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Economic Analysis

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SRI: Second Integrated Road Investment Program – Tranche 2

Improvement, Rehabilitation and Maintenance of selected roads in Western Province

Prepared by the Road Development Authority, Ministry of Highways for the Asian Development Bank.

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Asian Development Bank

Ministry of Highways

SECOND INTEGRATED ROAD INVESTMENT PROGRAM

Providing Services for Preparation of Environmental, Social Safeguard Documents, Economic Analysis for Improvement Rehabilitation and Maintenance of

1. Galle Road (A002) from William Junction to Maliban Junction
2. Peliyagoda Puttlam Road from Peliyagoda Roundabout to Nawaloka Roundabout & Dandugama to Kochchikade Bridge
3. Kotte Bope Road (B240) From Malabe to Godagama
4. Rathmalana Mirihana Road (B389)
5. B062: Borella–Rajagiriya Road (Cotta Road) (from 0+000 km to 1+380 km)
6. B214: Kelaniya–Mudungoda Road from Nagahamulla Junction to Belummahara Junction (from 6+000 km to 29+000 km)
7. B263: Malabe–Kaduwela Road (from 0+000 km to 5+630 km)
8. B345: Pagoda–Pitakotte Road (from 0+000 km to 1+530 km)
9. B368: Pitakotte–Thalawathugoda Road (from 0+000 km to 4+100 km)

Economic Analysis Report

October 2020

Prepared by

SMEC in Association with RDC & MHEC

On behalf of

Road Development Authority
Ministry of Highways

Submitted to

Asian Development Bank

Economic Analysis

Date: October 2020

Survey and Preliminary Engineering (SAPE) works for Second Integrated Road Investment Program

Rehabilitation and improvement of:

1. Galle Road (A002) from William Junction to Maliban Junction
2. Peliyagoda Puttlam Road from Peliyagoda Roundabout to Nawaloka Roundabout & Dandugama to Kochchikade Bridge
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Prepared by SMEC in Association with RDC & MHEC for the Road Development Authority, Sri Lanka

INTEGRATED ROAD INVESTMENT PROGRAM

ECONOMIC ANALYSIS

for

Selected Project Roads under Road Management Contracts in Western Province

A. Introduction

1. **Project Overview.** Asian Development Bank (ADB) provides financial assistance to the Government of Sri Lanka for rehabilitating selected rural and national roads under two phases of Integrated Road Investment Program (iRoad). The first phase was launched in 2014 and implemented in Central; North Central and North Western; Sabaragamuwa; Southern; and Western provinces to (i) upgrade and maintain about 2,200 km of rural access roads to all-weather standard and (ii) rehabilitate and maintain about 400 km of national roads to a good condition. When this phase advances, the original scope was revised to include 3,105 km of rural access roads. Eventually, the first phase of the program awarded 3,130 km of roads for civil works under the conventional road construction contracts while another 77 km under the road management contracts. About 2,500 km, awarded under the conventional road contracts, already have been upgraded and currently under a 3 year performance-based maintenance period. The second phase of the program was launched in 2016 to (i) upgrade and maintain about 3,400 km of rural access roads to an all-weather standard and (ii) rehabilitate and maintain about 340 km to a good condition of national roads in Eastern, Northern, Uva, and Western provinces. Under this phase, civil works in all provinces now have been commenced and in progress.

2. **Proposed project road sections.** The Government has proposed rehabilitation of nine national road sections in Western Province, with a total length of 73.82 km, as a scope change to the first phase of iRoad program under the road management contracts. Those proposed roads are included in two construction packages and listed in Table 1 together with their lengths and lane capacities.

Table 1: Project Road Details

Package No	Road	Chainage	Traffic Lanes (Nos)	Length (km)
1	A002: Colombo - Galle	8+320 – 13+350	4	5.03
	A003: Peliyagoda - Puttalam	0+000 – 0+600	2	0.60
		19+000 – 32+400	4	13.40
		32+400 – 37+550	2	5.15
	B240: Kotte – Bope	5+000 – 16+800	2	11.80
	B389: Rathmalana - Mirihana	0+000 – 2+200	2	2.20
			Sub-Total (Package 1)	**38.18**
2	B062: Borella - Rajagiriya	0+000 – 1+380	4	1.38
	B214: Kelaniya - Mudungoda	6+000 – 29+000	2	23.00
	B263: Malambe – Kaduwela	0+000 – 5+630	2	5.63
	B345: Pagoda - Pitakotte	0+000 – 1+530	2	1.53
	B368: Pitakotte - Thalawathugoda	0+000 – 4+100	2	4.10
			Sub-Total (Package 2)	**35.64**
			Total (Package 1 & 2)	**73.82**

Source: Project Management Unit, Integrated Road Investment Program, Road Development Authority

3. All proposed road sections are located on flat terrain and passing through urban and semi-urban areas in the Western Province. Out of nine road sections, two sections form the parts of major arterial national roads of A002 and A003, which are connecting Colombo to Southern and Northern Western Provinces of the country, respectively. All the other seven sections form the whole or a part of roads connecting major townships in Colombo District. The complete sections of A002 and B062, and a part of A003, from 19+000 to 32+400, currently operate with 4 traffic lanes. All the other sections are in two traffic lane configuration.

4. At present, all these proposed sections are surfaced with asphalt concrete and maintain a fairly deteriorated pavement condition with a roughness value varying between 3.5 -5.0 m/km. The proposed rehabilitation targets to improve the geometry, pavement, shoulders, drainages, and safety features of the project road sections, while surfacing the carriageway with asphalt concrete. The rehabilitations do not intend to widen any of the project roads beyond their existing right-of-way, but their widths of traffic lanes and shoulders will be standardized.

B. Demand Analysis

5. **Demand categorization.** Traffic demand estimate consists of (a) normal traffic passing along the project road despite the fact that it is improved or not, (b) diverted traffic shifting from another route in competition, and (c) generated traffic occurring additionally in response to road improvement. The base-year traffic only consists of the normal traffic while the future traffic, estimating over the project benefit period, includes all the above three categories.

6. **Base year traffic.** The base-year traffic (2020) for the project road sections were estimated by homogeneous sections based on the classified traffic counts provided by the Road Development Authority (RDA). For this analysis, full lengths of all project roads were considered as homogeneous, except for A003, which was discontinued in geography and lane configuration, thus required to consider under three different homogeneous sub-sections. The provided field counts by RDA were first averaged to estimate the average daily traffic (ADT) and then converted to the annual average daily traffic (AADT) by multiplying with an appropriate seasonal factor. Due to the non-availability of historical traffic data, a seasonal factor of 1.0 was assumed in this estimation. The estimated AADTs for each homogeneous sections are summarized in Table 2 by vehicle types.

Table 2: Base Year Traffic (2020) for the Homogeneous Road Sections
(AADT, Number of Vehicles/day)

Road (Chainage)	2 & 3 Wheelers	Car/Vans	Buses	Freight Vehicles	AADT	
					MT	NMT
A002 (8+320 – 13+350)	29,818	25,788	3,804	1,749	61,159	998
A003 (0+000 – 0+600)	14,872	5,123	1,766	3,907	25,668	568
A003 (19+000 – 32+400)	22,700	14,389	3,134	4,733	44,956	925
A003 (32+400 – 37+550)	19,989	12,671	2,760	4,168	39,588	812
B240 (5+000 – 16+800)	19,941	10,643	1,036	3,822	35,442	625
B389 (0+000 – 2+200)	13,533	10,131	439	2,277	26,380	725
B062 (0+000 – 1+380)	35,297	22,374	4,872	7,356	69,899	635
B214 (6+000 – 29+000)	18,860	7,743	707	3,623	30,933	625
B263 (0+000 – 5+630)	18,781	12,440	998	4,169	36,388	543
B345 (0+000 – 1+530)	6,953	7,808	300	820	15,881	325
B368 (0+000 – 4+100)	16,980	17,403	380	2,094	36,857	675

AADT = Average Annual Daily Traffic, MT = Motorized, NMT = Non-Motorized (only bicycles)
Source: Planning Division, Road Development Authority

7. **Future traffic.** The future traffic is an aggregation of the normal, diverted, and generated traffic growing over time in response to the socio-economic development of the project influenced area. RDA has forecasted the future traffic for the project road sections by using STRADA (System Traffic Demand Analysis) model developed based on the four-step demand forecasting method (trip generation, trip distribution, and model choice & traffic assignment) in traffic theories. This forecasting is for 'without project scenario' and hence only takes the normal traffic into account. Hence the diverted and generated traffic were needed to estimate separately and incorporate into the analysis.

8. The model, calibrated with present road network features and user characteristics, generates a user origin-destination matrix enabling to estimate present vehicular demand on the project road sections. The zonal trip generations which contribute to the vehicular demand on a given project road section are related to zonal socio-economic parameters such as population, vehicular population, labor force, and regional production and thereby build-up a best-fitted correlation. Assuming such found correlation will remain unchanged, trip generations and, in turn, vehicular demand on the particular project road section are estimated for future years by using predicted socio-economic parameters as applicable. Such forecasted traffic till 2045 presents in Table 3 as AADTs for the project roads in homogeneous section-wise. It should be noted that this forecasting has taken the likely impact of COVID-19 into account.

Table 3: Forecasted Traffic for Project Benefit Period
(AADT, Number of Motorized Vehicles/day)

Road (Chainage)	2020	2025	2030	2035	2040	2045
A002 (8+320 – 13+350)	61,159	65,612	69,966	74,011	80,424	87,393
A003 (0+000 – 0+600)	25,668	26,369	32,843	35,295	42,440	51,031
A003 (19+000 – 32+400)	44,956	47,403	53,257	57,051	64,427	72,757
A003 (32+400 – 37+550)	39,588	43,111	48,642	54,612	61,608	69,500
B240 (5+000 – 16+800)	35,442	38,810	49,446	52,797	59,582	67,239
B389 (0+000 – 2+200)	26,380	27,266	35,034	37,882	42,299	47,231
B062 (0+000 – 1+380)	69,899	72,136	86,090	95,798	109,448	125,043
B214 (6+000 – 29+000)	30,933	38,761	49,588	55,255	62,989	71,806
B263 (0+000 – 5+630)	36,388	49,506	64,031	71,230	80,226	90,358
B345 (0+000 – 1+530)	15,881	17,749	21,965	23,583	25,555	27,692
B368 (0+000 – 4+100)	36,857	38,943	44,897	47,784	53,099	59,005

AADT = Average Annual Daily Traffic
Note: Non-motorized vehicles only include bicycles, and they are expected to grow at 1.8% during 2021-2030 and 1.5% during 2031 – 2040, aligning with the population growth.
Source: Planning Division, Road Development Authority

9. Since diverted and generated traffic have not been properly evaluated, they were to add as percentages of the normal traffic in future forecast. However, the diverted traffic was not considered in this analysis, since there are no routes in competition with the selected project roads. The generated traffic estimated at 5% of the normal traffic was applied to all project road sections as road rehabilitation would improve inter-regional mobility by reducing the travel time.

C. Economic Analysis

10. **Methodology and assumptions.** The economic analysis follows ADB's guidelines and uses the HDM-4 model to compare transport costs for road agency and road users under with- and without-project scenarios.[1]The without-project scenario includes routine and periodic maintenance for the project road sections and no capacity improvement, whereas the with-

[1] Asian Development Bank. 2017. *Guidelines for the Economic Analysis of Projects*. Manila.

project scenario includes rehabilitation or up-gradation to the specified standard together with required routine and periodic maintenance.

11. The economic analysis was conducted in the domestic price numeraire presented in the national currency and for a 22-year benefit period for each road section, which includes a 2 year construction period commencing from the first quarter of the year 2021. The constructed road sections would be opened for traffic in the first quarter of 2023. The project includes newly-built structures that have an asset life much longer than the benefit period. Hence, the salvage value of 10% at the end of the benefit period was estimated, assuming a 40-year life span for the structures. The analysis used 2020 constant prices and a discount rate of 9% to actualize net benefits. A shadow exchange rate factor of 1.033, estimated from trade data, was used for approximating the domestic price equivalent of tradable inputs and outputs.[2] A shadow wage rate factor of 1.0 for skilled and semiskilled workers; and 0.72 for unskilled labor were estimated based on current wages of the construction industry.

12. **Construction cost.** The construction costs for the project road sections are based on their engineer's financial estimate. These estimates include those for civil works, environmental impact mitigation (to control dust, noise, waste, and traffic disruption caused by construction), shifting utilities, quality control, construction supervision, project management, and contingencies. Such estimated financial cost of construction was converted to economic cost by excluding financial contingencies and applying the shadow exchange factor and shadow wage rate factors to the remainder as stipulated in the ADB guidelines (footnote 1). The estimated financial and economic construction costs per km for the project road sections are summarized in Table 4. These estimated costs for each project road section will be disbursed as 40% in 2021 and 60% in 2022 during their construction.

Table 4: Construction costs per km
(SLRs)

Package No	Road	Chainage	Financial	Economic
1	A002: Colombo - Galle	8+320 – 13+350	164,646,741	133,586,790
	A003: Peliyagoda - Puttalam	0+000 – 0+600	127,077,382	103,407,101
		19+000 – 37+550	183,115,946	147,204,647
	B240: Kotte – Bope	5+000 – 16+800	78,567,066	63,745,702
	B389: Rathmalana - Mirihana	0+000 – 2+200	100,576,755	81,529,591
		Package 1	**144,117,196**	**116,245,718**
2	B062: Borella - Rajagiriya	0+000 – 1+380	101,919,134	83,766,424
	B214: Kelaniya - Mudungoda	6+000 – 29+000	165,630,770	136,130,448
	B263: Malambe – Kaduwela	0+000 – 5+630	123,250,863	100,956,941
	B345: Pagoda - Pitakotte	0+000 – 1+530	104,041,470	85,510,753
	B368: Pitakotte - Thalawathugoda	0+000 – 4+100	170,781,288	140,363,613
		Package 2	**122,077,574**	**100,120,233**
		Package 1 & 2	**133,393,954**	**108,399,963**

Source: Project Management Unit, Integrated Road Investment Program, Road Development Authority

13. **Maintenance costs.** The costs for periodic and routine maintenance were calculated based on Highway Schedule of Rates (HSR) and recent road expenditure details. For asphalt concrete roads, the cost for periodic overlay was estimated at SLRs 1,700 per m^2 for 40 mm thickness. Unit prices for treatments were estimated at SLRs 450 per m^2 for patching, SLRs 1,200 per m^2 for edge repair, SLRs 330 per m^2 for crack sealing, SLRs 1,200 per km for shoulders. The regular annual routine maintenance cost for weeding, cleaning ditches, and re-

[2] International Monetary Fund. http://data.imf.org/regular.aspx?key=61545859 (accessed September 2020).

painting markings etc., was estimated at SLRs 45,000 and SLRs 20,000 per km for with and without project scenarios.

14. **Project benefits.** The economic analysis presented herein estimates four categories of tangible benefits: (i) savings in vehicle operating costs due to improved road conditions, (ii) savings in travel time due to increased travel speeds, (iii) savings in carbon dioxide (CO_2) emission cost, and (iv) savings in non-motorized (NMT) user costs. In addition to tangible benefits, the project will generate intangible benefits due to the accelerated economic growth of its influenced areas as it provides improved access to social, health, education, market, employment facilities for the inhabitants. Moreover, there would be a likely reduction in road accidents following the improvements in road geometry, pavement, road signs, and markings etc. Ignorance of these intangible benefits suggests that the project's feasibility indicators are certainly stronger than the derived herein.

15. **Travel time cost savings.** The average operating speeds on the proposed road sections are currently in-between 30 - 40 km/h. Following the proposed rehabilitation, these speeds would only increase by 5 -10 km/h as the project mainly targets to improve the road pavement condition but not the capacity. The HDM 4 assesses the value of time saved by comparing travel times in the with- and without-project scenarios weighted with unit time values of passengers. The unit time values of passengers used in the HDM 4 are given in Table 5. Those values were estimated using current income levels and relevant published data in a methodology recommended by a government manual,[3] which defines users of public and private transport by income categories.

Table 5: Value of Travel Time for Passengers and Occupancy Rates, 2020

Vehicle Type	Value of Work Time (SLRs/hr)	Value of Non-work Time (SLRs/hr)	Occupancy Rate
Two- and three-wheeler	123.6	20.5	1.5
Car/Van	650.6	108.4	Car: 2.5/Van: 4.0
Public transport	64.4	10.7	25.0–35.0

hr = hour, SLRs = Sri Lanka rupees.
Source: Consultant's estimates.

16. **Cargo delay.** The value of cargo delay per hour was derived as the opportunity cost of capital tied up in delayed cargo (value of cargo multiplied by the interest rate) and was estimated at SLRs 11.56 for light trucks, SLRs 25.43 for medium trucks, SLRs 42.38 for heavy trucks and SLRs 77.05 for multi-axle trucks. These estimations assume cargo values per ton to range between SLRs 250,000 – SLRs 300,000 across different vehicle categories, an interest rate of 12%, and two-thirds of cargo vehicles benefited.

17. **Vehicle operating cost savings.** The HDM 4 was used to estimate the vehicle operating cost (VOC) for the traffic under the with- and without-project scenarios. The model estimates VOCs taking into account the speed and travel time of vehicles; road surface quality; road congestion; vehicle characteristics, utilization and their economic prices (including capital cost, maintenance cost, crew cost, fuel, and lubricants). The net reductions in VOCs are presented as savings. Vehicle characteristics are as per the manufacturer's specifications while their utilization and economic prices are derived from recent road user cost studies and market surveys.

18. **CO_2 emission savings**. The emission model built into HDM 4 is capable of estimating the net annual change (increase or decrease) of CO_2 in terms of quantity when the project is implemented. For this estimation, the model primarily uses input characteristics data for vehicle fleet and road conditions. Such estimated savings in quantity were monetized by using a unit value of $36.30 per tonne of CO_2 in 2016 prices and expected to increase by 2% annually in real terms (footnote 1).

[3] Government of Sri Lanka, Ministry of Finance and Planning. 2001. *Assessing public investment in the transport sector.* Colombo.

19. **NMT Savings.** These savings were estimated only for bicycles in terms of VOC and time savings. HDM 4 predicts that bicycles are gained a speed increase of about 2-3 km/hr after the improvement of the project road sections. This gain is translated to the time saving by using the unit time value of SLRs 22/hour and an average occupancy of 1.1 passengers. The model estimates savings in operating cost by using key inputs of operating weight of 100 kg, average life of 10 years; annual working hours of 150 km and annual km ridden of 2500.

20. **Economic feasibility.** The results of the economic analysis for individual project road sections, packages, and total investment are presented in Table 6 in terms of economic internal rate of return (EIRR) and economic net present value (ENPV) at 9% discount rate. These results demonstrate that selected project roads are eligible for implementation as all of them, road-wise and package-wise, are economically feasible with an EIRR above the threshold values of 9% at the base case. Further, the cost-benefit stream developed by aggregating all project roads (Table 7) provides an EIRR of 15.7% and thereby indicates that the proposed total investment is also economically feasible for implementation as a whole.

21. **Sensitivity analysis.** The robustness of the economic feasibility of project roads is tested with a sensitivity analysis conducted in the form of risk analysis and switching value analysis. These analyses tested the economic feasibility against uncertainties in estimated capital costs and benefits associated with the project road sections. The risk analysis was conducted with respect to adverse changes in the estimated costs (15% increase), benefits (15% decrease), and the combination of those two cases (worst case) that can negatively influence the project's economic feasibility. The results of this analysis, given in Table 6, indicate that EIRRs of the project road sections remain robust against all sensitivity scenarios, including the worst-case. Only the sections of B345 and A003 fall marginally below the EIRR threshold of 9% at the worst case. However, the switching values, presented in Table 6, indicate that those two roads require about 20% increase in cost or decrease in benefits to turn unfeasible. Such unfavorable variations in costs and benefits are unlikely since more conservative approaches were followed in their estimations for the base-case. Moreover, the results of switching value analysis for all the other road sections demand an unlikely increase in capital costs, ranging from 41.3% to 211.0%, and decrease in benefits, ranging from 30.8% to 69.2%, to turn project roads unfeasible. Therefore, sensitivity analysis affirms the economic feasibility of project road sections demonstrating their unlikeliness to turn unfeasible even with the adverse changes in project costs and benefits.

Table 6: Results of Economic Analysis

Road Sections	Base Case (with CO_2 Benefits)		Base Case (without CO_2 Benefits)		Sensitivity Cases (EIRR, %)			Switching Value, (% change)	
	EIRR, %	**ENPV,** SLRs Million	**EIRR,** %	**ENPV,** SLRs Million	**+15% Capital Cost**	**-15% Benefit**	**Worst Case**	**Capital Cost (+)**	**Benefits (-)**
Package 1	**14.8**	**2,109.8**	**15.2**	**2285.4**	**12.6**	**12.4**	**10.5**	**50.4**	**35.1**
A002: Colombo - Galle	14.2	262.2	15.0	309.7	11.9	11.8	9.7	41.3	30.8
A003: Peliyagoda - Puttalam	11.8	636.5	12.3	760.7	9.9	9.8	8.0	23.9	20.3
B240: Kotte – Bope	24.0	1084.9	24.2	1086.5	21.0	20.8	18.2	151.7	62.1
B389: Rathmalana - Mirihana	18.1	126.2	18.2	128.5	15.4	15.2	12.8	74.0	44.1
Package 2	**16.7**	**2601.5**	**16.8**	**2615.0**	**14.6**	**14.4**	**12.4**	**77.2**	**45.0**
B062: Borella - Rajagiriya	16.0	122.1	16.9	138.9	13.9	13.8	11.8	68.4	42.7
B214: Kelaniya - Mudungoda	14.4	1120.6	14.5	1119.4	12.4	12.2	10.4	50.8	34.9
B263: Malambe – Kaduwela	24.9	965.1	25.0	959.8	22.3	22.0	19.7	211.0	69.2
B345: Pagoda - Pitakotte	11.4	40.5	11.4	40.2	9.5	9.3	7.6	19.9	17.3
B368: Pitakotte - Thalawathugoda	20.6	353.2	20.8	356.7	17.9	17.7	15.3	108.2	53.5
Both Packages (Aggregated)	**15.7**	**4711.3**	**16.0**	**4900.4**	**13.6**	**13.4**	**11.4**	**62.4**	**39.9**

EIRR = economic internal rate of return; ENPV = economic net present value
Source: Consultant's estimates.

Table 7: Cost-Benefit Stream for Aggregated Project Roads (Total Investment)
(SLRs million, 2020 constant prices)

Year	Capital Costs	Recurrent Costs	VOC Savings	VOTT Savings	NMT Saving	CO_2 Savings	Net Benefits	Discounted Benefits
2021	3,181.2	0.0	0.0	0.0	0.0	0.0	(3,181.2)	(3,181.2)
2022	4,771.8	(591.5)	0.0	0.0	0.0	0.0	(4,180.3)	(3,835.2)
2023	0.0	1.9	435.7	594.1	4.0	(19.8)	1,012.2	851.9
2024	0.0	1.9	457.7	587.9	4.0	(42.2)	1,005.5	776.4
2025	0.0	1.9	506.8	615.6	4.1	(26.1)	1,098.6	778.3
2026	0.0	1.9	550.1	643.3	4.2	(27.7)	1,168.1	759.2
2027	0.0	1.9	592.3	671.9	4.3	(29.0)	1,237.6	738.0
2028	0.0	1.9	645.9	698.9	4.4	(29.4)	1,318.0	721.0
2029	0.0	1.9	709.0	737.9	4.6	(26.6)	1,423.0	714.2
2030	0.0	1.9	765.1	781.4	4.7	(13.4)	1,536.0	707.2
2031	0.0	1.9	806.2	798.9	4.9	(14.1)	1,594.0	673.3
2032	356.1	1.9	859.0	819.0	5.0	(14.2)	1,310.9	508.0
2033	0.0	1.9	612.8	838.3	4.3	(16.4)	1,437.2	511.0
2034	0.0	1.9	646.8	857.2	4.5	(16.3)	1,490.3	486.1
2035	0.0	1.9	692.8	876.9	4.6	(16.1)	1,556.3	465.7
2036	0.0	1.9	751.0	903.6	4.7	(15.7)	1,641.7	450.7
2037	0.0	1.9	811.6	934.2	4.9	(15.3)	1,733.4	436.6
2038	0.0	1.9	932.6	992.2	5.0	(13.3)	1,914.6	442.4
2039	0.0	1.9	1,047.6	1,039.4	5.2	(13.5)	2,076.7	440.3
2040	0.0	1.9	1,091.1	1,050.3	5.3	(16.5)	2,128.3	413.9
2041	0.0	1.9	1,159.3	1,079.3	5.5	(16.9)	2,225.4	397.1
2042	(449.7)	1.9	1,242.0	1,110.0	5.8	(17.0)	2,788.7	456.5
TOTAL	**7,859.4**	**(553.8)**	**15,315.4**	**16,630.2**	**94.1**	(399.4)	24,334.7	4,711.3
							ENPV @ 9%	**4,711.3**
							EIRR	**15.7%**

( ) = negative, CO_2 = carbon dioxide, EIRR = economic internal rate of return, ENPV = economic net present value, NMT = Non-Motorized Traffic, VOC = vehicle operating cost, VOTT = value of travel time.
Source: Consultant's Estimates.

D. Conclusions and Recommendations

22. All project road sections are economically feasible for implementation as they individually record an EIRR value above the threshold value of 9% at base-case and remains robust at all possible negative sensitivity scenarios. Thus it is recommended to proceed with their constructions without a delay to maximize the anticipated benefits.