

## FINANCIAL ANALYSIS

### A. Bus Rapid Transit Subproject

1. **Bus operating cost.** The operating cost of the bus rapid transit (BRT) system has been estimated based on an international BRT system's operating cost model, with prices localized for the Lao People's Democratic Republic (Lao PDR). The model was selected for its predictive accuracy.<sup>1</sup> The model analyzes the BRT system's operating costs by categories of (i) vehicle operations; and (ii) fare system, control center, and station services operations. For the BRT subproject, fee-based services of (i) a vehicle operating company; and (ii) a fare system, control center, and station services operating company will be procured through separate competitive bidding. A summary of the estimated BRT subproject operating costs is in Table 1.

**Table 1: Bus Rapid Transit Subproject Bus Operating Costs (\$)**

Item	Parameter	Cost per km	Cost per Bus	Annual Cost
Bus fleet size (number of buses)	96			
Annual bus passenger-distance (passenger-km)	72,566,306			
Annual bus distance (km)	3,918,581			
Vehicle operating cost				2,807,771
Vehicle operating variable cost		0.423		1,655,717
Vehicle operating fixed cost			12,001	1,152,053
Fare system, control center, and station services cost				1,403,885
<b>Total BRT operating cost</b>				<b>4,211,656</b>
Bus operating cost per passenger-km				0.06

BRT=bus rapid transit, km = kilometer.

Note: The table uses 2014 constant prices.

Source: Asian Development Bank estimates.

2. The annual bus distance in Table 1 is derived from the equilibrium average daily bus passenger trips and trip distance estimated by transport demand modeling.<sup>2</sup> The average operating cost per passenger-kilometer can be directly compared with average fare revenue.

3. **Revenue, bus fare, and operating cost recovery.** Based on the tariff, bus fares currently average about KN230 per kilometer (km) (footnote 2). However, this figure understates the fare actually paid because of the following: (i) under the present fare regime a passenger traveling a given distance who needs to make at least one transfer between bus lines will end up paying more than another passenger able to travel the same distance without transferring; and (ii) owing to the current Vientiane bus routes system, most trips require a bus transfer (which means greater waiting time as well as a higher fare). The actual fare is likely to be close to KN300 per km. Moreover, the current bus routes are not aligned well to desired travel routes for the area being served, resulting in generally poor bus frequencies and long waiting times at bus stops. Through improved bus service planning, the BRT subproject will cut the average waiting time by about 6 minutes (footnote 2). To motorcycle-owning households in Vientiane, 1 minute of travel time saved is estimated to be worth KN108 (footnote 2). The average trip

<sup>1</sup> The BRT operational cost model is based on the business model originally created for the Bogota Trans-Milenio system and subsequently utilized and refined in cities such as Ahmedabad, Cape Town, Istanbul, Johannesburg, Lima, Mexico City, Rio de Janeiro, and Surat. The cost used in the financial analysis has particularly utilized the cost ratios developed for the Cape Town "MyCiti" BRT system, on account of a similarity in the operation design of the BRT subproject and the MyCiti system.

<sup>2</sup> ADB. 2014. *Vientiane BRT Conceptual Design, Final Report*. Consultant's Report. Manila (TA 7964-LAO).

distance of a BRT subproject bus passenger is anticipated to be 6 km. With the average waiting time per trip cut by 6 minutes, each km of an average bus trip will save KN108 in value of waiting time, which means that, for the average trip, a BRT subproject bus fare set at KN408 per km can be considered equivalent to the current KN300 per km equilibrium bus fare.<sup>3</sup> Compared to the operating cost of KN470 per passenger-km, the KN408 per km fare revenue falls short of the operating cost recovery fare by KN62 per passenger-km.

4. **Bus fare elasticity and fare analysis.** To understand the BRT subproject's financial sustainability, analysis was done on the scope for increasing fare revenue by adjusting the fare tariff. The assessment of financial sustainability examined projected operating results over 15 years. Surveyed international studies on transport demand indicate that the corresponding price elasticity of demand for bus service averages  $-0.40$  over a 2-year period,  $-0.56$  over a 5-year period, and  $-1.00$  over a 10-year period.<sup>4</sup> The calculated weighted average fare elasticity for a projection period of 15 years is thus  $-0.83$ .<sup>5</sup> Table 2 shows the bus ridership levels and fare revenues for (i) the base case, with the current KN 2,500 average fare per trip; (ii) a scenario with the fare at a revenue-maximizing level of KN3,000; and (iii) a scenario with a higher fare of KN3,300.

**Table 2: Fare Analysis for Bus Rapid Transit Subproject Operating Cost Recovery**

Average Fare (KN)	2,500	3,000	3,300
Operating cost per passenger (KN)	2,821	2,821	2,821
Daily ridership (number of trips)	39,242	32,728	28,819
Annual fare revenue (KN million)	32,865	32,891	31,860
Annual operating cost (KN million)	34,114	34,114	34,114
Fare revenue shortfall (KN million)	(1,249)	(1,223)	(2,255)

( ) = negative.

Note: The table uses 2014 constant prices.

Source: Asian Development Bank estimates.

5. The results confirm the BRT subproject's need for external financial support. Raising fares will not solve the operating deficit issue, given that the maximum revenue obtained by raising fares adds barely 1% to the base case fare revenue. Furthermore, a fare set at a higher level would require even more support, as it would decrease the number of passengers.

## B. Parking Subproject

6. **Parking cost.** The parking subproject investment and operation will be procured as a build–operate–transfer (BOT) public–private partnership concession through competitive bidding, based on an annual payment of a concession fee to the government. The parking subproject cost was taken from an adaptation of the costing for an implemented on-street parking BOT concession.<sup>6</sup> Table 3 summarizes the investment cost for a 10-year BOT on-street parking concession in the Vientiane core area for 2,087 spaces for cars and 1,770 for motorcycles.

<sup>3</sup> The bus fare assumed is a flat fare of KN2,500, which equals about KN417 per km given a 6 km average trip distance.

<sup>4</sup> TRL. 2004. *The demand for public transport: a practical guide*. London.

<sup>5</sup> A convex demand curve was assumed in conducting the fare analysis.

<sup>6</sup> The costs are based on prices and remuneration rates in the People's Republic of China. Consequently, the parking subproject cost is conservative. The costs related to financing were independently estimated based on financing costs for transport BOT concessions in neighboring countries. ADB. 2014. *Vientiane Parking Reform*. Consultant's Report. Manila (TA 7964-LAO).

**Table 3: Parking Subproject Public–Private Partnership Investment Cost**

<b>Item</b>	<b>Amount (\$)</b>	<b>Share (%)</b>
<b>System and Equipment Cost</b>		
Parking meter equipment, signage, and installation	1,313,860	34.7
Occupancy sensor equipment and signage	446,180	11.8
Network management software and information communication technology equipment	425,865	11.2
Office furnishing and equipment	276,794	7.3
<b>Subtotal</b>	<b>2,462,699</b>	<b>65.0</b>
Project management, testing, commissioning, and contingency	1,327,718	35.0
<b>Total</b>	<b>3,790,417</b>	<b>100.0</b>

Note: The table uses 2014 constant prices.

Source: ADB. 2014. *Vientiane Parking Reform*. Consultant's Report. Manila (TA 7964-LAO).

7. The parking concession operation and maintenance cost was estimated by activity group, as shown in Table 4.

**Table 4: Parking Subproject Annual Operating Cost**  
(\$)

<b>Activity</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Years 4–10</b>
Parking Control <sup>a</sup>	855,000	641,250	427,500	425,000
Customer Services	151,219	151,219	151,219	151,219
Security	77,042	77,042	77,042	77,042
Technical O&M	694,832	694,832	694,832	694,832
Support <sup>b</sup>	408,805	408,805	408,805	408,805
<b>Total</b>	<b>2,186,898</b>	<b>1,973,148</b>	<b>1,759,398</b>	<b>1,756,898</b>

O&M = operation and maintenance.

Note: The table uses 2014 constant prices.

<sup>a</sup> This represents parking enforcement cost; the relatively high cost in years 1 and 2 reflects the expected effort to establish and enforce a regime where practically none exists.

<sup>b</sup> Support activities include information technology, public relations, legal, human resources, and general administration.

Source: ADB. 2014. *Vientiane Parking Reform*. Consultant Report. Manila (TA 7964-LAO).

8. **Parking revenue and concession fee.** International experience of tolled on-street parking indicates that, with a transparent collection method and enforcement, there will be strong willingness to pay an on-street parking fee (i) that is high relative to the public transport fare, and (ii) that is raised frequently (if required) to balance demand and supply of parking spaces (footnote 2). On this basis, implementing a parking fee of KN5,000 per car and KN2,750 per motorcycle in 2021, with an annual real fee adjustment of 7.5% from 2022 to 2031 and 5.0% thereafter, was assumed for the analysis. Details of other assumptions, including the terms of concessionaire limited recourse leveraged financing, of projected financial statements and related financial viability analysis for the BOT parking concession, appear in the Project Financial Sustainability supplementary document.<sup>7</sup> The analysis indicates that the operator of the system can pay an annual concession fee equal to 65% of the concession gross profit (after depreciation), while retaining the ability to satisfy the opportunity cost pricing of the debt and equity investment funds. These results support a reasonable expectation that the parking concession will provide substantive project revenue and operating subsidy support for the BRT subproject.

<sup>7</sup> Project Financial Sustainability (accessible from the list of linked documents in Appendix 2 of the main text).

### C. Project Financial Sustainability Analysis

9. To complete the present examination of the financial sustainability of the BRT subproject, projected financial statements including an income statement, cash flow statement, and balance sheet were developed for the whole project for a 15-year period after project completion. The financial statements include the anticipated ongoing costs of the BRT and nonmotorized transport subprojects, but not those of parking and electronic vehicle registration, as these are the intended responsibility of the public–private partnership concessionaires. The statements report on the estimated revenue of the BRT subproject and the estimated parking subproject concession fee revenue, but the vehicle registration fee generated from the electronic vehicle registration subcomponent is not included as project revenue, as it is an established public revenue. However, the government is expected to derive greater vehicle registration fee revenue from a more efficient electronic vehicle registration-based fee collection method. The increased revenue could be used to provide the capital grant for replacement of buses and related equipment, and subsidization of operation of the BRT subproject (para. 5).

10. The projected financial statements are expressed in kip in nominal values, with bus fare revenue escalated annually at 2.0% and costs at 3.0%, with the exception of capital cost of equipment, which is escalated at 1.5%. The projected financial statements for the alternative fare scenarios with the fare at a revenue-maximizing level of KN3,000; and a scenario with a higher fare of KN3,300 are included in the Project Financial Sustainability supplementary document (footnote 7). The projected financial statements for the base case average bus fare of KN2,500 at constant 2014 prices per passenger trip appear in Table 5.

11. Based on the projected financial statements, the project requires the following for financial sustainability: (i) a capital grant for the replacement of the BRT buses and fare and traffic control systems; and (ii) a temporary operating subsidy of an expected total of \$3.7 million equivalent during the first 4 years of operations, the SUTMA operation and staff costs, and the maintenance of parts of the BRT and nonmotorized transport subproject infrastructure not covered by the BRT operating and other BRT contracts. However, the bus revenues and parking concession fees are expected to equal or exceed bus operating costs in all years except 2021–2022. Moreover, the operating subsidy is expected to be recovered from the project net cash flow within a 15-year period after project completion.

**Table 5: Projected Financial Statements: Financial Sustainability of the Project Operation**  
(KN million)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
<b>Income Statement</b>															
Bus operating revenue	23,061	26,882	30,847	34,960	35,660	36,373	37,100	37,842	38,599	39,371	40,159	40,962	41,781	42,617	43,469
Parking concession fee	6,652	9,453	12,461	14,241	16,151	17,913	20,155	22,583	25,210	28,053	30,796	32,864	35,044	37,343	39,766
<b>Total revenue</b>	<b>29,712</b>	<b>36,335</b>	<b>43,309</b>	<b>49,201</b>	<b>51,811</b>	<b>54,286</b>	<b>57,255</b>	<b>60,425</b>	<b>63,809</b>	<b>67,424</b>	<b>70,954</b>	<b>73,825</b>	<b>76,825</b>	<b>79,960</b>	<b>83,235</b>
BRT operating contract cost	27,156	27,971	28,810	29,674	30,565	31,482	32,426	33,399	34,401	35,433	36,496	37,591	38,718	39,880	41,076
Other BRT contract cost	13,578	13,985	14,405	14,837	15,282	15,741	16,213	16,699	17,200	17,716	18,248	18,795	19,359	19,940	20,538
Management entity staff and operation	1,235	1,272	1,310	1,350	1,390	1,432	1,475	1,519	1,565	1,612	1,660	1,710	1,761	1,814	1,868
BRT, NMT infrastructure maintenance	3,126	3,220	3,316	3,416	3,518	3,624	3,733	3,845	3,960	4,079	4,201	4,327	4,457	4,591	4,728
<b>Total operating expenses</b>	<b>45,096</b>	<b>46,448</b>	<b>47,842</b>	<b>49,277</b>	<b>50,755</b>	<b>52,278</b>	<b>53,846</b>	<b>55,462</b>	<b>57,126</b>	<b>58,839</b>	<b>60,605</b>	<b>62,423</b>	<b>64,295</b>	<b>66,224</b>	<b>68,211</b>
Total depreciation, amortization	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	43,129	43,129	45,796	45,796	45,796
Interest paid	9,046	8,586	9,455	8,818	8,180	7,543	6,906	6,268	5,631	4,994	4,357	3,719	3,082	2,445	2,038
<b>Net income</b>	<b>(65,960)</b>	<b>(60,231)</b>	<b>(55,519)</b>	<b>(50,425)</b>	<b>(48,656)</b>	<b>(47,067)</b>	<b>(45,028)</b>	<b>(42,837)</b>	<b>(40,479)</b>	<b>(37,941)</b>	<b>(37,136)</b>	<b>(35,446)</b>	<b>(36,348)</b>	<b>(34,505)</b>	<b>(32,809)</b>
<b>Cash Flow Statement</b>															
Net income	(65,960)	(60,231)	(55,519)	(50,425)	(48,656)	(47,067)	(45,028)	(42,837)	(40,479)	(37,941)	(37,136)	(35,446)	(36,348)	(34,505)	(32,809)
Add: depreciation, amortization	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	41,531	43,129	43,129	45,796	45,796	45,796
BRT buses	0	0	0	0	0	0	0	0	0	0	(59,060)	(137,807)	0	0	0
Fare and traffic systems	0	0	0	0	0	0	0	(29,994)	(69,987)	0	0	0	0	0	0
<b>Total renewal investment</b>	<b>0</b>	<b>(29,994)</b>	<b>(69,987)</b>	<b>0</b>	<b>(59,060)</b>	<b>(137,807)</b>	<b>0</b>	<b>0</b>	<b>0</b>						
Change in net working capital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in loans outstanding	(16,200)	(16,200)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(28,013)	(11,813)
Government debt service funding	25,246	24,786	37,467	36,830	36,193	35,556	34,918	34,281	33,644	33,006	32,369	31,732	31,095	30,457	13,850
Government capital grant	0	0	0	0	0	0	0	29,994	69,987	0	59,060	137,807	0	0	0
<b>Cash flow before operating subsidy</b>	<b>(15,383)</b>	<b>(10,113)</b>	<b>(4,533)</b>	<b>(76)</b>	<b>1,055</b>	<b>2,008</b>	<b>3,409</b>	<b>4,963</b>	<b>6,683</b>	<b>8,584</b>	<b>10,349</b>	<b>11,403</b>	<b>12,530</b>	<b>13,735</b>	<b>15,024</b>
Government operating subsidy	15,683	10,113	4,533	76	0	0	0	0	0	0	0	0	0	0	0
<b>Net cash flow</b>	<b>300</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,055</b>	<b>2,008</b>	<b>3,409</b>	<b>4,963</b>	<b>6,683</b>	<b>8,584</b>	<b>10,349</b>	<b>11,403</b>	<b>12,530</b>	<b>13,735</b>	<b>15,024</b>
<b>Balance Sheet</b>															
Cash balance	300	300	300	300	1,355	3,363	6,772	11,735	18,418	27,003	37,352	48,755	61,284	75,020	90,044
Net working capital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed assets	734,996	734,996	734,996	734,996	734,996	734,996	734,996	764,990	834,977	834,977	894,037	1,031,844	1,031,844	1,031,844	1,031,844
Less: Cumulative depreciation	41,531	83,062	124,593	166,124	207,656	249,187	290,718	332,249	373,780	415,311	458,440	501,569	547,364	593,160	638,955
<b>Net fixed assets</b>	<b>693,465</b>	<b>651,934</b>	<b>610,402</b>	<b>568,871</b>	<b>527,340</b>	<b>485,809</b>	<b>444,278</b>	<b>432,741</b>	<b>461,197</b>	<b>419,666</b>	<b>435,597</b>	<b>530,275</b>	<b>484,480</b>	<b>438,684</b>	<b>392,888</b>
<b>Total assets</b>	<b>693,765</b>	<b>652,234</b>	<b>610,702</b>	<b>569,171</b>	<b>528,696</b>	<b>489,172</b>	<b>451,050</b>	<b>444,476</b>	<b>479,615</b>	<b>446,669</b>	<b>472,949</b>	<b>579,030</b>	<b>545,764</b>	<b>513,704</b>	<b>482,932</b>
Loans	494,100	477,900	449,888	421,875	393,863	365,850	337,838	309,825	281,813	253,800	225,788	197,775	169,763	141,750	129,938
EU AIF and GEF grants	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754	70,754
Accumulated income	(65,960)	(126,191)	(181,710)	(232,135)	(280,791)	(327,857)	(372,885)	(415,722)	(456,201)	(494,141)	(531,278)	(566,723)	(603,071)	(637,576)	(670,385)
Government counterpart fund	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942	153,942
Government debt service fund	25,246	50,032	87,499	124,329	160,522	196,078	230,996	265,277	298,921	331,927	364,296	396,028	427,123	457,580	471,430
Government capital grant fund	0	0	0	0	0	0	0	29,994	99,982	99,982	159,042	296,848	296,848	296,848	296,848
Government bus operating subsidy fund	15,683	25,797	30,330	30,406	30,406	30,406	30,406	30,406	30,406	30,406	30,406	30,406	30,406	30,406	30,406
<b>Total liabilities and equity</b>	<b>693,765</b>	<b>652,234</b>	<b>610,702</b>	<b>569,171</b>	<b>528,696</b>	<b>489,172</b>	<b>451,050</b>	<b>444,476</b>	<b>479,615</b>	<b>446,669</b>	<b>472,949</b>	<b>579,030</b>	<b>545,764</b>	<b>513,704</b>	<b>482,932</b>
Working ratio <sup>1</sup>	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bus operating cost coverage index <sup>2</sup>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1=Operating expenses/revenue; 2=Revenue from bus and parking operations/bus operating cost

BRT = bus rapid transit, EU-AIF = European Union-Asian Investment Facility, GEF = Global Environment Facility, NMT = non-motorized transport.

<sup>a</sup> Operating expenses/revenue.

<sup>b</sup> Revenue from bus and parking operations/bus operating cost.

Source: Asian Development Bank estimates.