The Feasibility Study
on The Can Tho Bridge Construction in
Socialist Republic of Viet Nam

CHAPTER 18

ECONOMIC ANALYSIS

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18.1 Benefits

18.1.1 Direct Benefits

(1) Vehicle Operating Costs

The direct economic benefits of the project road are calculated as savings in vehicle operating costs (VOCs) by a "with" and "without" project comparison scenario. Vehicle operating costs were calculated for the project following a detailed review and updating of a number of recent highway studies performed in Viet Nam.

Specific vehicles that best represent the fleet of different vehicles actually used in Viet Nam were selected based upon the results of traffic surveys and reviews of previous highway feasibility studies.

Vehicle operating costs were divided into two main categories:

- running or variable costs, which are directly related to the operation of the vehicle and include those for fuel, oil, tires, maintenance, depreciation and capital costs; and
- fixed costs, which are incurred whether or not vehicles are operated and include drivers wages, overhead, insurance, and taxes.

However, for the purpose of the estimate of benefits brought about by the construction of bridge, more discerningly expressed VOCs would be desirable to calculate the benefits from the reduction of ferry waiting time or change in travel distance.

In this study two types of VOCs were estimated, they are time related VOCs and distance related VOCs. Time related VOCs are constituted of passenger time costs, crew costs, cargo time costs and standing costs. Assuming the yearly vehicle utilization in terms of hours, the standing costs are interpreted to be time related costs. Distance related costs are constituted of costs for vehicle, fuel, oil, tires, maintenance and time related costs. Time related costs are included in the distance related

costs in this study for the estimate of changes in VOCs accruing to the alteration of route due to the construction of the bridge.

All costs are based on constant 1997 prices. Economic costs do not include taxes and fees.

Data on vehicle operating costs were collected by a Vietnamese counterpart in this study, therefore, the data on VOCs should be reliable for the present situation.

a) Basic data for VOCs

- Passenger time cost

Passenger time costs were estimated from the data on GDRP and the working population in the Mekong Delta. In 1995 the working population was 9.762 million and GDRP in current price terms was 41,671 billion dong, assuming 2,400 working hours a year. 1,800 dong per hour was calculated as the working time cost of workers in the Mekong Delta. Similarly 5,856 dong per hour was estimated as the working time cost of workers in HCMC. The latter figure is considerably above the national average (Table 18.1). Since the traffic between the Mekong Delta and HCMC, or the growth triangle constitutes a considerable portion of the traffic crossing the Hau River, the passenger time cost of workers to be considered in this study should fall somewhere between the above two figures. Provided that the average working time cost of workers is more approximate to that in the Mekong Delta but rather higher than the average, a figure of US$ 0.30 per hour was adopted.

The time cost of non-business or non-working time was assumed at 25 percent of the working time cost.

Assuming that the future increase of passenger time cost is in proportion to the future increase of GDRP per capita, passenger time costs and passenger time costs by vehicle in the forecast years are estimated (Tables 18.2 through 18.5).

- Cargo time cost

For cargo, an average value per ton of US$ 850 per ton was obtained from the field survey in this study (Table 18.6). Based on this average value, cargo time costs were valued by two different approaches. One approach is applying interest rates to cargo value.

The prevailing interest rate is 8 percent for loans in foreign exchange (US$) in Ho Chi Minh City. At an 8 percent interest rate, and assuming a working time of some 196 hours a month, this gives an inventory cost as:

(US$850/ton x 0.08)/(12 months x196 hours/month) = 0.029 US$/ton-hour.

Another approach is using the turn over time of cargoes. If the turn over time of cargo is assumed at one month and infinite demand is assumed, the value of cargo in one hour of transit would be calculated at US$4.337/ton-hour (US$850/ton/196 hours).

The true opportunity cost of cargo should fall somewhere in between the above. Because the difference between the two figures is rather large, a three times larger figure than the lower figure is used, i.e. US$0.087 per ton-hour as cargo time cost in 1997. For the estimate of future cargo time costs the cargo value was assumed to increase at an average rate of 5 percent per annum. Considering the average loading on each vehicle type, cargo time costs by vehicle in the forecast years were estimated (Tables 18.7 through 18.10).

- Vehicle costs

Many different vehicle makes, shapes and sizes can be observed operating in Viet Nam. Although vehicles produced in the former Soviet Union were common, the number of Japanese-manufactured vehicles has rapidly increased and recently Korean-made vehicles have started to emerge. Formerly all new vehicle purchasers belonged to the public sector (including import-export companies and state-owned

enterprises); however, individuals and private companies are allowed to purchase vehicles today.

A combination of Japanese-made and Korean-made vehicle types were adopted for the selection of passenger cars, and light truck types after examining the current market shares and differences in market prices.

The specific vehicles chosen to best represent each vehicle type in Viet Nam are as follows:

Motorcycle (MC):Honda Dream

Passenger Car (PC): Mazda 323 Standard (30%), KIA Pride GTX (70%)

Light Bus (LB): Toyota Hi-Ace

Heavy Bus (HB): Hino RU638

Light Truck (LT): KIA Ceres (60%), Toyota Hi-Lux (40%)

Medium Truck (MT): Hino FF1655 7.5t

Heavy Truck (HT): Kamaz 53212 (20%), Mitsubishi FV (80%)

Nearly all vehicles in Viet Nam are imported. In the case of completely built up vehicles, import duties of 55 percent of the CIF price are levied on passenger cars, 50-60 percent for trucks, and 50-55 percent for buses. The economic prices of vehicles are determined based on the information on market prices and The Export and Import Tariff, Ministry of Finance, 1997 which includes the minimum buying-price list for calculating the import tax.

The estimated tax component of vehicles ranges from 23 percent of the selling price for heavy trucks to 45 percent for that of light trucks (Table 18.11).

With respect to heavy trucks, initially it was assumed that vehicle operating costs of the commonly used Soviet-made heavy trucks would be utilized. However, the economic

VOCs of Soviet-made heavy trucks proved to be much lower than those of Japanese medium trucks. This situation whereby heavy truck VOCs were estimated to be lower than medium truck VOCs contradicts commonly observed VOC trends. Because it can be safely assumed that the older Soviet-made heavy trucks will gradually be replaced by better performance trucks made in other nations, the economic VOC for heavy trucks was estimated after providing the shares of former Soviet-made trucks and Japanese made trucks.

With respect to heavy buses, Japanese and Korean models also appear to be replacing the older Soviet-made types.

- Tires costs

Import duties are 40 percent of CIF for motorcycles, 40 percent for passenger cars, 20 percent for buses, and 10-20 percent for trucks (Table 18.12). The prices of tires produced in Viet Nam are equivalent to 1/2 to 3/5 of those of imported tires. However imported tires prevail in the market because of the small amount of domestically produced tires. Economic costs of tires are estimated to be the CIF price plus 10 percent of retail price as local cost and profit. The economic prices of vehicles are determined based on the information on market prices and The Export and Import Tariff, Ministry of Finance, 1997 which includes the minimum buying-price list for calculating the import tax.

Tires of motorcycles are assumed to be replaced every 15,000 km.

- Fuel and oil costs

Fuel from the former Soviet Union was used in Viet Nam in the past, but this is now being replaced with OPEC fuel imported from Singapore. It is expected that crude oil production and refinery operations will commence in Viet Nam in the near future. The import duties of fuels are 55 per cent of the CIF price for gasoline and 15 percent for diesel respectively (Government Decision 443 TC/QD/TCT, May 1996). The oil

price includes an import duty of 12 percent of the CIF price (Government Decision 443 TC/QD/TCT, May 1996), and profit accounts for 12-18 percent of its selling price (Table 18.13). Replacement of engine oil was assumed to be carried out at 1,500 km running intervals and fuel consumption was estimated at 30 km per liter for motorcycles.

- Maintenance costs

Usually the larger operators have their own workshops, and much of the maintenance costs are hidden in fixed overhead costs; smaller operators undertake much of the maintenance work themselves. Because of these factors, maintenance costs are difficult to estimate. Maintenance of motorcycles was assumed to be implemented at 15,000 km running intervals.

Many spare parts are purchased second-hand or are Vietnamese copies of the originals; these spare parts are generally regarded as being of low quality. Import duties on spare parts range between 5-20 percent. Labor costs for vehicle maintenance are slightly higher than the average countrywide labor costs. The average maintenance labor costs in 1997 were assumed at US$3.00 per hour for four-wheel vehicles and US$1.50 for two-wheel vehicles. The future increase of the maintenance labor cost was assumed to increase in proportion to the future increase of GDRP per capita.

- Crew costs

Crew costs constitute a very small part of vehicle operating costs due to the low labor costs. The typical crew cost in 1997 falls in the range between 1,000,000 and 1,200,000 dong per month (approximately between US$90 and US$100 per month). This translates into a range between US$0.45 and US$0.5 per hour. Considering the commonly observed payment system in Viet Nam in which a bonus is usually not inclusive, US$0.45 per hour was adopted as crew time cost for drivers. Two thirds of driver time cost was adopted as crew time cost for assistants. The future increase of crew costs was also

assumed to increase in proportion to the future increase of GDRP per capita (Table 18.14).

- Standing cost

Annual standing costs are the costs of vehicle ownership; they include overhead, insurance, and taxes or registration fees. During field interviews, some individual operators suggested an overhead rate of 10-30 percent of total operating cost. For light vehicles, overhead costs were determined to be negligible.

According to experience from other countries, a value of 10 percent of the total direct cost represents a reasonable overhead cost for an efficient commercial vehicle operator. Therefore, this figure of 10 percent was adopted for all vehicles except buses, for which a rate of 15 percent was used.

Before 1994, BAOVIET was the main insurance company in Viet Nam, however, seven insurance companies operate at present. The insurance for vehicles is divided into compulsory insurance and voluntary insurance. The premium of compulsory insurance is uniformly regulated by Government decree among insurance companies and varies according to the amount for indemnity which the insurant would receive. In the case of the lowest premium type of compulsory insurance, US$30 a year is charged as the premium for a motorcycle, US$100 a year for a passenger car and US$300 a year for a heavy bus.

Other than the above insurance, registration fees and vehicle inspection for safety are obligatory for all vehicle owners except motorcycle owners. The registration fees are charged at the rate of 4% of the market price of each type of vehicle but levied only once throughout the ownership. A vehicle inspection is first required three years after the commencement of using a new vehicle. The frequency of vehicle inspection depends on the vehicle condition and type, with vehicles for commercial use requiring more frequent inspection. The fee for vehicle inspections varies according to the vehicle type and different rates are applied to foreigners and Vietnamese. In

the case of Vietnamese the vehicle inspection cost is 120,000 VND for passenger cars and up to 200,000 VND for heavy trucks and buses. On average vehicle inspection was assumed to be required once a year (Table 18.15).

- Other conditions for VOC estimate

Interest on Capital

In Viet Nam different interest rates apply according to the currency. The interest rate of the State Bank of Vietnam for lending US$ was 8.5% a year and that for lending dong was 12% a year in 1997. The commercial banks adopted their own interest rates for lending based on their own judgment within the limitation of government financial policy. Vietcom Bank has adopted 8.0% a year as the interest rate for short-term lending of US$ and 12% a year for the lending Vietnamese Dong. Since inflation rates in recent years have fallen, the real interest rate after adjusting for inflation is estimated at less than 10% a year. A real annual rate of interest for decades was assumed to be 8 percent in Viet Nam because of insufficient domestic capital for investment.

Depreciation

A straight line method a with salvage value of 10 percent of initial cost was applied. The average annual decrease in value can then be simply estimated by dividing the new vehicle price by its expected lifetime.

b) VOCs by vehicle type

For the estimate of time related VOCs, passenger time costs crew costs, cargo time costs and standing costs are used. Assuming the yearly vehicle utilization in terms of hour, the standing costs are interpreted to time related costs.

Estimates of distance related VOCs were carried out utilizing the VOC3 model, a subprogram of HDM-III. As stated earlier distance related costs in this study are constituted of costs for vehicle, fuel, oil, tires, maintenance and time related costs.

Because the VOC3 model only applies to four-wheel vehicle types, distance related VOCs of motorcycles were estimated using a manual spread sheet method.

For an IRI value of 4, total vehicle costs vary from US$0.058 per vehicle-km for motorcycles to US$0.689 per vehicle-km for heavy buses. In general, vehicle operating costs for heavy buses and trucks are relatively high because of high fuel consumption and vehicle prices. The rates of time related costs in distance related costs (continuously driving) of motorcycles, passenger cars and buses, accounted for about 45 to 65 percent, and are higher than those of trucks which account for 21 to 24 percent (Table 18.20).

(2) Ferry Operation and Improvement Cost

Survey results of the ferry company budget at Can Tho ferry was interpreted as ferry operation costs. In 1997 for routine maintenance costs and periodic maintenance costs 37 percent and 35 percent of the total expenditure was allocated respectively (Table 18.21). Expenditure for wages was estimated at about 28 percent of total expenditure. Those costs can be considered as savings in ferry operations in the "with bridge" cases and interpreted as benefits due to the bridge construction.

Also additional investment for the ferry to cope with the overflow of ferry traffic can be diverted into benefits due to the bridge construction.

Since it is likely that these ferry operation costs will increase as transport demand across the Hau River increases, the future ferry operation cost was estimated in proportion to the future transport demand crossing the Hau River.

Though the timing and context to what extent of additional investment to cope with the expansion of transport demand depend on management decisions by the ferry company, no clear long-range plan for ferry improvement was obtained. The current ferry improvement plan was assumed to keep the existing service level of ferry operation. According to the hearing survey results at the Road Management Unit No.7 the procurement cost of a new ferry boat was estimated at US$1.6

million, however, this figure seems rather low considering the procurement cost in a neighboring country.

The following unit costs for the ferry improvement project were taken in this study.

Purchasing new ferry boat (200t)	US$2.0 million /boat
Repairing cost of ferry boat	US$0.7 million/boat
Administration and operation	US$0.27 million/boat-year

18.1.2 Indirect Benefits

(1) General

The main objectives of the project road are to (1) facilitate exchange and development within the Mekong Delta and between the Mekong Delta and the growth triangle centered on Ho Chi Minh City, (2) reduce transport costs in the project influence area and induce efficient movement of goods and passengers, (3) support rural development and increase earnings of low-income groups by enhancing the mobility of rural communities, (4) alleviate poverty and provide employment opportunities for women in areas along the route, and (5) promote tourism in the areas involved.

The project in conjunction with improvement of National Road No.1 will shorten distances between different areas on both sides of Hau River in terms of travel time. When the construction of the Can Tho bridge is completed, the radii of one day round trips from and back to each respective major city will expand remarkably. With these much improved transport conditions, many opportunities for the development of socioeconomic activities in the core cities in the Mekong Delta and in the surrounding areas will be created. These additional activities will, in turn, generate a reduction of disparities in income through new job creation in beneficiary industries.

The reduction of vehicle operating costs as a direct benefit of the project road would initially benefit road transport operators; however, it is expected that transport operators would pass on part of the savings to shippers and passengers, through lower freight tariffs and

passenger fares, and to the Government, through payment of taxes on incremental increases in operational profits accruing from the VOC savings.

(2) Promotion of Industries

While a large amount of investment funds has been channeled into heavy industry in Viet Nam, manufacturing output and employment remain overwhelmingly concentrated in light industries for non-durable consumer goods (e.g., textile, garment, tannery). These light-industry factories have been successively constructed around Ho Chi Minh City in recent years, with some being developed with the assistance of foreign aid.

Despite the nation's previous emphasis on heavy industry, the manufacturing labor force is actually well placed as the country shifts its orientation toward export-oriented policies. The Vietnamese Government is eager to secure foreign investment in its export processing zones (EPZs) and industrial estates (IEs).

A recently published report points out that Viet Nam has a debilitating transportation system that inhibits rapid economic growth.

The main objectives of improving existing industries are to increase productivity and quality of goods. To attain these objectives, important requirements include the enhancement of research and development capabilities, rapid correspondence to market needs, expansion of market reach though improved distribution means, and the formation of efficient production networks. All of these prerequisites are closely related to the features of transportation; therefore, the construction of the Can Tho Bridge significantly contributes to the existing and future industries.

The bridge will ultimately lead to a strengthening of existing industrial zones and give rise to the development of new industrial zones within its area of influence. It will also improve utilization of industrial resources, labor, crude oil in offshore areas near the Mekong Delta, and farm produce in the Mekong Delta and establish an domestic production network within its influence area.

(3) Improvement of the Production System

Existing industries will be influenced by the current trends of internationalization, market expansion, and information network innovation only if their production systems are improved. These three trends are realized through increased imports; exploitation of foreign markets; development of international, specialized industries; expansion of direct foreign investment; and encouragement of international technology exchange.

The activity level of industries in the Mekong Delta generally depend on accessibility to major markets. Development of the transport network will produce new markets for industries and at the same time facilitate a change in the cropping pattern. As a result, existing agriculture will be forced to improve their production systems if they are to raise income level.

The industries whose production systems will be most affected by the bridge are the agricultural industries. Freshness is a vital factor for the sale of products such as vegetables, fish, and meat and the project will no doubt stimulate production activities in agriculture and fisheries and promote agro-industrialization in the Mekong Delta.

Likewise, produce-oriented agro-industrial districts will rapidly expand with the improved transport service provided by the project. For example, in the case of rice milling, secondary processing industries would evolve, including rice grading for export, rice grading and packaging for the retail trade, and packaging of (pre-cooked) rice in cans or vacuum packs. Because the project will offer quick and dependable transport of products between the Mekong Delta and other regions or foreign countries, factories and facilities of businesses related to secondary processing industries will emerge along National Road No.1.

18.1.3 Estimate of Benefits

The economic evaluation pursued in this chapter assesses the feasibility of alternatives in terms of all quantifiable benefits, because of the delicate value range of EIRR in the preliminary economic evaluation.

The main quantifiable direct benefits of the project would be savings in waiting time related to freight and passenger traffic with a new bridge. Since it is planned that the existing ferry boats upon completion of the bridge is to be removed to the places where require crossing the river by ferry boats, savings in ferry operating costs for the "with bridge" cases and additional ferry improvement costs for the "without bridge" cases are considered as the benefits of the project.

It is commonly recognized that all direct and indirect benefits due to large infrastructure projects finally converge into land potential and are measured by the market land price. Therefore, the increase in land price is estimated as an overall benefit of the project in this chapter.

However, though the Can Tho bridge is deemed to influence the activities in the whole area of the Mekong Delta region, especially the right bank area of Hau River, only a limited area of the right bank of Can Tho River is expected to have any drastic change in land price.

Since the increase in land price is assumed to comprise both direct and indirect benefits, exclusion of benefit in VOCs savings in the area where an increase in land price is to be measured is theoretically correct to avoid the duplication of benefits. The benefit of land price increases in this study were estimated within only a limited area on the right bank of Can Tho River and the rest of the Mekong Delta was not considered. The traffic volume crossing the Can Tho River generated and attracted to the Delta area was estimated only 2 to 2.5% of those as a whole. Therefore no exclusion of benefits in VOCs savings nor in ferry operating costs were made considering that the benefit left out in the estimate of land rice offset the benefits in VOCs savings and ferry operation related to the area where the increase of land price was measured.

The direct benefits in intermediate years were estimated by interpolation between the years 2006, 2010, and 2020. The direct benefits after 2020 were estimated by extrapolation between the years 2010 and 2020.

(1) Vehicle Operating Costs

a) Time reduction at bridge location

The reduction in travel time can be computed by traffic assignments for both the "with" and "without bridge" cases;

however, the travel times at the bridge were externally assumed for traffic assignment. For the estimate of ferry waiting times for the "without bridge" cases, a simulation program was developed. The results showed that ferry waiting time steeply increase in the case where the traffic demand came closer to the ferry capacity. Based on these results 25 minutes was uniformly adopted as the reduction of travel time for the Hau River crossing due to the bridge construction.

The reductions in waiting time at the ferry point was considered as benefits of the project.

Benefits as changes in consumer surplus for induced traffic were estimated as half of that for the normal traffic case.

b) Change in travel distance

The change in travel distance caused by construction of the Can Tho bridge was computed in the traffic assignment procedure. The VOCs estimated in this study include travel time costs; therefore, a change in time cost inherent to a change in travel distance can be estimated. For the estimate of changes in VOCs, unit VOCs (at 40 kilometers per hour as average travel speed and road roughness level of IRI 4) were externally applied to changes in VOCs between the "with" and "without bridge" cases.

The traffic assignment results showed that the construction of a bridge at Can Tho would cause the expansion of total travel distance compared to the "without bridge" case. These results also were considered as a minus benefit (Table 18.22).

(2) Ferry Operating Costs

a) Present ferry operation cost

Present ferry operation costs at Can Tho were considered as a benefit of the project.

b) Additional ferry investment in the "without bridge" case

Traffic forecast results show that, for the "without bridge" case under the condition of free-flow, traffic volumes will exceed the

ferry capacity in the year 2006. For these cases, if additional investments in ferry improvements are not considered, passenger waiting times for ferries would grow enormously (and unrealistically) long and overinflated benefits of the project would be calculated. Consequently, additional ferry improvement investments were taken into account when estimating benefits of the bridge for these cases. The scale of ferry investments was assumed to be the provision of two ferry boats each with a capacity of 200 tons and related facilities, administration, and operation. It is important to note that this "without bridge" case is significantly different from the literal "do nothing" base case typically applied in economic evaluations.

The timing of ferry improvement investments was determined such that the increased capacity would accommodate the future traffic demand at each ferry point when capacity levels are reached. As a result, no diverted traffic from one ferry point to another ferry point would occur in years 2006 or 2010, because the increased ferry capacities in these years would be sufficient to meet the demand. However, before 2020 the increased ferry capacity at Can Tho would not be able to meet the traffic demand; therefore, diversion of traffic from the Can Tho ferry to other ferries would emerge unless new ferry ports at both sides of the Hau River were constructed. The construction cost of new ferry port facilities including pier, slope and earthworks is estimated of roughly 10 million USD per site. These additional ferry investments were considered as benefits of the Can Tho bridge in the economic evaluation (Table 18.23). Benefits in intermediate years were estimated by interpolation between the years 2006, 2010 and 2020. The benefits after 2020 were estimated by extrapolation between the years 2010 and 2020.

The timing and scale of ferry investments at ferry points other than the bridge location were the same for both the "with" and "without bridge" cases.

(3) Increase in Land Price

a) Rationale

These indirect benefits are hard to estimate in monetary or physical terms in general. In this study overall benefits including direct and indirect benefits by the project were estimated by measuring the increase of land price. The main reasons for adopting the increase in land price as overall benefits are as follows:

As stated earlier the Can Tho Bridge Project is expected to emerge with vast indirect benefits and omission of indirect benefits leads to an underestimate of the project feasibility especially in such cases where a delicate range of EIRR values are preliminarily estimated.

There are several approaches to assess the overall benefits including direct and indirect benefits, and the total effects on economic activities. One approach is to measure the increase in GDP and another is to measure the increase in land prices. The former approach requires a macroeconomic model using many factors. In this study the overall benefits are measured by an estimate of the increase in market land price from the viewpoint that all direct and indirect benefits are finally reflected in the increase of the market land price.

In Viet Nam after Doi Moi (1986), a series of institutional reforms were attempted corresponding to Government policy to promote a market oriented economy. In 1993 the New Land Act was enforced, which assured farmers of the right of cultivation of agricultural land for 20 years in the case of annual cropping and for 50 years in the case of perennial cropping with an upper limitation placed on the agricultural land area. Farmers become free in selling, purchasing, transfer and a succession of those rights under the New Land Act, though the agricultural land still belonged to the State. Consequently a germinal land market was formed in Viet Nam and in the Mekong Delta where the situation is not exceptional.

b) Estimate of land price increase

Though the Can Tho bridge is deemed to influence the activities in the whole area of the Mekong Delta region, especially the right bank area of the Hau River, only a limited area of the right bank of the Can Tho River is likely where any drastic change in land price may occur.

A survey on land prices to get information on the possible influence by the project were conducted in Can Tho and Vinh Long Provinces by the Study Team. As a result the estimate based on the land price data observed at the sites with similar conditions sometimes proved to be more reliable than applying the land price function.

Recently the prices of the land on the right bank of the Can Tho River were reportedly to be going up steeply and those in the area where the Alternative C route is proposed have already reached a range between 70,000 and 100,000VND per sq. m. This compares with agricultural land rights in the rural area on the left bank of the Can Tho River which were traded at around 14,000VND per sq. m on average though prices were dependent on the location. Those at Binh Minh District in Vinh Long Province were traded at around 11,000VND per sq. m.

As presently no major infrastructure works are provided on the right bank of the Can Tho River, and therefore an increase in this area is attributable to speculation expecting future enhancement of land potential with the background of three major infrastructure plans, i.e. development of the Southern Industrial Zone, the Quang Trung Bridge construction and Can Tho Bridge construction. Since the prices of agricultural land rights before the announcement of these plans were some 15,000VND, the increase in land price is estimated at 55,000 to 85,000VND. It can be reasonably considered that about one third of the increase has been caused by the construction plan for the Can Tho Bridge which contains the approach road plan to the built-up area of Can Tho city.

Regarding the land right prices along the existing national

highway, it was confirmed that those along the recently constructed National Highway No.91B ranged from 150,000 to 200,000VND, and those along National Highway No.1 beyond Cai Rang Bridge at Chau Thanh District between 150,000 to 200,000VND. In those areas electricity and water supply infrastructure were provided together with road improvement. If those effects are deducted the net increase in the land rights price due to road construction would be about 90,000 to 140,000VND per sq.m.

Therefore increases in land price as an overall development benefit by the Can Tho Bridge are estimated at 90,000VND in the belt zone with a width of 50m along the route and 20,000VND in the area beyond the belt zone up to 1,000m width along the route (Table 18.24).

Table 18.1 Population, Labor Force and Time Value, 1995

Region	GDP (1995) (at current prices)	Pop. (1995)	Ratio of labor force (1994)	Unemployment rate (1994)	Working pop. (1994)	Time value	
	(bil. dong)	(1,000 pers.)		(%)	(1,000 pers.)	(dong/hour/pers.)	(US$/hour/pers.)
Mekong River delta	41,671	16,196	0.6313	4.52%	9,762	1,809	0.15
Ho Chi Minh City	38,810	4,795	0.6245	6.22%	2,808	5,856	0.49
Whole country	222,840	73,959	0.6512	5.82%	45,359	2,082	0.17

Source: "Economy and Society 1991-1995", Statistical Department of Ho Chi Minh City, Sep.1996
"Statistical Yearbook", Statistical Publishing House, 1996

Table 18.2 Population and GDRP Growth Rates

	1997-2010	2010-2020
Population growth rates	1.6	1.4
GDRP growth rates	9	7
Per capita GDRP growth rates	7.2	5.5

Source: JICA Study Team

Table 18.3 Passenger Time Costs (2006) (US$/hour)

	MC	PC	LB	HB	LT	MT	HT
Crew time cost (driver)	-	-	0.840	0.840	0.840	0.840	0.840
Crew time cost (assisstant)	-	-	0.560	0.560	-	0.560	-
Crew size (persons)	-	-	2	2	1	2	2
Hourly crew cost	-	-	1.400	1.400	0.840	1.400	1.680
Passenger time cost (business)	0.560	1.680	0.560	0.560	-	-	-
Passenger time cost (non-business)	0.140	0.420	0.140	0.140	-	-	-
Business trip rate	65%	60%	65%	65%	-	-	-
Average occupancy of passengers (pers./veh.)	1.6	5.2	8	38	-	-	-
Hourly passenger time cost	0.661	6.115	3.304	15.694	-		
Total travel time cost	0.661	6.115	4.704	17.094	0.840	1.400	1.680

Source: JICA Study Team
Note: Business purpose trip rate for motocycles was assumed to be same rate as for buses.

Table 18.4 Passenger Time Costs (2010) (US$/hour)

	MC	PC	LB	HB	LT	MT	HT
Crew time cost (driver)	-	-	1.110	1.110	1.110	1.110	1.110
Crew time cost (assisstant)	-	-	0.740	0.740	-	0.740	-
Crew size (persons)	-	-	2	2	1	2	2
Hourly crew cost	-	-	1.850	1.850	1.110	1.850	2.220
Passenger time cost (business)	0.740	2.220	0.740	0.740	-	-	-
Passenger time cost (non-business)	0.185	0.555	0.185	0.185	-	-	-
Business trip rate	65%	60%	65%	65%	-	-	-
Average occupancy of passengers (pers./veh.)	1.5	4.4	8	38	-	-	-
Hourly passenger time cost	0.819	6.838	4.366	20.739	-		
Total travel time cost	0.819	6.838	6.216	22.589	1.110	1.850	2.220

Source: JICA Study Team

Note: Business purpose trip rate for motocycles was assumed to be same rate as for buses.

Table 18.5 Passenger Time Costs (2020) (US$/hour)

	MC	PC	LB	HB	LT	MT	HT
Crew time cost (driver)	-	-	1.900	1.900	1.900	1.900	1.900
Crew time cost (assisstant)	-	-	1.270	1.270	-	1.270	-
Crew size (persons)	-	-	2	2	1	2	2
Hourly crew cost	-	-	3.170	3.170	1.900	3.170	3.800
Passenger time cost (business)	1.270	3.810	1.270	1.270	-	-	-
Passenger time cost (non-business)	0.318	0.953	0.318	0.318	-	-	-
Business trip rate	65%	60%	65%	65%	-	-	-
Average occupancy of passengers (pers./veh.)	1.4	3.4	8	38	-	-	-
Hourly passenger time cost	1.311	9.068	7.493	35.592	-		
Total travel time cost	1.311	9.068	10.663	38.762	1.900	3.170	3.800

Source: JICA Study Team

Note: Business purpose trip rate for motocycles was assumed to be same rate as for buses.

Table 18.6 Prices of Commodity on Trucks

Commodity		Unit price (US$/ton)	Percentage	Average price (US$/ton)
Agricultural products	Rice (80%), Others (20%)	410	45	185
Logs & timber	Timber (100%)	100	4	4
Foods/drinks	Water (50%), Others (50%)	1,000	10	100
Manufactured goods	Sewing Machine (100%)	2,500	20	500
Construction Materials	Cement (20%), Brick (80%)	60	10	6
Fuel/Chemicals	Gasoline(80%), Oil (20%)	700	5	35
Other		400	5	20
Total		-	99	850

Source: JICA Study Team

Table 18.7 Estimated Cargo Time Cost (US$/ton-hour)

	1997	2006	2010	2020
Cargo time cost	0.09	0.12	0.14	0.17

Source: JICA Study Team

Table 18.8 Average Cargo Time Costs by Vehicle Type (2006)

	MC	PC	LB	HB	LT	MT	HT
Average load on loaded vehicle (ton)	0.03	-	-	0.5	1.9	5.5	8.1
Cargo time cost (US$/ton-hour)	0.120	0.120	0.120	0.120	0.120	0.120	0.120
Empty load vehicle ratio	0.30	-	-	0.30	0.30	0.30	0.30
Average cargo time cost (US$/hour)	0.001	-	-	0.042	0.160	0.462	0.680

Source: JICA Study Team

Table 18.9 Average Cargo Time Costs by Vehicle Type (2010)

	MC	PC	LB	HB	LT	MT	HT
Average load on loaded vehicle (ton)	0.03	-	-	0.5	1.9	5.5	8.1
Cargo time cost (US$/ton-hour)	0.140	0.140	0.140	0.140	0.140	0.140	0.140
Empty load vehicle ratio	0.33	-	-	0.33	0.33	0.33	0.33
Average cargo time cost (US$/hour)	0.001	-	-	0.047	0.178	0.516	0.760

Source: JICA Study Team

Table 18.10 Average Cargo Time Costs by Vehicle Type (2020)

	MC	PC	LB	HB	LT	MT	HT
Average load on loaded vehicle (ton)	0.03	-	-	0.5	1.9	5.5	8.1
Cargo time cost (US$/ton-hour)	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Empty load vehicle ratio	0.4	-	-	0.4	0.4	0.4	0.4
Average cargo time cost (US$/hour)	0.002	-	-	0.051	0.194	0.561	0.826

Source: JICA Study Team

Table 18.11 Vehicle Costs in Viet Nam, 1997 (US$)

Vehicle Type & Model			Import Price (CIF)	Import Duty (% of (A))	Others	Local Sales Cost $ Profit	Selling Price	Economic Cost (A)+(D)
			(A)	(B)	(C)	(D)	(E)	(F)
MC	HONDA Dream	CBU	1,400	840	213	273	2,725	1,673
PC	MAZDA 323 Std.	CBU	10,750	5,913	3,786	2,272	22,720	13,022
PC	KIA Pride GTX	CBU	7,000	3,850	2,425	1,475	14,750	8,475
LB	TOYOTA Hi-Ace	CBU	16,000	8,800	1,300	2,900	29,000	18,900
HB	HINO RU638	CBU	46,000	23,000	19,200	9,800	98,000	55,800
LT	KIA Ceres	CBU	5,800	3,480	2,240	1,280	12,800	7,080
LT	TOYOTA Hi-Lux	CBU	12,000	7,200	4,650	2,650	26,500	14,650
MT	HINO FF165S	CBU	26,400	7,920	1,230	3,950	39,500	30,350
HT	KAMAZ 53212	CBU	20,000	6,000	1,000	3,000	30,000	23,000
HT	MITSUBISHI FV	CBU	33,500	10,050	1,450	5,000	50,000	38,500

Source : "The Export and Import Tariff", Ministry of Finance and TESI and JICA Study Team

Table 18.12 Imported Tire Costs, 1997 (US$)

Vehicle Type & Model		Import Price (CIF)	Import Duty (% of (A))	Others	Local Sales Cost & Profit	Selling Price	Economic Cost (A)+(E)
		(A)	(B)	(D)	(E)	(F)	(G)
MC	HONDA Dream	7.5	3.0	0.6	2.0	13.0	9.5
PC	MAZDA 323/KIA Pride	21.0	8.4	1.2	5.4	36.0	26.4
LB	TOYOTA Hi-Ace	90.0	18.0	0.8	19.2	128.0	109.2
HB	HINO RU638	102.0	20.4	0.8	21.8	145.0	123.8
LT	KIA Ceres/TOYOTA Hi-Lux	120.0	24.0	0.5	25.5	170.0	145.5
MT	HINO FF165S	120.0	24.0	0.5	25.5	170.0	145.5
HB	KAMAZ 53212/MITSUBISHI FV	120.0	24.0	0.5	25.5	170.0	145.5

Source : "The Export and Import Tariff", Ministry of Finance and TESI and JICA Study Team

Table 18.13 Fuel and Oil Costs, 1997 (US$/liter)

Type		Import Price (CIF) (A)	Import Duty (% of (A)) (B)	Others (C)	Local Sales Cost & Profit (E)	Selling Price (F)	Economic Cost (A)+(E) (G)
Fuel	Petrol (regular)	0.180	0.099	0.018	0.052	0.349	0.232
	Petrol (super)	0.190	0.105	0.023	0.056	0.374	0.246
	Diesel	0.160	0.040	0.041	0.042	0.283	0.202
Oil	Passenger Cars	0.900	0.108	0.055	0.188	1.250	1.088

Source: TESI and JICA Study Team

Table 18.14 Estimated Passenger Time Cost and Driver Time Cost (US$/hour)

	1997	2006	2010	2020
Passenger time cost	0.30	0.56	0.74	1.27
Driver time cost	0.45	0.84	1.11	1.90
Maintenance labor time cost (four-wheel vehicle)	3.00	5.61	7.41	12.65
Maintenance labor time cost (two-wheel vehicle)	1.50	2.80	3.70	6.33

Source: JICA Study Team

Table 18.15 Vehicle Standing Costs, 1997 (US$/year)

		MC	PC	LB	HB	LT	MT	HT
Financial	Insurance	30	100	200	300	150	200	300
	Overhead	0	0	813	941	0	528	556
	Vehicle inspection	0	10	15	17	14	15	17
	Total	30	110	1,028	1,257	164	743	873
Economic	Insurance	0	0	0	0	0	0	0
	Overhead	0	0	569	659	0	370	389
	Vehicle inspection	0	5	8	8	7	8	8
	Total	0	5	577	667	7	377	398

Source: JICA Study Team

Table 18.16 Vehicle Fleet Characteristics and Unit Costs, 2006

Category	Vehicle Type						
	MC	PC	LB	HB	LT	MT	HT
Vehicle type	HONDA Dream	MAZDA323/KIA	TOYOTA Hi-Ace	HINO RU638	KIA Ceres/ TOYOTA Hi-Lux	HINO FF165S	KAMAZ 53212/ MITSUBISHI FV
HP metric	8.5	72	74	235	68	121	272
Tare weight (kg)	89	1,070	1,570	6,660	1,500	3,720	7,200
ESA	0	0	0	0.7	0	1.00	1.50
No. of axles	2	2	2	2	2	2	3
Financial Costs (US$)							
Vehicle price	2,725	20,329	29,000	98,000	18,280	39,500	46,000
Tire cost (per tire)	13	36	128	145	170	170	170
Maintenance labor (per hour)	2.80	5.61	5.61	5.61	5.61	5.61	5.61
Crew time cost (per hour)	-	-	1.40	1.40	0.84	1.40	1.68
Passenger time cost (per hour)	0.66	6.12	3.30	15.69	-	-	-
Standing costs (per year)	30	110	1,028	1,257	164	743	873
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.35	0.35	0.35	-	-	-	-
Diesel (per liter)	-	-	-	0.28	0.28	0.28	0.28
Engine oil (per liter)	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Economic Costs ($)							
Vehicle price	1,673	11,658	18,900	55,800	10,108	30,350	35,400
Tire cost (per tire)	10	26	109	124	146	146	146
Maintenance labor (per hour)	2.80	5.61	5.61	5.61	5.61	5.61	5.61
Crew time cost (per hour)	-	-	1.40	1.40	0.84	1.40	1.68
Passenger time cost (per hour)	0.66	6.12	3.30	15.69	-	-	-
Standing costs (per year)	0	5	577	667	7	377	398
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.23	0.23	0.23	-	-	-	-
Diesel (per liter)	-	-	-	0.20	0.20	0.20	0.20
Engine oil (per liter)	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Average km driven (per year)	10,000	15,000	30,000	30,000	15,000	20,000	20,000
Average vehicle life (years)	8	10	10	10	10	10	10
Average hours driven (per year)	400	400	1200	1200	400	800	800

Source: JICA Study Team

Note: Assumed average crew sizes are 1 on LT, 2 for MT and HT, and 2 on LB and HB.
Assumed average vehicle occupancies are 1.6 on MC, 5.2. on PC, 8 on LB, and 38 on HB.

Table 18.17 Vehicle Fleet Characteristics and Unit Costs, 2010

Category	Vehicle Type						
	MC	PC	LB	HB	LT	MT	HT
Vehicle type	HONDA Dream	MAZDA323/KIA	TOYOTA Hi-Ace	HINO RU638	KIA Ceres/ TOYOTA Hi-Lux	HINO FF165S	KAMAZ 53212/ MITSUBISHI FV
HP metric	8.5	72	74	235	68	121	272
Tare weight (kg)	89	1,070	1,570	6,660	1,500	3,720	7,200
ESA	0	0	0	0.7	0	1.00	1.50
No. of axles	2	2	2	2	2	2	3
Financial Costs (US$)							
Vehicle price	2,725	20,329	29,000	98,000	18,280	39,500	46,000
Tire cost (per tire)	13	36	128	145	170	170	170
Maintenance labor (per hour)	3.70	7.41	7.41	7.41	7.41	7.41	7.41
Crew time cost (per hour)	-	-	1.85	1.85	1.11	1.85	2.22
Passenger time cost (per hour)	0.82	6.84	4.37	20.74	-	-	-
Standing costs (per year)	30	110	1,028	1,257	164	743	873
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.35	0.35	0.35	-	-	-	-
Diesel (per liter)	-	-	-	0.28	0.28	0.28	0.28
Engine oil (per liter)	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Economic Costs ($)							
Vehicle price	1,673	11,658	18,900	55,800	10,108	30,350	35,400
Tire cost (per tire)	10	26	109	124	146	146	146
Maintenance labor (per hour)	3.70	7.41	7.41	7.41	7.41	7.41	7.41
Crew time cost (per hour)	-	-	1.85	1.85	1.11	1.85	2.22
Passenger time cost (per hour)	0.82	6.84	4.37	20.74	-	-	-
Standing costs (per year)	0	5	577	667	7	377	398
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.23	0.23	0.23	-	-	-	-
Diesel (per liter)	-	-	-	0.20	0.20	0.20	0.20
Engine oil (per liter)	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Average km driven (per year)	10,000	15,000	30,000	30,000	15,000	20,000	20,000
Average vehicle life (years)	8	10	10	10	10	10	10
Average hours driven (per year)	400	400	1200	1200	400	800	800

Source: JICA Study Team

Note: Assumed average crew sizes are 1 on LT, 2 for MT and HT, and 2 on LB and HB.
Assumed average vehicle occupancies are 1.5 on MC, 4.4. on PC, 8 on LB, and 38 on HB.

Table 18.18 Vehicle Fleet Characteristics and Unit Costs, 2020

Category	Vehicle Type						
	MC	PC	LB	HB	LT	MT	HT
Vehicle type	HONDA Dream	MAZDA323/KIA	TOYOTA Hi-Ace	HINO RU638	KIA Ceres/ TOYOTA Hi-Lux	HINO FF165S	KAMAZ 53212/ MITSUBISHI FV
HP metric	8.5	72	74	235	68	121	272
Tare weight (kg)	89	1,070	1,570	6,660	1,500	3,720	7,200
ESA	0	0	0	0.7	0	1.00	1.50
No. of axles	2	2	2	2	2	2	3
Financial Costs (US$)							
Vehicle price	2,725	20,329	29,000	98,000	18,280	39,500	46,000
Tire cost (per tire)	13	36	128	145	170	170	170
Maintenance labor (per hour)	6.33	12.65	12.65	12.65	12.65	12.65	12.65
Crew time cost (per hour)	-	-	3.17	3.17	1.90	3.17	3.80
Passenger time cost (per hour)	1.31	9.07	7.49	35.59	-	-	-
Standing costs (per year)	30	110	1,028	1,257	164	743	873
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.35	0.35	0.35	-	-	-	-
Diesel (per liter)	-	-	-	0.28	0.28	0.28	0.28
Engine oil (per liter)	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Economic Costs ($)							
Vehicle price	1,673	11,658	18,900	55,800	10,108	30,350	35,400
Tire cost (per tire)	10	26	109	124	146	146	146
Maintenance labor (per hour)	6.33	12.65	12.65	12.65	12.65	12.65	12.65
Crew time cost (per hour)	-	-	3.17	3.17	1.90	3.17	3.80
Passenger time cost (per hour)	1.31	9.07	7.49	35.59	-	-	-
Standing costs (per year)	0	5	577	667	7	377	398
Interest (%)	8%	8%	8%	8%	8%	8%	8%
Petrol (per liter)	0.23	0.23	0.23	-	-	-	-
Diesel (per liter)	-	-	-	0.20	0.20	0.20	0.20
Engine oil (per liter)	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Average km driven (per year)	10,000	15,000	30,000	30,000	15,000	20,000	20,000
Average vehicle life (years)	8	10	10	10	10	10	10
Average hours driven (per year)	400	400	1200	1200	400	800	800

Source: JICA Study Team

Note: Assumed average crew sizes are 1 on LT, 2 for MT and HT, and 2 on LB and HB.
Assumed average vehicle occupancies are 1.4 on MC, 3.4. on PC, 8 on LB, and 38 on HB.

Table 18.19 Vehicle Operationg Costs of Motorcycle

		2006	2010	2020
Time related cost				
Average hours driven	(hours/year)	400	400	400
Passenger time cost	(US$/hour)	0.66	0.82	1.31
Crew cost	(US$/hour)	0	0	0
Cargo cost	(US$/hour)	0.00	0.00	0.00
Standing cost	(US$/hour)	0	0	0
Total	(US$/hour)	0.66	0.82	1.31
Running cost (V=40km/h)	(10,000 km/year)			
Vehicle cost	(US$/1,000 km)	18.82	18.82	18.82
Fuel and lubricant cost	(US$/1,000 km)	10.12	10.12	10.12
Tire cost	(US$/1,000 km)	1.33	1.33	1.33
Maintenance cost	(US$/1,000 km)	0.37	0.49	0.84
Maintenance parts	(US$/1,000 km)	0.58	0.58	0.58
Time related cost	(US$/1,000 km)	16.55	20.50	32.83
Total	(US$/1,000 km)	47.78	51.85	64.52

Source: JICA Study Team

Table 18.20 Vehicle Operating Costs

(1) Time Related Costs (US$/hour)

	MC	PC	LB	HB	LT	MT	HT
2006	0.66	6.13	5.19	17.69	1.02	2.33	2.86
2010	0.82	6.85	6.70	23.19	1.31	2.84	3.48
2020	1.31	9.08	11.15	39.37	2.11	4.20	5.12

(2) Distance Related Costs (IRI=4) (US$/1,000km)

	MC (40km/h)	PC (50km/h)	LB (50km/h)	HB (50km/h)	LT (50km/h)	MT (50km/h)	HT (50km/h)
2006	47.78	247.21	218.67	581.27	148.28	237.26	283.60
2010	51.85	261.64	287.03	728.19	154.08	247.40	295.80
2020	64.52	306.16	339.77	1014.32	170.37	274.92	328.29

Source: JICA Study Team

Table 18.21 Budget Plan of the Hau Giang Ferry Company, 1998

Category	Amount (1,000US$)	Amount (bil.dong)
Revenue	1,950.0	23.400
1 Charges for ferry company	1,741.7	20.900
2 Charges for other organization	208.3	2.500
Expenditure	1,637.1	19.645
1 Routine maintenance	598.3	7.180
facilities	74.2	0.890
ferry boats & equipments	184.2	2.210
engineering works	340.0	4.080
2 Periodic maintenance	580.4	6.965
facilities	137.5	1.650
ferry boats & equipments	401.3	4.815
contingencies	41.7	0.500
3 Wages	458.3	5.500
Profit	0.3	0.004

Source: Hau Giang Ferry Company, The Road Management Union No. 7

Table 18.22 Benefits in Vehicle Operating Cost

2006 Alt.C

		MC	PC	LB	HB	LT	MT	HT	Total
Time related cost	(US$/hour)	0.66	6.13	5.19	17.69	1.02	2.33	2.86	-
Normal & development traffic	(veh./day)	10,736	2,479	1,126	512	859	2,068	104	17,884
Benefit	(1,000US$/year)	1,077.6	2,311.1	888.8	1,377.5	133.3	732.8	45.2	6,566.2
Induced and diverted traffic	1) (veh./day)	4,429	298	141	54	59	133	81	5,195
Benefit	(1,000US$/year)	222.3	138.9	55.6	72.6	4.6	23.6	17.6	535.2
Distance related cost	(US$/1,000km)	47.78	247.21	218.67	581.27	148.28	237.26	283.60	-
Change in total trip distance	2) (km)	-10,711	-2,593	-1,399	-408	-1,050	-2,163	-261	-18,585
Benefit	(1,000US$/year)	-186.8	-234.0	-111.7	-86.6	-56.8	-187.3	-27.0	-890.2
Benefit	(1,000US$/year)	1,113.1	2,216.0	832.8	1,363.5	81.0	569.1	35.8	6,211.3

Source: JICA Study Team

Note 1) Those from watereway to road are considered as diverted traffic.

2) Normal and development traffic are considered.

2010 Alt.C

		MC	PC	LB	HB	LT	MT	HT	Total
Time related cost	(US$/hour)	0.82	6.85	6.70	23.19	1.31	2.84	3.48	-
Normal & development traffic	(veh./day)	15,777	4,577	1,822	810	1,606	3,897	194	28,683
Benefit	(1,000US$/year)	1,967.5	4,769.2	1,855.9	2,856.9	318.9	1,681.5	102.6	13,552.7
Induced and diverted traffic	1) (veh./day)	6,504	562	229	88	115	278	203	7,979
Benefit	(1,000US$/year)	405.6	292.8	116.6	155.2	11.4	60.0	53.7	1,095.3
Distance related cost	(US$/1,000km)	51.85	261.64	287.03	728.19	154.08	247.40	295.80	-
Change in total trip distance	2) (km)	-16,129	-4,831	-2,260	-666	-2,090	-4,133	-486	-30,595
Benefit	(1,000US$/year)	-305.2	-461.4	-236.8	-177.0	-117.5	-373.2	-52.5	-1,723.6
Benefit	(1,000US$/year)	2,067.8	4,600.7	1,735.8	2,835.1	212.7	1,368.3	103.8	12,924.3

Source: JICA Study Team

Note 1) Those from watereway to road are considered as diverted traffic.

2) Normal and development traffic are considered.

2020 Alt.C

		MC	PC	LB	HB	LT	MT	HT	Total
Time related cost	(US$/hour)	1.31	9.08	11.15	39.37	2.11	4.20	5.12	-
Normal & development traffic	(veh./day)	34,972	12,387	3,922	1,652	4,614	11,180	542	69,269
Benefit	(1,000US$/year)	6,983.4	17,110.1	6,648.2	9,891.1	1,481.7	7,145.1	422.3	49,681.8
Induced and diverted traffic	1) (veh./day)	14,640	1,578	498	182	344	798	511	18,551
Benefit	(1,000US$/year)	1,461.7	1,089.8	422.1	544.8	55.2	255.0	199.1	4,027.8
Distance related cost	(US$/1,000km)	64.52	306.16	339.77	1014.32	170.37	274.92	328.29	-
Change in total trip distance	2) (km)	-36,309	-13,431	-4,869	-1,374	-6,195	-12,196	-1,370	-75,744
Benefit	(1,000US$/year)	-855.1	-1,500.9	-603.8	-508.7	-385.2	-1,223.8	-164.2	-5,241.7
Benefit	(1,000US$/year)	7,590.0	16,699.1	6,466.4	9,927.2	1,151.7	6,176.2	457.2	48,467.9

Source: JICA Study Team

Note 1) Those from watereway to road are considered as diverted traffic.

2) Normal and development traffic are considered.

Table 18.23 Ferry Administration and Operation Improvement Cost

		1997	2006	2010	2020
Transport demand	(pcu./day)	3,435	11,608	20,017	51,683
Procurement cost of ferry boats					
Number of existing ferry boats,1997 (200t (5),100t (2))	(boats)	7	7	7	7
Existing ferry capacity	(pcu./day)	9,216	9,216	9,216	9,216
Number of ferry boats to be procured	(boats)	0	2	7	28
Number of boats to be operated	(boats)	7	9	14	35
Number of boats to be purchased	(boats)	0	2	5	21
Unit cost of purchasing new ferry boat	(1,000US$/boat)	2,000	2,000	2,000	2,000
Procurement cost of new ferry boats	(1,000US$)	0	4,000	10,000	42,000
Repairing cost of ferry boats					
Unit cost of repairing ferry boat	(1,000US$/boat)	700	700	700	700
Number of ferry boats to be repaired (20 years interval)	(boats)	0	0	3	4
Repairing cost of ferry boats	(1,000US$)	0	0	2,100	2,800
Administration and operation costs					
Unit cost of administration and operation	(1,000US$/boat-year)	270	270	270	270
Adminisration and operation cost of ferry boat	(1,000US$/year)	1,890	2,430	3,780	9,450
Total cost	(1,000US$/year)	1,890	6,430	15,880	54,250

Source: JICA Study Team

Note: Capacities of 200 ton ferry boat and 100 ton ferry boat were assumed 32 pcu. per boat and 16 pcu. per boat respectively.
Following pcu. factors are applied; MC=0.25, LB=1, HB=3, LT=1, MT=2, and HT=3.

Table 18.24 Benefit of the Increase in Development Potential

Approach Road Length	0-50 m		50-1000 m		Total
	Unit	Increase in Land Price	Unit	Increase of Land Price	
	(m)	(US$/sq.m.)	(1,000US$)	(US$/sq.m.)	(1,000US$)	(1,000US$)
Vinh Long	5,580	7.5	2092.5	1.3	6891.3	8983.8
Can Tho	3,280	7.5	1230	1.3	4050.8	5280.8
Total	8,860	7.5	3322.5	1.3	10942.1	14264.6

Source: JICA Study Team

18.2 Economic Costs

18.2.1 Circumstances for Economic Cost Estimate (Shadow Prices)

Circumstances for the estimate of economic prices are as follows:

(1) Foreign Exchange

The US dollar has traded freely in the parallel market and circulates as a medium of exchange. The exchange rate of the Vietnamese dong is now officially announced to be geared to the market values of foreign currencies by the Vietnamese Government. The financial construction cost estimates for Viet Nam shown in Chapter 15 were determined by domestic market surveys in Vietnamese dong and in US dollars.

The official exchange rate quoted by the State Bank of Viet Nam has remained stable to the US dollar despite the recent Southeast Asian economic crisis. However, there maybe some discrepancies between the official and real exchange rate, as such discrepancies are occasionally reported in the mass-media. Therefore, these costs are subject to price distortions in the foreign exchange market, or it is necessary to apply a shadow exchange rate during the economic evaluation.

(2) Taxes

Once prices were liberalized, especially after 1989, new sources of revenue were sought and a series of new taxes were introduced in Viet Nam. Changes included the introduction of excise tax (1990), a natural resource tax and income tax (1991), a turnover tax, a profit tax and a revised export and import duty (1993). Recently the Law on Value Added Tax and Law on Enterprise Income tax were introduced. It is assumed that value added tax will supersede the turnover tax and the enterprise income tax will supersede the profit tax in 1999 (Annexure 10). Despite these changes the tax system still remains complex.

(3) Wages

Viet Nam's labor force is growing rapidly due to high population growth over the past two decades. With redundant workers being

phased out of State-owned enterprises and civil service, the extent of public-sector layoffs has been considerable. The realties of refugee repatriation and military demobilization are further contributing to mass unemployment. In an economy marked by vast unemployment such as Viet Nam's, the real costs of labor used in the project may be less than the actual wage rate. Therefore, it was considered necessary to use a price distortion factor to adjust financial labor cost into economic cost.

Although an unemployment rate was estimated at around 6% in Viet Nam, the existing unemployment situation in Viet Nam is deemed more serious. The Asian Development Bank's memorandum entitled "Parameters for Use in the Economic Analysis of Projects" provides conversion factors for unskilled labor in various countries: 0.60 in Philippines, 0.64 in People's Republic of China, 0.65 in Indonesia, 0.85 in Malaysia, and 1.00 in Thailand. Using this information as a guide, the conversion factor for unskilled labor was assumed to be 0.65 in Viet Nam.

Conversion factors for each work item or cost component were then estimated by applying this conversion factor for unskilled labor to the labor component after the deduction of taxes.

(4) Other Adjustments

In addition to the use of shadow prices, other types of adjustments were deemed necessary for the economic evaluation. These include:

physical contingencies;

engineering and supervision;

compensation for land acquisition; and

price contingencies.

Physical contingencies may be included in the economic evaluation when additional real resources may be required beyond the base cost in order to complete the project. Engineering and supervision costs were assumed to fully represent economic costs with no tax portion.

Although land acquisition costs are not a part of the economic evaluation, compensation paid to landowners during land acquisition procedures is a real economic cost and was included.

18.2.2 Method of Economic Cost Estimate

The economic cost of the project is mainly composed of "the construction cost", and "the maintenance cost".

Considering the data described in the previous section, economic construction costs were estimated by applying conversion factors to the direct cost in the total project cost. A summary of economic construction costs are also described in the next section, 18.2.3 Economic Construction Cost.

The economic maintenance cost is estimated by assuming a uniform percentage (0.1%) of the economic project construction cost of main bridge after referring to OECD (Organization for Economic Cooperation Development) reports.

Table 18.25 Composition of the Economic Cost and Project Cost

Component	Economic Cost	Project Cost
1) Construction Cost (Direct / Indirect Cost) for: a) Mobilization & Demobilization b) Approach Roads c) Main Bridge d) Approach Span Bridges	E(= 80% of P)	P
2) Engineering & Administration Cost	E(= 100% of P)	P
3) Environmental Monitoring & Countermeasures	-	P
4) Land Acquisition & Compensation	-	P
5) Physical Contingency	E*	P
6) Maintenance Cost	0.1% of 1)- c) / year	-

E: Figures for Economic Cost

P: Figures for Project Cost

*: E = { 1) of P x 80% + 2) of P x 100% } x 5%

An implementation schedule is necessary in estimating the distribution of the economic cost to each year. Fig. 20.1 of the Chapter 20, "IMPLEMENTATION PROGRAMME" shows the general implementation schedule applied for economic evaluation.

18.2.3 Economic Construction Cost

A summary of the preliminary estimated economic cost is shown in Table 18.26.

Table 18.26 Summary of Economic Cost

Estimated Case (Route)	Economic Cost (thousand US dollar)		
	Portion	Construction (Total)	Maintenance (Total for 20years)
Route C-2/3	Foreign Exchange	134,778.64	1,354.20
	Local Currency	56,714.98	315.60
	Total	191,493.62	1,669.80
Route C-1 (Shortest Route)	Foreign Exchange	130,002.09	1,354.20
	Local Currency	47,755.42	315.60
	Total	177,757.51	1,669.80
Route C-3 (Longest Route)	Foreign Exchange	135,397.86	1,354.20
	Local Currency	58,370.90	315.60
	Total	193,768.76	1,669.80

18.3 Economic Evaluation

18.3.1 Conditions for the Economic Evaluation

Economic evaluations were made focusing on the variations of Alternative C which were selected as the most desirable route for the Can Tho Bridge.

The detailed economic evaluation to obtain information on an effective combination of investments or effective operations of a bridge are to be carried out in this chapter.

The basic conditions for economic evaluations are as follows:

(1) Base Year

The start year of the Project, 1999 was set as the base year for the economic evaluation.

(2) Evaluation Period

Because of the severe budgetary constraints, it is not likely that many large bridge projects will be implemented in Viet Nam. Therefore, the project life in the economic evaluation should be long. A 50-year period after opening was assumed as the evaluation period.

(3) Salvage Value

No salvage value was assumed because the influence on the evaluation indicators is assumed negligible due to the 50-year period.

(4) Evaluation Indicator

As evaluation indicators, the economic internal rates of return (EIRRs) were calculated for the evaluation period. Also Net Present Value (NPV) and B-C ratios were referred to.

18.3.2 Evaluation Results

(1) Study Cases

At first the promising variations of Alternative C were selected for the sensitivity test.

i) C-2/3 route (recommended route)

ii) C-1 route (shortest route)

iii) C-3 route(longest route)

(2) Results

The economic internal rates of return (EIRRs) of the alternatives show values between 13.4 - 14.0% for the base cases of each route variation. Compared with the results of the preliminary economic evaluation, the EIRRs are improved due to the estimate of the benefits escalation of land prices. These values indicate that the project is considerably

favorable (Table 18.27). The alternative C-1 shows the highest EIRR, followed by C-2/3, and C-3.

Table 18.27 EIRRs of Route Variations

		C-2/3 Case (recommended route)	C-1 Case (shortest route)	C-3 Case (longest route)
Base Line	EIRR	13.5%	14.0%	13.4%
	NPV (mil.USD)	143	153	141
	B/C Ratio	2.00	2.15	1.98

Source: JICA Study Team

18.3.3 Sensitivity Analysis

(1) Study Cases

The indicators of the economic evaluation vary in response to the change in costs, benefits and other prerequisites for the economic analysis. Sensitivity tests in this study were attempted to get a more realistic idea of the project feasibility. The following cases were used for the sensitivity test based on the alternative C-2/3 route and the Hybrid structure type.

i) Project costs

- 100% of estimated cost (base)
- 10% increase of estimated cost
- 20% increase of estimated cost

ii) Benefits

- 100% of estimated benefit (base)
- 10% decrease of estimated benefit
- 20% decrease of estimated benefit
- 30% decrease of estimated benefit

(2) Results

The economic internal rates of return (EIRRs) of the study cases fall into the range between 9.8 - 13.5%. The value of the EIRR of the case

where 30% of the benefits decrease and 20% of the costs increase reduces the EIRR down to 9.8% (Table 18.28). However, it still seems that the project will bring a higher return than opportunity cost of capital.

In appraising the project, the values of the EIRRs and other economic indicators need to be evaluated taking account of the following circumstances and characteristics of the project.

Though the GDP growth rates are expected to be higher in Viet Nam than those in other southeast Asian countries, the expectation of past high EIRR standards should be reconsidered as the economy in Viet Nam exists more or less interdependently with that of other countries.

Another is the probable underestimate of the total amount of benefits brought by the project. As stated previously the influenced areas of the project are expected to be diverse and large due to its special characteristics. The benefits of the project is no doubt vast especially in developing the Mekong Delta; however, only a small portion of such vast benefits were estimated in terms of the increase in land price in this study.

If considered above, the values of EIRRs are conservatively low and it can be concluded that the project is more than feasible from the economic viewpoint.

Table 18.28 EIRRs of Sensitivity Test (C-2/3 Case)

		Benefit			
		Base	-10%	-20%	-30%
Cost	Base	13.5%	12.7%	11.9%	10.9%
	+ 10%	12.8%	12.0%	11.2%	10.3%
	+ 20%	12.2%	11.4%	10.6%	9.8%

Source: JICA Study Team