ECONOMIC ANALYSIS

A. Introduction

1. **Macroeconomic and Sector context.** The Lao People's Democratic Republic (Lao PDR), a landlocked country at the heart of the six-nation Greater Mekong Subregion (GMS), plays an increasingly pivotal role as a transnational road link for rising cross-border trade, tourism, and investment.[1] As of 2011, one-third of its population of 6.4 million resided in five large urban centers and 150 small towns in 148 districts. With rapid urbanization, the agriculture sector's share of national gross domestic product dropped from over 50% in 1998 to 28% in 2012. While regional cooperation and globalization have strengthened the links between the Lao PDR's towns and the GMS, the rapid increase in the country's urban population has put a strain on the government's capacity to provide basic public services and infrastructure to accommodate increases in trade and the flow of goods and people from neighboring countries.

2. **Demand analysis.** A weak regulatory environment and the government's inability to achieve financial sustainability have contributed to limited participation by the private sector in urban services provision. This has resulted in inadequate quality, availability, and accessibility of public services such as solid waste management, urban roads and drainage, and ecological parks and recreational areas, particularly for the urban poor and other vulnerable groups.

3. **Project rationale.** For the Lao PDR to benefit from the economic development in the GMS, the government must improve (i) the competitiveness of towns along strategic economic corridors by investing in priority infrastructures, and (ii) the investment climate to attract private sector participation. Houayxay and Luang Namtha are towns in northwestern Lao PDR along the GMS North–South Economic Corridor. Houayxay is the administrative capital and urban center of Bokeo Province and borders Thailand and Myanmar. Luang Namtha is the administrative capital and urban center of Luang Namtha Province, which borders the People's Republic of China and Myanmar. Luang Namtha town has benefited from growing ecotourism centered on the cultural heritage, biodiversity, and landscapes of the Nam Ha Biodiversity Conservation Area. Despite the increase in economic activity in Houayxay and Luang Namtha towns, there have been minimal capital investments to improve and expand the public services and infrastructure due to limited funds at the provincial and national levels.

B. Overall Approach to Economic Analysis

4. The economic analysis of the investments was undertaken in accordance with the principles and procedures set out in various Asian Development Bank (ADB) guidelines.[2] The period of analysis extends over 25 years from the start of project implementation in 2016 to 2040. Costs and benefits were quantified at April 2015 prices and were converted to their economic cost equivalents using shadow prices. Costs include construction, land acquisition and resettlement, capacity building, project management support, and physical contingencies. An exchange rate of $1 to KN8,000 was used when converting foreign exchange costs to local currency equivalent. All costs were valued using the domestic price numeraire. Economic costs were derived from the technical team's financial estimates of investment and recurrent costs, adjusted for transfer payments and other market distortions. Taxes and duties were excluded

[1] Asian Development Bank (ADB). 2010. *Development Effectiveness Brief – Lao PDR: At the Crossroads of Change*. Manila.

[2] These guidelines include the following: ADB. 2013. *Cost–Benefit Analysis for Development: A Practical Guide*. Manila; ADB. 1997. *Guidelines for the Economic Analysis of Projects*. Manila; ADB. 1999. *Guidelines for the Economic Analysis of Water Supply Projects*. Manila; ADB. 1994. *Framework for the Economic and Financial Appraisal of Urban Development Sector Projects*. Manila.

because they represent transfer payments. Traded goods, net of taxes and duties, were adjusted by the shadow exchange rate factor of 1.1, while for unskilled labor, the shadow wage rate factor of 0.8 was used. Both costs and benefits were treated as increments to a without-project situation. A socioeconomic survey conducted in February 2015 in the course of the project preparatory technical assistance is the source of economic data on consumer surplus and flood damages used to quantify some economic benefits. [3]

5. Economic viability was determined by computing the economic internal rate of return (EIRR) and comparing the result with the economic opportunity cost of capital (EOCC) of 12%. An EIRR exceeding the assumed EOCC indicates that the project is economically viable. The viability of the investments was then tested through sensitivity analysis for changes in key variables such as capital costs, operation and maintenance (O&M) costs, and benefits. Distribution of project net economic benefits (NEBs) and poverty impact analysis were also undertaken to determine how many of the NEBs resulting from the investments will directly benefit the poor.

C. With- and Without-Project Scenarios

6. The project will construct priority infrastructure through the following subprojects:

(i) **Houayxay town integrated urban development.** To address severe flooding, limited recreational facilities, and the poor condition of river port facilities, components include (i) riverbank upgrading and protection, (ii) construction of riverside road and walkway, (iii) river port rehabilitation and upgrading, and (iv) development of an ecological park and recreational areas.

(ii) **Houayxay town solid waste management.** To rehabilitate an existing open dump site, the subproject will include planned cell development, clay lining, leachate collection and storage, regular waste covering, surface water management, groundwater monitoring, a public awareness campaign, and capacity building for government staff and other stakeholders.

(iii) **Houayxay town urban roads and drainage upgrading.** The subproject will upgrade urban roads and the roadside drainage system, which are susceptible to flooding during heavy rains, and it will improve access in eight priority urban villages.

(iv) **Luang Namtha town solid waste management.** The subproject will rehabilitate the town's existing dump site and its access road, and incorporate features for sustainable solid waste management, including capacity building for government staff and other stakeholders.

(v) **Luang Namtha town integrated urban development.** The subproject components comprise the following: (i) upgrade poor urban village infrastructure, including improving roads, developing drainage, conducting landscaping, and upgrading old community facilities in poor condition or developing new facilities; (ii) upgrade urban recreation facilities in poor condition, including sports facilities; and (iii) construct the Nam Tha bridge to facilitate improved access to the town.

[3] ADB. 2013. *Technical Assistance to the Lao People's Democratic Republic for the Second Greater Mekong Subregion Corridor Towns Development Project.* Manila.

D. Economic Benefits

7. **Integrated urban development.** This component is expected to upgrade existing urban infrastructure or develop new facilities in the towns of Houayxay and Luang Namtha.

8. Integrated urban development in Houayxay town will generate the following benefits: (i) the riverbank upgrading and protection will provide flood protection and recreation opportunities; (ii) the riverside road and walkway will provide essential pedestrian and vehicular links between town center and the proposed ecological park and recreation area; (iii) the river port rehabilitation will improve the port's overall environment, facilitate operations for boat owners and port users, and provide better ferryboat facilities for visitors and tourists; and (iv) the ecological park and recreation area will increase the economic activity in the project area, specifically tourism development. The multiplier approach is used to estimate the economic benefits of increased tourism volume.[4] The data and assumptions used in the analysis include the following: base 2013 tourism data of 24,237 local tourists and 173,857 international tourists; 50% of the local income from tourism will be spent within the locality; and 60% of total tourists in the town will spend in the locality.

9. Integrated urban development in Luang Namtha town will generate the following benefits: (i) the urban village upgrading will positively impact the economic and social dimensions of the communities, improve road access, provide access to employment opportunities, and facilitate a more comfortable living environment, particularly during the rainy season when local flooding will be eliminated or reduced; (ii) the upgrading of the town's urban recreation facilities will increase the number of tourists, which will increase economic activities; (iii) the construction of the bridge across the Nam Tha River will improve access to the area, including accommodating heavy vehicles, providing a link to Road 3A, and increasing economic activity in Donsamphan and nearby villages. Benefits are quantified through increased land values. The land value by 2024 is KN1.5 billion per hectare in the without-project scenario, and KN2.2 billion per hectare in the with-project scenario. The projected land value after project completion was estimated based on the impact of similar infrastructure and amenities.

10. **Solid waste management**. The subprojects will reduce the risks of environmental pollution in the service area and adjacent watercourses and groundwater. Surrogate values to quantify the economic benefits include solid waste revenues and consumer surplus.[5]

11. The willingness to pay for solid waste services in Houayxay is KN20,000 per household per month, compared to the current solid waste fee of KN15,000. Assumptions for the projections include the following: (i) 2015 revenues remain the same for the without-project scenario; (ii) a 5% increase in the number of households and commercial customers every year starting in 2017; (iii) O&M is 4% of capital cost; (iv) proposed tariff increases are 10% in 2016, 20% in 2019, 25% in 2022, and 20% in 2025 and every 3 years thereafter; and (v) the number of customers by 2028 is 4,544.

12. The willingness to pay for solid waste services in Luang Namtha is KN22,500 per household per month, compared to the current solid waste fee of KN15,000. Assumptions for the projections include the following: (i) 2015 revenues remain the same for the without-project

[4] Income multiplier is computed as follows: 1 / (1 – [local income spent within the locality x tourist spending in the locality]) x (1 – proportion of economic activity reduced from outside the locality).

[5] The willingness of the beneficiary to pay for the services, above the existing and/or proposed tariff rates, is taken as the value of the consumer surplus. Consumer surplus is computed as follows: number of households (*i.e.*, with project - without project) x (willingness to pay/existing tariff – 1).

scenario; (ii) the number of household customers increases by 4% every year starting in 2017, and the number of commercial customers increases by 10% over the same period; (iii) O&M is 4% of capital cost; (iv) proposed tariff increases are 25% in 2016 and 2019, and 20% in 2022 and every 3 years thereafter; and (v) the number of customers by 2028 is 4,161.

13. **Urban roads and drainage upgrading.** The project will improve the economic and social dimensions of the villages in Houayxay, including providing a more comfortable living environment, particularly by reducing flooding during the rainy season. The urban roads and drainage upgrading will increase land values from KN1.5 billion per hectare in the without-project scenario to KN2.4 billion per hectare in the with-project scenario by 2024. The projected land values after project completion were estimated based on properties with similar infrastructure and amenities in the same town.

14. **Direct beneficiaries.** Summary data for both towns is provided in Table 8.1.

Table 8. 1: Direct Beneficiaries by Town and Subproject

Town	Component	Number of Beneficiaries by Year			Units
		2016 (Non-incremental)	2016 to 2028 (Incremental)	2028	
Houayxay	Urban roads and drainage	160	0	160	Hectares of developed land
	Solid waste management	2,584	1,960	4,544	Customers
	Integrated urban development	209,469	42,198	167,271	Foreign and local tourists
Luang Namtha	Solid waste Management	1,486	2,675	4,161	Customers
	Integrated urban development	216	0	216	Hectares of developed land

Source: Asian Development Bank estimates

E. Economic Costs

15. Economic costs were derived from the estimates of capital and noncapital investments, replacement costs, and O&M costs in financial terms, removing price contingencies and duties and taxes, and multiplying the net results by the conversion factors. No land acquisition was assumed. The weighted overall factors for capital costs and O&M costs were computed and applied to the net costs to derive the economic cost equivalents, as summarized in Table 8.2.

Table 8.2: Summary of Economic Cost Equivalents

(KN billion)

Town	Component	Capital Costs	Annual O&M Costs
Houayxay	Integrated urban development	5.15	0.82
	Solid waste management	1.87	0.60
	Urban roads and drainage upgrading	8.89	1.42
Luang Namtha	Solid waste management	1.81	0.58
	Integrated urban development	9.07	2.31

O&M = operation and maintenance.
Source: Asian Development Bank estimates.

F. Economic Internal Rate of Return and Sensitivity Analysis

16. The overall EIRR for Houayxay and Luang Namtha is 21.7% for the base case and 19.0%–21.4% under the sensitivity tests (see Table 8.3). Summary results and detailed computations are shown in Tables 1 to 5 of the Supplementary Appendix.

Table 8.3: Overall Economic Viability Results

Item	EIRR (%)	NPV (KN billion)	SV (%)
Base Case	21.7%	97.3	
10% Increase in Capital Cost	19.1%	77.7	50%
10% Increase in O&M Cost	21.4%	94.2	312%
10% Decrease in Benefits	18.5%	64.8	-30%
1-Year Delay in Benefits	17.0%	60.4	

EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance.
Source: Asian Development Bank estimates

17. Given the stream of economic benefits and costs over the 25-year period, all subprojects are evaluated as economically viable since their EIRRs are higher than the assumed EOCC of 12%. Sensitivity tests were computed for scenarios based on (i) a 10% increase in capital costs, (ii) a 10% increase in O&M costs, (iii) a 10% decrease in benefits, and (iv) a 1-year delay in benefits. Table 8.4 summarizes the results of the base case analysis and the sensitivity tests.

Table 8.4: Economic Viability Results

Scenario	HOUAYXAY						LUANG NAMTHA			
	EIRR (%)	NPV (KN billion)	EIRR (%)	NPV (KN billion)	EIRR (%)	NPV (KN billion)	EIRR (%)	NPV (KN billion)	EIRR (%)	NPV (KN billion
	Solid Waste Management		Urban Roads and Drainage		Integrated Urban Development		Solid Waste Management		Integrated Urban Development	
Base Case	16.0	5.7	18.7	9.8	32.9	63.1	13.8	2.5	18.9	16.3
10% Increase in Capital Cost	15.0	4.5	14.8	4.4	30.4	60.0	12.9	1.4	15.0	7.4
10% Increase in O&M Cost	15.8	5.3	18.3	9.1	32.7	62.7	13.5	2.2	18.5	15.0
10% Decrease in Benefits	14.7	3.6	14.0	2.6	30.0	53.2	12.6	0.8	14.1	4.5
1-Year Delay in Benefits	14.1	3.0	13.1	2.1	26.6	51.3	12.2	0.2	13.2	3.7
Switching Value-Capital Cost	50.0		18.0		201.0		23.0		18.0	
Switching Value-O&M Cost	174.0		127.0		1408.0		79.0		129.0	
Switching Value-Benefits	-28		-14		-64		-15		-14	

EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

G. Distribution of Net Economic Benefits and Poverty Impact Ratio

18. The subprojects are expected to generate total NEBs ranging from KN0.8 billion to KN63.1 billion, with a significant portion accruing to integrated urban development and roads and drainage beneficiaries. A significant number of person-days of local labor will be needed for physical construction, rehabilitation, or replacement of the facilities, as well as their eventual operation, which will benefit local laborers. The computed poverty impact ratios for the infrastructure investments range from 20% to 27%, which means that at least 20% of the NEBs will directly benefit the poor.

19. Summary results and detailed computations are shown in Tables 6 to 9 of the Supplementary Appendix.