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

CHAPTER 19

FINANCIAL ANALYSIS

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19.1 General

19.1.1 Scope of Financial Study

The project cost is estimated to be a substantial amount and is likely to suppress the state budget. The problem of funding constraints highlights the need to take into account the close correlation between capital and recurrent expenditure and to consider possible ways in implementing larger investment programs (Table 19.1).

Table 19.1 State Budget for Transport Sector

(Unit: billion dong)

			1990	1991	1992	1993
GDP			44,289	76,707	110,535	136,571
State Budget	Revenue	Total	6,732	10,609	21,023	32,199
		Domestic	6,153	10,083	20,175	31,171
		Grants	219	526	848	1,028
	Expenditure	Total	9,186	12,081	23,711	39,063
		Ratio to GDP	15.2	13.8	19.0	23.6
		Transport sector total	569	762	1,554	2,561
		Ratio to GDP	0.013	0.010	0.014	0.019
		Ratio to total expenditure	0.062	0.063	0.066	0.066
		Transport sector investment	377	487	907	1,422
		Ratio to GDP	0.009	0.006	0.008	0.010
		Ratio to total expenditure	0.041	0.040	0.038	0.036
		Domestic	1,173	393	1,373	2,625
		Foreign loans	1,641	1,079	1,315	4,239
	Balance		-2,814	-1,472	-2,688	-6,864

Source: Statistical Yearbook 1994, Central Statistical Office

(1) Bridge Operation

It was assumed that the Can Tho Bridge will be operated as a toll bridge similar to the My Thuan Bridge. Charges will be collected from users of the bridge and these revenues will be allocated to repayment of the loan, pay back capital for the project investment, and to meet the costs for operation and maintenance of the bridge.

(2) Scope of Financial Study

As the estimated project cost is considerable, the funding source was naturally assumed to be combination of a soft loan and Government subsidies. Financial analysis is, therefore, focusing on the following issues through the examination of the financial feasibility after the financial cost estimate, revenue forecast, and financial planning considerations (Fig. 19.1).

a) the possible level of investment pay back by revenue

b) the desirable procurement condition of investment fund, and

c) the appropriate charge level on users for revenue

Based on these factors the rationale of governmental subsidy and the justified supporting measures as a public enterprise is pursued.

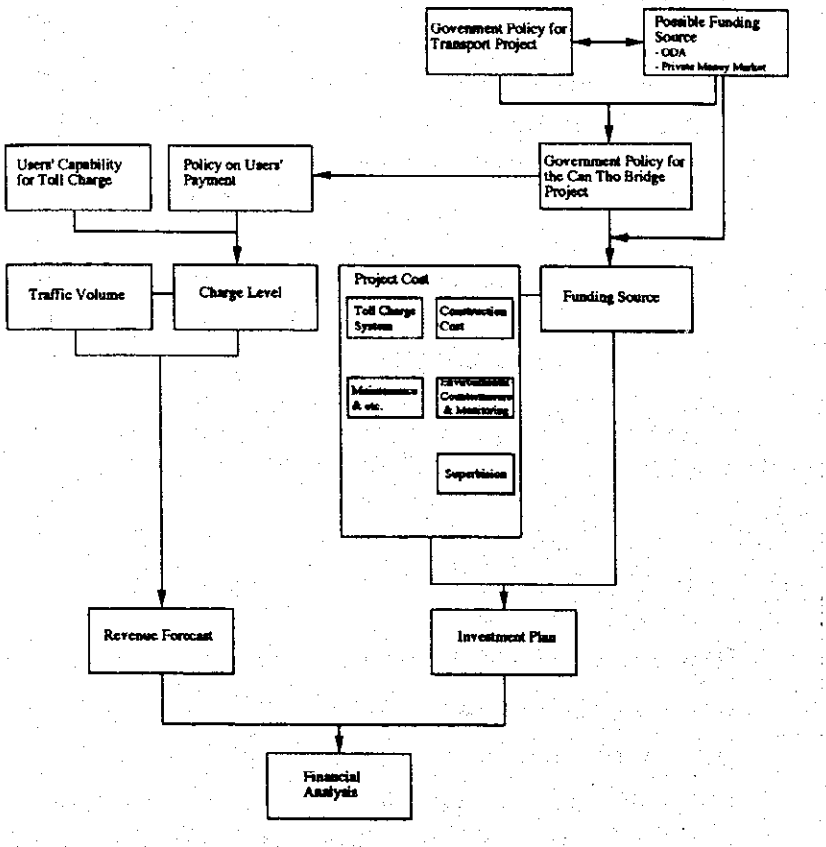


Fig. 19.1 Approach to the Financial Analysis

19.2 Revenue

The total revenue can be estimated by charges for each vehicle type multiplied by traffic volumes. Since it is likely that charge levels will affect traffic volumes and total revenue, demand elasticity with respect to charge level should be known.

19.2.1 Charge Level

Public services, which includes bridges have monopolistic characteristics and officially restricted supply. The principles for determination of charge level are generally classified into the following two categories:

a) marginal cost pricing principle

b) average cost pricing principle

For the marginal cost principle, though the social surplus can be maximized, it is pointed out that a loss on the enterprise is inevitable.

Under the average cost pricing principle prices should be in accordance with average cost so that no deficit will emerge. Government subsidy for the deficit of the enterprise can be avoided and the beneficiaries payment principle is secured. Generally, the latter principle as been adopted for toll roads and toll bridges throughout the world. In Viet Nam, the average cost principle is recommended because of the financial situation due to underfunding in transport sector.

A bridge project can be characterized in that the portion of investment on fixed assets is considerably large, and marginal cost can be considered a small amount of the total project cost because it mainly comprises direct costs for maintenance and administration. The marginal cost of bridge can be considered negligible so far as traffic volume is within its capacity.

Providing that the average fixed cost is constant, the charge level to meet the average cost pricing principle can be computed based on the future traffic demand. When setting up new charges, other factors must be considered beside generating sufficient revenue. In case the computed charge level is too high for the affordable level of users, and traffic demand does not meet the required level for project viability, countermeasures will be necessary.

Lowering the average fixed investment cost by the Government as a subsidy can be regarded as the most common type of countermeasure.

In this study referring to the present ferry charges, toll bridge charges, and toll road charges in Viet Nam, the present charge level of the Can Tho Ferry was set as a baseline, and the charge level was raised 2.5 times with an interval of 0.5 times (Table 19.2).

Table 19.2 Ferry Fares and Toll Road Rates, 1997

	Pedestrian	MC	PC	LB	HB	LT	MT	HT
Can Tho	600	2,000	11,000	15,000	21,000	18,000	33,000	40,000
					~30,000	~23,000		~80,000
My Thuan	500	1,800	8,000	10,000	13,000	13,000	25,000	33,000
					~24,000	~17,000		~60,000
Rach Mieu	1,000	3,000	18,000	23,000	30,000	30,000	70,000	70,000
(Ben Tre)					~50,000	~42,000		~12,000
National Road No.5 Bridge	-	1,000	10,000	15,000	15,000	25,000	25,000	45,000
(47km~62km)				~20,000	~24,000	~30,000	~30,000	~60,000

Source: Can Tho Ferry Company, My Thuan Ferry Company, Ben Tre Ferry Company

19.2.2 Results of Revenue Forecast

(1) Price Elasticity

Two different approaches were taken to estimate the price elasticity with respect to traffic volume. One way is to use a simulation model of traffic assignment and another way is to analyze the time series of data on traffic volume and charges in Viet Nam.

However no reasonable figures were obtained by the latter approach because growth rates of traffic volumes were large and historical traffic volume data varied considerably.

Simulation model analysis was relatively crude in this study, the outcome is the only numerical data on elasticity available in Viet Nam and these seem reasonable (Table 19.3).

Elasticities are rather small at the river crossing near Can Tho because no convenient transport means are provided near the Can Tho River crossing, so as a consequence most traffic will have to pass over this

bridge. In the feasibility study on My Thuan Bridge Project the elasticity was estimated at -0.05.

In consideration of above circumstances the following conservative figures were adopted as price elasticities.

Normal traffic	-0.1
Diverted traffic	-0.3
Induced traffic	-0.5

Table 19.3 Estimated Price Elasticity

	Normal and Development Traffic	Diverted Traffic	Induced Traffic
MC	-0.005	-	-0.157
PC	-0.157	-	-0.200
LB	-0.078	-	-0.131
HB	-0.072	-	-0.118
LT	-0.141	-0.400	-0.168
MT	-0.101	-0.370	-0.126
HT	-0.288	-0.360	-0.330
Total	-0.094	-0.363	-0.155

Source: JICA Study Team

(2) Revision of Charge Level

It is empirically unnatural that the charge level will remain unchanged. In accordance with the rise of future users' benefits brought about by a toll bridge, a revision of charge level is a certainty. However, the revision of charge level favors the project financial feasibility, and it was not adopted in this study to prove the project feasible under severe conditions.

(3) Forecast Revenue

Forecast revenues are shown in Table 19.4. Revenue would increase by 70% when the charge level is doubled.

Table 19.4 Revenue from Bridge Charges

(Unit: 1,000 US$)

			2006	2010	2015	2020
Case R1	Fares at the existing ferry fare level (m=1.0)	(1,000US$/year)	5,371	9,571	17,412	25,253
Case R2	Fares at 1.5 times higher than the existing fare level (m=1.5)	(1,000US$/year)	7,465	13,309	24,228	35,147
Case R3	Fares at double of the existing ferry fare level (m=2.0)	(1,000US$/year)	9,166	16,347	29,782	43,217
Case R4	Fares at 2.5 times higher than the existing fare level (m=2.5)	(1,000US$/year)	10,473	18,687	34,076	49,466

Source: JICA Study Team

19.3 Financial Costs

In addition to the construction costs, maintenance costs, costs related to the charge collection system are required for the financial cost estimate in the case of a toll bridge. Costs related to charge collection systems comprising administration, operation costs and taxes were studied and determined in this chapter.

19.3.1 Construction and Maintenance Costs

For the construction costs including the costs for environmental countermeasures, maintenance costs, the results estimated in chapter 16 were used in the financial analysis.

19.3.2 Costs related to Revenue System

Costs related to the toll system are those for operation and facilities and equipment. Cost for facilities and equipment were already estimated in Chapter 16. Equipment costs vary depending on the charge collection system.

The costs for the operation system mainly compose of personnel expenditure and maintenance costs for the toll system and are determined based on the survey results of current salary levels and costs for equipment in the case of the Can Tho Ferry Company (Table 19.5). The maintenance

cost for the toll system was assumed to be 10% of personnel expenditure. Compared with yearly maintenance costs of the bridge and road themselves, the amount is nearly 50%.

Table 19.5 Personnel Expenses for Toll Bridge Operation

Work Type	Number of Staff	Yearly Expense (US$/year)
Manager	1	
Assistant Manager	1	
Administrative Staff	3	
Technical Staff	4	
Fare Collection Staff	24	
Kitchen Service Staff	2	
Controller	6	
Accountant	4	
Guard	8	
Total	53	94,560

Source: JICA Study Team

19.4 Financial Analysis

Profitability of the project largely depends on the construction costs, charges, and funding conditions. Therefore, study cases are established by assuming the possible variations of those factors to meet the scope of the financial analysis.

19.4.1 Conditions for Financial Evaluation

The basic conditions for financial analysis are stated below.

(1) Base Year

The beginning year of the project, 1999 was set as a base year for the financial evaluation.

(2) Evaluation Period

A 30-year period after opening was assumed as the evaluation period. Since the construction work is scheduled to be completed in 2005, the evaluation period is from 2006 to 2035.

(3) Prices

All prices are expressed as current 1997 market prices.

(4) Inflation

No inflation rate was adopted for revenue and costs.

(5) Interest Rate

In Viet Nam different interest rates are observed according to the currency involved and a real interest rate was assumed at less than 10%. An annual rate of interest for decades was assumed to be 8 per cent in Viet Nam.

(6) Depreciation

The following depreciation periods were assumed.

bridge	50 years
building	50 years
equipment for charging system	10 years

(7) Salvage Value

10% of the initial cost was assumed.

A 30-year evaluation period was set only for the purpose of financial analysis, whereas the bridge and other facilities will remain and be operated after 2035. Therefore the remaining value of assets, or salvage value was added to the cash flow of investment as a minus cost in the last year of the evaluation period. A straight line method with a salvage value of 10% of the initial cost after 50 years of the depreciation period was applied to the construction cost.

(8) Taxes

In January, 1999 enterprise income tax and value added tax will be introduced in Viet Nam. However, according to the taxation system in Viet Nam, presently ferry and bridge operation stations are regarded as non-profitable organizations. From the total revenue of

these organizations they will subtract total expenditure, and put the remaining revenue into the state budget without paying tax.

So no consideration was made for paying the profit and enterprise tax in the financial analysis.

(9) Loans

For the financial analysis the following two kinds of loans were assumed available.

a) long-term loan

- interest rate	1.8% a year
- grace period	10 years
- repayment period	30 years

b) short-term loan

- interest rate	8 % a year
- repayment period	1 year

A long-term loan is assumed to cover up to 85 per cent of the project costs in combination with a government subsidy to meet the remaining project costs. A short-term loan would be introduced only if a deficit for cash outflow emerged.

Cash outflow is allocated to the construction costs during the construction period, maintenance and administration costs, paying back long-term loans, and short-term loans if any. When surplus cash is generated, it is allocated to pay back to short-term loans, if any.

(10) Evaluation Indicators

As an evaluation indicator, discounted cash flow investment pay back period, Financial Internal Rate of Return (FIRR), and Net Present Value (NPV) were calculated.

19.4.2 Study Cases

Financial study cases were set with a combination of route options, financial conditions, and charge levels. At first, the promising approach road

options of Alternative C were selected. Then funding cases were set up for those approach road options by means of binary choice between subsidy and long-term loan for major work items. The charge level was also differentiated to examine the level for project feasibility.

(1) Route Options

The following route options regarding the Alternative C Route were considered.

a) C-2/3 route (recommended route)
b) C-1 route (shortest route)
c) C-3 route (longest route)

(2) Financial Conditions

There exist several funds for the project ranging from the national and provincial budget, user charges, contributions from other economic sectors needing dedicated transport infrastructure, ODA grants and loans and in-kind contributions from the local population.

The amount of the project cost was estimated to be considerably large and the application of the full cost principle for the recovery of the project costs seems rather difficult. On the other hand there would be a limitation of affordable expenditure of users for the charge of the bridge.

In this context introduction of an official restriction on the charge level and subsidy for the project cost would be required. And with the financial limitation of the state budget, introduction of some type of soft loan would be necessary.

- construction cost for main bridge,
- construction cost for approach road,
- costs for environmental countermeasures and monitoring,
- cost for supervision and contingencies,
- administration cost, and
- land acquisition cost and compensation cost.

Of those major work items a soft loan was assumed to be applicable for costs other than administration, land acquisition, and compensation. The following financial cases were adopted (Table 19.6).

a) FC-0

Financing the project costs other than costs for administration, land acquisition and compensation with a limitation of 85% of the project cost. Recovery of full project cost was assumed.

b) FC-1

Financing the project costs other than costs for administration, land acquisition and compensation with a limitation of 85% of the project cost. Recovery of long-term loan was assumed.

c) FC-2

Financing the foreign portion of the project costs other than costs for administration, land acquisition and compensation with a limitation of 85% of the project cost.

Recovery of the long-term loan for the foreign portion was assumed in the financial analysis.

(3) Charge Level

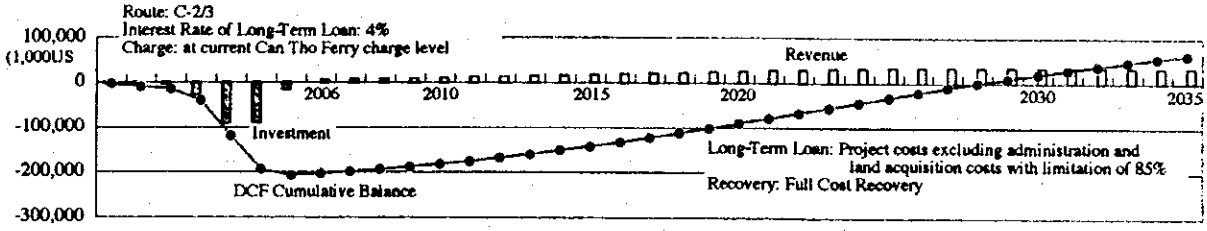
A change of charge level was also taken account in the setting of the study cases. The present charge level of the Can Tho ferry service was set as a base charge level, and a multiplier was applied with values of 1.5 and 2.0.

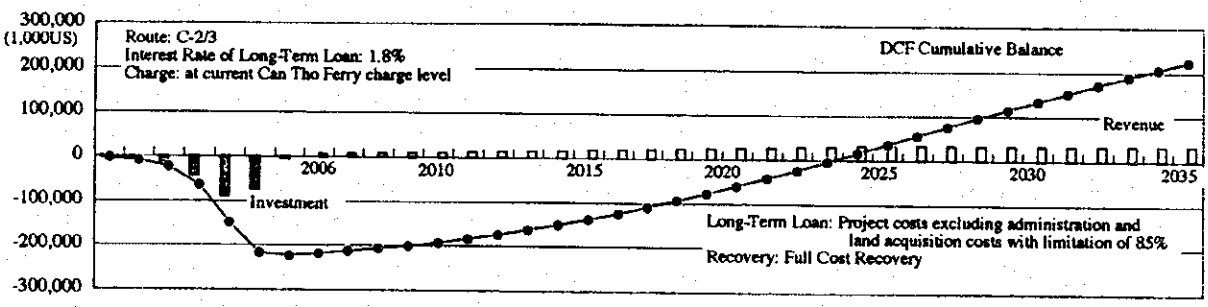
Table 19.6 Funding Case

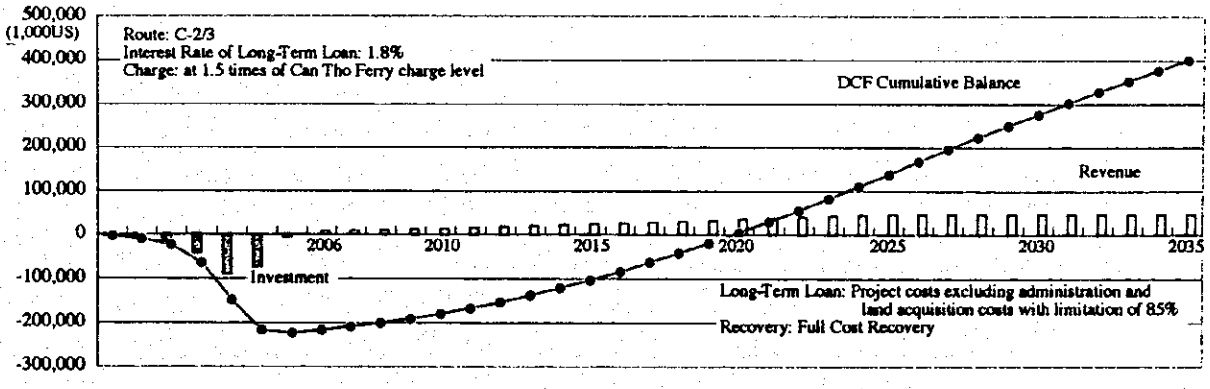
	FC-0 Case (Full Cost Recovery)	FC-1 Case (Recovery for Loan Portion)	FC-2 Case (Recovery for Loan Portion)
a) Construction Cost for Main Bridge	Long-term loan	Long-term loan	Long-term loan (foreign portion)
b) Construction Cost for Approach Road (including Small Bridges and Service Area)	Long-term loan	Long-term loan	Long-term loan (foreign portion)
c) Cost for Environmental Counter Measures and Monitoring	Long-term loan	Long-term loan	Long-term loan (foreign portion)
d) Supervision and Contingency	Long-term loan	Long-term loan	Long-term loan (foreign portion)
e) Administration	Subsidy	Subsidy	Subsidy
f) Land Acquisition Cost and Compensation	Subsidy	Subsidy	Subsidy

19.4.3 Results

Introduction of short-term loan after opening of the bridge was narrowly avoided in all cases under financial condition of FC-0, FC-1, and FC-2. It was recognized that the interest rate of the long-term loan would evidently affect the project profitability (Fig. 19.2). Under FC-0 financial condition the pay back period of the C-2/3 case with 4% of the interest rate of long-term loan was calculated 4 years longer than that of the case with 1.8% of the interest rate of long-term loan.







THE FEASIBILITY STUDY ON THE CAN THO BRIDGE CONSTRUCTION IN SOCIALIST REPUBLIC OF VIET NAM	Fig. 19.2 DCF Cumulative Balance
	JAPAN INTERNATIONAL COOPERATION AGENCY

Under the same charge level as the Can Tho Ferry, the DCF investment pay back periods of each route option were between 15 and 19 years. The FIRRs showed values from 5.6% in C-3 (longest route) under the financial condition of FC-0 (the full cost recovery) to 8.1% in Case C-1 (shortest route) under the financial conditions of FC-2 (the recovery for the long-term loan portion) (Table 19.7). These FIRR figures implied that the project would hardly succeed as a profitable business if funds were procured in the money market.

Table 19.7 Results of Financial Analysis

			C-2/3 Case (recommended route)	C-1 case (shortest route)	C-3 Case (longest route)
Project Cost		(mil. USD)	239.8	236.5	240.2
FC-0	Full Cost Recovery				
	Amount for Recovery	(mil. USD)	239.8	236.5	240.2
	FIRR		5.6%	5.6%	5.6%
	Investment Payback Period (DCF)	(years)	19	19	19
FC-1	Recovery of Long-term Loan				
	Amount for Recovery	(mil. USD)	203.8	201.0	204.2
	FIRR		6.6%	6.6%	6.6%
	Investment Payback Period (DCF)	(years)	17	17	17
FC-2	Recovery of Long-term Loan				
	Amount for Recovery	(mil. USD)	166.4	161.1	166.7
	FIRR		7.9%	8.1%	7.9%
	Investment Payback Period (DCF)	(years)	15	15	15

Source: JICA Study Team

As for the C-2/3 (recommended case) financial feasibility was examined by a differentiating charge level under FC-0, FC-1 and FC-2 conditions. It was clarified that the DCF investment pay back period would be much reduced if the charge level was raised. The DCF investment pay back period under the FC-0 condition in the case of the full project cost recovery would be 15 years if the charge level was raised 1.5 times higher than the current Can Tho Ferry charge level, and 14 years at 2.0 times. In these cases the FIRR was estimated to rise to 9.0% at two times the current Can Tho Ferry charge level. Under the FC-2 condition the DCF investment pay back period was estimated to be reduced to 11 years if the charge was doubled (Table 19.8).

Table 19.8 Results of Financial Analysis Regarding Charge Level

			C-2/3 Case (recommended route)		
			Base (m=1.0)	(m=1.5)	(m=2.0)
FC-0	Full Cost Recovery				
	Investment Payback Period(DCF)	(years)	19	15	14
	FIRR		5.6%	7.6%	9.0%
FC-1	Recovery for Long-term Loan				
	Investment Payback Period(DCF)	(years)	17	14	12
	FIRR		6.6%	8.7%	10.1%
FC-2	Recovery for Long-term Loan				
	Investment Payback Period(DCF)	(years)	15	12	11
	FIRR		7.9%	10.2%	11.7%

Source: JICA Study Team

A sensitivity test to the cost increase (10% and 20%) and revenue decrease (-20%, -30% and -40%) was made for the C-2/3 route option at the charge level 1.5 times higher than the current Can Tho Ferry charge level under the FC-0 condition for full project cost recovery. The result showed that the DCF investment pay back periods were considerably sensitive to the cost increase and revenue decrease. In the case of 40% decrease of the revenue, the DCF investment pay back period was extended to nearly 30 years (Table 19.9).

Table 19.9 Results of Sensitivity Analysis

		C-2/3 Case (m = 1.5)					
			Cost Increase		Revenue Decrease		
		Base Case	10%	20%	-20%	-30%	-40%
FC-0	Full Cost Recovery						
	Investment Payback Period (years) (DCF)	15	16	17	18	19	21
	FIRR	7.6%	7.0%	6.5%	6.2%	5.4%	4.5%

Source: JICA Study Team

All above cases were examined on condition of Government subsidy for the portion other than that covered by long-term loan, and short-term loan was only considered when short in cash flow would emerge. The study case

where Government subsidy was superseded by short-term loan was examined for reference with the charge level 1.5 times higher than current Can Tho Ferry charge level under the financial condition of FC-0. In this case introduction of new short loan after opening was narrowly avoided. The result revealed that the short-term loan for capital investment would be repaid after 7 years of the completion of the project. Investment pay back period was extended one year if combination of discount rates of 8 percent and 1.8 percent was assumed.

In conclusion although the expected revenue depends on a sound increase of future traffic, the project seems viable and can resist considerably the failure of forecast revenue under favorable funding conditions.

19.4.4 Recommendation

Based on the analysis the following recommendations were made on the basis for realization of a toll bridge.

a) Financing conditions of long-term loan

As an enterprise the profitability of the project can not be highly expected without favorable financing conditions and government subsidies. It is necessary to select the long-term loan with the most generous financing conditions of interest rate, grace period, repayment period, and applicable work items. For instance the grant portion varies considerably depending on the combination of the interest rate and grace period of a soft loan, and overall judgment for the application of a soft loan will be required. The costs for resettlement were estimated to be large and if these costs are funded by a long-term soft loan, the burden to the state budget will be mitigated.

b) Scope of government subsidies

It should be considered to introduce some government subsidies for the project cost and charges if necessary. Firstly the subsidies for the project cost should be considered to secure the average cost pricing principle, in other words to reduce the project cost put in use for the financial analysis. Work items to be subsidized by the government shall be those for which no soft loan can be applied due to financing rules. Though financing conditions vary depending on the types of

loan, land acquisition, compensation, administration, and approach road costs can be enumerated as those work items.

Regarding the subsidy for charges, it should be considered only in the case where the charge level becomes too high for users under the average cost pricing principle to suppress the economic activities of users. This case is likely to secure the sufficient revenue enabled by the estimated rigid values of price elasticity. However subsidies for charges should be prudently implemented after scrutiny of the expenditure structure of users.

c) Determination of charge level

The revision of charge level can not be carried out so frequently and can not be determined apart from the users' affordable level. Further studies on the influences on prices by raise of charge, or expenditure structure of households are required to set the charge level.

Charges for vehicle type should be also studied from the viewpoint of maximization of social surplus and income redistribution.

In the case of the individual bridge project concept, it is supposed that the charge levels vary considerably according to the profitability level of the project. The charge level of the Can Tho Bridge would be set higher than that of the nearby My Thuan Bridge under the average cost pricing principle for each individual bridge project because the project cost of the Can Tho Bridge was estimated much higher than that of the My Thuan Bridge Project. However, the charge level should be carefully determined based on the beneficiary-to-pay principle. Such a concept together with a pooling system and Ramsey pricing deserves study for determination of the charge level.

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CHAPTER 20

IMPLEMENTATION PROGRAMME

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20.1 Project Outline

The Can Tho Bridge Construction Project can be characterized as a national project as well as one of the most important projects for the regional development of the Mekong Delta. The bridge is planned to cross the Hau River between Vin Minh (of Vin Long Province) and T. P. Can Tho. The location of the bridge will be about 2.9 km downstream from the existing ferry crossing.

The features of the project are summarized below:

a) Predicted Future Traffic Volumes on the Bridge

Year 2006	:	17,134 PCU/day
Year 2010	:	29,628 PCU/day
Year 2020	:	75,262 PCU/day

b) Design Flood Level and Discharge

- For Structure Design

100-year return period (1% frequency)

High Water Level: 195.46 (cm)

Design Discharge: 30,999 (m^3/sec)

- For Vertical Alignment (Level for Navigational Clearance)

20-year return period (5% frequency)

High Water Level: 191.66 (cm)

Design Discharge: 28,204 (m^3/sec)

c) Bridge Location : 2.9 km downstream from the existing ferry crossing

d) Bridge Width : 22.1 m (4-lane carriageway)

e)

Total Bridge Length	:	2,615 m
Main span bridge	:	1,040 m
Vin Long side approach span bridge	:	350 m

Can Tho side approach span bridge : 1,225 m*

* : inclusive of 175 m of the substream bridge

f) Main Span Bridge

- Superstructure Type : Hybrid (Steel and Prestressed Concrete) Cable-stayed Girder
- Foundation Type : Reinforced Concrete Open Caisson
  Cast-in-Place RC Pile
  Steel Pipe Pile
- Span Arrangement : 70m + 200m + 500m + 200m + 70m = 1,040 m

g) Approach Span Bridges

- Vinh Long Side : Prestressed Concrete Box Girder (Superstructure)
  Cast-in-place Reinforced Concrete Piles (Foundation)
  Spans : 7 @ 50.0m = 350 m

- Can Tho Side : Prestressed Concrete Box Girder (Superstructure)
  Cast-in-place Reinforced Concrete Piles (Foundation)

Spans	:	18 @ 50m	= 900 m
		50m + 75m + 50m	= 175 m
		3 @ 50m	= 150 m
		Total Length (both sides)	= 1,575 m

h) Approach Roads

- Road Length :

Vinh Long Side:	4,990 m
Can Tho Side:	6,917 m
Total	11,907 m

i) Intersections

- Vinh Long Side : Double Y-shaped type (Grade Separation)

- Can Tho Side : T-shaped type (At-grade)
- Roundabout : Rotally type

j) Service Area

- Vinh Long Side : 15,000 m^2
- Can Tho Side : 15,000 m^2

20.2 Project Packaging

The engineering services (E/S) for the project can be split into 2 phases: Detailed Design and Construction Supervision.

The construction for the project has been divided into 5 packages: 1) Main Bridge, 2) Approach Bridge on Vinh Long side, 3) Approach Bridge on Can Tho side, 4) Approach Road on Vinh Long side, and 5) Approach Road on Can Tho side. The interfaces between the construction packages will have to be coordinated appropriately with the responsibility of the administration by the PMU My Thuan and the construction supervision by an international consultant.

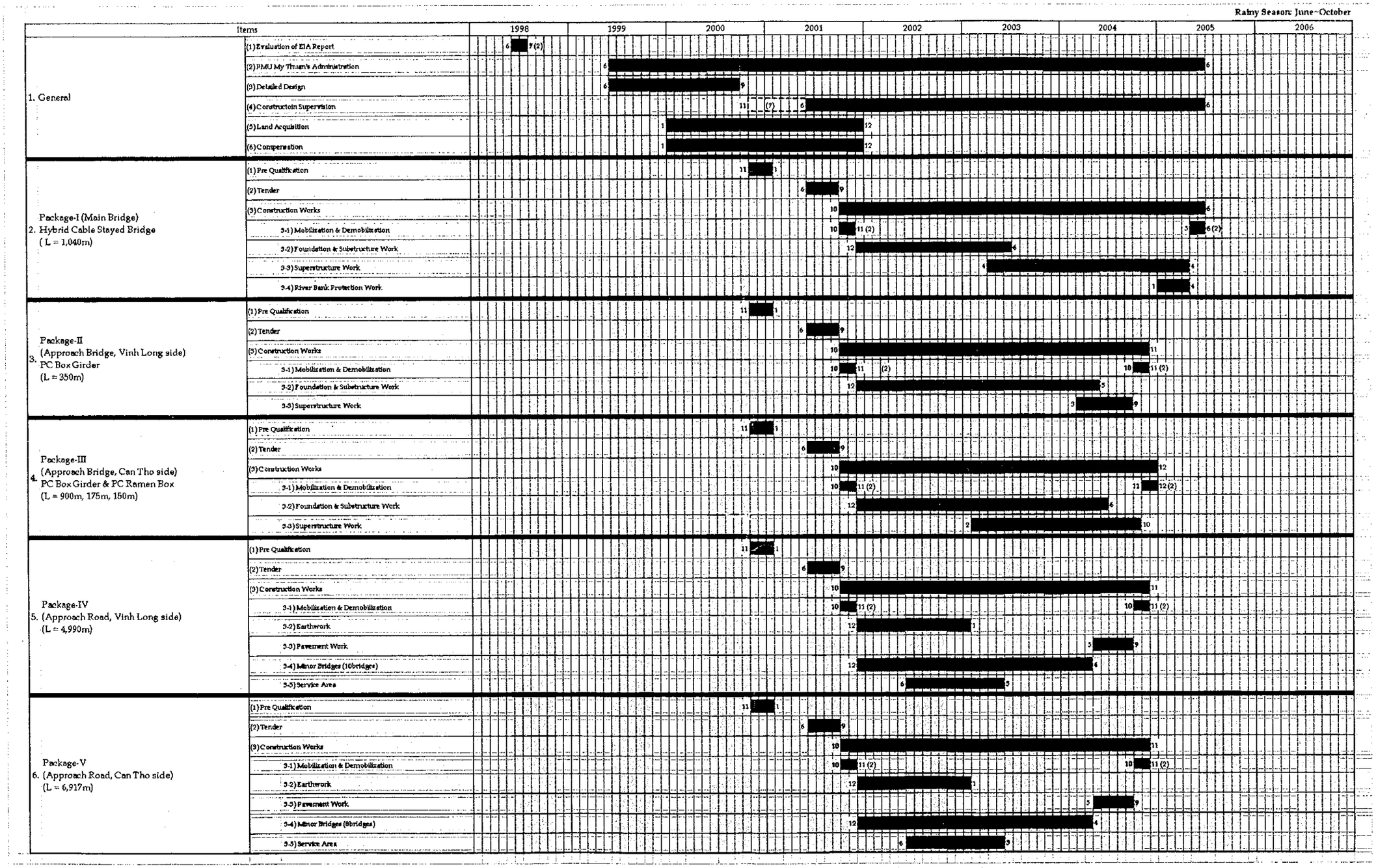
20.3 Implementation Schedule

The implementation schedule of the Can Tho Bridge Construction Project takes into consideration the periods of detailed design, pre-qualification, tendering, and construction.

The Study Team has proposed an ordinary case consisting of end to end activities to complete the project by June 2005 as shown in Fig. 20.1. In addition, an alternative implementation schedule is examined at the Vietnamese Government's preference that the overall time schedule be shortened by adopting some overlapped activities to complete the project by December 2004 as shown in Fig. 20.2.

However, the alternative implementation schedule would require that the pre-qualification proceedings even before settling the financial arrangements of the project facilities.

Fig 20.1 Recommended Implementation Schedule (End to End Activities)



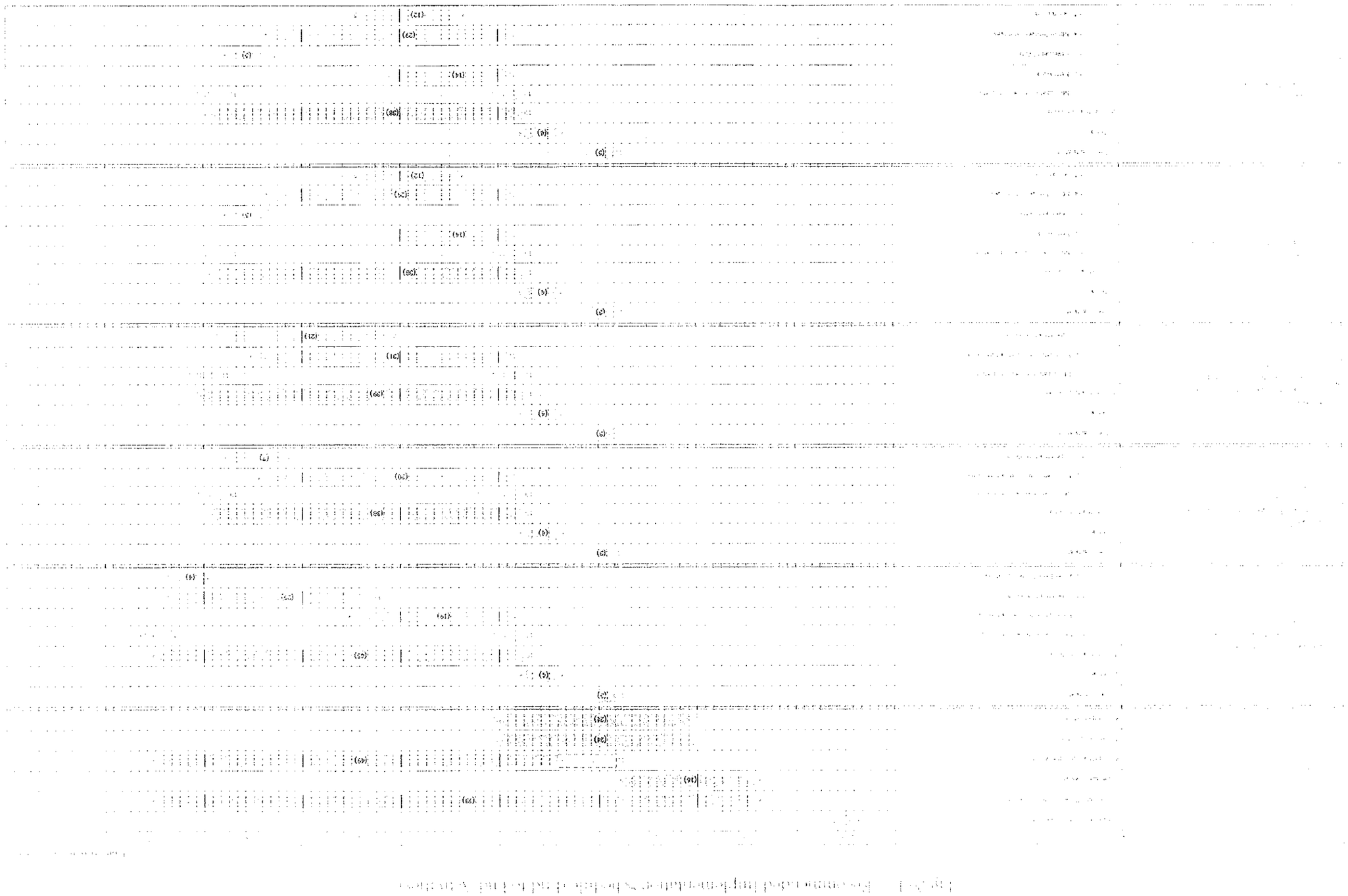
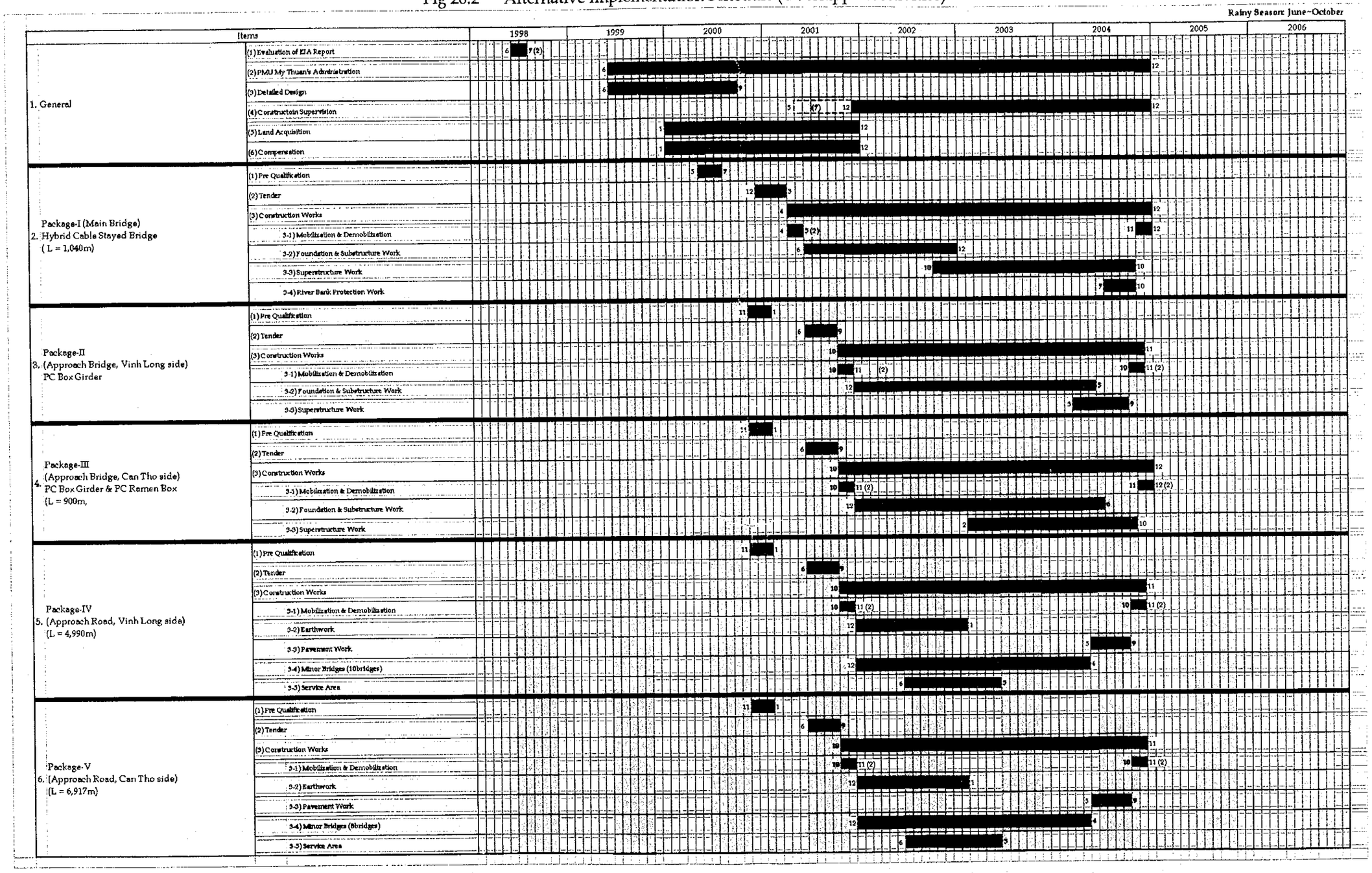
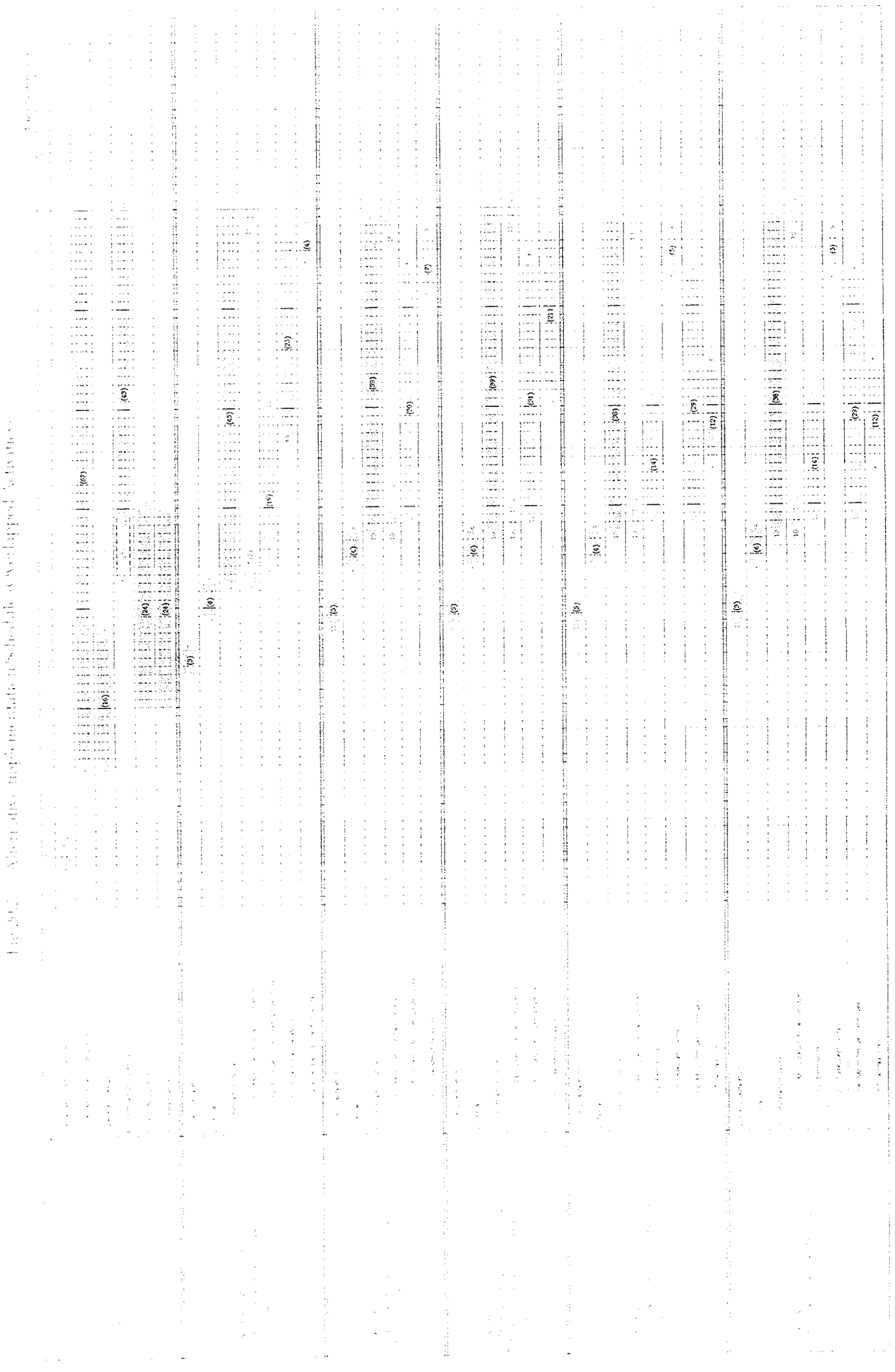


Fig 20.2 Alternative Implementation Schedule (Overlapped Activities)





20.4 Project Cost

Based on the detailed design, construction cost, and construction schedule, etc., the project cost is summarized as follows:

Table 20.1 Project Cost by Components

Unit: thousand US $

Component		Foreign Exchange Portion	Local Currency Portion	Total
1. Construction Cost	Mobilization & Demobilization	6,838.24	4,111.93	10,950.17
	Main Bridge	84,636.21	19,723.36	104,359.57
	Approach Bridge (Vinh Long)	8,734.35	3,428.45	12,162.80
	Approach Bridge (Can Tho)	33,763.77	10,071.57	43,835.34
	Approach Road (Vinh Long)	5,157.11	9,333.34	14,490.45
	Approach Road (Can Tho)	4,473.20	9,756.92	14,230.12
(Sub Total)		(143,602.88)	(56,425.57)	(200,028.45)
2. Engineering Cost	Detail Design & Tender Assistance	4,087.50	3,240.00	7,327.50
	Construction Supervision	3,506.25	2,384.20	5,890.45
(Sub Total)		(7,593.75)	(5,624.20)	(13,217.95)
3. Administration Cost		0.00	2,000.28	2,000.28
4. Environmental Monitoring & Countermeasures		0.00	235.90	235.90
5. Land Acquisition		0.00	1,944.45	1,944.45
6. Compensation		0.00	591.67	591.67
7. Sub Total of Project Cost without Contingency (1. + 2. + 3. + 4. + 5. + 6.)		(151,246.63)	(66,772.07)	(218,018.70)
8. Physical Contingency		15,124.66	6,677.21	21,801.87
9. Price Escalation (Base year, 1997)		17,647.76	10,747.22	28,394.98
Total	(7. + 8.)	166,371.29	73,449.28	239,820.57
	(7. + 8. + 9.)	184,019.05	84,196.50	268,215.55

* Price Escalation: 2% for Foreign Exchange Portion
3% for Local Currency Portion

*Yearly maintenance cost:
Foreign Exchange Portion: 89.09 thousand USD
Local Currency Portion: 20.92 thousand USD
Total: 110.01 thousand USD

20.5 Annual Budgetary Schedule

Based on the project cost and implementation schedule, the annual funding requirement for 7 years is shown in Table 20.2.

Table 20.2 Annual Budgetary Schedule

Unit: thousand US$

	Investment Cost			Maintenance Cost			Total Financial Cost		
	F.E. Portion	L.C. Portion	Total	F.E. Portion	L.C. Portion	Total	F.E. Portion	L.C. Portion	Total
1997	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	1,770.40	1,614.32	3,384.72	0.00	0.00	0.00	1,770.40	1,614.32	3,384.72
2000	2,456.09	4,275.40	6,731.49	0.00	0.00	0.00	2,456.09	4,275.40	6,731.49
2001	7,048.87	6,540.83	13,589.70	0.00	0.00	0.00	7,048.87	6,540.83	13,589.70
2002	23,899.15	19,963.17	43,862.32	0.00	0.00	0.00	23,899.15	19,963.17	43,862.32
2003	69,864.14	20,799.70	90,663.84	0.00	0.00	0.00	69,864.14	20,799.70	90,663.84
2004	56,794.44	18,359.86	75,154.30	0.00	0.00	0.00	56,794.44	18,359.86	75,154.30
2005	4,538.22	1,760.25	6,298.47	0.00	0.00	0.00	4,538.22	1,760.25	6,298.47
2006	0.00	29.11	29.11	89.09	20.92	110.01	89.09	50.03	139.12
2007	0.00	29.11	29.11	89.09	20.92	110.01	89.09	50.03	139.12
2008	0.00	29.11	29.11	89.09	20.92	110.01	89.09	50.03	139.12
2009	0.00	29.11	29.11	89.09	20.92	110.01	89.09	50.03	139.12
2010	0.00	19.40	19.40	89.09	20.92	110.01	89.09	40.32	129.41
~	~								
2025	0.00	0.00	0.00	89.09	20.92	110.01	89.09	20.92	110.01
Total	166,371.27	73,449.30	239,820.57	1,781.80	418.40	2,200.20	168,153.07	73,867.70	242,020.77

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CHAPTER 21

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 21 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations can be made:

1. The study area belongs to a part of the Mekong River, which originates in the Tibetan Plateau and drains into the South China Sea. During the wet season, the river water level increases and large scale inundation occurs in the north. Generally, flooding in this area starts in July or August, and extends up to November or December. The past flood incidents that occurred in the Can Tho Area (the largest flood occurred on 25th October 1961 with a record water level of 2.09 m) must be considered in planning the bridge.

2. The daily tidal change in the vicinity of the estuary is considerable, and the range of high tides is also high. However the effects of tides lessen in the upper stream reaches. Also, it is observed that the tidal changes are high in the dry season (December to July), rather than in the period when the water level of the river is high, and this tidal changes should be considered in the design.

3. Transport in the Mekong Delta depends on inland waterways, road, sea, and air. Since the economy in Viet Nam has been expanding rapidly, there has been a shift of freight transport from railway to roads. Can Tho city is the largest and most important city in the Mekong Delta and is a key food producing area. The presence of the Can Tho Bridge, therefore, is a must so that transport and connections to neighboring areas are facilitated and the development in the economy on both river banks is accelerated.

4. A two-lane bridge will reach its capacity in the year 2011 (5 years after opening in 2006). The capacity for the two-lane facility can be approximated at 20,000 pcu./day. The capacity for a four-lane facility (two lanes in each direction) is approximated at 60,000 pcu./day. A four (4) lanes carriageway are required for the bridge and the approach roads to meet future demand.

5. The option C-3 on the Vinh Long side and the option C-2 on the Can Tho side was selected as the most suitable alternative route for the Can Tho Bridge construction after consideration of engineering, economic, and environmental aspects.

6. A vertical navigational clearance of 39.0 m (for vessel size 15,000 DWT) above the flood water level of 5% frequency (20-year return period) was agreed on 27th March, 1998 at the Steering Committee Meeting.

7. Standards and specifications for the design of the Can Tho Bridge shall be based mainly on the Vietnamese standards or codes, otherwise AASHTO specifications or Japanese standards will be used.

8. The span length of the main bridge depends not only on the required navigational (horizontal) clearance, but by the required conditions that the bridge structure shall be free from hydrodynamic issues, due to the riverbed deepening at the river section of the bridge crossing point (which may be caused by the planform (riverbank) changes at the upstream of the bridge site). The required span length for the main bridge shall be greater than 500 m so that the main towers of the bridge can clearly straddle the deepening channel.

9. For crossing the main stream, a Hybrid Cable-stayed with a Prestressed Concrete (PC) Box Girder type for approach spans are recommended. For the branch river a Balanced Cantilever (PC) Bridge type is recommended.

10. The maintenance organization should be simple and be met by the specific requirements and resources of Viet Nam. The organization shall liaise with the appropriate existing Vietnamese authorities and follow the budgetary systems for the maintenance of highways.

11. The construction cost covers mobilization/demobilization, main & approach bridges, and approach roads and is estimated at 200.0 million USD, while the project cost including the engineering cost, environmental cost, land acquisition, compensation, etc. is 239.8 million USD.

12. The tentative construction schedule is 45 months from 2001 to 2005.

13. The economic internal rates of return (EIRRs) of the options to the basic alternative case which was related to selected routes varies from 13.4 to 14.0%. These small variation of EIRRs is attributable to the narrow differences among the estimated costs for each option. The basic alternative case, i.e. the route option C-3 on the Ving Long side and the option C-2 on the Can Tho side, has an EIRR of 13.5%, resulting in this

option being recommended with due consideration of the technical feasibility, and environmental aspects of the project.

14. The profitability of the project cannot be highly expected without favorable financing conditions and government subsidies. Work items to be subsidized by the government shall be those for which no soft loan can be applied due to financing conditions. It is recommended to select the long-term loan with generous financing conditions of interest rates, grace period, repayment period, and applicable work items.

    The toll charges for the Can Tho Bridge will be set rather higher than those of the nearby My Thuan Bridge. Providing that future traffic volume on the Bridge expand as forecast, it is expected that the charges for the Can Tho Bridge would be below the users' affordable level.

15. The adverse impacts on the natural environment or socio-economic environment of the study area are small in scale and can be easily mitigated by the appropriate measures. The adverse impacts caused by the construction of the proposed bridge will certainly not overweigh the benefits which the whole Mekong Delta region would achieve from implementation of the Project.

    To mitigate the adverse impacts on the socio-economic environment of the local communities, the construction of two resettlement zones and two service areas close to the bridge is recommended. These plans should be examined in detail and prepared at early stage of the detailed study after approval of the Project.

    The issue of compensation for loss of dwellings and lands should be discussed carefully to avoid any delay of the construction of the project as soon as possible after approval of the Project.

The Study Team concludes that the construction of the Can Tho Bridge is technically and economically feasible under the proper financing conditions discussed in this study. Thus, it is recommended that the implementation of the project be made in the immediate future.

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CHAPTER 22

ADVANCE TECHNOLOGY FOR BRIDGE CONSTRUCTION (FOR TECHNOLOGY TRANSFER)

CHAPTER 22 ADVANCE TECHNOLOGY FOR BRIDGE CONSTRUCTION (FOR TECHNOLOGY TRANSFER)

22.1 General

This chapter deals with the programs for technology transfer already conducted in the Feasibility Study as well as being planned for the subsequent detailed design and construction stages.

22.2 Training Program in the Feasibility Study

As requested in the Scope of Work for the Feasibility Study on the Can Tho Bridge Construction, the program for technology transfer and training to the Vietnamese counterpart personnel in the course of the Study was prepared. The programme can be categorized into two parts, i.e. technology transfer through local seminars and counterpart training in Japan.

22.2.1 Technology Transfer

A part of the technology transfer through a seminar was conducted on 21st January 1998 at the PMU My Thuan Office. The participants consisted mainly of Vietnamese personnel who are either involved in the study or have an interest on the project. Topics of technology transfer through the seminar were as follows:

a) Advanced Technology for Bridge Construction in Japan

- PC Extra-dosed Bridge
- PC Hybrid Bridge

b) Construction Methods for Deep Bridge Foundation

- Method of Sinking a Caisson Foundation
- Automatic Operation of Sinking Open Caisson

Above papers are summarized in the Volume IV Annexures

At a late stage of the study, the Study Team has produced a video movie that contains the highlights of the respective activities of the Study Team as well as the study conclusions.

Presentation of this video was conducted in July 1998 on the occasion of submission and discussion of the Draft Final Report in Viet Nam.

22.2.2 JICA Counterpart Training

JICA has arranged for a counterpart training program in Japan.

- Trainee: MR. NGUYEN XUAN HIEP
- Training Period: 13th July 1998 to 2nd August 1998

22.3 Recommendation on Future Program

The Study Team recommends an overseas and domestic training program for the Vietnamese experts associated with the Can Tho Bridge Construction Project to facilitate the transfer of technology.

The recommended subjects for technology training, place of training and participants to each subject are summarized in Table 22.1 below.

Table 22.1 Summary of Future Training

Items	Technology Transfer		Place of Training		Participants
	Technical Training	Manual Preparation	Overseas	Domestic (Vietnam)	
Bridge Project Management			○		G
Investigation Works	○			○	G & C
Foundation Design Works	○		○	○	G & C
Superstructure Design Works	○		○	○	G & C
Construction Supervision on Foundation Works	○	○	○	○	G & C
Construction Supervision on Superstructure Works	○	○	○	○	G & C
Traffic Control		○	○	○	G
Toll Collection	○		○	○	G

Notes: G = Vietnamese Government Staff
C = Vietnamese Consultant Staff

JICA