ECONOMIC AND FINANCIAL ANALYSIS

A. Traffic Forecast

1. Vehicular traffic measures are based on the Department of Public Works and Highways (DPWH) traffic surveys for each project road. Average traffic volume varies significantly, currently ranging from a high of about 35,100 vehicles per day on the Butuan–Cagayan de Oro road to a low of about 1,100 vehicles per day on the Olongapo–Bugallon Road.

2. Forecasts by traffic and vehicle type were prepared for the project roads for 2011–2033 (Table 1). The forecasts are based on expected growth of factors such as population and real per capita income, and on the income elasticity of demand for transport. Total traffic is forecast to grow at annual rates ranging from 1.9% on the Dipologo–Oroquieta road to 4.4% on the Bauang–Baguio road. The growth rates for the other project roads are in the range of 2.5%–3.3%. The projected growth rates are considered reasonable, considering expected economic growth in the project area. Normal traffic is expected to comprise all forecast traffic, with no diverted or generated traffic, as (i) the civil works only involve asset preservation of existing roads, and (ii) no viable alternative routes are available for the project roads. Potential alternative routes are substantially longer, often twice as long.

Table 1: Projected Traffic (Annual Average Daily Traffic) for Project Roads

Name of Road	2010	2015	2020	2025	2030
Bauang–Baguio	3,992	5,011	6,162	7,649	9,498
Olongapo–Bugallon	1,095	1,288	1,509	1,774	2,079
Iloilo–Capiz (old route)	6,700	7,765	8,995	10,332	11,877
Dumaguete North Road	5,322	6,572	8,048	9,557	11,311
Palo–Carigara–Ormoc (Liloan naval highway)	2,949	3,472	4,050	4,731	5,507
Daang Maharlika Road	5,587	6,408	7,224	8,155	9,190
Dipolog–Oroquieta City	2,241	2,488	2,723	2,984	3,270
Butuan–Cagayan de Oro City (Misamis Oriental)	35,131	40,275	46,175	52,826	60,821
Bukidnon–Cotabato	3,282	3,761	4,306	4,934	5,636
Butuan–Cagayan de Oro (Agusan del Norte)	1,642	1,977	2,305	2,657	3,083

Source: Asian Development Bank.

B. Economic Analysis

3. The economic analysis for the project compares the with- and without-project scenarios. In the without-project scenario, the road is assumed to remain in its present condition. The with-project scenario includes routine and periodic maintenance according to international standards. The project preparatory technical assistance considered various mutually exclusive project alternatives, such as different pavement types, and the project is based on the most cost-effective and least-cost option. The economic analysis covers 22 years (2011–2033), based on a 2-year implementation period. All benefits and costs are in constant 2010 prices. The economic prices are expressed using the world price numeraire.

4. **Costs.** Project economic costs include the resource costs of periodic road maintenance, consulting services, and the institutional capacity development component. Price contingencies, interest during construction, and taxes and duties are excluded. Costs are divided into tradable and nontradable portions. A standard conversion factor of 0.8 was applied to the nontradable portion. To take into account local unemployment and underemployment, costs for unskilled

labor were adjusted by a shadow wage rate factor of 0.8 to arrive at the economic opportunity cost. The project will not result in any significant incremental recurrent costs, as all roads to be improved under the project already exist and require maintenance expenditure.

5. **Benefits.** The primary economic benefits are vehicle operating cost (VOC) savings from normal traffic, as the project includes periodic maintenance of existing roads. Economic benefits are calculated using the same methodology used for costs. Unit economic VOCs for nine types of vehicles were estimated using the Highway Design and Maintenance Standards Model-IV. Savings from improved road safety will be accrued, but these have not been quantified because of the lack of sufficient data.

6. **Results of economic analysis.** An economic internal rate of return (EIRR) of 36.2% was calculated for the project; the net present value is $161.24 million, using a 12.0% discount rate (Table 2).

Table 2: Economic Internal Rate of Return

	Base Care		
Year	**Total Cost**	**Total Benefits**	**Net Benefits**
2012	35.47	0.00	(35.47)
2013	21.28	0.85	(25.43)
2014	0.00	14.47	14.47
2015	0.00	20.19	20.19
2016	0.83	23.37	22.54
2017	0.00	27.01	27.01
2018	0.12	31.00	30.88
2019	1.18	35.78	34.60
2020	2.25	40.51	38.26
2021	0.05	43.74	43.69
2022	5.87	45.99	40.11
2023	18.94	47.53	28.59
2024	0.78	51.14	50.36
2025	0.00	53.27	53.27
2026	0.25	55.43	55.18
2027	0.00	57.76	57.76
2028	4.84	59.74	54.89
2029	0.00	62.14	62.14
2030	1.33	64.82	63.49
2031	0.00	67.48	67.48
2032	0.00	70.26	70.26
2033	0.00	73.02	73.02
		EIRR	36.21
		NPV	161.24

( ) = negative value, EIRR = economic internal rate of return, NPV = net present value.
Sources: Asian Development Bank and technical assistance consultant estimates.

7. **Sensitivity analysis.** This analysis was carried out to test the effects of negative changes in key parameters that determine the project benefits and costs. It indicates that capital costs would have to increase by 166.4% or total benefits decrease by 51.0% for the EIRR to reach 12.0% (Table 3). Such changes are not expected to occur. The sensitivity analysis shows that the EIRR exceeds 12.0% in all cases. There will be some obstructions of traffic during project implementation; however, these will only have a minor impact and will not significantly affect the project's viability

Table 3: Sensitivity Analysis

Item	EIRR (%)	ENPV ($ million)	Switching Value (%)
Base case	36.2	161.2	
Total benefit (20%)	31.0	117.4	53.3
Capital costs increase by 20%	31.9	149.6	166.4
Normal traffic (20%); capital costs increase 20%	27.1	105.8	
One-year implementation delay	35.2	137.2	

( ) = negative value, EIRR = economic internal rate of return, ENPV = economic net present value.
Sources: Asian Development Bank and technical assistance consultant estimates.

8. **Distribution analysis.** The analysis was carried out to examine the project's impact on beneficiaries, using the same EIRR methodology and assumptions for discount rate, price numeraire, constant price, and standard conversion factor adjustment. The project benefits are distributed among five national groups: (i) users of passenger transport, (ii) users of freight transport, (iii) vehicle owners, (iv) laborers, and (v) the government and economy. Users of passenger transport vehicles will receive about 57.0% of the total net benefits accruing from the project, users of freight transport vehicles about 15.0%, vehicle owners and operators about 20.0%, laborers (both vehicle crews and construction workers) about 5.0%, and the Philippine economy about 3.0%.

C. Financial Analysis

9. The project is financially sustainable. Project road improvements will result in lower costs for routine maintenance than would be the case without the project. While financing for road maintenance in the Philippines is not adequate, the situation is improving. General appropriations for road maintenance have been increasing since 2007, when they were reintroduced. The World Bank is addressing the issue of insufficient financing of road maintenance through strengthening the operation of the road board and utilization of the motor vehicle user charge special funds, reviewing and updating the mandate and implementing rules and regulations of the road board and road fund, and supporting appropriate expansion of the revenue base of road-user cost recovery to a sustainable level. Given the government's commitment to improving the condition of the project roads, the operation of the road board, and financing of road maintenance generally, it is expected to provide sufficient financing for the maintenance of project roads.