ECONOMIC ANALYSIS

1. The economic analysis of the Sustainable Urban Transport for Ho Chi Minh City Mass Rapid Transit Line 2 Project considered with- and without-project scenarios. Under the with-project scenario, the project's intended mass transit line (MRT) proposed access improvements, public transport system enhancements, and policy changes were assumed to be effective and to provide the benefits of integrated public transport in Ho Chi Minh City (HCMC). The without-project scenario assumed that project's outputs were not delivered and the expected benefits of better coordinated, coherent public transit and urban transport in general were not achieved.

2. The economic assessment covered 35 years, 2014–2048, comprising 5 years of project preparation and construction during 2014–2018 and a 30-year benefit period. Benefits and costs were calculated in constant 2013 prices. Values were border equivalent prices for tradable goods, and domestic prices after removing the effects of taxes and subsidies for non-tradable goods.

A. Demand Forecast

3. The analysis used transport demand forecasts for the MRT Line 2 prepared in a 2010 feasibility study: 135,000 passengers per day in 2018, and 328,500 passengers per day in 2028. Using the feasibility study estimate of a post-2028 traffic growth rate of 3.5% per annum, the daily demand in 2038 was estimated to be 463,365 passengers per day. The demand estimates in terms of the project station entries and exits excluded transfers between other MRT lines. The daily demand in terms of passenger entries and exits at the project stations was estimated to be 128,960 passengers per day in 2018 and 412,745 passengers per day in 2038.

4. These demand forecasts took into account incremental demand on MTR Line 2 expected to result from the project. The demand for the sustainable transport measures was forecast by assuming that the average perceived time saving per passenger for access to MRT stations would be 1.3 minutes. These time savings are conservatively assumed to be 10% of the project case MRT demand (i.e. or 11% of the base case demand).[1] A summary of the forecast passenger trips is in Table 1.

B. Costs

5. The project's economic costs were derived from the financial capital cost estimate and the recurrent financial operation and maintenance (O&M) costs. The project capital cost included the costs of construction, equipment, project administration, design and management consultancy, land acquisition, and resettlement compensation. The equipment cost included the acquisition of a public transport information system, as well as the cost of mid-life refurbishment of rolling stock and replacement of electrical and mechanical systems at the expiry of a 15-year useful life. Economic costs excluded taxes, duties, price contingencies, and interest during construction, but included physical contingencies. The infrastructure has an economic life of 20 years, and the systems and equipment a useful life of 15 years.

[1] This time saving was estimated by the study team by a systematic examination of how proposed measures would affect each access mode user at each station in 2018 and in 2038.

Table 1: Estimated Daily Demand by Access Mode, 2018 and 2038

Access Mode 2018	Base Case (MRT Line 2) No.	%	Sustainable Urban Transport (SUT) Alone No.	%	Project Case (MRT 2 with SUT) No.	%
Walk-in or local walk	48,368	41.7	5,374	41.8	53,743	41.7
Cycle-in, share/ local cycle	5,371	4.6	597	4.6	5,967	4.6
Bus	24,626	21.2	2,736	21.3	27,362	21.2
Car Driver	534	0.5	0	0	534	0.4
Car Passenger	1,481	1.3	165	1.3	1,646	1.3
Taxi Passenger	4,221	3.6	469	3.7	4,690	3.6
Motorcycle Driver	10,162	8.8	1,129	8.8	11,291	8.8
Motorcycle Passenger	21,350	18.4	2,372	18.5	23,723	18.4
Total	**116,113**	**100.0**	**12,842**	**100.0**	**128,955**	**100.0**

Access Mode 2038	Base Case (MRT Line 2) No.	%	Sustainable Urban Transport (SUT) Alone No.	%	Project Case (MRT 2 with SUT) No.	%
Walk-in or local walk	154,809	41.7	17,201	41.8	172,010	41.7
Cycle-in, share/ local cycle	17,189	4.6	1,910	4.6	19,099	4.6
Bus	78,817	21.2	8,757	21.3	87,574	21.2
Car Driver	1,708	0.5	2,000	4.9	3,708	0.9
Car Passenger	4,742	1.3	527	1.3	5,268	1.3
Taxi Passenger	13,509	3.6	1,501	3.7	15,010	3.6
Motorcycle Driver	32,525	8.8	1,614	3.9	34,139	8.3
Motorcycle Passenger	68,334	18.4	7,593	18.5	75,927	18.4
Total	**371,633**	**100.0**	**41,103**	**100.0**	**412,736**	**100.0**

6. Recurrent O&M costs were estimated to comprise 20% for manpower, 40%–45% for electricity, and 35%–40% for other expenses, including insurance. The estimated O&M costs included an allowance for the recurrent cost of administering and evaluating the project.

C. Benefits and Beneficiaries

7. The project's core benefits were identified using transport modelling and estimating the difference between passengers' perceived travel time and vehicle operating costs (VOC) with and without the project. While important otherwise, the with-project benefits of reduced road decongestion, environmental improvements, and reduced transit fatalities expected to result from a shift from private vehicle travel to public transit were considered minor in the evaluation.

8. **Perceived travel time.** The principal benefits are assumed to be perceived travel time savings, associated travel reliability and land use value increases due to the project measures. The estimated average with-project perceived travel time saving per forecast MRT Line 2 passenger is about 1.3 minutes to access stations and the same to egress stations. The evaluation applied the transport appraisal rule of half to new passengers expected due to the with-project sustainable transport measures, and each was estimated to perceive a benefit of about 40 seconds in each direction. These perceived travel time savings were multiplied by the value of time to derive the incremental changes in consumer surplus (perceived travel time benefit), the key user benefit (see Table 2).

9. **Vehicle operating cost.** Since the forecasts of the number of car and motorcycle drivers switching to MRT due to the project measures and the relevant perceived costs were calculated outside the transport model the price of fuel and other potential perceived out-of-pocket costs were not included in the calculation of consumer surplus. Consequently, switching car drivers were assumed to perceive the full avoided cost of vehicle operation.

10. The unit VOC used in valuing the VOC savings benefit was based on a standard model in current use by an international transport authority for project economic benefit–cost assessment. Fuel prices were independently estimated. The estimate of the economic price of fuel was based on applying standard refining margins to the economic price of crude oil to obtain petrol and diesel prices. As differences in fuel consumption with and without the project are small, the VOCs under the two scenarios were not significantly influenced by fuel prices. Table 2 summarizes the core time costs and VOC per passenger trip with and without the project. The users of the HCMC's region urban transport system are the beneficiaries.

Table 2: Estimated Daily Annual Benefits
($ p.a. 2013 prices)

Benefit Category	2018	2028	2038	2048
User Benefits—Consumer Surplus				
Existing users	0.750	5.700	10.650	11.764
New users	0.042	0.316	0.590	0.652
Total	**0.792**	**6.016**	**11.240**	**12.416**
Other Benefits				
Public transport user reliability and service quality benefit	0.198	1.504	2.810	3.104
Land use value increase benefit:	0.040	0.863	1.686	1.862
Traffic Decongestion Benefit:				
Time and VOC benefits	0.069	0.088	0.107	0.118
Resource Correction for Mode Switchers—Unperceived VOC				
Cars	0.000	0.737	1.475	1.629
Motorcycles	0.099	0.158	0.218	0.241
Total	**0.099**	**0.896**	**1.692**	**1.870**
Environmental benefits				
Reduction in air pollutants	0.042	0.234	0.425	0.470
Greenhouse gas emissions reduction	0.055	0.161	0.267	0.295
Total	**0.098**	**0.395**	**0.693**	**0.765**
Reduced Crash Costs				
Private vehicles	0.006	0.021	0.036	0.040

D. Results of Economic Analysis

11. With capacity maintained to required service levels, the MRT Line 2 can continue to provide transport services and the associated benefits indefinitely. By capitalizing annuities included in terminal values of the project cost streams, allowances were made to ensure that the line would be equipped for an assumed 3.5% annual growth in passenger traffic after 2036. The corresponding terminal values derived from these growth rates were calculated for inclusion in the benefits streams. The evaluation of the MTR Line 2's sustainable transport measures showed an economic internal rate of return (EIRR) of 13.3%, a benefit–cost ratio of 1.14, and a Net Present Value of $4.7 million, using a discount rate of 12% per annum.

12. The majority of the project beneficiaries are likely to be from the poorest 60% of households in HCMC and have incomes lower than the city average. The main beneficiaries will be existing users of public transit, and 94.5% of the benefits in perceived travel time and improve transport reliability will accrue to them. The analysis estimated that up until the MTR Line 2 opens, (i) up to 30% of trips planned by existing public transit users were not made;[2] (ii) 32% were made by bus; (iii) 27% were made by motorcycle; (iv) 6% were made by car; and (v) and 5.4% were made in taxis. Evidence suggests that bus passengers are mainly members of households in the lowest 40% income group. Motorcycle users may have slightly higher incomes on average. Surveys by the HCMC have indicated that females represent slightly less than one-half of all bus passengers. Surveys undertaken in Ha Noi in 2013 showed that motorcycle and bus users were about equally divided between females and males.

E. Sensitivity and Risk Analysis

13. The analysis tested the estimated EIRR for sensitivity to two key variables, separately and in combination: (i) increased project capital costs due to unexpected changes in fuel and other raw material costs; (ii) a decline in project benefits, to account for the uncertainties of estimation and the possible impact of high raw material and oil prices on growth and incomes; and (iii) both.

14. The results of the sensitivity testing shown in Table 3 indicated that achievement of an EIRR of above 12% is sensitive to changes in assumptions on the cost and the benefits levels, demonstrated by the switching values of +14% for the first variable and –13% for the second. Two further tests were undertaken. They showed that (i) a 1-year delay in opening of MRT Line 2, with the same investment schedule as assumed for the principal evaluation, would reduce the EIRR to 12.2%; and (ii) reduced annual gross domestic product growth in Viet Nam of 4% after 2020, rather than base case assumption of 6% for 2020–2030 and 5% thereafter, would reduce the EIRR to 11.3%.

Table 3: Sensitivity Tests

Scenario	EIRR (%)	Switching Value (%)
Base case	13.3	
Capital costs are 10% above most likely value	12.4	14
Benefits are 10% below most likely value	12.3	(13)
Capital costs are 5% above and benefits 5% below most likely values	11.7	

( ) = negative, EIRR = economic internal rate of return.
Source: Asian Development Bank estimates.

15. The risk of a cost increase is moderate and will be partly mitigated by strong international support to the implementing agency. In addition, the benefits are considered to have more upside than downside potential. This is because it is likely that a proposed road development plan for HCMC will not be implemented, which will result in much higher vehicle operating costs than projected in the analysis, thus make the savings in vehicle operating and other costs and the project benefits greater than now estimated.

[2] Trips not made are by public transit users who avoided a trip as existing services are poor and unreliable. A small proportion of former pedestrian and bicycle trips (fewer than 3%) are assumed to be included in the new trips.