

## ECONOMIC ANALYSIS

### A. Background

1. The economic analysis, which was carried out following the Asian Development Bank's (ADB's) *Guidelines for the Economic Analysis of Projects*, compared with- and without-project scenarios using the EIRR (economic internal rate of return) and net present value (NPV) at a 12% discount rate as measures.<sup>1</sup> The project's overall viability is rated based on (i) the assessment of five individual road subprojects within Output 1; (ii) the assessment of a representative community-based tourism subproject for Output 2; and (iii) an overall viability assessment based on the first two assessments, plus the additional costs for project management and capacity development within Output 3. These findings are detailed in the supplementary appendixes.

### B. Output 1: Road Subprojects

2. The Viet Nam Development Triangle Area (VDTA) provinces rely on agriculture for employment and income generation. Improved transport links will (i) increase the connectivity of these economies to regional and international markets, (ii) increase the efficiency and market orientation of rural and agricultural production, and (iii) provide the rural poor with access to services and markets. While past investment in national and provincial highways and productive rural infrastructure has yielded significant gains, it is necessary to strengthen the links between the two. The investment proposed under this project addresses these gaps.

3. Five road subprojects with a total length of 263 kilometers (km) will be constructed or upgraded. The project focuses on connections with national highways—local connections will be supported by future government and donor programs. The key arterials in the project areas are the north–south National Highways 14 and 14C, which link Ho Chi Minh City—a logistics and export node—with international border crossings. The project roads were selected from an initial list of roads that met the overall project objectives. The prioritization process used a multicriteria analysis that scored potential projects in terms of agricultural production, population served, ethnic minority populations impacted, and poverty rates, as well as access to key national highways and border crossings.

#### 1. Assumptions

4. The major assumptions were as follows:

- (i) The analysis considered a 23-year period, comprising a 3-year implementation period and 20 years of subsequent use of the reconstructed roads.
- (ii) Land acquisition and resettlement costs were based on opportunity costs. The value of lost production over the project's life was estimated based on average yields for the province, assuming a 50% profit margin and 12% discount rate.
- (iii) Economic costs and benefits were converted to economic prices in constant 2016 values using a domestic price numeraire but expressed in US dollars.
- (iv) Economic costs were estimated excluding taxes and duties, using a shadow price of foreign exchange of 1.1 (equivalent to a standard conversion factor SCF of 0.98).
- (v) The shadow price of labor was estimated in accordance with ADB guidelines. The value used was 0.7. This was also applied to the value of travel-time savings.

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<sup>1</sup> ADB. 1997. *Guidelines for the Economic Analysis of Projects*. Manila; ADB. 1996. *Economic Valuation of Environmental Impacts: A Workbook*. Manila.

- (vi) An allowance was made for traffic delays during construction.

## 2. Costs

5. The financial costs were derived from the preliminary engineering designs and bill of quantities that were reviewed and modified by the project preparatory technical assistance. The economic costs are distributed over 3 years, with the first year of works disbursing in project year 3. The total economic cost for Binh Phuoc (\$15.1 million), Dak Lak (\$16.0 million), Dak Nong (\$16.4 million), Gia Lai (\$15.4 million), and Kon Tum (\$17.5 million).

6. Maintenance costs were estimated assuming that (i) periodic resurfacing costing \$125,000 per km will be necessary in the without-project scenario in 2020, 2030, and 2039; and (ii) routine maintenance is currently planned (not on an as-needed basis) in both the with- and without-project scenarios at a rate of \$2,000 per km, except for the 5 years of project implementation, and at a rate of \$1,000 per km for the first 5 years after construction.

## 3. Benefits

7. Reduced vehicle operating costs (VOCs) and time savings yield major benefits. VOCs by vehicle type vary with the state of the pavement as measured by the International Roughness Index (IRI) and were derived from the Highway Design and Maintenance Model 4. Improved surfaces also increase speed, saving time. The VOC of business travel by bus or motorcycle is \$0.9 per hour, and by car is \$2.0 per hour, with non-business travel costs set at 25% of the business rates. The VOC as a function of the IRI is shown in Table 1. The planned rehabilitation will reduce the IRI of the project roads to 2; this will gradually rise to around 8, at which stage a mid-life overlay is assumed. The current IRIs of the project roads vary from 8 to greater than 16.

**Table 1: Vehicle Operating Costs as a Function of the International Roughness Index**

IRI	Cars	Small– Medium– Sized Buses	Large Buses	Light– Medium– Sized Trucks	Heavy Trucks (3 axles)	Heavy Trucks (>3 axles)	Motorcycles	Tractors
2	23.1	31.4	57.7	34.0	52.2	57.5	4.0	9.6
5	25.2	35.7	66.0	37.4	58.4	62.9	4.2	10.9
8	27.5	40.6	75.5	41.1	65.3	68.8	4.5	12.3
12	30.9	48.2	90.4	46.6	75.7	77.6	4.9	14.5
16	34.8	57.2	108.1	52.8	87.8	87.6	5.4	17.0

IRI = International Roughness Index.

Source: Highway Development and Maintenance Management System 4 analysis.

8. The project's benefits depend heavily on traffic volume. Traffic on the project roads is relatively light, with a high proportion of motorcycles (see Table 2).

**Table 2: Daily Baseline Traffic**

Section	Province	Motorcycles	Cars	Buses	Trucks	Total PCU
PR 675A	Kon Tum	192	32	4	157	207
PR 665	Gia Lai	3461	102	18	23	3619
NR 29	Dak Lak	6002	180	60	148	6546
PR 686	Dak Nong	794	142	36	169	1212
PR 756	Binh Phuoc	658	112	24	129	1053

NR = National Road , PCU =Passenger Car Units , PR = Provincial Road.

Source: Consultant estimates.

9. The available historical traffic count data did not provide an adequate basis for traffic projections. To estimate future traffic with and without the project, historical data were

reviewed, including (i) average yearly growth of transport activity (14%–15%), (ii) the percentage of the population who own vehicles (2% [cars] and 90% [motorcycles]), (iii) average yearly growth of agricultural output (6%–7%), and (iv) average provincial gross domestic product growth (4.6%–13.4%). A travel elasticity with respect to gross domestic product of 1.2 was used, resulting in growth rates of 7%–9%. This was tested by a sensitivity analysis.

10. The benefits assessed included (i) reduced agency costs for routine and periodic maintenance, (ii) reduced VOCs, (iii) reduced user times, and (iv) generated traffic. Agency cost savings are based on periodic resurfacing (every 10 years) costing \$125,000 per km, and routine maintenance at a cost of \$2,000 per km. The with-project scenario applies a 50% reduction in maintenance costs for 5 years, with a mid-life overlay after 10 years.

#### 4. Results

11. An economic analysis was undertaken for each of the five road subprojects, by comparing the two treatment options with the do minimum treatment option. The EIRRs for the provincial subprojects are 13.3% (Binh Phuoc), 16.0% (Dak Lak), 12.2% (Dak Nong), 18.5% (Gia Lai), and 12.7% (Kon Tum). For Output 1, the investment across all subprojects is assessed as feasible, with an EIRR of 14.6% (see Table 4).

12. A sensitivity analysis was carried out to test the effects of adverse changes in the key parameters that determine the project benefits and costs. The sensitivity analysis (Table 3) indicates that total costs would have to increase by 20% or traffic decrease by 33% for the EIRR to reach the threshold level of 12%. Neither traffic generation nor travel-time savings are required to make the project viable.

**Table 3: Sensitivity Analysis**

	Change (%)	EIRR (%)	NPV (\$'000)	Switching Value (%)
Base case		14.6	13,327	
Increase in total cost	20	12.0	-1	20
Reduction in traffic	20	13.1	5,264	33
Reduction in generation	20	14.4	12,380	-
Reduction in VOC	20	13.1	5,360	33
Reduce VOT saving	20	14.4	12,284	-

EIRR = economic internal rate of return, NPV = net present value, VOC = vehicle operating cost, VOT = value of time.

Source: Consultant analysis.

#### C. Output 2: Tourism Subprojects

13. The sector and social assessments indicated the importance of (i) increased passenger numbers and associated visitor growth within the VDTA, and (ii) transport connectivity in the project area to increase rural communes' opportunities for economic growth, the lack of which has resulted in poverty rates above the national average. Within these communes, ethnic minorities are overrepresented in households rated as poor, and the number of households rated as near poor has been increasing since 2010. If the VDTA's economic objectives are to be advanced, it is essential to prioritize options for capturing the potential value of increased visitation within the rural communes. The VDTA and local Socio-Economic Development Plans (SEDP's) both prioritize (i) community-based tourism, (ii) the building of enterprises that support tourism through locally sourced goods and services, and (iii) the development of tourism products based on historical, cultural, and natural assets. The project will support the further development of community-based, pro-poor tourism at seven subproject sites, contributing to the implementation of sector plans and priorities. An initial feasibility study of the seven subprojects assessed the proposed investment's economic viability.

**Table 4: Analysis of Output 1 (Overall)**  
(\$'000)

Year	Capital Works		Maintenance		User VOC		User Time		Generated Traffic		Net Benefit	
	With	Without	With	Without	With	Without	With	Without	VOC	Time		
2017	26,795	0	254	508	22,071	22,071	1,747	1,677	0	0	-26,610	
2018	26,795	0	254	508	26,528	26,528	2,158	2,078	0	0	-26,620	
2019	26,795	0	254	508	31,894	31,894	2,666	2,575	0	0	-26,632	
2020	0	31,750	254	508	28,824	38,251	1,898	3,186	988	133	43,840	
2021	0	0	254	508	31,555	32,583	2,110	2,234	107	13	1,526	
2022	0	0	254	508	34,547	36,481	2,345	2,581	202	24	2,651	
2023	0	0	254	508	37,824	40,851	2,606	2,983	316	38	4,012	
2024	0	0	508	508	41,413	45,749	2,896	3,447	453	56	5,396	
2025	0	0	508	508	45,344	51,242	3,219	3,984	616	78	7,357	
2026	0	0	508	508	49,650	57,401	3,578	4,605	810	105	9,692	
2027	0	0	508	508	54,367	64,308	3,977	5,322	1,040	138	12,463	
2028	0	0	508	508	59,534	72,055	4,420	6,152	1,310	177	15,739	
2029	0	0	508	508	65,195	79,179	4,913	6,857	1,463	199	17,589	
2030	9,302	31,750	508	508	71,396	85,326	5,461	7,370	1,456	195	39,937	
2031	0	0	508	508	67,674	68,534	4,384	4,588	103	22	1,190	
2032	0	0	508	508	74,138	76,803	4,873	5,305	293	45	3,435	
2033	0	0	508	508	81,224	86,080	5,417	6,133	524	74	6,171	
2034	0	0	508	508	88,989	96,490	6,022	7,092	803	110	9,484	
2035	3,278	0	508	508	97,501	108,173	6,694	8,200	1,138	155	10,192	
2036	0	0	508	508	102,801	121,286	7,032	9,482	1,940	251	23,126	
2037	0	0	508	508	112,607	136,006	7,816	10,965	2,457	323	29,327	
2038	0	0	508	508	123,354	152,533	8,688	12,681	3,064	410	36,646	
2039	0	31,750	508	508	135,131	167,749	9,657	14,141	3,424	461	72,737	
											<b>NPV</b>	<b>13,327</b>
											<b>EIRR</b>	<b>14.6%</b>

EIRR = economic internal rate of return, NPV = net present value, VOC = vehicle operating cost.

Sources PPTA consultants estimates

14. The subprojects will invest in (i) homestay rooms; (ii) a cultural performance facility and supporting costumes, training, and marketing; (iii) a water supply and sanitation infrastructure for visitors and the local community; (iv) a goods supply chain for local food and beverage enterprises; (v) capacity building for local tourism service providers; and (vi) links to and promotion in the tourism market.

### **1. Assumptions and Methodology**

15. The same basic assumptions were used for Output 2 as were used for Output 1, except that labor costs form a much higher proportion of the capital investments (assumed to be 40%). Financial costs were derived from provincial planning estimates and modified by the project preparatory technical assistance. The total economic investment, which will be distributed across 4 years, is \$159,800. The first year costs support the feasibility study, and with the actual investment will be spread over the next 3 years.

16. Maintenance costs were set at 2% of the capital investment, with 15% of the capital cost being replaced every 7 years.

### **2. Benefits**

17. The project benefits are based on incremental increases in the number of visitors, amount spent by the visitors, and additional revenues from the homestay business. The assumptions used include the following:

- i. Projections as to the expected number of provincial visitors consider national and international visitors separately, with national visitors accounting for 90% of all visitors and each visitor spending an average of 1.3–1.5 days in the region. Growth rates for 2015 are adjusted by 0.7.
- ii. Site visitation figures assume a provincial visitation rate of less than 1.00%, comprising 0.50% international visitors and 0.30% national visitors in the without-project scenario; these figures increase to 0.75% and 0.50% in the with-project scenario. Each visitor will spend \$8 on average (30% of the average daily rate).
- iii. Homestay occupancy is calculated at 5% in the dry season and 30% in the wet season in the without-project scenario; these figures increase to 10% and 50% in the with-project scenario.
- iv. Incremental revenue is reduced by 25% for leakage out of Viet Nam and by 25% for substitution of spending between existing and proposed project sites.

### **3. Results**

18. A \$13,000 benefit is expected in year six (2022); this will initially decrease to \$10,000 after allowing for maintenance costs, but will increase to \$108,000 by 2038. A capital replacement charge of \$24,000 is provided for in 2028 and 2035.

19. The subprojects have an average estimated EIRR of 15.5%, which is expected to be sufficient to cover the capacity strengthening costs of Output 2.

### **D. Output 3: Project Management and Capacity Development**

20. There are no directly measurable benefits from Output 3. The total expected cost of Output 3 is \$7.6 million, which is covered by the NPV of Output 1 and expected value of Output 2.

### **E. Conclusions**

21. All of the road and tourism subprojects have EIRR's that fall above the required hurdle rate and support the project's wider multisector objectives. Furthermore, the subprojects' projected NPV is sufficient to cover project management and capacity building costs.