mines, with explicit emphasis and mandates on these sectors. Third, the Electricity Law was revised in December 2008. The approval of these laws signals more streamlined decision procedures in the hydropower industry. Fourth, besides internal strengthening in MEM, the Water Resources and Environmental Administration (WREA) was created in mid 2007 as part of the Prime Minister's Office with the intention to assume the role as the environmental and social regulator, responsible for implementation and oversight of the Compensation and Resettlement (CAR) Decree adopted by the GoL in 2005 and the new Environmental and Social Impact Assessment (ESIA) Decree which approved in 2010.

Despite the Government's commendable effort to develop a coherent and systematic approach to the sustainability of hydropower development and its impact on poverty alleviation, several constraints remain to be addressed as identified in the Paper on *Water Resources Management in Lao PDR (WREA, 2008)* including:

- Limited legislation and enforcement;
- No clear policy preference for types of projects;
- Single project orientation, rather than program-based planning;
- Fragmented water resources management arrangements, limiting legal functioning and capacity, and gaps among the related sectors;
- Data fragmentation, problematic access to information, and other issues limiting the use of robust information in decision making and implementation.

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## Constraints to achieving sustainable development

**The rapid growth in investor interest, and increase in the scale and scope of investments, imposes high demands on the Government and its agencies for improved governance with regard to (a) a clear and functional legal and institutional framework; (b) systematic planning for optimized development of natural resources; (c) adequate capacity in negotiation and oversight of implementation; and (d) mitigation of environmental and social impacts and eventually revenue management and benefits sharing.** (For more on benefit sharing, please refer to the Background Paper on "Improving Hydropower and Mining Resettlement Performance in Lao PDR: Examining Potential for Benefit-Sharing Approaches", Gibson, Daniel, Helene Carlsson Rex, 2010.) The Government and its agencies are responding by issuing laws and regulations, institutional restructuring, gradually strengthening their capacity, improving review and approval processes, enhancing enforcement and monitoring, and increasing transparency and public consultations. However, governance problems persist such as:

- individual project proposals are not integrated into broader land and water management planning;
- hydropower development is driven by developers on an ad-hoc basis, with sequence not following the least-cost expansion planning of the Government;
- lack of capacity in managing the concessioning process, with difficulties in applying equal terms and conditions for all investors, resulting in great differences in financial and social returns to government and local communities;
- financial and human resource constraints limit enforcement of inspection procedures and monitoring for compliance, particularly at the local level where actual projects and compensation programs are implemented;
- procedures for management and tracking of revenue and benefit streams have not matched the surge in tax income; and
- the principal sector agency responsible - the Ministry of Energy and Mines (MEM) - lacks the logistical resources to adequately supervise the sector.



Experience in other countries demonstrates that successful generation and use of revenues from hydropower to leverage broader economic development depends on (a) improved management of concessions; (b) clear responsibilities and mandates of oversight institutions; (c) consistent application of attractive investment terms and clear requirements on safeguard compliance and benefit sharing; and (d) adequate human and logistical resources in the government agencies, private companies and civil society.

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## World Bank support

Many of these issues are being addressed through the recently approved **Technical Assistance for Capacity Building in the Hydropower and Mining Sectors Project (H539-LA)**. In particular, the project will finance training and continuing education for government staff as well as support advanced formal education at the National University of Laos and selected technical colleges to develop the next generation of hydropower engineers and other skilled sector professionals. It will also assist the government to move away from the present opportunistic and enclave nature of the investments to more systematic sector planning with reviewing of hydropower economic and financial implications, updating and applying least-cost expansion planning, and establishing integrated river basin planning practice and address cumulative impacts of river basin development. Finally it will refine the National Policy on Environmental and Social Sustainability of the Hydropower Sector (NPSH) in line with the new ESIA Decree and the recent institutional restructuring as well as build capacity at MEM, for enforcement and monitoring of compliance with the NPSH and the Compensation and Resettlement Decree.

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