4. ECONOMIC FEASIBILITY OF THE TOURISM DEVELOPMENT PLAN

4. ECONOMIC FEASIBILITY OF THE TOURISM DEVELOPMENT PLAN

4.1 Benefits from Tourism Development

The Thai economy has achieved favorable economic growth higher than the target during the 6th National Social and Economic Development Plan (plan period: 1987-1991) because of increased exports, inward investment and tourism revenue. The beneficiaries of this economic development, however, are largely limited to the central region areas lying to the east of Bangkok and several large cities, and most rural areas and many local urban areas are not fully enjoying the benefits of the high growth. In the 7th National Plan which commenced in October, 1991, therefore, the wider distribution of the fruits of the country's economic growth is regarded as the major objective and it is believed that the development of tourism will play an important role in the achievement of this objective.

The development of tourism is expected to have the following direct and indirect effects on regional communities and their economies:

1. promotion of regional economy through increased revenue from tourism as well as from related industries;
2. increased employment opportunities;
3. consolidation of such social infrastructure as roads, water supply and sewerage, etc. which are improved in accordance with the development of tourism;
4. active conservation of cultural resources as tourism resources; and
5. increased exchange between regional people and tourists.

4.2 Evaluation Method

4.2.1 Outline of the Evaluation Process

The purpose of overall evaluation is to determine whether or not implementation of the projects and programs recommended in the Tourism Development Plan, hereinafter referred to as the Projects, is suitable from the view point of local economy. Actual evaluation is conducted in terms of the economic internal rate of return (EIRR) which is calculated by the following equation:

$$\sum_{i=0}^{n} \frac{Bi - Ci}{(1+r)^i} = 0$$

Where,

Bi : Benefit in i-th year
Ci : cost in i-th year

r : rate of discount

The value which satisfies the above equation is called the internal rate of return (IRR). The overall calculation process is shown in figure. 4.2-1.

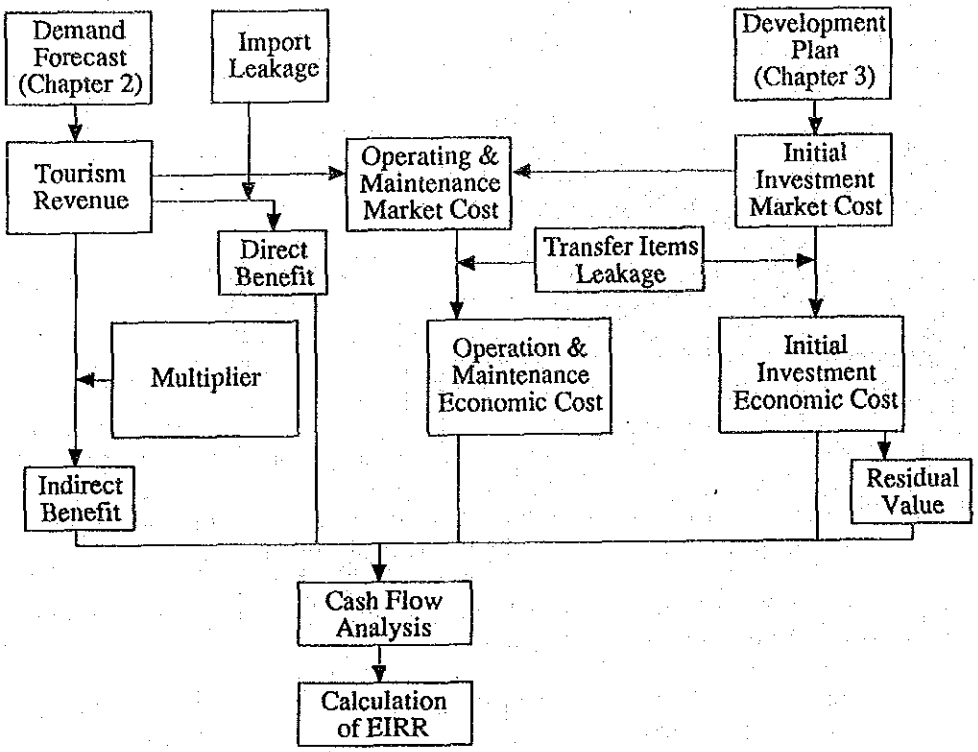


Figure 4.2-1 Evaluation Process for Economic Evaluation of the Tourism Development Plan

4.2.2 Preconditions for Evaluation

(1) Economic Benefits

In this report, the economic benefits resulting from the development of tourism in a local area are the incremental tourism revenue following an increased number of tourists and the incremental production value in the Study Area due to increased income in tourism-related industries. These economic benefits can be quantitatively measured as the difference between the total revenue with the Projects' implementation and the total revenue without implementation of the Projects. There are, in fact, 2 different underlying thoughts in regard to the latter, i.e. without implementation of the Projects. One is that the present number of tourists has reached the maximum level and will not increase in the future without the projects' implementation. The other is that the number of tourists will hit the ceiling without the projects' implementation despite a gradual annual increase for some time to come.

(2) Project Cost

The project cost estimated in Chapter 3.6 is spread over the project years in accordance with the project implementation schedule. The project cost estimated in Chapter 3.6 is expressed in terms of the market cost, and was converted into

economic cost where the transfer cost (customs duties, business tax and sales tax, etc.) is deducted from the market cost for economic evaluation purposes. With regard to the land cost, even though the market cost estimate disregards the land cost in the case of public land, it is included in the economic cost as the estimated opportunity cost.

(3) Evaluation Period

Large development projects in the public sector are generally initiated by the government and authorized within the framework of the Five Year NESDP. The expected life of the tourism and infrastructural facilities proposed here is some 20-30 years. In consideration of these factors, the project evaluation period has been set at 23 years, from 1994 to 2016.

4.3 Calculation of Benefits from Tourism Development

4.3.1 Direct Benefits from Tourism Development

The direct benefits is expressed in terms of the increased tourism revenue generating from an increased number of tourists to the Study Area.

(1) Regional Tourism Revenue

Based on the estimated number of tourists, the incremental tourism of the Study Area can be estimated using the following equation.

$$(dTRV) = (dITA) \times (EPD) \times (LST)$$

Where,

dTRV	:	incremental tourism revenue
dITA	:	incremental tourist arrivals
EPD	:	tourist expenditure/person/day
LST	:	average length of stay

1) EPD (Tourist Expenditure/Person/Day)

According to the Domestic Tourists Survey 1990 (Tourism Authority of Thailand), the EPD in the Study Area is 830 baht for a Thai tourist and 1,858 baht for a foreign tourist. This EPD figure will be increased with expanded sightseeing facilities and an improved level of facilities as a result of the Projects' implementation. The EPD for a Thai tourist is assumed to increase in proportion to the GDP growth while the future increase of the EPD for a foreign tourist is estimated based on past trends, i.e. expenditure trends of foreign tourists visiting Thailand as local statistics in this regard area scarce.

2) LST (Average Length of Stay)

The same survey gives a LST figure of 1.82 days for a Thai tourist and 3.47 days for a foreign tourists visiting the Study Area (see Table 4.3-1). Most Thai tourists come from the central region, including Bangkok. Given the geographical proximity of the Study Area to the central region, it is unlikely that the number of Thai overnight tourists in the Study Area will substantially increase in the future and the maximum LST will be approximately the 2.0 days currently recorded for Pattaya. In contrast, the LST for a foreign tourist appears to have room for prolongation provided the area improves its tourist attractions. Consequently, the target LST for a foreign tourist is to increase the present LST 6.0 days by 2006.

Table 4.3-1 Average Length of Stay at Main Beach Destinations in Thailand (1990)

unit: days

Area	Thai Tourists	Foreign Tourists	Total
Koh Samui	2.63	8.79	6.90
Pattaya	2.06	6.17	5.05
Phuket	4.42	5.35	4.99
Cha-Am	1.87	4.31	2.23
Hua Hin	1.73	2.75	1.85
Rayong	1.68	2.24	1.72
Study Area	1.82	3.47	2.09

source: Domestic Tourists Survey 1990, TAT

3) Incremental Tourism Revenue

Based on the conditions described above and the number of future tourists estimated in Chapter 2.3.2, the incremental tourism revenue will be 6,855 million baht in 2001 and 19,109 million baht in 2006 as shown in Table 4.3-2.

Table 4.3-2 Summary of Long-Term Projections for Tourism in the Study Area

	1990	1996	2001	2006	2016
Tourism Expenditure (baht/person/day)					
Thai Tourists	829.81	1,245.32	1,666.52	2,126.95	3,148.40
Av. Annual Growth Rate	-	7.0 %	6.0 %	5.0 %	4.0 %
Foreign Tourists	1,858.13	2,490.07	3,029.55	3,512.08	4,281.21
Av. Annual Growth Rate	-	5.0 %	4.0 %	3.0 %	2.0 %
Length of Stay (days)					
Thai Tourists	1.82	1.93	2.03	2.03	2.03
Av. Annual Growth Rate	-	1.0 %	1.0 %	0.0 %	0.0 %
Foreign Tourists	3.47	4.52	5.37	6.08	6.08
Av. Annual Growth Rate	-	4.5 %	3.5 %	2.5 %	0.0 %
Incremental Tourist Arrivals (1,000s)					
Thai Tourists	0	0	618	1,294	1,294
Foreign Tourists	0	0	293	634	634
Total	0	0	911	1,928	1,928
Incremental Tourism Revenue (million baht)					
Thai Tourists	0	0	2,091	5,589	8,272
Foreign Tourists	0	0	4,764	13,521	16,482
Total	0	0	6,855	19,109	24,754

source: Study Team

(2) Direct Economic Benefit

The direct economic benefit of the Projects' implementation can be quantified by converting the incremental tourism revenue (dTRV) to the gross regional product (GRP). The actual value of the conversion parameter (p) depends on the local economic structure and the tourist expenditure structure and is given by the following equation where the rate of value added in the tourism-related industrial sector (RVAj) is weighted by the rate of tourist expenditure in the industrial sector (EXPj).

$$(p) = \sum_{j}(EXPj) \times (RVAj)/100$$

Where,

p	:	conversion parameter from tourism revenue to direct economic benefit
EXPj (%)	:	rate of tourist expenditure in j industrial sector
RVAj (%)	:	rate of value added in j industrial sector

1) Tourist Expenditure Structure (EXPj)

The expenditure structure of foreign tourists shown in Table 4.3-3 shows that the share of shopping expenditure substantially increased in 1988 but has leveled out in subsequent years. Consequently, the average figures for the period from 1988 onwards are used to represent the EXPj for the present purposes.

Table 4.3-3 Foreign Tourist Expenditure Structure

unit: %

Type of Expenditure	1986	1987	1988	1989	1990	Average
Accommodation	26.6	26.8	24.0	27.1	23.4	24.8
Food and Drinks	17.0	18.0	15.9	16.2	15.0	15.7
Shopping	27.3	26.8	38.5	36.9	38.8	38.1
Entertainment	10.0	12.1	6.6	4.8	7.6	6.4
Local Transport and Tours	15.6	13.4	13.1	13.7	13.3	13.3
Miscellaneous	3.4	2.9	1.8	1.3	1.9	1.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

source: TAT

The expenditure structure for Thai tourists is set as shown in Table 4.3-4 based on the findings of the Master Plan 1987.

Table 4.3-4 Thai Tourist Expenditure Structure

unit: %

Type of Expenditure	Day-Trip*	Overnight Tourist*	Total**
Accommodation	-	14.7	10.2
Food and Drinks	26.7	19.5	21.7
Local Transportation	10.0	6.1	7.3
Shopping	23.8	18.0	19.8
Other Transportation	32.7	23.5	26.3
Miscellaneous	6.8	18.2	14.7
Total	100.0	100.0	100.0

source: * Master Plan 1987
** Calculation made on assumption of 55 % share of overnight tourists

2) Rate of Value Added in j Industrial Sector (RVAj)

The rate of value added in the tourism-related j industrial sector(RVAj) is given as a proportion of the value added of the total demand of each industry which is calculated using the data listed in the Input/Output Table in Thailand (1989) prepared by the NESDB (refer to table 4.3-5).

$$(RVAj) = (VATj) / (TSPj)$$

Where,

RVAj	:	rate of value in j industrial sector
VATj	:	value added in j industrial sector
TSPj	:	total demand in j industrial sector

Table 4.3-5 Rate of Value Added in Tourism Related Industries

unit: million bath

Code	Sector	Value Added	Total Supply	Rate of Value Added
021	Hotels and Restaurants	84,422	195,204	0.43248
022	Transport	131,331	273,954	0.47939
027	Other Services	447,114	590,005	0.75781

source: Study Team

3) Direct Economic Benefit

The resulting value of conversion parameter (p) is 0.589 for foreign tourist expenditure and 0.581 for Thai tourist expenditure, indicating that the direct benefit of the Projects will be either 58.9 % or 58.1 % of the incremental tourism revenue (refer to table 4.3-6).

Table 4.3-6 Projection of the Direct Economic Benefit of the Projects and Programs

unit: million baht

	1996	2001	2006	2011	2016
Incremental Tourism Revenue					
Thai Tourists	0	2,091	5,589	6,799	8,272
Foreign Tourists	0	4,764	13,521	14,928	16,482
Total	0	6,855	19,109	21,727	24,754
Direct Economic Benefit					
Thai Tourists	0	1,215	3,247	3,950	4,806
Foreign Tourists	0	2,806	7,964	8,793	9,708
Total	0	4,021	11,211	12,743	14,514

source: Study Team

4.3.2 Indirect Benefit from Tourism Development

In reality, tourist expenditure means the direct revenue for such tourism-related businesses as hotels, restaurants, souvenir shops and transport operators, etc. (direct benefit). Since this revenue is partly used to procure raw materials and fuel, etc. by these business, industrial sectors other than tourism-related also benefit from tourism (indirect benefit). The size of this indirect benefit can be calculated by the following equation using the coefficient to the inverse matrix given by the Input/Output Table.

$$(IDB) = (dTRVi) \times \sum_{j} (RIBij)$$

$$(RIBij) = (CIMij) \times (RVAj)$$

Where,

IDB : tourism-based indirect benefit for i industrial sector
dTRVi : incremental tourism revenue in i industrial sector
RIBij : rate of indirect benefit for j industrial sector associated with tourism-related expenditure of i industrial sector
CIMij : coefficient of inverse matrix for j industrial sector associated with increased production of i industrial sector
RVAj : rate of value added in j industrial sector

1) Coefficient of Inverse Matrix (CIMij)

The coefficient of inverse matrix indicates the degree of influence on the production of related industries when the production of a given industry increased

by one unit and is listed in the Input/Output Table. Table 4.3-7 shows the calculation results of the inverse matrix based on the Input/Output Table in Thailand (1989). The sum of the vertical column is the coefficient of the inverse matrix for a given industry which is 0.95 for the hotel/restaurant industry, 0.57 for the transport industry and 0.32 for other service industries.

2) Rate of Indirect Benefit (RIBij)

The rate of indirect benefit, calculated based on the coefficient of the inverse matrix and the coefficient of the value added shown in Table 4.3-7, is 0.40 for the hotel/restaurant industry, 0.20 for the transport industry and 0.16 for other service industries.

Table 4.3-7 Coefficient of Inverse Matrix and Value Added by Industrial Sector

Sector Code	Industrial Sector	Coefficient of Inverse Matrix			Coefficient of Value Added
		Hotel and Restaurant	Transport	Other Services	
1	Paddy	0.022919	0.001258	0.004513	0.765346
2	Other Crops	0.025769	0.004714	0.004618	0.648737
3	Vegetables and Fruit	0.044443	0.000851	0.002267	0.410765
4	Other Agriculture	0.093311	0.004810	0.007473	0.369021
5	Fish	0.038642	0.000686	0.001261	0.379522
6	Slaughtering	0.130242	0.002231	0.004052	0.171027
7	Canned and Preserved Food	0.008094	0.000199	0.000565	0.288467
8	Rice	0.030777	0.001648	0.006155	0.143729
9	Beverages	0.100040	0.006050	0.005424	0.522331
10	Tobacco	0.011537	0.000179	0.000342	0.569111
11	Other Food	0.097813	0.003774	0.008150	0.276324
12	Cloth	0.020806	0.020249	0.023198	0.270433
13	Wood, Paper and Tires	0.010776	0.031535	0.022246	0.220931
14	Energy, Mining and Industries	0.039317	0.060757	0.017065	0.189982
15	Appliances	0.002884	0.003623	0.005581	0.142466
16	Other Household	0.005464	0.001614	0.004341	0.215428
17	Other Industries	0.008009	0.087372	0.006213	0.190085
18	Fuel	0.019786	0.155235	0.011084	0.191328
19	Utilities	0.050981	0.021236	0.030479	0.582116
20	Construction	0.003990	0.001500	0.003160	0.335954
21	Hotels and Restaurants	0.007237	0.015174	0.024902	0.432483
22	Transport	0.029210	0.051069	0.018884	0.479392
23	Real Estate	0.002848	0.004575	0.001379	0.845351
24	Public Administration	0.000000	0.000000	0.000000	1.000000
25	Education	0.000000	0.000000	0.000000	0.874997
26	Health	0.000000	0.000000	0.000000	0.633443
27	Other Services	0.147156	0.093500	0.104273	0.757817
	Total	0.952052	0.573837	0.317626	

source: Study Team

3) Estimated Value of Indirect Benefit (IDBi)

The total value of indirect benefit of tourism expenditure, estimated on the basis of the incremental tourism revenue and the rate of indirect benefit for each industrial sector, is 1,735 million baht in 2001, 4,842 million baht in 2006 and 6,244 million baht in 2016 as shown in Table 4.3-8.

Table 4.3-8 Projection of Indirect Economic Benefit of the Projects and Programs

unit: million baht

	1996	2001	2006	2011	2016
Incremental Tourism Revenue					
Thai Tourists	0	2,091	5,589	6,799	8,272
Foreign Tourists	0	4,764	13,521	14,928	16,482
Total	0	6,855	19,109	21,727	24,754
Indirect Economic Benefit					
Thai Tourists					
Hotels and Restaurants	0	215	576	701	852
Transport	0	141	378	460	559
Other Services	0	133	355	431	525
Sub-Total	0	490	1,308	1,592	1,937
International Tourists					
Hotels and Restaurants	0	775	2,199	2,428	2,680
Transport	0	128	363	401	443
Other Services	0	342	971	1,072	1,184
Sub-Total	0	1,245	3,534	3,901	4,307
Total	0	1,735	4,842	5,493	6,244

source: Study Team

4.4 Cost Calculation of Tourism Development

4.4.1 Development Cost

(1) Land Cost

The unit land price to estimate the Projects' cost must use the real purchase price. The assumed 1.5 million baht/rai appears to incorporate the inflation effect of the recent speculative activities in the property sector in the Study Area. The land price in the economic evaluation, however, is expressed as the value lost due to the halt in land use, i.e. the maximum opportunity cost of the land concerned.

Since most land subject to purchase is farmland, the opportunity cost of a paddy rice field is used as the economic price of the land cost in question. The economic price of the land cost using the following estimation conditions is 7,224 baht/rai.

a = Producer Price of Paddy Rice : 4,030 baht/ton
b = Productivity of Paddy Rice : 343 kg/rai
c = Rate of Net Value : 0.783923
d = Opportunity Cost of Capital : 15 %
e = Economic Land Price : 7,224 Baht/rai (axb/1000)xc/(d÷100)

(2) Construction Cost

The economic price of the construction cost is given by the following equation where such transfer costs as customs duty and indirect taxes, etc. are deducted from the market price.

$$(CTC) - 1 - (TIc) - \sum_{j}(IMAj \times TIj)$$

Where,
CTC : conversion coefficient of construction cost to economic price
TIc : ratio of transfer cost in construction industry
IMAj : ratio of intermediate input by j industrial sector to production value of construction industry
TIj : ratio of transfer cost in j industrial sector

Based on the Input/Output Table, the value of TIc is calculated to be 0.0089 while the actual values of IMAj and TIj are as shown in Table 4.4-1. The conversion coefficient of the construction cost to the economic price (CTC) is 0.9452, indicating that approximately 5.48 % of the construction cost is deducted as the transfer cost. Note that the influence of inflation is not included in this calculation.

Table 4.4-1 Intermediate Transactions and Transfer Item Ratios by Industrial Sector

Sector Code	Industrial Sector	Ratio of Intermediate Transactions	Customs Duty and Import Tax	Indirect Tax	Transfer Items Total
4	Other Agriculture	0.002202	0.008458	0.002535	0.010994
12	Cloth	0.000512	0.005918	0.020713	0.026631
13	Wood, Paper and Tires	0.051725	0.019085	0.016509	0.035593
14	Energy, Mining and Industries	0.404714	0.043371	0.013841	0.057212
15	Appliances	0.045266	0.051362	0.010262	0.061624
16	Other Household	0.013608	0.042264	0.024273	0.066537
17	Other Industries	0.037811	0.089367	0.015549	0.104916
18	Fuel	0.011152	0.086048	0.151461	0.237508
19	Utilities	0.005176	0.000000	0.001925	0.001925
20	Construction	0.001401	0.000000	0.008900	0.008900
21	Hotels and Restaurants	0.003183	0.000000	0.043266	0.043266
22	Transport	0.043603	0.000138	0.002550	0.002688
23	Real Estate	0.000157	0.000000	0.140755	0.140755
27	Other Services	0.042427	0.000000	0.031741	0.031742

source: Input/Output Table to Thailand, 1989

4.4.2 Operation Cost

The operation cost for such facilities as hotels, restaurants and shops where tourism revenue is generated is estimated from the rate of the operation cost to the value added (direct benefit) calculated in chapter 4.3. With regard to infrastructural facilities and others which do not directly receive tourism revenue, the operation cost is estimated as a set proportion of the initial investment cost. As the case of the construction cost, such transfer costs as taxes are deducted from the operation cost.

(1) Operation Cost for Facilities with Tourism Revenue

The rate of the operation cost to the value added in tourism-related industries, calculated from the Input/Output Table, is given in Table 4.4-2. The operation cost of a tourism-related industrial sector is obtained by multiplying the value added per industrial sector by this operation cost rate.

Table 4.4-2 Rate of Operation Cost to Value Added for Tourism-Related Sectors

Sector Code	Sector	Wages	Depreciation	Transfer Items (indirect Tax)	Total
021	Hotels and Restaurants	0.267177	0.046008	-0.100041	0.213145
022	Transport	0.379523	0.167418	-0.005319	0.541622
027	Other Services	0.300317	0.061511	-0.041886	0.319942

source: Input/Output Table to Thailand, 1989

(2) Operation Cost for Facilities without Tourism Revenue

2.5 % of the initial investment cost is accounted for annually to cover the operation cost. In addition, 5.48 % is deducted to cover the transfer cost as in the case of the construction cost.

4.5 Overall Economic Evaluation of the Projects and Programs

The cost benefit flow from 1993 to 2016 which is included in Table 4.5-2, shows that the economic internal rate of return (EIRR) is 30.3%. EIRR in general should be larger than the opportunity cost of the country's confirms capital. Thailand's capital opportunity cost is estimated at around 16 % judging from loan interest rates provided by commercial banks. The calculated EIRR is sufficiently greater than their capital opportunity cost, which therefore confirms the economic viability of the Projects.

One of the reasons why the evaluation result is significantly higher than forenamed capital opportunity cost, is that the development cost of infrastructure development, such as roads, water supply, sewerage and power supply is not included in the cost calculation of the Projects. Plans for the development of such basic infrastructure have already been settled, and would be implemented irrespective of further tourism development.

Table 4.5-1 shows the result of sensitive analysis of fluctuations of construction costs or the number of tourists. The table shows that even if the construction cost will be 40% (8 billion baths) higher than estimated EIRR will be still be high enough with 24% to consider the Projects feasible. The worst case is when the number of tourists drops by 40 % with EIRR reducing to 17.5 %, down 12.8% from the basic case. However, the evaluation result of the basic case is still high enough to accommodate that reduction. Therefore, the economic viability of the Projects is considered stable even in the face of these changes.

Table 4.5-1 Result of Sensitive Analysis for Overall Evaluation

unit: %

	Economic Internal Rate of Return
Base Case	30.3
Cost 20 % up	26.8
Cost 40 % up	24.0
Tourists 20 % down	24.7
Tourists 40 % down	17.5

source: Study Team

Table 4.5-2 Cash Flow for Overall Evaluation of the Projects and Programs

(Unit:Million Baht)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cost																							
Investment Cost	1,904	1,904	1,904	1,296	1,296	1,296	1,296	1,296	1,753	1,753	1,753	1,753	1,753										
Land Acquisition				0	0																		
Construction Cost	1,797	1,797	1,797	1,234	1,234	1,234	1,234	1,234	1,669	1,669	1,669	1,669	1,669										
Tourism Promotion & Others	17	17	17	0	0	0	0	0															
Design & Supervion 5%	90	90	90	62	62	62	62	62	83	83	83	83	83										
(Residual Value)																							-470
Operating & Maintenance Cost	0	45	90	326	595	869	1,196	1,563	1,939	2,381	2,880	3,443	4,084	4,223	4,322	4,424	4,529	4,638	4,750	4,865	4,984	5,106	5,232
Operating Cost	0	0	0	191	429	672	969	1,305	1,650	2,050	2,508	3,028	3,629	3,725	3,824	3,926	4,032	4,140	4,252	4,367	4,486	4,608	4,734
Maintenance Cost	0	45	90	135	166	196	227	258	289	331	372	414	456	498	498	498	498	498	498	498	498	498	498
Total	1,904	1,949	1,994	1,622	1,890	2,165	2,492	2,858	3,692	4,133	4,633	5,195	5,837	4,223	4,322	4,424	4,529	4,638	4,750	4,865	4,984	5,106	5,232
Benefit																							
Direct Benefit				593	1,330	2,078	2,990	4,021	5,089	6,324	7,740	9,351	11,211	11,500	11,797	12,104	12,419	12,743	13,077	13,421	13,774	14,139	14,514
Indirect Benefit				256	575	898	1,291	1,735	2,195	2,729	3,341	4,038	4,842	4,965	5,091	5,221	5,355	5,493	5,635	5,781	5,931	6,085	6,244
Benefit Total				849	1,905	2,976	4,281	5,756	7,284	9,053	11,080	13,389	16,053	16,465	16,889	17,325	17,774	18,236	18,712	19,201	19,705	20,224	20,758
Net Benefit	-1,904	-1,949	-1,994	-773	14	811	1,789	2,897	3,592	4,920	6,448	8,194	10,216	12,242	12,567	12,901	13,245	13,598	13,962	14,336	14,721	15,118	15,056
NPV(23 Years,15%)	14,836																						
EIRR(23 Years)	30.33%																						

Note: Calculation Method
- (1) Design & Supervision : Construction Cost x 5%
- (2) Residual Value : Constant Rate 25 Years, Residual Value 10%
- (3) Operating Cost : Value Added in Tourism-related Sectors x (30.6-36.7%)
- (4) Operating Cost : Accumulative Construction Cost x 2.5%

5. FEASIBILITY OF THE PRIORITY PROJECTS

5. FEASIBILITY OF THE PRIORITY PROJECTS

5.1 Selection of Priority Projects and Programs

5.1.1 Selection Process

For several of the 26 projects which were selected as "most significant projects" in Chapter 3, feasibility studies were carried out. These priority projects were selected based on the following criteria:

1. The project meets the development strategy; in other words, the level of significance indicated in the project list (table 3.6-1) is high;

2. The project needs initiatives of and will be carried out by the public sector. Accommodation development projects were not selected, since they may be developed by the private sector;

3. The project requires urgent implementation and consent is given to the project by the authorities concerned. However, projects for which extensive study, e.g. detailed design, has already been carried out are not selected; and

4. The investment scale is large enough to consider its implementation under a soft loan agreement.

It should be noted that, although recognized as priority project, the following projects were not selected:

1. Power supply and telecommunication projects

An appropriate budget has already been appointed to these projects. It is stressed that their implementation as scheduled is indispensable to develop the Study Area into a prominent international tourist destination.

2. Solid waste disposal projects

The establishment of proper solid waste disposal systems is very important to sustain the Study Area's natural environment. The Study Team has identified issues concerning solid waste disposal in the Study Area, but study on the most adequate solutions should be carried out on a national scale, since it involves various legislative and administrative issues.

5.1.2 Selection of Priority Projects and Programs

As a result of above procedure the following 8 projects were selected:

1. Cultural and Recreational Center in Cha-Am

2. Phet Kasem Road Improvement

   Cha-Am Section: 2.50 km
   Hua Hin Section: 0.67 km

3. Improvement of Circulation Roads in Phetchaburi

4. Improvement of Phetchaburi Coastal Road

5. Municipal Water Supply Development

   in Cha-Am
   in Hua Hin

6. Sewerage System Development in Cha-Am

7. Tourism Promotion Program

8. Environmental Management Program

Project numbers. 1, 2 and 7 respond to the target to develop and improve tourist attractions in the Study Area, projects 3 and 4 strengthen the linkage of tourism resources, project 5 contributes to the target to develop necessary infrastructure and projects 6 and 8 enhance the quality of the Study Area's natural environment.

Feasibility studies were carried out for the first 6 projects, including details of the proposed developments and their economic/financial analysis. The result of the feasibility studies is described here after.

5.2 Cultural and Recreational Center in Cha-Am

5.2.1 Description of the Project

(1) Background

The project covers an area of 389 rai (62.3 ha), and includes the development of various facilities on a 327 rai (52.3 ha) government owned site in Takard Phlee in northern Cha-Am, and the improvement of its neighboring area 62 rai (9.9 ha). The site is located at a distance of 2 km from Cha-Am railway station, requiring the introduction of a shuttle service to the site.

Figure 5.2-1 shows that the project area is located 1,200 meters west of Cha-Am Beach behind the Forest Reserve Area and is bounded by the railway on the west. There is no direct access road from the beach to the site. To the north of the site a cement factory is situated, which is connected to the sea with a 50 meter wide canal. The unique structure of Leaf Bridge, which crosses the canal, attracts tourists. However the bridge is so narrow that it has become a bottleneck for the flow of north-south traffic.

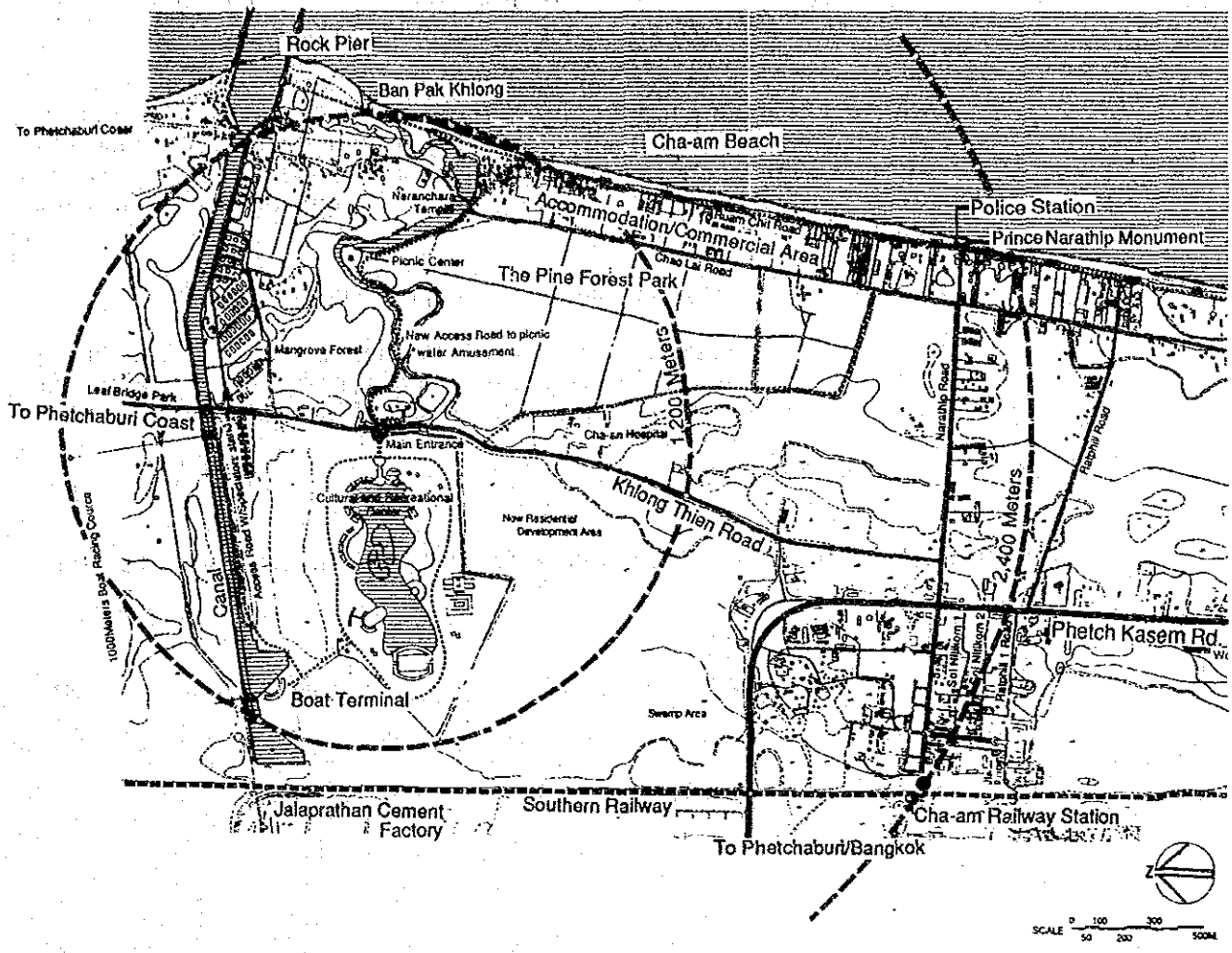


Figure 5.2-1 Site Plan of the Cultural and Recreational Center

(2) Objectives

The project involves the development of a cultural and recreational center with the following objectives:

1. To be the center of Thai art and cultural education in western Thailand.

   In developing an internationally renowned beach resort, a center featuring local culture and art will be established as a place of interest. The complex will also be designed to facilitate exhibitions, and demonstration of local products for sale.

2. To be a center for activities of the local community and the young.

   Together with Phetchaburi Teacher's Training School, it will give an opportunity for vocational education. It will also be open to the public, which will contribute to presentation by local groups and to exchange programs between the local community and tourists.

3. To be a recreational center for local population as well as tourists from within and outside the country.

   As long as recreation and sport facilities require continuation in pursuit of health, it will be designated as fashion for a healthy and sport life. Also, in order to promote international understanding, facilities will be constructed for various to learn unique Thai sport, such as takraw and kick boxing which will provide opportunities for Thai people and foreign tourists to meet one another.

4. To be the special tourist attraction with unique events.

   Planning and organizing of events will provide higher value for tourists arriving in Hua Hin and Cha-Am. Space should be created to hold various types events, while software technology must be developed for such events.

(3) Market Framework

Table 5.2-1 Estimated Number of Visitors to the Cultural and Recreational Center

units: persons, %

	Target Market 2006	%	2007	2008	2009	2010	2011
Overnight tourists	2,804,818		664,387	677,674	691,228	705,052	719,153
Day trip tourists							
International	22,315		6,205	6,329	6,455	6,585	6,717
Domestic	878,719		345,578	352,490	359,540	366,730	374,064
Total	901,034		351,783	358,819	365,995	373,315	380,781
Local visitors							
Phetchaburi	127,400	30	38,220	38,984	39,764	40,559	41,371
Cha-Am	81,200	80	64,960	66,259	67,584	68,936	70,315
Tha Yang	127,600	60	76,560	78,091	79,653	81,246	82,871
Khao Yoi	45,700	30	13,710	13,984	14,264	14,549	14,840
Ban Laem	70,900	30	21,270	21,695	22,129	22,572	23,023
Ban Lard	59,100	30	17,730	18,085	18,446	18,815	19,192
Nong Ya Plong	15,000	30	4,500	4,590	4,682	4,775	4,871
Hua Hin Municipality	41,400	50	20,700	21,114	21,536	21,967	22,406
Pranburi	102,800	25	25,700	26,214	26,738	27,273	27,819
Prachuap Khiri Khan	67,300	25	16,825	17,162	17,505	17,855	18,212
Total	738,400		300,175	306,178	312,301	318,547	324,920
Total Visitors	4,4439,252		1,316,345	1,342,671	1,369,524	1,396,914	1,424,854
Average visitors/day			3,306	3,679	3,752	3,827	3,904

source: Study Team

The population of Hua Hin / Cha-Am Beach Area and their neighboring areas is expected to reach a little over 320,000 in the year 2011. The number of day trip tourists and overnight tourists is expected to reach 720,000 and 380,000, respectively, by the same year. Especially, tourists in Cha-Am and visitors to the community, which number a moderate 1,420,000 annually, will be considered as a prime target for the center.

At the initial stage of development, the total number of tourists to the Cha-Am Beach and visitors from the community is estimated at 560,000 per year. The estimates for the yearly number of visitors is presented in Table 5.2-1. Special events can be organized, advertised and held in such a way to attract more people. Peak instantaneous demands for the complex will be double the number of moderate figure.

(4) Physical Plans and Programs

1) Zoning and Land Use Concept

The site allocated for the development of the complex composes over 62.2 hectares of which 36.2 hectares will be utilized for associated tourism facilities. Nine zones are distinguished for each of which the land use concept is shown in figure 5.2-2 and described in Table 5.2-2.

Table 5.2-2 Zoning and Land Use Concept for the Cultural and Recreational Center

units: ha

	Zone	Site Area	Land Use Concept
1	Entrance Zone	1.80	- Dramatic sense of arrival with tropical landscape, designed signs and symbols, security office, gate. - Entrance plaza.
2	Restaurants, Shops and Cultural Exhibition Zone	6.30	- Various food services, souvenir shops, art and exhibition hall, clustered on a lifted wooden floor. - Outdoor cafe terrace, providing a view of the garden with pond and the sun-set.
3	Amphi-theater and Garden Zone	18.45	- Tropical flower garden with amphi-theater, garden coffee shop and rowing boat facility.
4	Outdoor Sports Facilities Zone	12.63	- Tennis courts with spectator stand, tennis museum and pro-shop. - Multi-purpose stadium with spectator stand and lighting system.
5	Indoor Sports Facilities Zone	5.98	- Arrangement of amusement pools, sliders and various indoor spots facilities, meeting halls, pro-shop, offices for management and maintenance.
6	Clinic and Health Care Zone	7.17	- Clinic, first aid, rehabilitation and nursing facilities. - Thai traditional massage and beauty care salon. - Human science museum.
7	Tourist Boat Terminal Zone	7.49	- Boat terminal including information service, offices, parking lots, plaza and marine museum. - Arrangements for boat racing events with start and finish towers and spectator stands along the canal.
8	Leaf Bridge Zone	0.21	- Amenity spot development in the leaf bridge area, including look out and areas to relax.
9	Picnic Park Zone	2.17	- Picnic area in the forest reserve, including access road along the river. - *Enhancement of the beach area.*
	Total Area	62.2	

source: Study Team

2) Master plan

The master plan for the complex is presented in Figure 5.2-2 and illustrated in Figure 5.2-3.

3) Facility Program

An overview of the facilities proposed is given in Table 5.2-3 and a description for each facility is presented below:

1. Project for a Restaurant, Shop and Cultural Exhibition

This project has been planned close to a gate area. Constructed under the project will be a 400 seats of restaurant with a lobby and a reception area for beverage services and a multi-purpose exhibition hall to display arts and crafts. The 1,000

sq.m. hall will extend into a 9,500 sq.m. outdoor lifted wooden floor deck area while a 18,500 sq.m. tropical landscape will be integrated into this complex. A variety of shops including bicycle rental shops and administration and mechanical functional area along with restaurants, cover additional 1,400 sq.m.. In total the complex will comprise covered and outdoor floor area of 48,700 sq.m..

2. Outdoor Sports Facilities

A major feature of the development project in terms of sports will be a football stadium and a excellent tennis center. It is envisaged that the facilities will attract not only tourists but also national and international competitions. Training will be offered by qualified coaches, and top class specialists will be able to take an active role in the directing and supervising coaching.

The ground and the court of an all-weather surface will be constructed in the light of local climate conditions. They will have sand filled synthetic grass, with fixed spectators stands and grass-covered stands.

3. Indoor Sports Amusement

This project will provide various amusement swimming pools with two sets of 30-meter long sliders, locker rooms, and administration offices on the ground level; a gym, multi-purpose sports court, a restaurant and coffee shops on the 2nd level; and slider decks, conference rooms and classrooms on the 3rd level. This facilities will cover 7,300 sq.m..

Space for machines, maintenance and employees' accommodation will be created at the back of the main building which will constitutes 600 sq.m..

4. Clinic, Health Care and Human Science Museum

Security is a top priority in an international resort. In the Study Area, the tourist police are patrolling to ensure the safety of tourists. Also, the marine patrol is on duty in Hua Hin. Small-scale hospitals are situated in Hua Hin and Cha-Am, but it is a mandate to improve an all-day health care system for tourists in these hospitals. It is proposed to construct a facility for first-aid treatment, coupled with a accommodations which will enable tourists to stay under medical care.

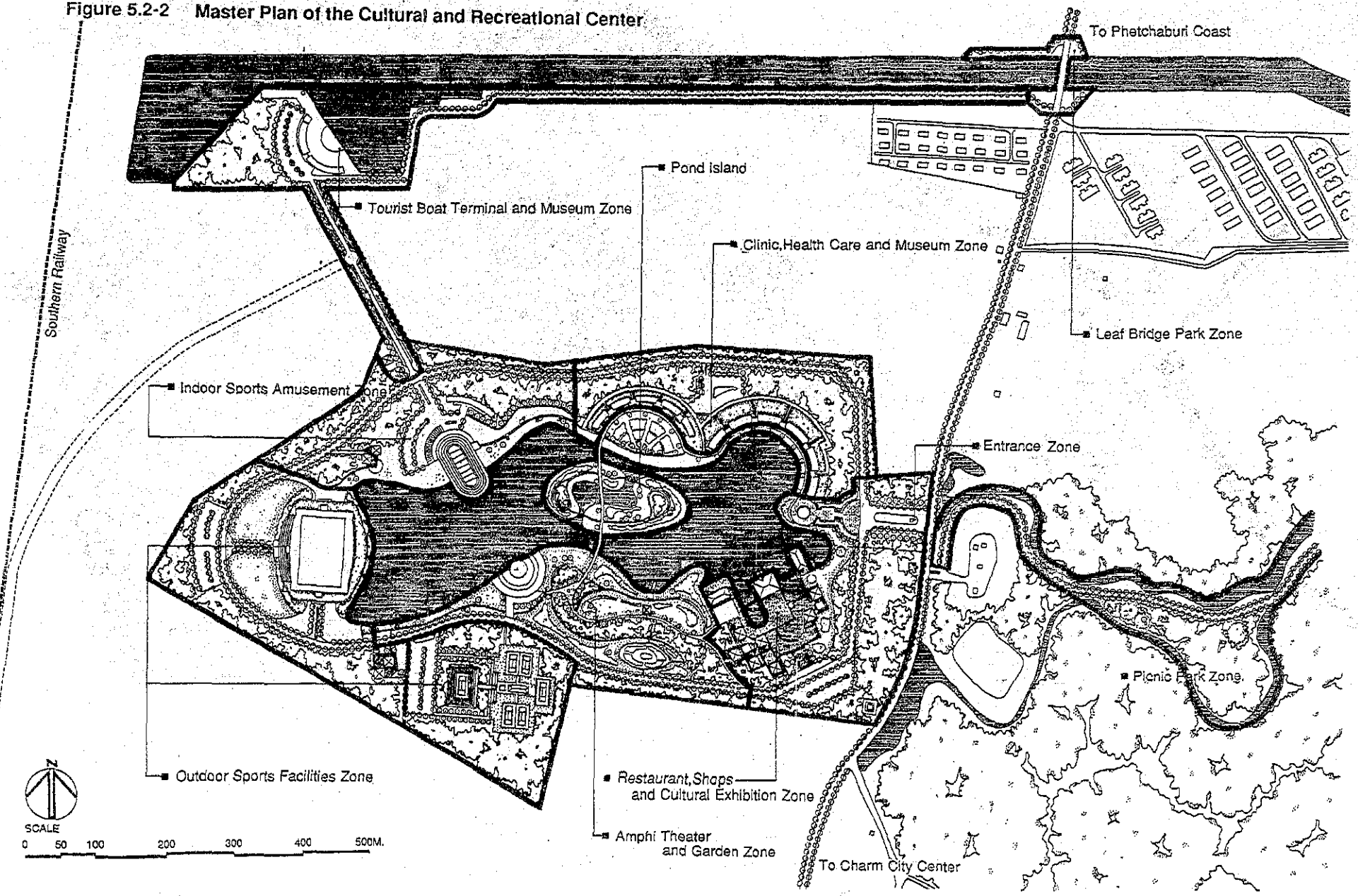
The proposed clinic and sports training hotel between 50 to 60 one-bed room villas will have common and private garden areas facing a pond. Such facilities will form an integral part of an international resort. In addition, Human Science Museum will be founded to feature such subjects as the mechanism of a human body in order to stimulate interest in this field among the community and tourists.

5. Amphitheater and Garden

The garden will be located close to the restaurant complex where the views are the most spectacular. This garden complex will be constructed to create tropical environments.

Conceived as a multi-purpose theater with a capacity of 1,600 seats cafe, this component constructed 56,000 sq.m. with a garden cafe and lush landscape gardens and plazas.

Figure 5.2-2 Master Plan of the Cultural and Recreational Center



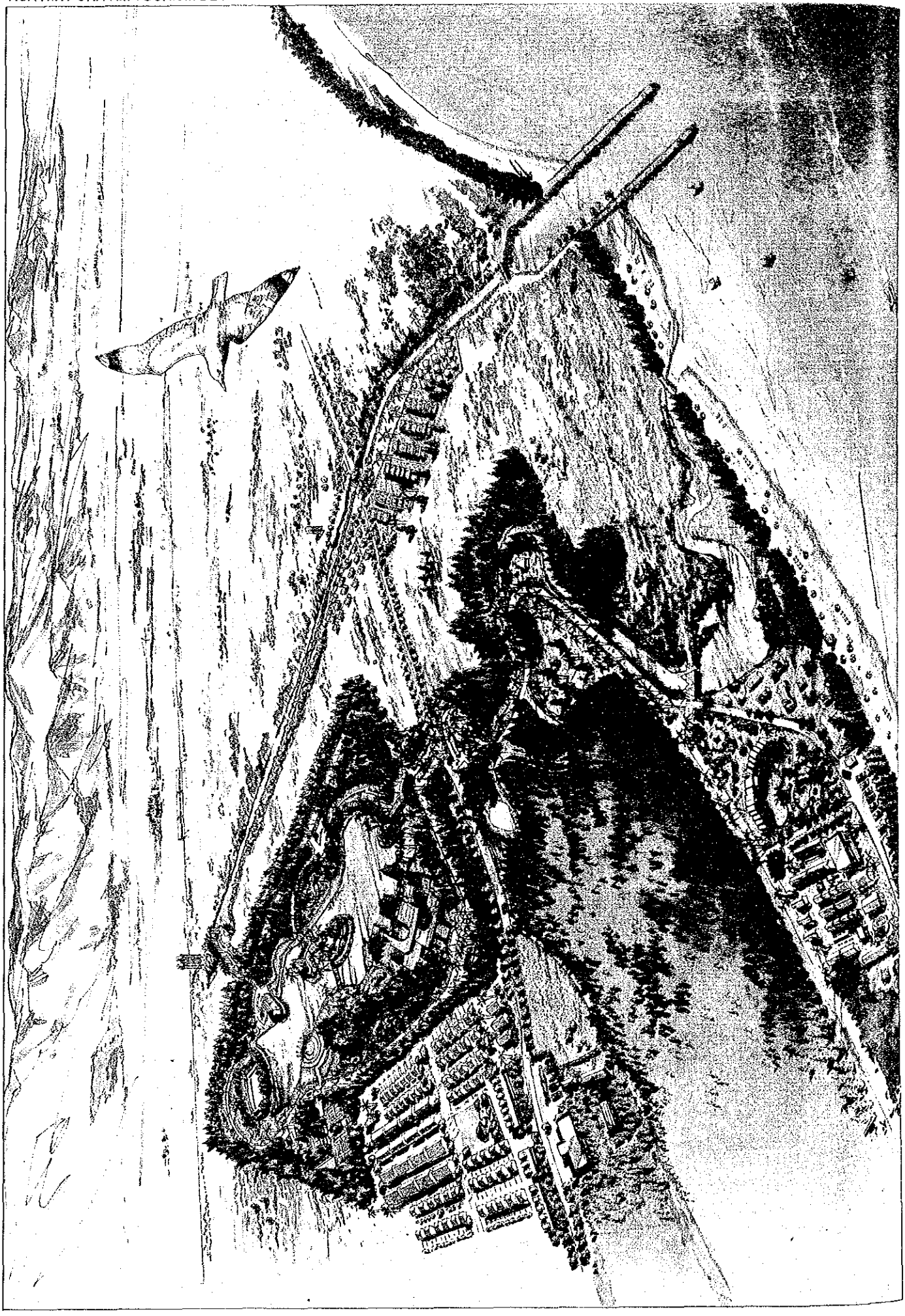


Figure 5.2-3 Image Sketch of the Cultural and Recreational Center

Table 5.2-3 Facility Program for the Cultural and Recreational Center

units: Site Area: ha
Floor Area: sq.m

Zone	Facility	Site Area	Bldg. Floor Area	Details	Construc-tion Body
2	Restaurants, Shops and Exhibition Hall	6.30	3,900	- Main restaurant: 2,200 sq.m, 400 seats - Souvenir shops: 5 units, each 20 sq.m - Exhibition hall: 510 sq.m - Road/parking: 7,100 sq.m. - Landscaping	Private Private Public Private Public
3	Amphi-theater and Garden	18.45	300	- Amphi-theater: 3,300 sq.m - Garden w/play equipment: 54,200 sq.m - Garden coffee shop, boat pier: 300 sq.m - Road/Parking: 4,700 sq.m	Public Public Public Public
4	Outdoor Sports Facilities	12.63	2,100	- Multipurpose stadium w/fixed spectator stands: 1,000 sq.m. - Main building: 1,000 sq.m. - Landscaping (incl. stadium area): 31,400 sq.m. - Tennis courts: 3,400 sq.m. - Main spectator stand: 1,800 sq.m. - Club house, tennis museum: 600 sq.m. (bldg.) - Landscaping: 8,600 sq.m. - Road/parking: 19,300 sq.m.	Public Private Public Private Private Private Public Public
5	Indoor Sports and Amusement Facilities	5.98	8,400	- Amusement swimming pool w/locker rooms: 5,100 sq.m. - Gym, squash courts, running track & coffee shop: 1,100 sq.m. - Conference rooms: 1,100 sq.m. - Landscaping/parking: 12,000 sq.m. - Road/parking: 9,500 sq.m. - Restaurant: 300 sq.m.	Private Private Private Public Public Private
6	Clinic, First Aid and Science Museum	7.17	3,900	- Clinic, first aid and offices: 650 sq.m - Thai traditional massage, esthetic rooms, etc.: 350 sq.m - Human science museum: 650 sq.m - Clinic's accommodation rooms: 2,100 sq.m - Staff housing: 100 sq.m - Landscaping: 26,900 sq.m - Road/parking: 8,900 sq.m	Private Private Private Private Private Public Public
7	Tourist Boat Terminal and Marine Museum	7.49	1,200	- Tourist boat pier: 17,000 sq.m, connecting canal - Terminal building, marine museum: 1,200 sq.m - Spectator stand for boat racing along the canal - Landscaping: 32,140 sq.m - Road/parking: 10,860 sq.m	Public Private Public Public Public
8	Leaf Bridge Park	0.21	100	- Parking w/landscaping: 2,000 sq.m - Food stall: 100 sq.m	Public Private
9	Picnic Park	2.17	0	- 10 picnic units: 1,000 sq.m - Additional landscaping: 13,600 sq.m - Road/parking: 8,160 sq.m	Public Public Public

source: Study Team

6. Tourist Boat Terminal and Marine Museum

The terminal will provide all the hotel operators with safe access to deep-sea spot fishing, hydrofoil, speed power boats for coastal tours and charter cruises. The area also offers an ideal location for boat racing along the canal, which offers 1,000 meters large enough for amateur and marine museum located in the terminal building.

7. Leaf Bridge Park

This project has been planned at the intersection of canal and Khlong Thian road whose unique bridge structure attracts tourists as well as local people the area will also be a finish point of boat racing course.

The project will cover 100 sq.m. of food stalls in a 2,000 sq.m. landscape area.

8. Picnic Park

The Picnic Park will be built along the river in the existing forest with natural screening and provide playing fields picnic tables and benches under the shade. This project consists of a 1,300-meter access road and 13,600 sq.m. landscape.

(5) Land Development and Infrastructure

1. General

The project site is mostly covered with water. Therefore, in order to develop the area, some area will have to be filled for facility development. Only a minimum land fill will be necessary for a restaurant building area, because floors and walkways will be lifted 0.2-2.0 meters above the ground level. The other facility site and a garden area should partly be filled which will require about 200,000 cubic meters of filling materials. To develop a boat terminal, 42,500 cu.m. of soil must be excavated.

2. Road Network

The existing Khlong Thian road provides an adequate capacity for current traffic demand. This road plans to be improved under the 7th NESDP. Considering estimated long-term demands, and in particular the likely volume of traffic needed for construction of accommodation and other tourism-related facilities in the 3rd phase, the capacity of the existing access road is not enough. To meet the projected demands and prevent excessive noises, danger and visual intrusion at Cha-Am Beach, a new direct routes should be constructed from Phet Kasem to the center along the rail way.

An inner road is looped and connects each facility with parking. It is a two-lane road with a 3.0 meter sidewalk on both sides with rows of flowering trees. Parking space for cars and coaches for special events is located at the gate area.

3. Water Supply and Sewage

Daily demand for potable water and irrigation water are expected to reach 500 and 300 cubic meters, respectively. Water is to be supplied by Municipal water supply system. The volume of sewage is expected to be 70 percent of potable water demand. Treatment should be done individually by a project company.

4. Telecommunication

The required number of telecommunication lines is estimated at about 18 lines at the final phase. This development requires a collaboration from relevant authorities.

(6) Landscape

1. Development of Existing Conditions

The site is totally flat, covering a large amount of water area. This water area will be utilize for a landscaping element as well as water recreational area. A part of water area will be filled with earth because of additional space for construction of facilities.

2. Development of Site Surroundings and Boundary Area

A tourist gateway to the site shall be landscaped with distinctive appearance with rows of flowering trees to identify the way to the site. The boundary margin of the site shall be provided with tall green foliage trees to create some screening, wind brakes and dust protection.

3. Water Area

Some of the margin of a pond area shall be developed in solid type revetment with pleasure boat landing, indoor sports building, a stadium, and an amphi-theater which will be exposed to the water area. In order to control ground surface erosion and maintain water quality of the pond, it is important to provide a green turf and ground covering plants with small posts and a horizontal wire fence around the pond area.

4. Facilities Area

It is recommended that each facility area utilizes various types of plants and enhance the tropical attractiveness in connection with facility design and layout. The landscape of the sports complex and the pool garden shall basically consist of a green turf and some functional places shall be planted with large crowned trees for people to take a rest and watch the sports games and other recreational activities.

(7) Organization

The proposed development areas cover as many as 57.8 ha. in total, of which private land accounts only for 7.2 hectares. Because of the nature of the development including public facilities such as stadium, an event hall, a museum and an amphi-theater, the project is too difficult for the private sector alone to manage. Thus, this report assumes two types of administrative entities. The suggested organization scheme is shown in Figure 5.2-4.

1. Land Development Corporation (LDC)

To develop land for the proposed site, to improve public facilities and infrastructure. Responsible for leasing developed land and maintaining such facilities. In order to manage and operate facilities according to the Master Plan, the whole plan should be placed under the supervision of a developer. Since most area is government owned, such a organization can possibly consist of a public agency(s) and Private company(s).

2. Private Sector Developers (PSD)

To rent developed land, tourist services facilities, and provide tourist-related services in order to generate proceeds. In the light of know-how required for tourist services, a private company with no public participation is preferred.
As shown in the figure below, the establishment of a project company with the institutional and private sector is recommended as the most appropriate development system.

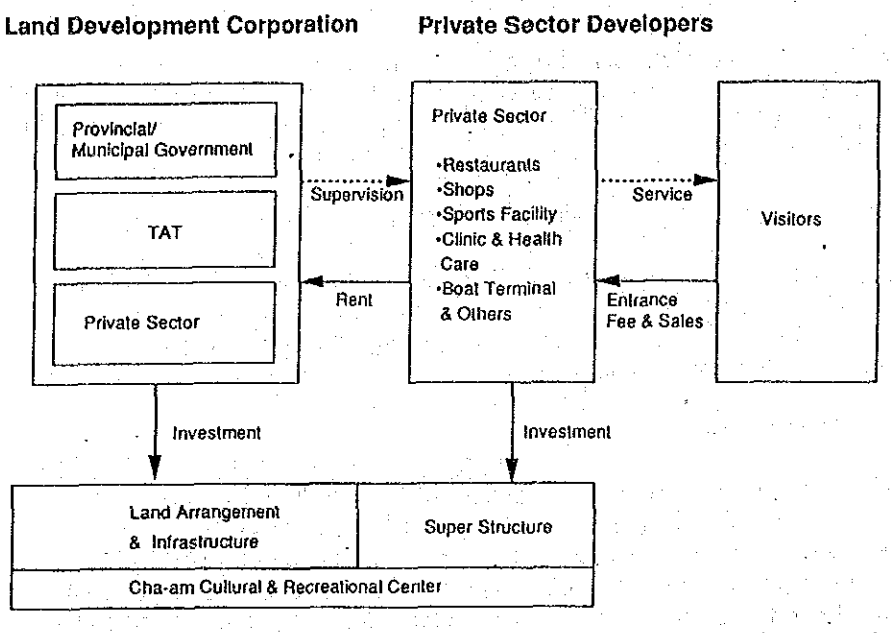


Figure 5.2-4 Proposed Organization for Development of the Cultural and Recreational Center

(8) Construction Cost and Implementation Schedule

1) Development Cost

An overview of the project cost is shown in Table 5.2-4.

Table 5.2-4 Construction Cost of the Cultural and Recreational Center

units: sq.m, 1,000 baht

	Site Area	Construction Cost
Restaurant, shops and cultural exhibition site	63,000	37,958
Stadium site	74,700	67,984
Tennis courts site	51,600	34,928
Indoor sports and amusement site	59,800	99,271
Clinic, first aid and museum site	71,700	58,626
Amphi theater and garden	184,500	31,398
Exterior	18,000	113,184
Infrastructure		23,637
Terminal site	74,900	113,296
Leaf bridge park	2,100	3,007
Picnic area	21,760	35,546
Total	622,060	618,835

source: Study Team

Cost estimates developed for this feasibility study are based on recent property development study in Cha-Am area in 1991. For construction cost, only major cost items such as buildings, were applied a unit cost and road, parking and landscape items were added on a lump sum per sq.m.. Other costs, landfill and initial cost of infrastructure development, design and supervision and contingency were estimated as percentage of construction cost and added for budgeting and evaluation purposes.

2) Implementation Schedule

The implementation schedule is shown in Figure 5.2-5.

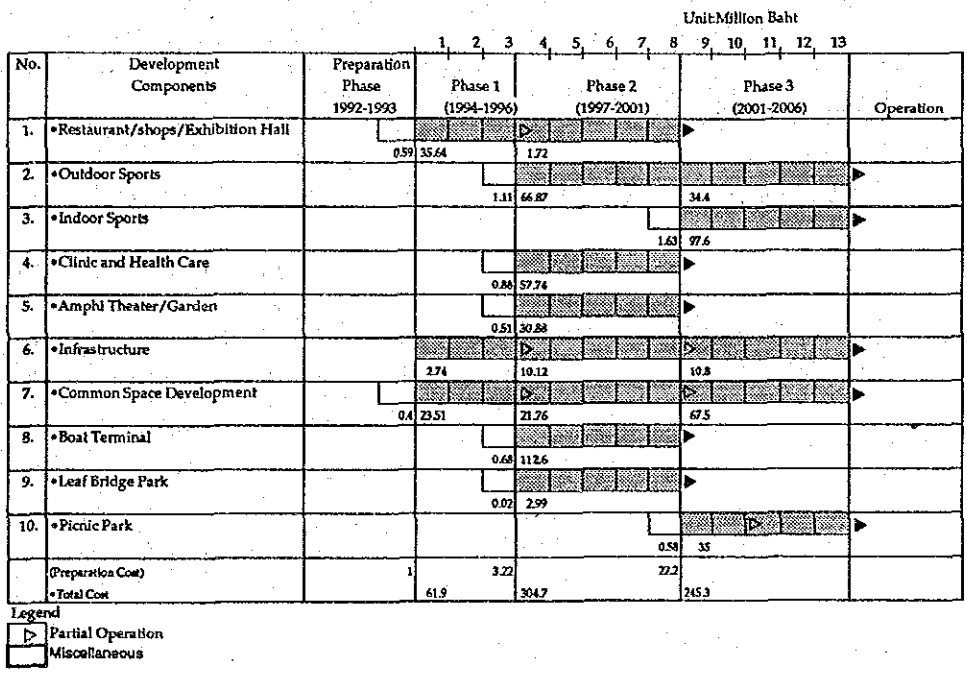


Figure 5.2-5 Implementation Schedule for the Cultural and Recreational Center

In order to develop the complex systematically, it is important to encourage public investment in infrastructure and public facilities to the extent that the identity of the complex is well recognized in society.

In the 1st Phase, due to limited time for preparation, efforts will be made to complete designing in a relatively short period. In order to minimize the size of development, focus will be given to local practices to choose components indispensable for tourism development. It can be the most effective to develop restaurants, shops and cultural exhibition hall within a zone nearest to an access road.

The efficient use of large site, such as space for events to attract people, is proposed for the 2nd Phase. A direct access road will be built from the Cha-Am Beach in a way to unite the beach, the picnic park and complex under a comprehensive development plan.

In the 3rd phase, a wide range of requirements for development will be addressed to establish a resort rated as international in terms of quality and quantity.

The development will be based on zoning so as not to affect management and operated facilities.

5.2.2 Financial Feasibility of the Project

(1) Project Cost

Table 5.2-5 shows investment costs according to the type of work involved in the Project. The entire investment cost is detailed in Chapter 4. Land Development Corporation (LDC) comprises costs for land development and local infrastructure (road, power, telephone service, water supply and sewerage system) to be borne by land developers, while Private Sector Developers (PSD) comprises costs for superstructure development to be borne by tourist agencies.

Table 5.2-5 Calculation of Project Costs of the Cultural and Recreational Center

unit: 1,000 baht

	LDC*	PSD*	Total
Land Acquisition	73,150	0	73,150
Land Dev. & Utilities	20,042	0	20,042
Superstructure	178,745	186,405	365,150
Landscape Area/Reserved Area	59,812	4,800	64,612
Miscellaneous	37,129	35,115	72,244
Infrastructure	23,637	0	23,637
Total	392,515	226,320	618,835

source: Study Team
* Land Development Corporation
** Private Sector Developers

(2) Revenue and Expenditure of LDC Costs

1) Revenue

1. Down Payment

Those wanting to rent land should pay 30 % of the total business expenses as down payment.

2. Land rent

First, assuming that the total business expense minus 30 % down payment will be borrowed at the annual interest rate of 13 %, and that the borrowed amount will be reimbursed with equal repayment of principal and interest for 25 years, the annual reimbursement plus the annual maintenance cost is taken as annual land rent.

Reimbursement:

Phase - 1 : 3,866,000 baht/year

Phase - 2 : 23,347,000 baht/year

Phase - 3 : 9,575,000 baht/year

3. Facility use fee

Common facilities (event hall, stadium, museum, and theater), 2 % of their construction costs with an expected annual increase of 2.5 %.

2) Expenditure

1. Maintenance cost

2.5 % of the investment cost less the design maintenance cost and land development cost, with an expected annual increase of 6 %.

2. Taxes

Not considered as the Project will be developed by the government.

(3) Revenue and Expenditure of PSD Cost

1) Revenue

Entrance fees and sales from retail shops are included. They are calculated by multiplying the number of visitors by the average expenditure (375 bath for 1996). The average expenditure is assumed to increase annually by 5 % until 2001, 4 % until 2006, and 3 % after that.

2) Expenditure

1.	Down payment	: The same as a) of LCD.
2.	Land rent	: The same as b) of PSD.
3.	Maintenance cost	: 2.5 % of the net construction cost.
4.	Material cost:	: 60 % of the income of fees.
5.	Taxes	
	Sales or business tax	: 3.5 % of the income
	Municipal tax	: 0.35 % of the income
	Income tax	: 35.0 % of the profit

(4) Evaluation Result

Financial internal rate of return (FIRR) of Thailand is calculated by using annual records of revenues and expenditures, as shown in table A6-2 and A6-3 of Appendix 6. FIRR is then obtained to be 4.90 % for LCD and 29.89 % for PSD. FIRR in general should be greater than loan interest rates of commercial banks. For LCD, since the Project is to build a complex which will be operated by public corporation, low loan interest rates form international institutes is one of the prerequisites of the Project. Therefore, FIRR of about 3.0 % is considered sufficient. For PSD, though they are all private commercial corporations which require loans from commercial banks for their enterprise, it is still considered sufficient if FIRR exceeds 16.5 % which is the ceiling of general loan interest rates.

Therefore, as far as FIRR is concerned, the Project is confirmed financially feasible. Table 5.2-6 illustrates calculations of FIRRs in the case several conditions worsens in a given simulated analysis. As a result, for each case, the financial status of the Project is confirmed viable.

Table 5.2-6 Result of Sensitive Analysis

unit: %

		Financial Internal Rate of Return	
		LDC*	PSD**
Base Case		4.90	29.89
Construction Cost	+ 10 %	4.88	26.11
Tourist Arrivals	- 10 %	4.88	25.73
Rent	+ 10 %	6.13	29.30
Down Payment	+ 10 %	5.29	26.46

source: Study Team
* Land Development Corporation
** Private Sector Developers

5.3 Transportation Development Projects

5.3.1 Phet Kasem Road Improvement

(1) Objectives and Location

With the construction of the new bypass of Highway No 4, the stretch of the existing highway from Cha-Am to Pranburi will change its function to local access road to the principle tourist centers of Cha-Am and Hua Hin. To improve the sense of arrival and traffic safety in these principal tourist centers this project aims to provide ample pedestrian space and lush landscaping. The project covers a stretch of 0.67 km in the center of Cha-Am and 2.5 km in the urban area of Hua Hin. Their location is shown in Figure 5.3-1.

(2) Design Traffic Volume

Tables 5.3-1 and 5.3-2 present the design traffic volume which may be diverted to the new bypass.

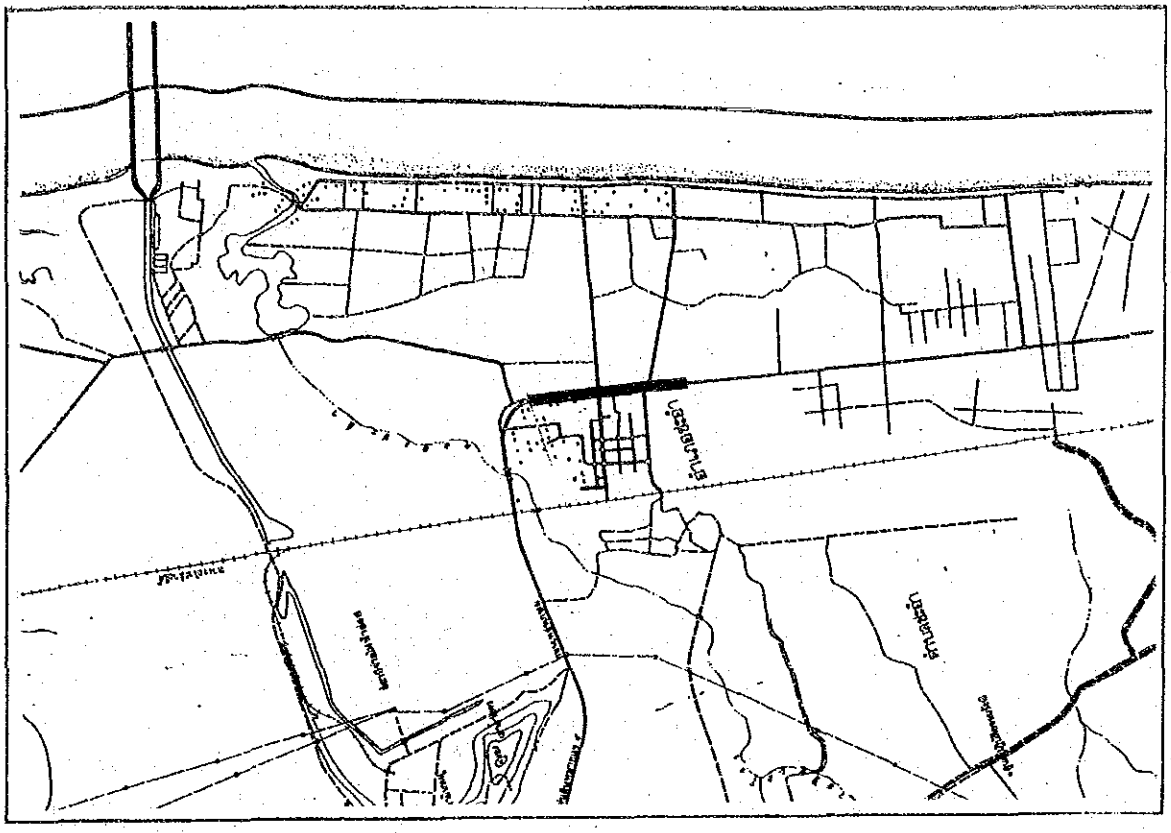
Table 5.3-1 Traffic Diversion to Highway No.4 Bypass

units: day, pcu, %

Traffic on Phet Kasem Road	Direction	Vehicle Type				
		Passen-ger Car/ Light Bus	Light Truck	Medium Truck	Heavy Truck/Bus	Total
Existing Traffic (1991)						
Av. daily volume (day)	two-way	6,857	1,483	1,783	4,063	14,186
Av. daily volume (pcu)	two-way	6,857	1,483	1,783	8,126	18,249
Through Traffic Rate*	P-H**	25.1	20.2	35.9	40.4	
(%)	H-P**	40.7	31.0	42.0	59.4	
Existing Through Traffic						
Av. daily volume (day)	two-way	2,256	372	694	2,027	5,350
Av. daily volume (pcu)	two-way	2,256	372	694	4,055	7,378
Divertable Traffic Rate (%)	two-way	32.9	25.1	38.9	49.9	40.4

* source: OD Survey by DOH, 1989
** P=Phetchaburi, H=Hua Hin

Cha Am Section



Hua Hin Section

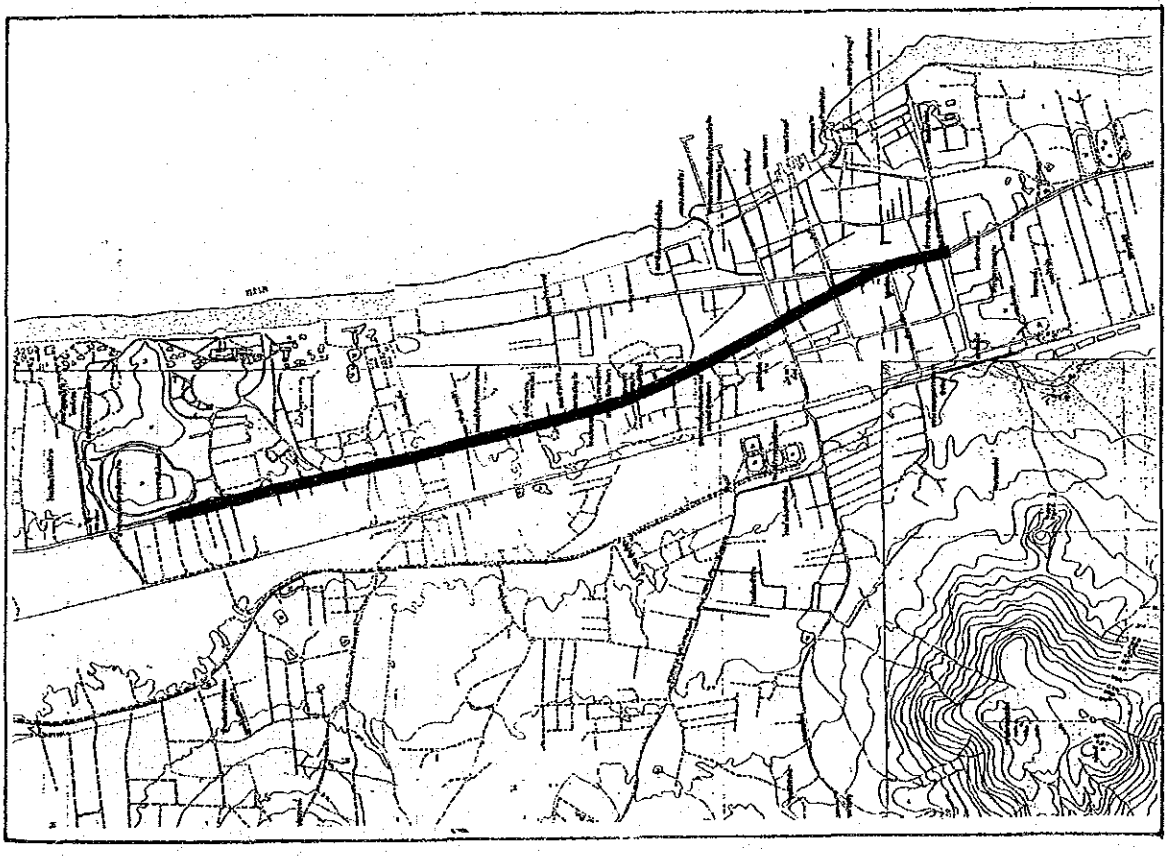


Figure 5.3-1 Location of Phet Kasem Road

Table 5.3-2 Design Traffic Volume for Phet Kasem Road (2006, 2011)

units: pcu, %

	Average Daily Traffic	Peak Hour Traffic
Existing Traffic Volume (two-way), 1991	18,300	1,830*
Diverted Traffic Volume (two-way)		
Diverted volume	40.2**	40.4
Diverted rate	7,400	740
Design Traffic Volume (two-way)		
Annual growth rate	4.2***	
1991	10,900	1,090
2006	20,200	2,020
2011	24,700	2,470

* Peak Hour Rate: 10%
** source: OD Survey by DOH, 1989
*** Based on annual growth rate of GDP (2006: x 1.85, 2011: x 2.27)

The tables also show forecasts for the future traffic volume with target years 2006 and 2011. Based on these data 3 lanes in each direction are recommended

(3) Improvement Plan

The improvements proposed for Phet Kasem Road are illustrated in Figures 5.3-2 and 5.3-3. The first figure present image sketches of the stretches in both Cha-Am and Hua Hin, and Figure 5.3-2 shows changes in the width of the road and landscaping. Appendix A4-1 to A4-7 show other details of the improvements proposed.

1. Road width

Figure 5.3-3 shows the proposed changes in width of Phet Kasem Road for both Cha-Am and Hua Hin sections. The improvements include the construction of a central median, the improvement of crossings and the establishment of sidewalks.

2. Pavement

- road pavement : based on DOH standards.
- side-walk pavement : adoption of colored concrete blocks, suitable for tourism purposes

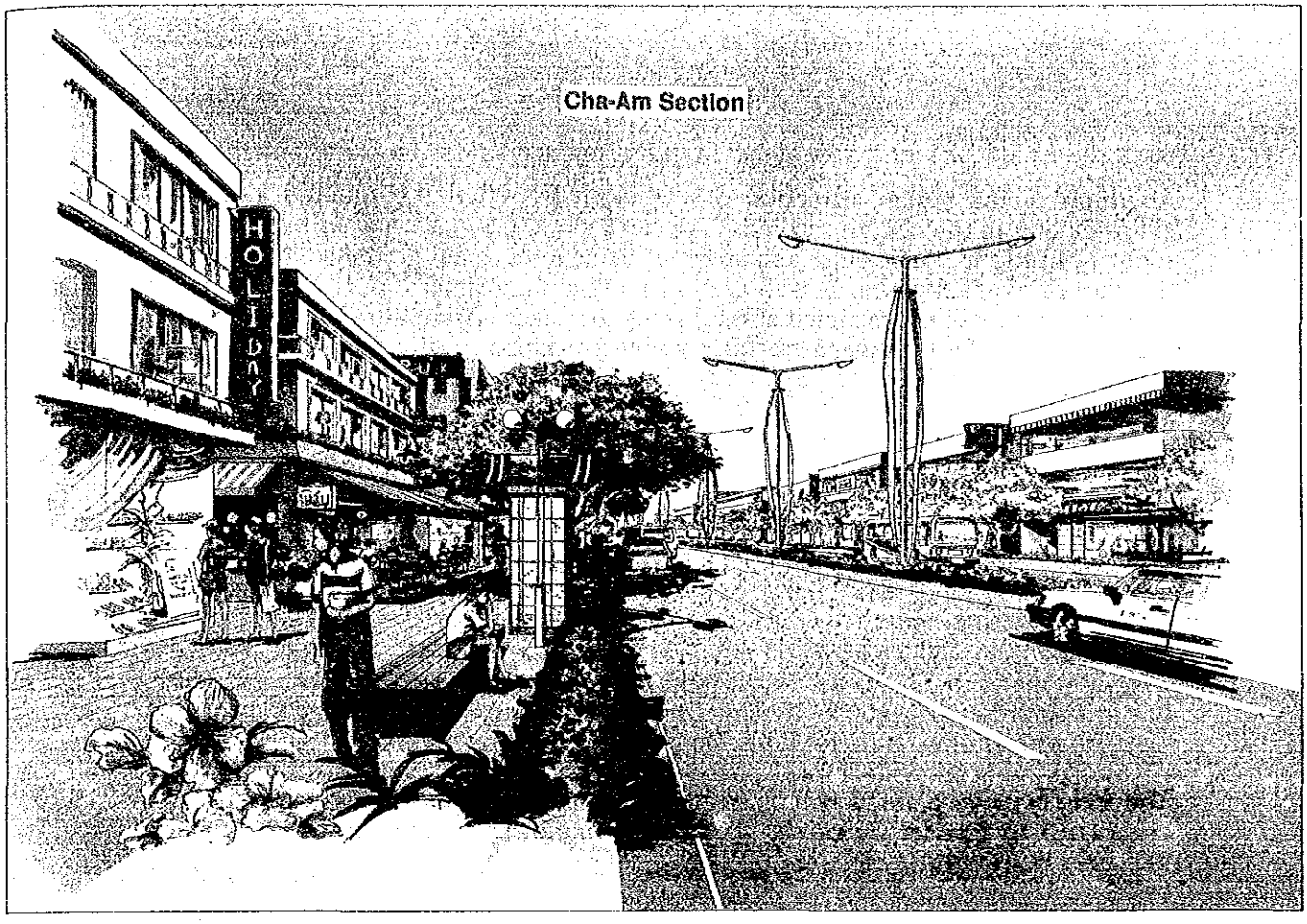
3. Incidentals

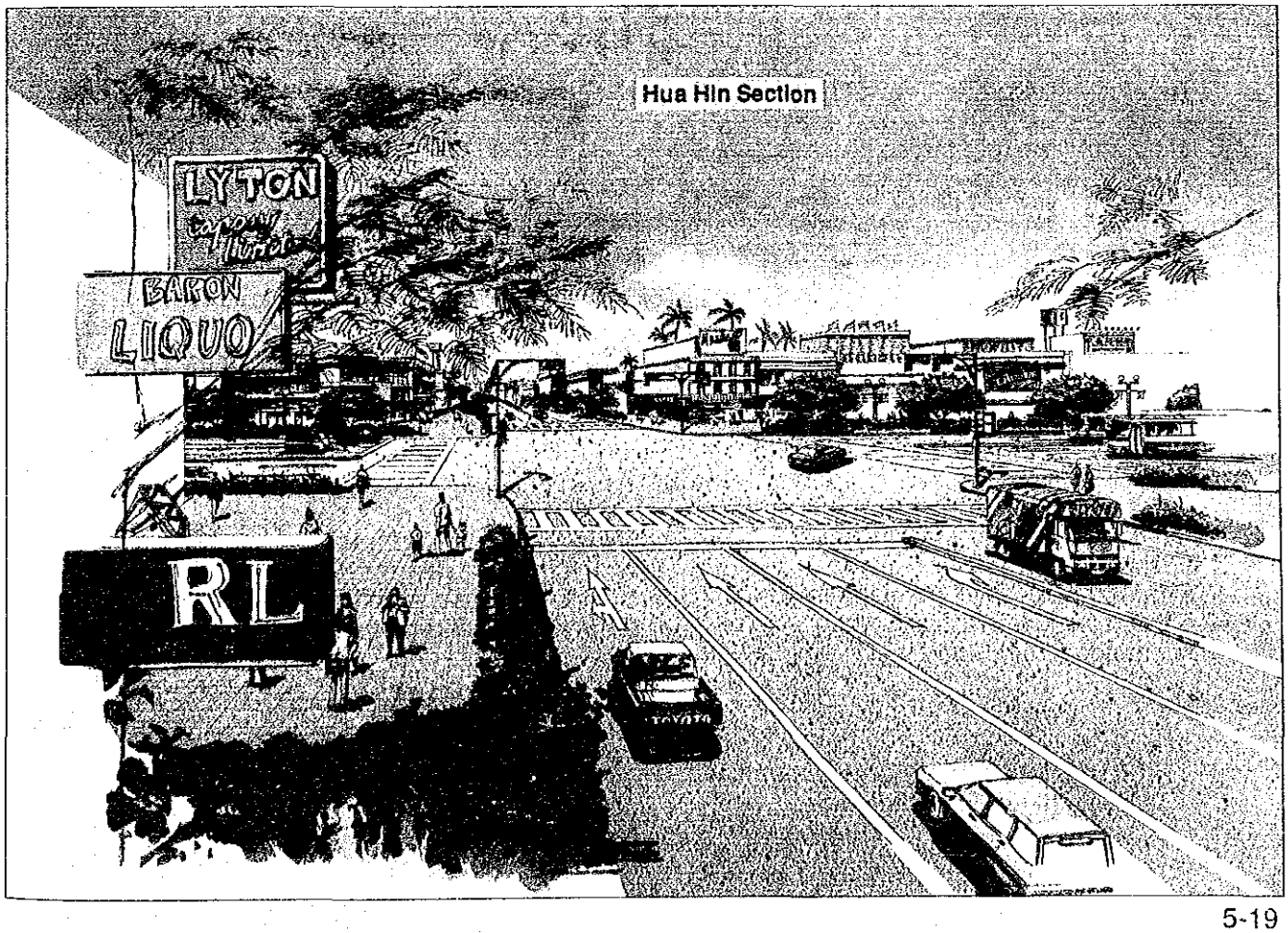
In order to provide continuous lighting along the entire route, 12 m high light fixtures will be installed along the central median, at intervals of 35 m. 3 m high light fixtures at intervals of 10 m will be placed along the sidewalks.

Road markings shall be based on DOH standards, e.g. center line, lane dividing line, pavement edge line, stop line, pedestrian crossing, lane use symbols.

4. Sidewalks

To improve the ease of walking, broad sidewalks will be provided as shown in Figure 5.3-3. Trees and shrubs will be planted to provide shade and protect pedestrians from light showers. Benches and telephone boxes will be provided.


Cha-Am Section
HOLIDAY


Hua Hin Section
LYTON
BARON
LIQUO
RL

5. Tree planting

To improve the visual attraction of the road, trees will be planted along the sidewalk and in the central median. The trees along the sidewalk will separate the footpath from the traffic lanes and provide shade, give visual guidance, buffer noise and absorb exhaust gases, as well as contribute to atmospheric purification. Trees in the central median are aimed at improving the road's visual attraction, enhancing the partition effect between traffic flowing in opposite directions, providing a shield against glare from the headlights of oncoming traffic and giving visual guidance.

The species of trees to be planted will be selected based on the following criteria:

- The trees must have a relatively small rooting range, and
- Trees for the roadside must have a 2 to 3 meters clearance from the ground to the lowest branch.

Based on the above criteria, bougainvillea should be considered as being suitable for the central median. For side-walk trees, flowering trees such as the Flame Tree may be used, and bougainvillea may be used as the shrub.

The trees will be planted within 10 meter intervals, while the shrubs shall form blocks of 1 to 2 meters in length. The shrubs in the central median will be planted to form a bushy hedge.

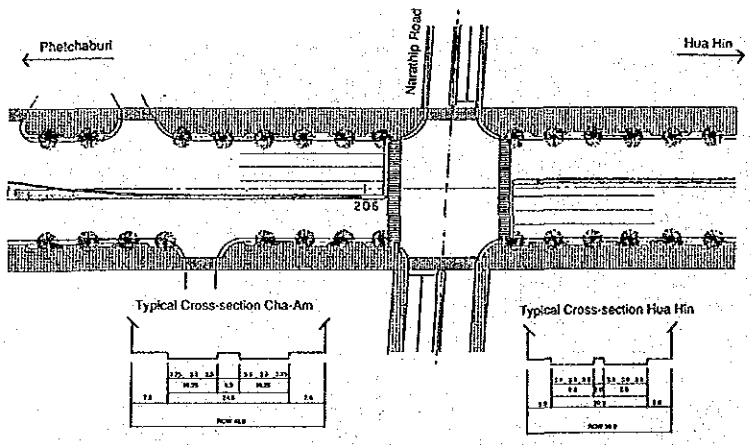


Figure 5.3-3 Improvement Plan of Phet Kasem Road

6. Traffic control signals

Arrangement of traffic control signals (lights) is planned to prevent traffic snarls and accidents at intersections. Traffic control signals are planned to control both motor vehicles and pedestrian transit.

7. Others

Although costly, electric power cables will be laid underground, to enhance the visual attraction of the road.

(4) Cost Estimation and Implementation Plan

Construction cost include material cost, machinery and cost of labor, and are calculated as the product of unit price and quantity for each construction stage. Contingencies calculated separately have been added to the estimation, as well as yearly maintenance cost. The development cost of the project are shown in Table 5.3-3. Improvement is scheduled to be completed in 1994 for the Cha-Am Section and in 1997 for the Hua Hin Section.

Table 5.3-3 Development Cost of Phet Kasem Road Improvement

unit: 1,000 baht

	Cha-Am Section	Hua Hin Section
Earthwork	904	2,033
Surface Course	3,422	7,500
Incidentals	23,690	87,133
Sub-total	28,016	96,666
Contingency	2,802	9,667
Total of Construction Cost	30,818	106,333
Maintenance	1,541	5,317
Design & Supervision	1,541	5,317
Total of Development Cost	33,900	116,967

source: Study Team

5.3.2 Improvement of Circulation Roads in Phetchaburi Province

(1) Objectives and Location

1. Objectives

The purpose of this project is to improve the traffic conditions, safety and comfort of the roads between the Phetchaburi City and Kang Krachan National Park, and in Cha-Am and Hua Hin Clusters to improve the access to major tourism attractions and facilities and provide a circular tour.

2. Location

The roads covering this tour zone are National Highway No. 4 under DOH control (including the old Phet Kasem Road), Highway No. 3179, Highway No. 3301, Highway 3218, and other roads under RID and OARD control. With the exception of Highway No. 4, all these roads are two-way, two lanes and 6 to 7 meters wide. These roads are mainly for local transit, supporting daily traffic activity. In the future, the roads must have the dual function of supporting both local traffic as well as local tourism.

As shown in Figure 5.3-4, the circulation road has a total length of 138 km. The current condition and the improvements required are shown in Figure 5.3-5. The improvements planned in this project cover 20.5 km of the road under RID control and 14.0 km under OARD control.

(2) Designed Traffic Volume

The designed traffic volume considered in this project is based on the number of tourists per year, applied on the CAR OD Table estimated from PCU, and the

traffic assignment. The local traffic based on future growth rate has been incorporated in the estimates.

Figure 5.3-6 shows the traffic demand forecast by road section in year 2011, and the generation/attraction volume of tourists are included in Appendix A4.

(3) Improvement Plan

Improvements required on the above described roads are as follows:

- 20.5 km under RID control : overlay pavement, marking, arrangement of guide signs, and incidentals.
- 14.0 km under OARD control : pavement, marking, arrangement of guide signs, and incidentals

1. Overlay pavement

The current road surface has many craters in the road surface and the road shoulders are broken. An overlay is necessary. The overlay consists of 5 cm of asphalt surface, 3 cm of leveling of asphalt concrete binder course, and the tack coat.

2. Pavement

The road at the Latterite area will have to be paved with asphalt. This will consist of 5 cm of asphalt surface, 20 cm of aggregate base and 15 cm of aggregate sub-base.

3. Marking

The marking will be based on DOH standards. The major markings are: center line, lane lines, pavement edge lines, stop lines, pedestrian crossing and lane use symbols.

4. Road guide signs

Road information and indications are signs showing drivers directions and destinations, and enhancing each tourism location's name. The standard size will be defined based on DOH standards. As the roads considered in this project are in principle two-way two-lane, the signals will be roadside double post type.

5. Arrangement of incidentals

Fences, guardrails and lighting will be placed at crossing points and major danger points.

(4) Cost Estimation and Implementation Plan

The construction costs of this project are shown in Table 5.3-4. For the cost estimation the same method was used as for the Phet Kasem Road Improvement Project. The project is scheduled to be completed in 1995.

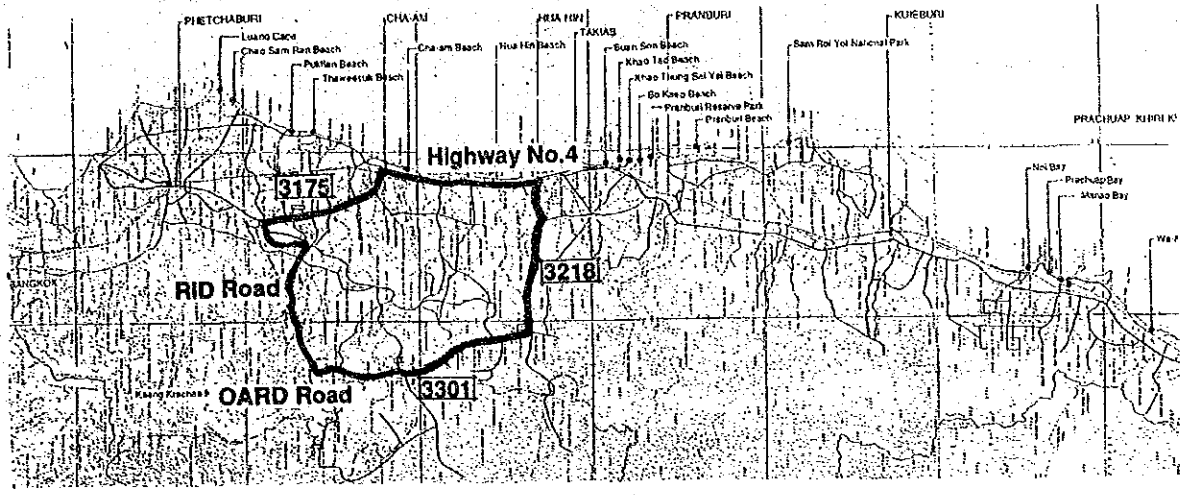


Figure 5.3-4 Location of the Circulation Roads in Phetchaburi Province

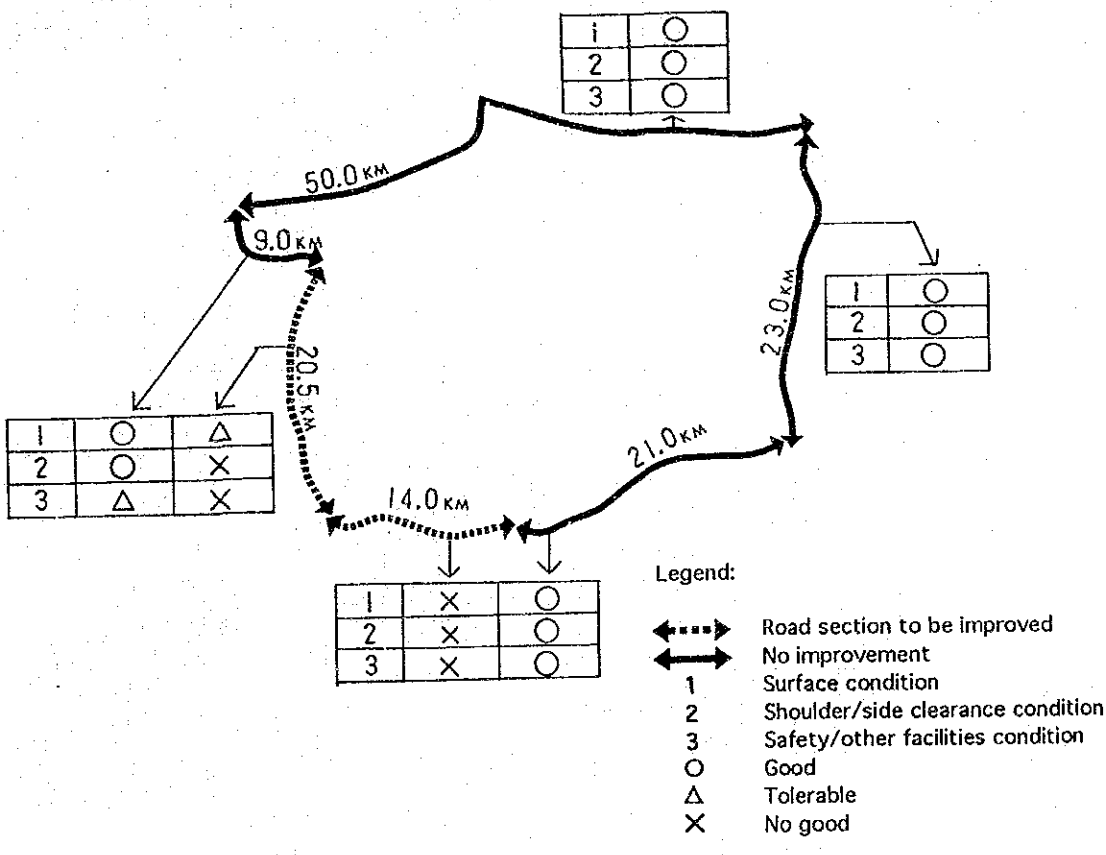


Figure 5.3-5 Existing Road Condition and Improvement Plan of the Circulation Roads in Phetchaburi Province

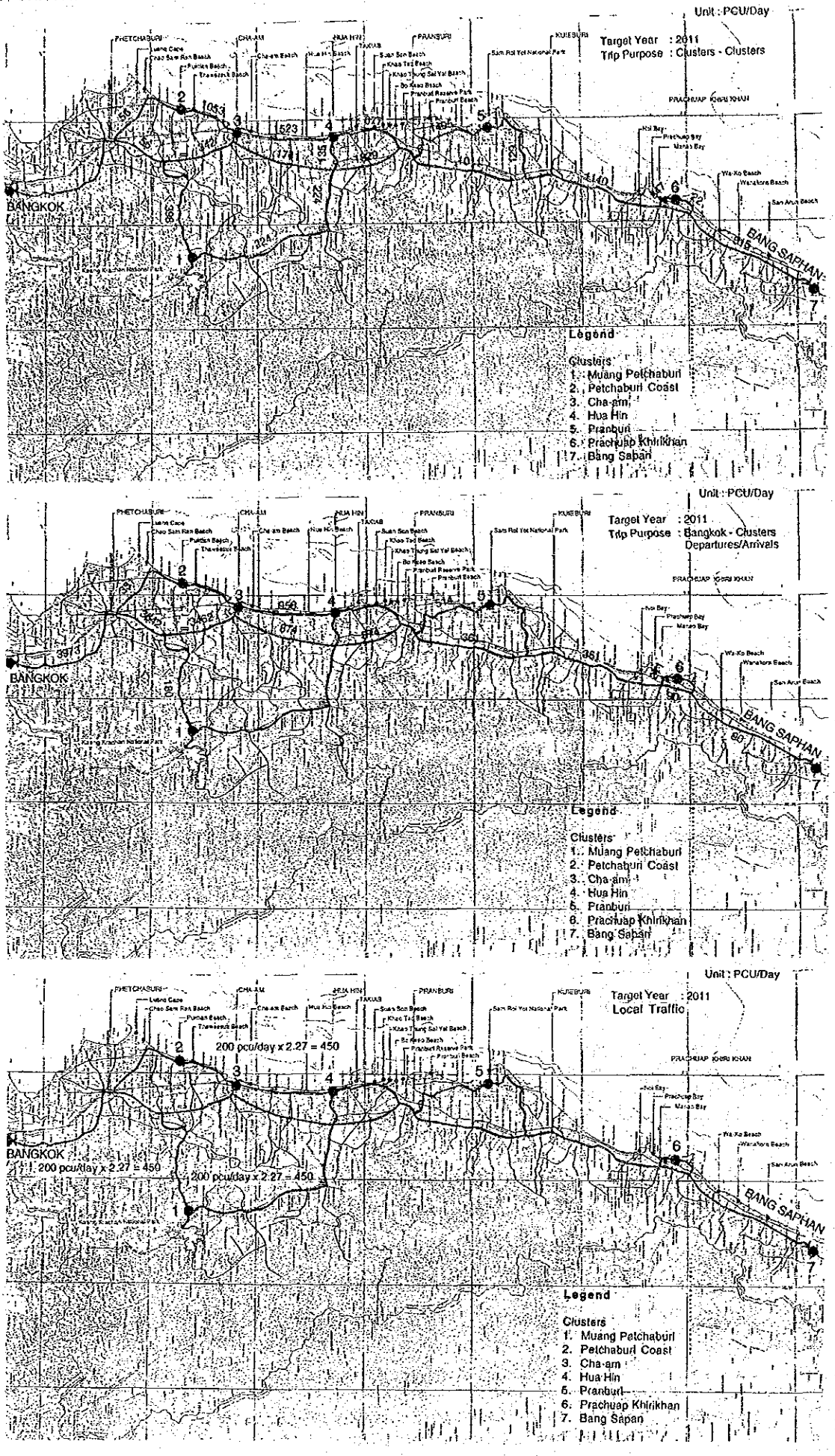


Figure 5.3-6 Traffic Demand Forecast by Section

Table 5.3-4 Development Cost of Phetchaburi Circulation Road Improvement

unit: 1,000 baht

	RID Road 20.5 km overlay	OARD Road 14 km pavement
Sub-base Course		11,424
Surface Course	28,290	11,480
Incidentals	3,901	2,408
Sub-total	32,191	25,312
Contingency	3,219	2,531
Total of Construction Cost	35,410	27,843
Maintenance	1,771	1,392
Design & Supervision	1,771	1,392
Total of Development Cost	38,952	30,627

source: Study Team

5.3.3 Improvement of Phetchaburi Coastal Road

(1) Objectives and Location

The purpose of this project is to provide a safe and comfortable access road for tourists visiting the Cha-Am and Hua Hin area, and coming from Phetchaburi and crossing the Phetchaburi coastal area.

The road referred to above is a 6 m. wide two-way two-lane road under RID control and stretches for 32.6 km along the coast north of Cha-Am. This road is mainly used by local residents for daily traffic activity. In the future, this road will have to cover both local transit as well as the transportation of tourists. The location of the road is shown in Figure 5.3-7 and Figures 5.3-8 illustrates its current condition.

(2) Designed Traffic Volume

The formulation of designed traffic volume was estimated as well as the method of circulation road project. The traffic forecast by road section shows in above-mentioned Figure 5.3-6.

(3) Improvement Plan

Improvement required on the above described roads are overlay pavement, marking, arrangement of guide signs and incidentals.

1. Overlay pavement

The current road surface has many craters in the road surface and the road shoulders are broken. An overlay consisting of 5 cm of asphalt surface, 3 cm of leveling of asphalt concrete binder course, and the tack coat is required.

2. Marking

The marking will be based on DOH standards. The major markings are: center line, lane lines, pavement edge lines, stop lines, pedestrian crossing and lane use symbols.

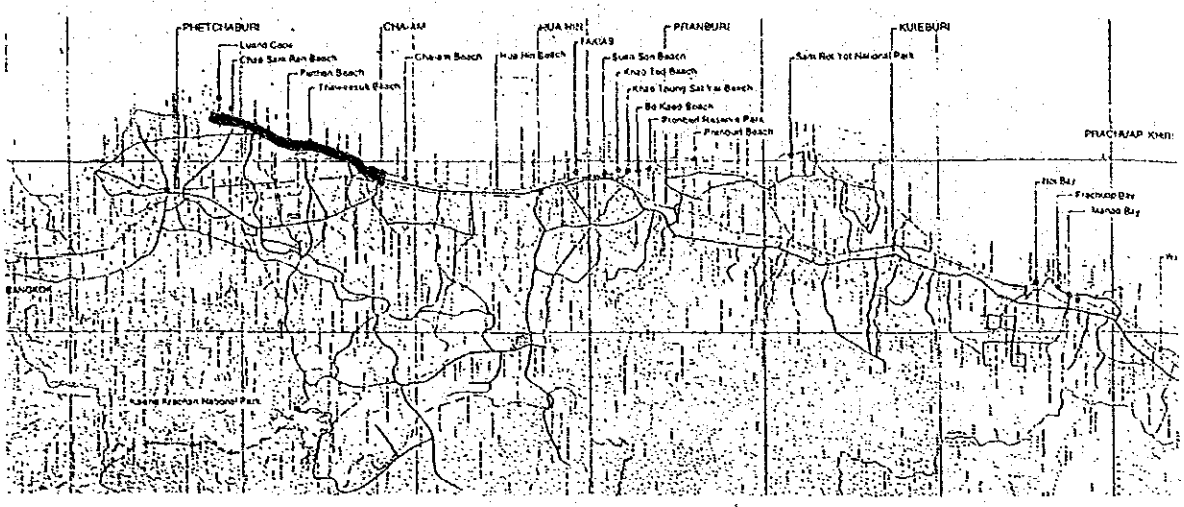


Figure 5.3-7 Location of Phetchaburi Coastal Road

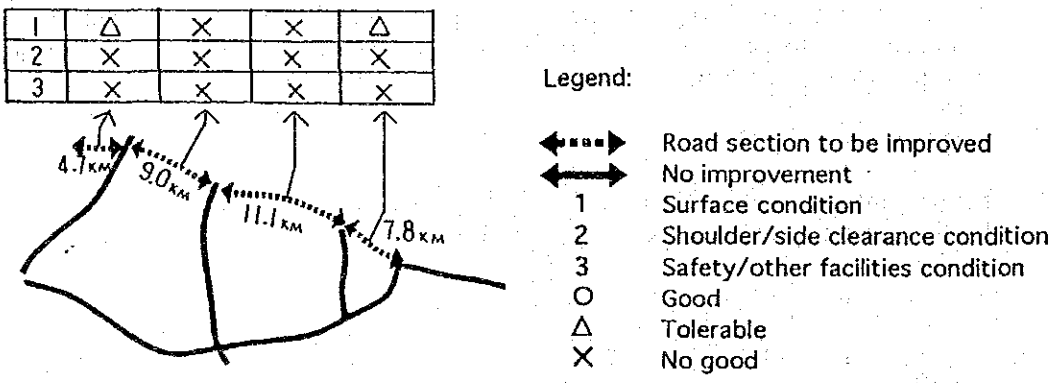


Figure 5.3-10 Existing Road Condition and Improvement Plan of Phetchaburi Coastal Road

3. Road Guide Signs

Road information and indications are signs showing drivers directions and destinations, and enhancing each tourism location's name. The standard size will be defined based on DOH standards. As the roads considered in this project are in principle two-way two-lane road, the signals will be roadside double post type.

4. Arrangement of incidentals

Fences, guardrails and lighting will be placed at crossing points and major danger points.

(4) Cost estimation and Implementation Plan

The construction costs of this project are shown in Table 5.3-5. For the cost estimation the same method was used as for the Phet Kasem Road Improvement Project. The project is scheduled to be completed in 1995.

Table 5.3-5 Development Cost of Phetchaburi Coastal Road Improvement

unit: 1,000 baht

	Phetchaburi Coastal Road
Surface Course	44,988
Incidentals	6,277
Sub-total	51,265
Contingency	5,127
Total of Construction Cost	56,392
Maintenance	2,820
Design & Supervision	2,820
Total of Development Cost	62,032

source: Study Team

5.3.4 Economic Feasibility of the Projects

Selected priority projects are as follows:

1. Phet Kasem Road Improvement
2. Improvement of Circulation Roads in Phetchaburi Province
3. Improvement of Phetchaburi Coastal Road

Project number 1 is to construct safety zones, improve pedestrian walks, and organize crossroads in hopes of enhancing the quality as a sightseeing spot and create an attractive town which induces tourists to walk. Although the project may be taken as one of tourist resources development plans, it aims at creating an "urban prosperity" unlike other natural and cultural resources. It is therefore not realistic to expect a flow of tourists from this project alone. However, a good sightseeing spot is rated not only by its tourist attraction but also greatly by the streets leading to it. One of the tourist's delight is to come in contact with the local people, which is made easier by creating safe, comfortable, and nice view streets. A poll conducted in respect to this Project indicated that "landscape" is considered as one of the very important criteria for sightseeing spot assessment by a greater percentage of respondents. This fact also supports the high degree of necessity for street improvement.

Project numbers 2 and no. 3 are plans to pave the roads that lead to sightseeing spots for comfortable driving as well as for vitalization of local economy as these roads are also used daily by the local people. The benefits gained from the improvement of these roads include reduction of vehicle operation cost and reduction of wasted time as the paved roads would shorten the traveling time.

(1) Evaluation Method

As previously explained, it is quite difficult to quantitatively evaluate the effect of project number 1. Thus, the other two projects are subjected to evaluation. The evaluation method used is to assess the economic viability of the projects by cost benefit analysis. Costs used in this evaluation are construction and maintenance costs, while the benefits include those of reduced vehicle operation cost and time wasted. These factors are then evaluated by using the economic internal rate of return. As this evaluation is also associated with a viewpoint of national economy, economic prices are used. A factor to convert road improvement cost to economic price in Thailand are empirically known to be 0.9 (economic price = market price x 0.9), and in our calculation, the estimated expenses was also multiplied by 0.9 to obtain the economic price.

(2) Calculation of Benefits

1) Vehicle Operation Cost (VOC) and Travel Time Cost (TTC)

Based on the result of the Study on the Medium and Long Term Road Plan for Bangkok Metropolitan Area in Thailand conducted in March 1990 by JICA, the VOC and TTC are calculated. However, for TTC, the value derived from the Bangkok metropolitan area cannot directly be used to represent the Study Area because (1) the subject surveyed area has different economic situation from that of the Bangkok area (that is, the average income in the Study Area is about 50 % of that of the Bangkok metropolitan area), and (2) with most trips being expected to be spent on sightseeing, economic values for time spent on sightseeing trips are presumed to be fairly smaller than those for ordinary livelihood trips. Therefore, the TTC value of the Bangkok metropolitan area multiplied by 0.3 is used in this study.

For VOC, values for ordinary paved roads are available. But for unpaved roads, the above value should be multiplied by 1.5. Table 5.3-6 shows set values of VOC and TTC.

Table 5.3-6 Vehicle Operating Cost and Travel Time Cost by Travel Speed

unit: baht/1,000 km

Speed	Vehicle Operating Cost		Travel Time Cost	
(km/h)	1996	2006	1996	2006
20	3,881	3,898	1,643	2,286
25	3,577	3,594	1,314	1,829
30	3,341	3,359	1,095	1,524
35	3,159	3,177	939	1,306
40	3,003	3,021	821	1,143
45	2,877	2,896	730	1,016
50	2,782	2,802	657	914

source: Study Team
note: VOC values are for paved roads.
For unpaved roads, values are multiplied by 1.5.

2) Benefit Estimation

The difference of VOC and TTC when the Project is implemented and when it is not is calculated as a benefit value. Based on field survey results, the benefit value was calculated, assuming that the current travel speed is set at 30 km/h for circulation roads (RID), 20 km/h for circulation roads (OARD)(unpaved), and 20 km/h for coastal roads, while the travel speed in case the Project is implemented was assumed to be all 50 km/h. The results are shown in Table 5.3-7.

Table 5.3-7 Benefit Estimation from Road Improvement Projects

unit: 1,000 baht

	Year 2001			Year 2006		
	Benefit from VOC	Benefit from TTC	Benefit Total	Benefit from VOC	Benefit from TTC	Benefit Total
Circulation Road (RID)	3,737	3,508	7,245	4,526	4,954	9,480
Circulation Road (OARD)	9,592	3,716	13,308	11,888	5,355	17,243
Coastal Road -1	7,836	8,415	16,251	10,078	12,613	22,691
Coastal Road -2	3,095	3,324	6,419	3,951	4,945	8,897

source: Study Team

(3) Evaluation Result

Tables A6-4 and A6-5 of Appendix A6 show cost benefit flows from 1996 to 2011. They show that EIRR for circulation roads and coastal roads are 24.1 % and 27.0 % respectively, confirming that both projects are economically feasible.

Table 5.3-8 shows a sensitive analysis of fluctuations of construction cost or traffic demand. The worst case is when the traffic demand for circulation roads are decreased by 20 %, dropping EIRR to 18.3 %, down 5.8 % form the basic case. However, the evaluation of the basic case shows far better results, sufficient to bear that much drop. Therefore, economic independence of the Projects are considered stable even in the face of these potential fluctuations.

Table 5.3-8 Result of Sensitive Analysis

unit: %

		Circulation Roads	Coastal Road
Base Case		24.1	27.0
Cost up	+ 10 %	21.5	24.4
Cost up	+ 20%	19.3	22.2
Demand down	- 10 %	21.3	24.2
Demand down	- 20 %	18.3	21.2

source: Study Team

5.4 Water Supply Development Projects

5.4.1 Cha-Am Water Supply Development

(1) Purpose of the Project

The present water supply capacity of the waterworks in Cha-Am is 12,000 cum/day, but on completion of the on-going expansion project of the municipality, the capacity will increase to 24,000 cum/day, sufficient to meet the growing demand until 2006.

However, the water distribution network does not cover the prospective development sites of hotels, condominiums, etc. In this context the project aims to expand the existing distribution network.

(2) Improvement Plan

In addition to ongoing improvements of the municipal water supply distribution system the project includes rooping and replacement of distribution pipes, construction of distribution facilities, boosting of the distribution pressure, water leakage protection, etc. The distribution pipes required for the system are described in Table 5.4-1 and Figure 5.4-1 shows the proposed plan for expansion and improvement of the water distribution network in Cha-Am.

Table 5.4-1 Proposed Water Distribution Pipelines for Cha-Am

units: mm, km

Size (mm)	Length (km)	Pipe Material
D 200	8.4	SP
D 150	2.7	PVC
D 100	1.2	PVC

source: Study Team

(3) Cost Estimation and Implementation Plan

An estimation of the development cost of the project is shown in Table 5.4-2. The project shall be implemented by Cha-Am Municipality and is scheduled to be completed by 1996.

Table 5.4-2 Development Cost of Cha-Am Municipal Water Supply Development

unit: 1,000 baht

	Cost Cha-Am Water Supply Development
Installation of Water Distribution Pipes	13,794
Detail Design for Expansion/Improvement of Water Distribution Network	1,500
Total Development Cost	15,294

source: Study Team

5.4.2 Hua Hin Water Supply Development

(1) Purpose of the Project

The present water supply capacity of the waterworks in Hua Hin is 12,480 cum/day, but on completion of the on-going expansion project of the municipality, the capacity will increase to 24,480 cum/day, sufficient to meet the growing demand until 2006.

However, the water distribution network does not cover the prospective development sites of hotels, condominiums, etc. In this context the project aims to expand the existing distribution network to improve water distribution to the southern part of the service area, e.g. Khao Thao area.

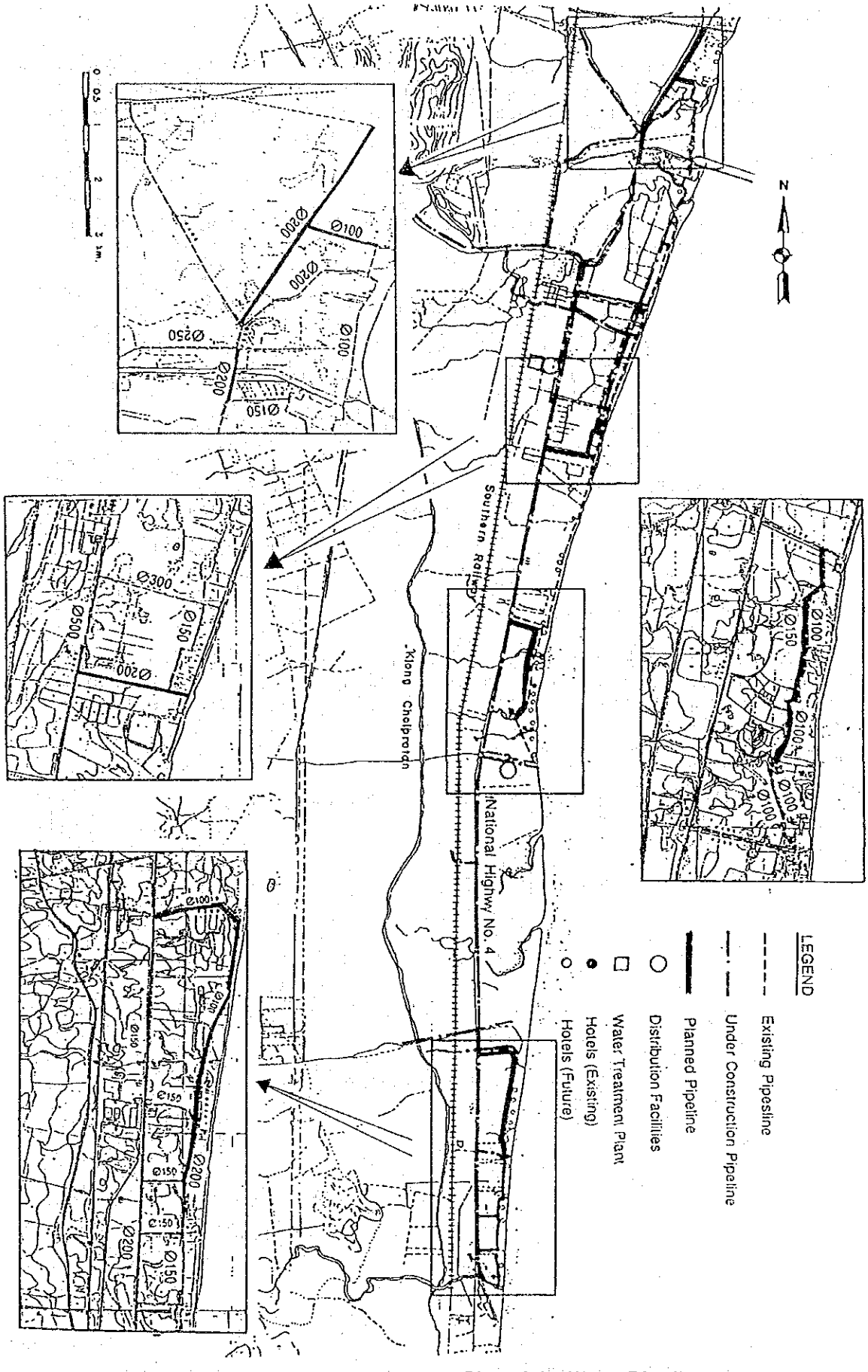


Figure 5.4-1 Expansion and Improvement Plan of the Water Distribution Network of Cha-Am

(2) Improvement Plan

In addition to ongoing improvements of the municipal water supply distribution system the project includes rooping and replacement of distribution pipes, construction of distribution facilities, boosting of the distribution pressure, water leakage protection, etc. The required facilities are summarized in Table 5.4-3 and illustrated in Figure 5.4-2.

Table 5.4-3 Proposed Water Distribution Pipelines, Elevated Tank and Booster Pump for Hua Hin

Size (mm)	Length (km)	Pipe Material
D 250	4.6	SP
D 200	4.6	SP
D 150	5.6	PVC

Elevated Tank at Khao Thao		
Storage Capacity	:	50 cu.m.
Structure	:	Reinforced Concrete
In line Booster Pumps for Elevated Tank		
Capacity	:	2.5 m^3/min x H25 m x 15 kw
Type	:	In-line Submersible Motor Pump
Quantity	:	2 units

source: Study Team

(3) Cost Estimation and Implementation Plan

An estimation of the development cost of the project is shown in Table 5.4-4. The project shall be implemented by Cha-Am Municipality and is scheduled to be completed by 1996. The Project Shall be carried out by the municipality and be completed by 1996.

Table 5.4-4 Development Cost of Hua Hin Municipal Water Supply Development

unit: 1,000 baht

Hua Hin Water Supply Development	Cost
Installation of Water Distribution Pipes	18,584
Construction of Elevated Tank and Installation of In-line Booster Pump	3,100
Total Construction Cost	21,684
Detail Design for Expansion/Improvement of Water Distribution Network	2,000
Total Development Cost	23,684

source: Study Team

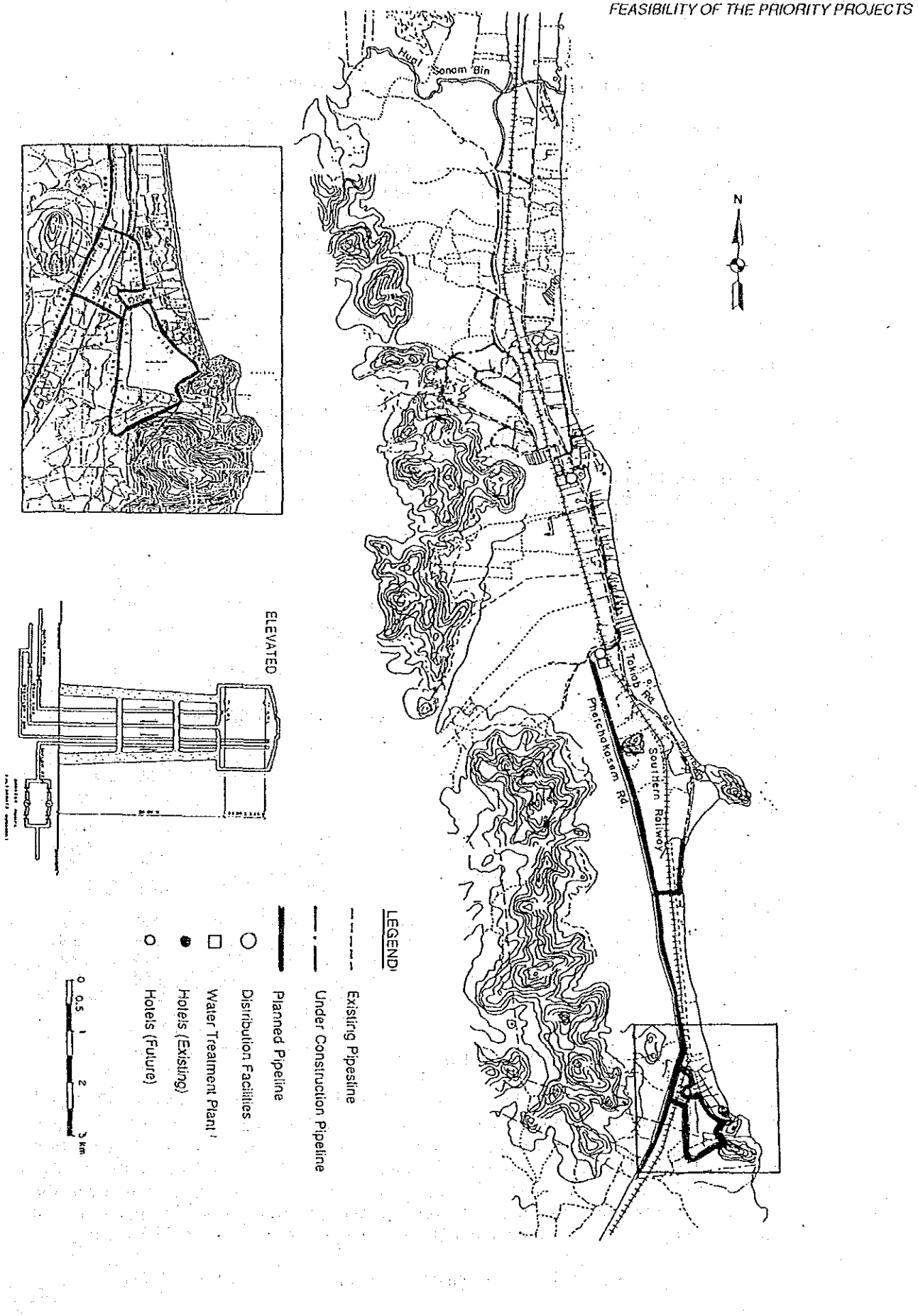


Figure 5.4-2 *Expansion and Improvement Plan of the Water Distribution Network of Hua Hin*

5.4.2 Financial Feasibility of the Water Supply Development Projects

(1) Evaluation Method

The selected priority project is the plan to improve water supply networks in cities of Cha-Am and Hua Hin including expansion of water supply coverage in the subject area and availability of a sufficient volume of water at sufficient water pressure. The record of annual expenses (project construction cost and maintenance cost) and revenue (water charges) were used to calculate internal economic rate of return for evaluation of the Project's appropriateness.

(2) Drinking Water Demand and Water Charges

1) Drinking Water Demand

The aim of the subject project is to supply water to hotels and condominiums to be constructed in the subject area, and the maximum drinking water demand required by the Project is set at 20 % of water to be consumed by hotels. Table 5.4-3 illustrates drinking water demand for hotels in the subject area. Drinking water demand may be obtained by multiplying the future number of rooms by usage per room as shown below:

Water demand per room

High class hotel	:	1.5 m^3/day/room
Middle class hotel	:	1.3 m^3/day/room
Low class hotel	:	1.1 m^3/day/room

Table 5.4-5 Water Demand Prediction for Hotels (1996, 2001,2006)

units: number, cum/day

	Required Number of Rooms				Water Demand (cum/day)			
	High	Middle	Low	Total	High	Middle	Low	Total
Cha-Am								
1991	1,657	354	901	2,912	2,486	460	991	3,937
1996	2,126	1,000	953	4,080	3,189	1,300	1,048	5,537
2001	2,661	1,448	1,120	5,229	3,992	1,882	1,232	7,106
2006	3,276	1,966	1,310	6,552	4,914	2,556	1,441	8,911
Hua Hin								
1991	664	104	542	1,310	996	135	596	1,727
1996	1,063	398	516	1,977	1,595	517	568	2,680
2001	1,406	593	581	2,580	2,109	771	639	3,519
2006	1,802	819	655	3,276	2,703	1,065	721	4,488

source: Study Team

2) Revenue from Water Charges

Average water charge collected by PWA is 7 baht/m^3. It will be raised to 9 baht/m^3 starting next year with the approval of the Cabinet. In our estimation, the yearly water charge is set based on the assumption that a 20 % hike is added every five years. Then, the water demands obtained (see Drinking Water Demand) are multiplied by this unit price to calculate revenue from water charges. However, the water demands are maximum per day, so the following coefficients must be multiplied by the water demands to obtain the daily average (see table 5.4-6).

Table 5.4-6 shows a prediction of water charges for 1996, 2001 and 2006.

Table 5.4-6 Estimation of Water Charges (1996,2001,2006)

units: consumption: liter/capita/day
cost: 1,000 baht/year

	Conversion from daily maximum to daily average demand			Estimated Water Charges	
	a = average water consumption	b = maximum water consumption	a/b	Cha-Am	Hua Hin
1991	150	270	0.556		
1996	175	290	0.603	10,977	5,312
2001	200	310	0.645	18,407	9,115
2006	210	330	0.636	26,907	13,552

source: Study Team

(3) Evaluation Result

Table A6-6 of Appendix 6 shows the cash flow of each Project. FIRR for the Cha-Am water supply network improvement and Hua Hin water supply network improvement is 14.2 % and -3.8 % respectively. Although water supply improvement, which is a public works by nature, may obtain low interest rate loans from international institutes, the evaluation of the Hua Hin water supply network improvement work does not show a good result. However, if the two works are regarded as one, FIRR becomes 5.4 %, which can support their financial viability.

Up until today Cha-Am and Hua Hin have had their own plans of sightseeing resources development, but they have to be integrally developed as a major tourist center in the western district of Thailand in the future. That is when the growth in tourist trade as envisaged in the master plan can be realized for the first time. Thus, the water supply network improvement works for Cha-Am and Hua Hin must be taken as one Project.

5.5 Cha-Am Sewerage System Development Project

5.5.1 Description of the Project

(1) Purpose of the Project

The existing drainage system is designed as a stormwater drainage system. However, sewers are connected to the drains as a result of which sludge deposits are left in the pipes and untreated sewage is discharged to the sea. The project aims to protect the coastal environment by developing a proper sewerage system in Cha-Am Municipality.

(2) Improvement Plan

The project includes the installation of combined sewers and the construction of a sewage treatment plant on a 9 ha site close to Khlong Tian north of Takad Phlee. The capacity op the plant, which uses the aerated lagoon treatment process, will be 11,000 cum/day. Details of the project are summarized below and the layout plant of the sewerage facilities for Cha-Am Municipality is shown in Figures 5.5-1 and 5 5-2

Project Components:

1) Expansion of Combined Sewers

System Capacity : Peak Flow 0.166 cum/sec
Wet-weather Flow 0.497 cum/sec